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Improving student achievement through professional cultures of teaching in Flanders

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Abstract

Student performance in general subjects such as language and mathematical skills is poor in secondary vocational education. A professional culture of teaching—including recruitment of well qualified teachers, effective teacher collaboration and effective teaching practice—could be the key to success. To what extent is there a professional culture of teaching in vocational education? Do differences in the professional culture of teaching affect student achievement? National achievement tests on functional language skills, mathematical skills and information processing were administered to third grade students ($N = 3,381$) in 116 secondary schools offering vocational education across Flanders. Their teachers ($N = 184$) completed an online questionnaire about their collaboration and teaching practice. We found evidence that teacher collaboration and effective teaching practices are strongly correlated. Positive correlations were found between combinations of characteristics of a professional culture of teaching and student achievement. However, in many schools a professional culture of teaching is not yet a reality. Our findings demonstrate a need for continually providing support within a professional culture of teaching to prevent teachers from leaving. Improving professional growth for teachers and their teaching teams is also needed, as well as a shift in education policies to support these needs.

1 | INTRODUCTION

In many countries, students in secondary vocational education perform poorly when it comes to general subjects. About 40% of vocational students do not achieve minimum standards for reading skills, and even less for mathematical skills, that are required to participate fully in modern society (OECD, 2013). Especially for those students whose family and academic backgrounds, and particularly their socioeconomic status (SES), have placed them at a disadvantage, the statistics display cause for serious concern (OECD, 2016; Smyth & Fasoli, 2007). Most students in vocational education are from low socioeconomic backgrounds. These students tend to receive limited academic support at home and are therefore particularly dependent on the support they can get at school (Johnson et al., 2012; Palardy & Rumberger, 2008). At the same time, an OECD report focussing on equity in education (2013) indicated that in most countries participating in the Programme for International Student Assessment (PISA), the learning environment at school offers a lower quality of learning experiences for students from lower socioeconomic backgrounds compared to more privileged students. These inequalities in learning opportunities are strongly related to differences in student achievement (Minor et al., 2015; Vanneman et al., 2009).

Competent teachers within a supportive teaching context are able to provide high-quality teaching and improve the learning achievements of a wide range of students (Darling-Hammond, 2012; McLaughlin & Talbert, 2006). The quality of individual teachers is important, but the organisational context and culture in which teachers work sets constraints and limits opportunities when it comes to teachers teaching as effectively as possible.

Providing a learning environment that prioritises and supports teaching contributes to improved student achievement (Johnson et al., 2012; Papay & Kraft, 2017). Samuelsson and Lindblad (2015) compared teaching cultures in schools in Finland and Sweden and examined how these relate to school achievement as measured in PISA. Based on their findings, they argue that better student outcomes are achieved in cultures of teaching that value decision-making and control on the part of the professionals (i.e., teachers) and prioritise authority based on the quality of professional education and experience. Such a *professional culture of teaching*, as described by Samuelsson and Lindblad (2015), refers to the length of teacher education (external to context of teaching), as well as teacher's participation in decision-making at school and using colleagues' knowledge and one's own concepts of how work should be done as sources of information for continuous professionalisation as a teacher (in the context of teaching). However, they re-analysed data from a survey constructed for another purpose and acknowledge as a limitation of their study that the investigated variables were not originally produced to cover the cultures of teaching presented in the theoretical framework (Samuelsson & Lindblad, 2015). We built on their idea of a professional culture of teaching and extended the number of variables with external features by considering the teaching degree, certification and experience, and features of the teaching context, by including effective teaching practice and collaboration with colleagues. We examined whether or not a professional culture of teaching—including *recruitment of well-qualified teachers, effective teacher collaboration* and *effective teaching practices*—could be a key to success in terms of student achievement in vocational education.

2 | TEACHER QUALIFICATIONS

Teacher qualifications can consist of a teaching degree that includes certification or a degree plus certification. Qualifications often prepare teachers for teaching a specific subject, implying also that the degree holder has experience in teaching that subject. Research on the relationship between teacher qualification and student achievement is not univocal (Palardy & Rumberger, 2008; Wayne & Young, 2003). Some researchers suggest that teacher certification is the strongest predictor of student achievement in mathematics and reading, followed by teacher experience (Betts et al., 2000). Minor et al. (2015) found that teacher certification and possessing a suitable degree were significant predictors of student achievement, but experience was not. Most studies, however, indicate experience as having a positive significant correlation with student achievement (Wayne & Young, 2003).

