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# One size does not fit all - mapping informal and formal professional development activities of vocational teachers

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## ABSTRACT

Vocational teachers continuously tailor their teaching to changes in occupational practice, technologies, and student diversity. Teacher professional development is crucial for dealing with these changes. A longitudinal study was conducted to study the professional development activities of vocational teachers in the Netherlands. It resulted in a typology of formal and informal professional development activities. This typology consolidates preceding typologies, and specifies these for the context of vocational education. During a two-and-a-half year period, 26 experienced teachers detailed their informal and formal professional development activities in learner reports. The 386 activities identified were grouped in six categories of informal professional development activities and in five categories of formal activities. In total, three quarters of the activities could be characterised as informal, embedded in daily practice. Our typology could encourage vocational schools in facilitating professional development more effectively.

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## Introduction

Continuous changes in occupational practice, technologies, and student diversity, require teachers in Vocational Education and Training (VET) to constantly tailor their teaching to these factors (Hoekstra et al., 2018). Teacher professional development (TPD) is crucial for dealing with these changes (Andersson & Köpsén, 2018).

Vocational teachers' professional development is embedded in the social practice of their school (Andersson et al., 2018). This perspective on professional development implies that their workplace affords teachers' formal and informal professional development activities, by which they further develop their knowledge and change their beliefs, routines, and actions. Informal activities are mostly implicit and spontaneous, for example experimenting with a new teaching approach with colleagues. Formal activities are organised activities for the purpose of learning, such as participating in a training on the latest digital tool (Rodriguez-Gomez et al., 2019).

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While research on teacher professional development (TPD) in general is growing (De Jong et al., 2022; Lecat et al., 2019), research on vocational teachers' formal and informal professional development activities is relatively scarce (Andersson et al., 2018). Research on individual TPD is mainly conducted in the contexts of primary and secondary education, often focusing on student and novice teachers or carried out in the context of a specific intervention, setting, or innovation (Lecat et al., 2019). The few studies that do describe vocational teachers learning frequently concern team learning, focus on either formal or informal professional development activities, or focus on the development of specific knowledge and skills (e.g. Sandal, 2021; Wildeman et al., 2022). Hence, there is no comprehensive typology of professional development activities relevant and specified for vocational teachers. From the perspective of TPD as situated in daily work and therefore embedded in practice, this article presents the results of a longitudinal study among Dutch vocational teachers to better understand and typify TPD activities of vocational teachers.

## Theoretical background

In this study TPD is framed from a social-cultural perspective on learning (Billett, 2001), viewing TPD of vocational teachers as situated in their daily work (Evans, 2019). From this perspective, how teachers learn and the situation in which they learn are considered fundamental for their learning. TPD arises through teachers' own particular circumstances and experiences in daily work situations. What teachers value and learn in these situations is directed through personal needs, engagement, and dispositions (Billett et al., 2018). In line with our situated perspective on TPD, these learning situations involve participating in and contributing to communities of practice together with significant others (Edwards, 2005). Vocational teachers interact and work together in teams, in various communities and with various stakeholders, such as students, colleagues, and workplace supervisors. These significant others provide teachers with opportunities that are crucial and stimulating for their professional development (Zhou et al., 2023).

Following our situated perspective, to develop professionally, while working, vocational teachers engage in different types of professional development activities, both formal and informal in nature (Lecat et al., 2019). Activities are part of teachers' daily work and serve as catalyst for expanding teachers' (practical) knowledge, changing their views, beliefs, awareness, and judgement, and elaborating their repertoire of actions (Akkerman & Bruining, 2016; Zeng, 2020). These activities are elicited in interaction with the work environment by teachers themselves and/or by events and actors in their environment (Poell et al., 2018). In this study, we define TPD as a continuous process characterised by teachers engaging actively in professional development activities.

To understand TPD as a continuous process situated in teachers' daily teaching context, it is important to capture the wide range of professional development activities teachers engage in (Akiba, 2012). A typification of vocational TPD cannot be limited solely to intentional activities. From our situated perspective on TPD, teachers are expected to undertake both formal activities as well as engage in informal activities that might encourage TPD (Kyndt et al., 2016; Lecat et al., 2019; Spaan et al., 2016).

Following our theoretical stance CPD can be supported by formal activities. In the past decade, many studies are carried out in the context of a specific programme or

intervention (Akiba, 2012). These activities—such as courses and programmes—are planned and structured in terms of time, space, goals, and support and can encompass multiple learning activities and experiences that elicit professional development (Kyndt et al., 2016). They provide teachers with dedicated time to exchange ideas and collaborate, and they provide access to significant others, such as peers and experts (Jones & Dexter, 2014). From our view on TPD, a single focus on formal activities disregards the variation of formal activities teachers engage in.

As TPD is situated in teaching practice, therefore, teachers' practice affords a substantial amount of spontaneous learning opportunities (Billett et al., 2018), such as learning from disruptive events during teaching, learning from co-designing a course, or learning through participating in a team meeting. Informal activities are omnipresent in teacher practice and occur both individually and in collaboration with others (Eraut, 2004; Kyndt et al., 2016). Gairín Sallán et al. (2022) and Noe et al. (2013) argue that approximately seventy-five percent of what is learned by professionals takes place through so-called informal development activities.