Teacher's level of education (e.g., holding a Master's degree) also sometimes shows a small but significant effect on student achievement (Betts et al., 2000). In general, little consistent evidence has been found that teacher qualifications directly affect student learning, but it could affect student learning indirectly through effective teaching practices (Palardy & Rumberger, 2008). Low socioeconomic status (SES) students tend to be served by less well-qualified teachers (Darling-Hammond, 2004; Minor et al., 2015; OECD, 2016) as the best qualified teachers tend to leave low-SES schools (Muijs et al., 2004).

3 | TEACHER COLLABORATION

Teachers predominantly work from their individual classroom-based perspectives, based on the day-to-day practicalities of teaching. In a professional teaching culture the teacher role is expanded. Establishing effective teaching practices is a collective as well as an individual responsibility (Lynch et al., 2014). This entails teachers working from the same set of principles and operating collaboratively for taking responsibility for planning the curriculum and instruction, for ensuring that their teaching is effective, for monitoring student learning and development and for stimulating each other's professional learning (Plinter et al., 2011). In several studies a positive relationship between teacher collaboration, teacher retention and student achievement was found (Goddard et al., 2010). As Hattie (2015) argues, the within-school variability of the impact of teachers on their students' learning is high and such variability should and can be overcome through collaboration.

Kardos (2005) explored new teachers' experiences of professional cultures and found that new teachers in low-SES schools experience less interaction with colleagues, state that their needs as beginners are less recognised and experience less collective responsibility for student learning than new teachers in high-SES schools. In the context of low-SES school populations, teacher collaboration is under-researched although it could be expected that establishing collaborative teacher teams is even more challenging in these schools, given the high rates of teacher turnover in low-SES schools.

4 | EFFECTIVE TEACHING PRACTICE

The research literature is rich in evidence on the effectiveness of well-delineated teaching strategies such as setting goals, giving feedback and using formative assessment for enhancing student performance (Hattie, 2009; Palardy & Rumberger, 2008). However, a reductionist approach which focuses on the effects of single strategies—although valuable—does not do full justice to the complexity of teaching. The everyday lesson in the classroom consists of a combination of strategies and interpersonal interactions within an environment conducive to learning, support and collaboration. The concept of a *powerful learning environment* (PLE) refers to a combination of student and learning-centred strategies, that have been shown to be effective for student learning. The relatively few schools that manage to combine a high number of disadvantaged students and high achievement, show strong evidence that a solution lies particularly in student- and learning-centred learning environments (Smyth & Fasoli, 2007; Walsh & Black, 2009).

The concepts used in this study as measures for *effective teaching practice* drew on the PLE concept. A PLE emphasises the integration of domain-specific knowledge and cognitive and emotional self-regulation skills for tackling problems and handling situations in everyday life, and is based on a constructivist epistemology (De Corte, 1990). The Model for Powerful Learning Environments in Vocational Education (PoLEVE) overviews these characteristics (Placklé et al., 2020).

The student is at centre of this model that focuses on teaching and learning. The surrounding characteristics refer to the type of learning tasks, key competences aimed for, and support provided in a PLE. Learning tasks in a PLE are authentic and challenging: they connect to students' lives (Rumberger, 2012), allow time for exploration,

and challenge students to think and reflect (Smyth & Fasoli, 2007). Key competences for self-regulated learning, collaborative learning and problem solving characterise the approach to teaching and learning (De Corte, 2003; Könings et al., 2005).

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 & Reagin, 2013). Nelson (1999) explicitly stipulated the importance of *collaborative problem solving*. Adaptive learning support is necessary to meet the needs of the heterogeneous student population in vocational education. The learning environment needs to be supportive and varied. This also implies evaluation for learning throughout the learning process (Brown, 2004; Tomlinson, 1999). Winters et al. (2012) emphasised that the most suitable coaching conversation must be dialogical, which implies that it stimulates and supports students to reflect on their own learning. A positive and safe learning culture is seen as a prerequisite for learning (Hattie, 2009; Placklé et al., 2014; Rubin, 2006). The various characteristics both together and in interaction with each other, aim to improve and expand the learning of each individual student (Placklé et al., 2014, 2020).

It is apparent that earlier studies, as mentioned above, focus on distinct components of a professional culture of practice, that is, teacher quality, teacher collaboration and teaching practices, and their relation to student achievement. In the current study, we combine the components and investigate how the *external features* of professional cultures of teaching—relevant teacher qualifications including degrees, certification and experience—and *teaching context features*, including teacher collaboration and effective teaching practices, are related to each other, and how they impact student achievement as measured in national assessment tests of functional language skills (reading and listening), mathematical skills, information gathering and processing skills, at the end of secondary vocational education.

The study on which this article reports sought to answer the following research questions:

RQ 1. To what degree are the components of teaching qualifications, teacher collaboration and effective teaching practices *interrelated*?

RQ 2. To what degree do teaching qualifications, teacher collaboration and effective teaching practices, relate to student *achievement* in terms of functional language skills, functional mathematical skills and information processing skills at the end of secondary vocational education?

RQ 3. To what degree does a *professional culture of teaching*, which combines teaching qualifications, teacher collaboration and effective teaching practices, relate to student *achievement* in terms of functional language skills, functional mathematical skills and information gathering and processing skills?

5 | METHOD

5.1 | Setting

The study took place within the context of a national assessment of students' functional language skills, functional mathematical skills and information gathering and processing. In Flanders these subject-related skills are taught in vocational secondary education in a course called Project General Subjects (PGS), a broad-based curriculum design for generic knowledge and skills. PGS teachers are encouraged to integrate content that logically fits together in real-life social and vocational contexts, and to develop social resilience and social responsibility alongside the development of functional skills.

5.2 | Participants

Data from a national assessment were collected in 2013 on 3,381 students in the last year of vocational secondary education (mean age = 18.7 years; 1,844 boys and 1,291 girls) and their PGS teachers ($N = 184$) in a representative sample of 384 classes from 124 school campuses in Flanders. Classes within the schools were randomly chosen. A majority of the students had a low SES-background (56%).

5.3 | Instruments

5.3.1 | Teacher survey

The online survey for teachers included measures of the external features of a professional culture of teaching including teaching qualifications (degree, certification and years of experience in education), as well as features specific to the teaching context (teacher collaboration and effective teaching practices).

5.3.2 | Teacher qualifications

Information on teachers' education levels, certification and years of experience was collected. [Table 1](#) provides an overview of the scales used to measure teacher collaboration and effective teaching practices. A 5-point Likert scale ranging from "I strongly disagree" (1) to "I strongly agree" (5) was applied. The scale "authentic and challenging" had a range from "never" (1) to "almost every day" (5).

The 'teacher collaboration' items (ten items) originate from the Integration General and Practical Subjects Scale (De Maeyer et al., 2003). The measures of "Effective Teaching Practice" cover characteristics of a PLE and refer to the extent of perceived implementation. The measure for "Authentic and Challenging Learning Tasks" (four items) is based on the scale "project activities" of the Teaching, Learning and Computing Survey (Ravitz et al., 2000). "Self-regulated learning" (five items) was measured using the scale "Supporting Autonomy" of the "Teacher as Social Context" (TASC; Wellborn et al., 1988). The scale "Evaluation for learning and differentiation" (five items) is based on Opdenakker (2003). "Coaching - Structure" (five items), it was measured using the TASC scale "offering structure" (Wellborn et al., 1988).

Principal Component Analysis (PCA) and Cronbach's Alpha were used to test instrument reliability. Based on the PCA for the original questionnaire items, the fit of the seven-factor model revealed the most opportune and acceptable model fit. Cronbach's Alpha was computed to test the internal consistency of the six scales of the instrument. The internal consistencies of the final scales were good for "authentic and challenging", "self-regulated learning", "collaborative problem-solving" and "coaching - structure", while acceptable for "teacher collaborative practice" and "evaluation for learning and differentiation" (see [Table 1](#)).

5.3.3 | National student assessment on project general subjects

We used the dataset of the national assessment of the Project General Subjects (PGS) in Belgium. The purpose of the national assessment of PGS is to measure the quality of education at the system level: the extent to which students achieve the curriculum objectives and the influence of student, family, teacher and school characteristics on achievement (De Smedt et al., 2016). For the construction of the instrument, we refer to Van Nijlen et al. (2013). Students were tested in three domains: (a) functional language skills including listening and reading, (b) functional mathematical skills and (c) functional information gathering and processing.

TABLE 1 Teaching context features of professional cultures of teaching. Scales used to measure teacher collaboration and effective teacher practices

Measures for teaching context features		Scales in original studies		Retained in current study		Sample item "In my teaching practice ..."
	Authors	n items	α	n items	α	
Teacher collaboration						
Collaborative teaching culture	De Maeyer et al. (2003)	10	.77	6	.64	"teachers PGS and practice develop learning activities together"
Teacher Effective Practice						
Learning tasks	Authentic and challenging	4	.75	4	.75	"students make products that will be used by others"
Key competences	Self-regulated learning	10	.79	5	.76	"students get a lot of possibilities to make their own decisions"
	Vandenbergh et al. (2011)					
	Collaborative problem solving	3	.74	3	.74	"I regularly design collaborative learning tasks, were students need each other in order to succeed"
Adaptive learning support	Evaluation for learning & differentiation	6	.72	5	.66	"I observe the learning of students in a more or less systematic way"
	Coaching Structure	6	.77	5	.77	"I make the expectations clear"

To make the assessment results better interpretable, the test scores were re-scaled to a scale with a mean of 50 and a standard deviation of 10. As a result, coefficients could be interpreted as a fraction of a standard deviation and, in this way, as an effect size (Kelley & Preacher, 2012 in Van Nijlen et al., 2013).

5.4 | Procedure

Teachers of selected classes were asked to fill out the online survey. For students, the national assessment of PGS took four hours spread over two days, with a break after each hour. Because of the workload of the total assessment, students were divided at random so that each student completed only two of the four scales. External test assistants supported the teachers in conducting the assessment and made sure that everything went according to plan.

5.5 | Data analysis

Descriptive statistics were used to report the level of professional culture of teaching in vocational education. We opted for an aggregation of data at the teacher level using median scores. We relied on Pearson's rank correlation coefficients to test if the components of a professional culture of teaching, that is, teachers' qualifications (experience), collaboration and effective practice, are correlated (RQ 1) and whether each of these components are correlated with student achievement (RQ 2). Non-parametric Mann-Whitney U Tests were performed to test relationships between teachers' qualifications (degree and certification) and student achievement (RQ 2). Additionally, we used the *Levene's test* to examine the equality of variances.

To examine whether a *professional culture of teaching* is related to student *achievement* (RQ 3), we first constructed the variable "optimal professional culture of teaching in vocational education" by selecting teachers who fulfilled the following criteria: referring to a relevant teaching qualification (certification specific for PGS and experience >5 years), a positive teacher collaborative teaching culture (>50th percentile), the existence of collaboratively developed learning pathways and effective teaching practices (>50th percentile). We used the Mann-Whitney U test to investigate whether or not student achievement differed between the conditions of an 'optimal' professional culture of teaching and "not optimal" professional culture.

6 | RESULTS

The students' test results for PGS were below standard: only 37.94% of the students in vocational education achieved the final attainment level for functional reading skills; only 38.69% for functional listening skills; and only 39.21% for functional mathematical skills. For functional information processing and gathering, 61.89% of the students achieved the final attainment level. In the next sections the relationship between student results and a professional culture of teaching will be reported.

6.1 | Professional culture of teaching in Flanders

6.1.1 | External features

First, we describe the external features of teaching qualifications in terms of teaching degree, certification and experience.

Teaching degree

More than half of the participants had a professional Bachelor's degree in secondary education ($n = 102$). One third of the teachers had a Master's degree ($n = 60$). Almost 12% of teachers had another study background, for example a Bachelor's degree in social work ($n = 22$).

Teacher certification

A specific certification for PGS is only offered as part of the professional Bachelor programme in secondary education. Within this group, one-fifth of the teachers had a certification in PGS ($n = 21$). Among both Bachelor's and Master's degree holders, the most common study backgrounds was languages (Dutch, English) and history. Twenty-six participants had a certification that was not in any way related to the contents of PGS. Almost all of the Master's degree holders (97%) had a certificate of teacher education in addition to their Master's degree.

Experience

Although the mean experience of PGS teachers ($N = 184$) in education was more than eleven years ($M = 11.26$, $SD = 9.19$) and seven years in vocational education or PGS ($M = 6.95$, $SD = 6.01$), the experience of most teachers in vocational education is limited: 26% of the teachers had two or less years of experience in vocational education; more than 54% were new teachers (≤ 5 years experience in vocational education); 80% of the teachers had less than ten years of experience.

6.1.2 | Teaching context features

Table 2 gives an overview of the means and standard deviations of the standardised scores (ranging from 0 to 1) for internal teaching context features of a professional culture of learning.

Teacher collaboration

For collaborative practice, the average result was moderately positive ($M = .63$, $SD = .15$). However, only one-third of the teachers reported that teacher collaboration led to joint curriculum products such as learning pathways.

Effective teaching practices

Teachers reported that they did not provide authentic and challenging learning tasks for students in vocational education ($M = .26$, $SD = .14$). Self-regulation ($M = .52$, $SD = .16$) and Collaborative Problem Solving ($M = .60$, $SD = .16$), Evaluation for Learning and Differentiation ($M = .54$, $SD = .16$) were reported as being considerably more present in teaching practice. Coaching - Structure ($M = .81$, $SD = .10$) was reported as the most commonly applied practice.

TABLE 2 Descriptives for teaching context features of a professional culture of teaching

Teaching context features	M	SD
Collaborative practice	.63	.15
Effective teaching practices		
Authentic and challenging	.26	.14
Self-regulation	.52	.16
Collaborative problem solving	.60	.16
Evaluation for learning and differentiation	.54	.16
Coaching - structure	.81	.10

6.2 | Relations between components of a professional culture of teaching

An overview of results pertaining to our first research question on the *relations between components of a professional culture of teaching* are shown in Table 3; specifically, an overview of the correlations between the components. Students with a low socio-economic background were taught by teachers with less experience in education in general or in vocational education ($r = .23, p < .01$; $r = .26, p < .01$). Experience in vocational education correlates with coaching students ($r = .12, p = .03$). The scale “collaborative practice” is positively correlated with almost every scale of “effective teaching practice” ($p < .01$), except for “authentic” learning tasks. The scale ‘collaborative practice’ correlates positively and strongly with the overall score on ‘effective teaching practice’ ($r = .50, p < .01$).

6.3 | Components of a professional culture of teaching and student achievement

In response to our second research question on the *components of a professional culture of teaching and student achievement*, we found no significant correlations between *teacher qualification* variables and student achievement (Table 4). We also found no correlation between the scale “Collaborative Teaching Practice” and student achievement. Between the scale “Effective Teaching Practice” and student achievement we found a positive correlation with functional mathematical skills ($r = .28, p = .01$). No correlation was found between ‘Effective Teaching Practice’ and student achievement scores on “functional language skills” (reading and listening) and “functional information gathering and processing”. We found a significant negative correlation between the scale ‘authentic’ and scores on functional language skills (reading) ($r = .26, p = .02$). The scales “Collaborative Problem Solving” ($r = .25, p = .02$) and “Coaching - Structure” ($r = .27, p = .01$) were positively correlated with student achievement in mathematics.

6.4 | Optimal professional culture of teaching and student achievement

For the third research question on *optimal professional culture of teaching and student achievement*, teachers (and their students) were subdivided into a condition with an optimal professional culture of teaching and a less optimal condition. When we combined the elements that together refer to an optimal professional culture of teaching, that is, a teaching qualification (certificate related to PGS, ≥ 5 years of experience), more than average “collaborative teaching culture” ($M > .63$), the existence of learning paths and more than average “effective teaching practices” ($M > .58$), compared with the other teachers, we obtained a very small sample of teachers belonging to that optimal condition (ranging from $n = 15$ to 20 versus $n = 68$ to 80 , depending on the tested skill, Table 4).

A Mann-Whitney test showed significantly higher student outcomes in “Information gathering and processing” for the optimal culture of teaching condition, $U = 590$ ($p = .04$), compared to the less professional culture condition. No better student achievement was found for functional language skills in reading, $U = 636$ ($p = .46$), nor for functional language skills in listening, $U = 539$ ($p = .46$), or functional mathematical skills, $U = 581$ ($p = .14$) between the optimal and the less optimal condition.

7 | DISCUSSION

Student performance in general subjects is poor in vocational education. In this study, less than 40% of the students were found to achieve the standard set for attainment levels in language and maths. The least we can say is that the results are not satisfactory. We argue that a majority of students in vocational education belong to the most underprivileged section of society and therefore need the most effective teachers. The study on which

TABLE 3 Pearson correlation matrix between teachers' self-reported collaboration, effective teaching practice and student achievement in national test for project general subjects (PGS)

		National assessment scores for functional skills in PGS										
		Teacher collaboration with practice	Effective teaching practices	Authentic and challenging	Self-regulated learning	Collaborative problem-solving	Evaluation for learning and differentiation	Coaching	Reading	Listening	Mathematics	Information gathering and processing
Qualification	Pearson correlation	0.049	.127	-0.07	0.08	0.08	0.03	0.09	.038	.214*	.005	.076
	Sig. (2-tailed)	0.51	.087	0.18	0.10	0.16	0.56	0.10	.727	.045	.960	.448
	N	184	184	184	184	184	184	184	88	88	97	101
Experience vocational education	Pearson correlation	0.007	.128	-0.05	0.00	0.05	0.08	0.12*	.046	.164	.037	.027
	Sig. (2-tailed)	0.86	.084	0.41	0.93	0.39	0.11	0.03	.671	.126	.716	.790
	N	184	184	184	184	184	184	184	88	88	97	101
Teacher collaboration	Pearson correlation	1	.505**	.131	.301**	.407**	.401**	.297**	0.07	0.05	0.11	0.07
	Sig. (2-tailed)		.000	.076	.000	.000	.000	.000	0.54	0.67	0.28	0.46
	N	184	184	184	184	184	184	184	86.00	88.00	95.00	101.00
Effective teaching practices	Pearson Correlation	.505**	1	.524**	.555**	.745**	.662**	.477**	-0.08	0.16	.282**	0.02
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000	0.49	0.13	0.01	0.82
	N	184	184	184	184	184	184	184	86.00	88.00	95.00	101.00
Authentic and challenging	Pearson Correlation	.131	.524**	1					-.256*	-0.08	-0.12	-0.03
	Sig. (2-tailed)	.076	.000						0.02	0.48	0.25	0.78
	N	184	184	184					86.00	88.00	95.00	101.00

TABLE 3 (Continued)

	National assessment scores for functional skills in PGS										
	Teacher collaboration with practice	Effective teaching practices	Authentic and challenging	Self-regulated learning	Collaborative problem-solving	Evaluation for learning and differentiation	Coaching	Reading	Listening	Mathematics	Information gathering and processing
Self-regulated learning	Pearson	.555**	.099	1				0.14	0.19	0.16	0.12
	Correlation										
	Sig. (2-tailed)	.000	.182					0.20	0.08	0.12	0.23
	N	184	184	184	184	184	184	86.00	88.00	95.00	101.00
Collaborative problem-solving	Pearson	.407**	.294**	.267**	1			0.08	0.19	.250*	-0.01
	Correlation										
	Sig. (2-tailed)	.000	.000	.000				0.49	0.08	0.01	0.89
	N	184	184	184	184	184	184	86.00	88.00	95.00	101.00
Evaluation for learning and differentiation	Pearson	.401**	.255**	.191**	.390**	1		-0.11	-0.04	0.19	-0.13
	Correlation										
	Sig. (2-tailed)	.000	.000	.010	.000			0.31	0.72	0.07	0.20
	N	184	184	184	184	184	184	86.00	88.00	95.00	101.00
Coaching	Pearson	.297**	.477**	.098	.372**	.243**	1	0.18	0.12	.274**	0.14
	Correlation										
	Sig. (2-tailed)	.000	.000	.186	.000	.001		0.10	0.25	0.01	0.16
	N	184	184	184	184	184	184	86.00	88.00	95.00	101.00

Source: Authors.

**Correlation is significant at the .01 level (2-tailed); *Correlation is significant at the .05 level (2-tailed).

TABLE 4 Mean student scores and standard variation, national PGS achievement tests, less versus optimal culture of teaching

National achievement test	Less/optimal professional culture of teaching	n (teachers)	M	SD	p
Functional reading skills	Less	68	50.26	5.41	.459
	Optimal	19	48.91	4.26	
Functional listening skills	Less	73	49.21	5.43	.463
	Optimal	15	49.49	3.67	
Functional mathematic skills	Less	77	48.86	5.13	.144
	Optimal	18	50.68	5.40	
Funtional information processing and gathering	Less	80	49.19	4.85	.035*
	Optimal	20	51.53	4.98	

Note: N = 184 teachers. Mann–Whitney test for culture of teaching. M refers to >50th percentile of answers.

*Significance one-tailed. N teachers of the students who completed the test for the different skills.

Source: Authors.

this article reports examined the teaching qualifications of vocational instruction teachers (*external features*) and features of the teaching context (*internal features*, e.g., teacher collaboration) that contribute to professional cultures of teaching in vocational education in Flanders. Our analysis has examined the interrelatedness and possible relations of these external and internal features with student performance. We analysed whether a professional culture of teaching—including teacher qualifications, collaboration and effective practice—could make a difference when it comes to student learning.

On average, the participating teachers had eleven years of teaching experience. We saw that more than a third of our teachers were novices (≤ 5 years of experience in education). Moreover, within this group of teachers, those with the least experience also taught classes with the lowest SES. This is in line with findings from previous research (European Commission, 2016; Minor et al., 2015). The turnover among staff in vocational education in Flanders is high. Teachers in vocational education tend to leave when they have acquired valuable teaching experience. Those teachers are replaced by new teachers, struggling with their own concerns as beginners, and faced, at the same time, with the challenge of making a difference in the learning of underprivileged students. As a result, it becomes impossible for schools to build up instructional capacity in the form of *collective knowledge* as discontinuity counteracts efforts to build a sustainable professional culture of practice (Johnson et al., 2012). Teachers leaving schools with many students from a low SES-background illustrates that teachers may try to avoid teaching underprivileged students. In contrast, Papay and Kraft (2017) found that strong supportive professional environments were much stronger predictors of teachers' career plans than student demographic characteristics.

Noteworthy are the relationships we found between the *inner features* of a professional culture of teaching, as investigated in the first research question. *Teacher collaboration* strongly relates to *effective teaching practice*. Teachers working in a collaborative culture are reported to provide better learning environments, conceptualised here as powerful learning environments (PLEs), for their students. This is in line with the literature on effective teacher professionalisation that strongly recommends teacher collaboration (Van Veen et al., 2010). Ronfeldt (2017) has demonstrated that teacher collaboration leads to more effective teaching. Teacher collaboration showed strong coherence with evaluation for learning and differentiation. It might be that, when teachers collaborate to improve their practice, there is a more consistent focus on student learning and a more purposeful effort to ensure that students learn, which underscores the need for teachers to monitor student progress and to use student data as an input for designing the next steps in the learning process.

Despite the relationship we found between teacher collaboration and effective teaching practice, it remains unclear as to how collaboration contributes precisely to effective teaching. Is it a direct effect resulting from professional growth in teaching, or rather an indirect effect in that collaboration helps teachers to take collective responsibility for student learning, or in the sense of providing trust and support for ensuring the focus on teaching and learning?

Strong relationships were found between the characteristics of effective teaching practices, more specifically between authentic, collaborative and problem-solving learning arrangements. Adaptive learning support is related to each of these concepts. This emphasises the interconnectedness of the characteristics of a PLE. The design allows for differentiation in learning support. Unfortunately very few PGS teachers seem to provide vocational students with authentic and challenging learning tasks. Previous research also indicated that students from underprivileged backgrounds got less rigorous curricula—referring to the learning environment that offers a lower quality of learning experiences for students from lower socio-economic backgrounds compared to more privileged students (Minor et al., 2015; OECD, 2013; Vanneman et al., 2009). When disadvantaged students receive watered-down lessons which limit their academic growth in a less rigorous curriculum, teachers contribute to a self-fulfilling prophecy of low expectations. A challenging curriculum with ambitious content and high expectations is important, regardless of academic track (Darling-Hammond et al., 2002) and even more so for students from underprivileged backgrounds.

In response to our second research question—on the extent to which teacher qualifications, teacher collaboration and effective teaching practices relate to student achievements—we found that an authentic learning environment related to lower student achievements in terms of functional reading skills. Firstly, this finding emphasises that authentic learning environments should also pay attention to implementing adequate reading strategies. After all, both teachers' pedagogical knowledge and teachers' subject matter knowledge are necessary to realise effective teaching for specific students. Within this integration of teachers' pedagogical knowledge and their subject matter knowledge, we found “pedagogical content knowledge” to play an important role (Cochran et al., 1993; Shulman, 1986). Within the integrated approach of PGS, pedagogical content knowledge *in plural* is required, because the specific pedagogical insights for each subject area should be combined with strategies for how to create PLEs in vocational education.

Second, authentic learning aims for the exploration of functional (language) skills beyond the classroom setting. Authentic problems, where functional (language) skills are needed to solve them, differ from the texts that are used within the context of the national testing regime. Ideally, authentic learning is aligned with a form of evaluation where students could show and improve their functional (language) skills in different authentic contexts (Jacobson et al., 2003). However, such an evaluation is hard to organise on a large scale.

Effective teaching practice is positively related to students' achievement of mathematical skills. More specifically, collaborative problem-solving and coaching seem to contribute to better results in terms of mathematical skills. The test items for mathematical skills were problem-centred and demanded a problem-solving approach. The constructive alignment of test items and effective teaching practice might explain the correlation.

In our combined analysis of the components of a professional culture of teaching, we found that very few teachers self-reported optimal conditions, including teacher qualifications, collaboration and effective practices. A professional culture of teaching is scarce in vocational schools in Flanders and we recommend future research to explore this further in an international context. We found limited evidence that an optimal professional culture of teaching contributes to student achievement, except in terms of information gathering and processing skills. This might be due to the small sample size of the optimal professional culture condition, which was underrepresented compared to the less optimal condition. This may have affected our findings and prompts further research. The fact that we did find a relation between a professional culture of teaching and achievement in information gathering and processing (while not with functional language skills) could be due to the strong alignment between information gathering and processing skills with authentic learning. After all, within a PLE, students are actively engaged in information gathering and processing. The test items were also embedded in authentic contexts, so the

constructive alignment with teaching practice and the assessment items on information gathering and processing could have contributed to this positive relationship.

7.1 | Limitations of the study and future research

Despite the integrated concept of PGS, the national test used in this study focused on instruction in the separate core areas of literacy, numeracy, and information gathering and processing. As PGS has the potential to engage students through deeply personalised connections to their cultures and their lives, the concept could probably also magnify its effectiveness if assessment was more closely aligned with integrated teaching.

The results should be interpreted with a critical view to teacher effectiveness in mind. The self-selection or non-random assignment of (mostly novice) teachers to vocational schools may have led to an underestimation of the possible impact of teacher effectiveness. In addition, this study only took student achievement into account at the end of secondary vocational education. The assessment does not incorporate student learning during a particular school year with their current teachers. Probably this also resulted in underestimating teacher effectiveness. Exploring gains in achievement using growth curve modelling that adequately accounts for change over time would give more fine-grained findings on effective teaching practices (Shin et al., 2013).

In this study we found evidence that teacher collaboration and effective teaching practices are strongly correlated; we also found relationships with the teachers' educational backgrounds. In future research, it would be important to form an understanding of the mechanisms that explain these relationships. Furthermore, the current study covers organisational factors which impact a professional culture of teaching. A more detailed study on the impact of teacher collaboration on the use of advanced (active) methods of teaching would help education policy makers to formulate concrete advice for practice.

7.2 | Recommendations for policy and practice

It is inappropriate that teachers who need support the most are required to provide support for students with the highest needs, as this study has shown. These students should be taught by highly effective teachers. Recent case studies have shown high-poverty schools that can attract and retain effective teachers by providing the necessary work conditions and which support teacher collaboration to succeed with their students—whenever those students may be (Hargreaves, 2017; Johnson & Birkeland, 2003; Papay & Kraft, 2017).

To achieve a professional culture of teaching in vocational education, it is crucial to empower teachers by continuously providing support, so that teachers are less likely to leave (Johnson, 2004); and to improve the professional growth of teacher teams resulting in effective teaching practices. Support for teacher learning must be part of an integrated whole that enables effectiveness during every stage of a teacher's career continuum (Darling-Hammond, 2012; European Commission, 2020). However, current schools are not set up around continuous support for the professional growth of teams. A shift in education policy is urgently needed.

It is the responsibility of schools to provide rich learning opportunities for all students. A professional culture of teaching—including the recruitment of well qualified teachers, supporting teacher collaboration and effective teaching practice—may be the key to success. In most schools, a professional culture of teaching is not yet a reality, but a valuable aim to strive for.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author, upon request.

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