To meet the aim of this study to study CPD from a situated perspective and to develop a comprehensive typology of both formal and informal activities vocational teachers engage in, we use two frameworks on teachers' professional development activities that emphasise the situated nature of teacher learning (Akiba, 2012; Kyndt et al., 2016). Firstly, the overview of Akiba (2012) was used to examine formal activities in the context of CPD defining it as situated. This framework provides a wide range of formal activities teachers engage in within immediate work context and broader professional contexts. Drawing from this study, we used five types of formal activities, namely participating in programmes, courses, mentoring, visiting professional conferences, and participating in formal teacher collaboration. Secondly, the overview of Kyndt and colleagues (Kyndt et al., 2016) was used to characterise informal activities of vocational teachers. Because research focused on informal activities of vocational teachers is limited, alternatively the meta-analysis conducted by Kyndt and colleagues (Kyndt et al., 2016) in the context of primary and secondary education serves as a thorough framework to examine vocational teachers' informal activities. Drawing from their study, we used seven different categories of informal learning activities, for example learning through interacting and discussing with others, learning from practicing, and testing, or learning through consulting information sources. From our situated perspective on TPD, the overviews of Akiba (2012) and Kyndt et al. (2016) formed the foundation to create our typology and characterise the range of formal and informal activities vocational teachers engage in. The following research question was formulated: *what type of formal and informal professional development activities do vocational teachers engage in?*

## Method

### Sample

This study was conducted in Dutch Senior Secondary Vocational Education at level 2 to 4 of the European Qualification framework, further referred to as vocational education. In the Netherlands, vocational education is a substantial subsystem of the public educational system, wherein students prepare for occupational practice through initial

vocational training (De Bruijn et al., 2017). Training programmes take place in full-time vocational education within schools and in companies in the form of apprenticeship, and in dual programmes in which students are employees. This study focuses on vocational teachers who teach in the full-time programmes. To transcend the specificity of one domain, participants were recruited in two contrasting domains: the domain of business and that of welfare. Participants were selected by using purposive sampling (Cohen et al., 2002). Selection criteria were based on the domain (business or welfare), teaching experience (>5 years; Berliner, 1994; Hoekstra et al., 2009), contract hours (>3 days per week), and scheduled contact time with students (>8 hours per week).

All vocational subject teachers of 30 vocational schools were invited to participate by the first author. The invitation consisted of an information letter sent through the author's network and a message on social media. This resulted in 33 registrations of experienced teachers from five different vocational schools. Due to time constraints, illness, and retirement, seven participants opted out during the first year. The data of the 26 remaining participants that participated throughout the study were included in the analysis (see Table 1). All participants took part in this study voluntarily and signed an informed consent form that was reviewed by the ethics committee of HU University of Applied Sciences Utrecht (project no. 2019–01).

### Data collection and instruments

Learner reports (Van Kesteren, 1993) were used to gather self-reported rich and in-depth descriptions of professional development activities, both formal and informal. The format of Meirink et al. (2007) was used redesigned and based on a pilot study for the specific context of vocational education. It consisted of a guideline with mainly open-ended questions (Appendix A).

In a longitudinal study participants were asked to complete online learner reports six times during two-and-a-half-years (2018 through 2020). Participants who completed more than four learner reports were included in the study. This resulted in a response of 138 learner reports. In each learner report, participants described the

**Table 1.** Demographic information.

Variable name	n	Mean (range)	Domain of welfare	Domain of business
Participants	26		15	11
Gender				
Female	16		12	4
Male	10		3	7
Age		44 (range 27–59)		
Educational degree				
Bachelor	14		10	4
Master	12		5	7
Work experience		11,6 years (range 5–18)		
Associated with educational programmes and courses			Social care Social work Pedagogical work	Trade Sales Accountancy Management assistant

professional development activities they undertook (<5). On average, each teacher described 15 activities over the two-and-a-half-year period of data collection (ranging from 8 to 26 per teacher). After receiving a learner report, when a learner report lacked detail the first author carried out a member check by phone to gather additional information.

### **Data analysis**

The 138 learner reports contained 386 unique activities. To analyse the activities, a template was developed based on the typology of Kyndt et al. (2016) to categorise the informal development activities and on the typology of Akiba (2012) to categorise the formal development activities. To align with the context of vocational education, adjustments were made to the template during the categorisation process. To increase coding process reliability, these adjustments were discussed in the research team until consensus was reached. 50 professional development activities were analysed separately by the first and third author to determine inter-rater reliability. They both assigned 150 codes, of which 119 codes were found to be identical (79%), after which contrasting codes were discussed until agreement was reached. This categorisation process resulted in the reformulation of two types of activities. Learning from ‘reflecting in and on action’ was reformulated into ‘reflection and evaluation’. Learning from ‘practicing and testing’ was reformulated and split as ‘the primary process of teaching and coaching students’ and ‘experimenting and innovating’. Moreover, two types of activities described by Kyndt et al. (2016) were not reflected in the dataset and therefore excluded from the template (‘encountering difficulties’ and ‘learning from others, without interaction’). The final template was used to identify the frequency and nature of TPD activities relevant and specified for vocational education. The classification of the types of TPD activities was used to present the results.

### **Results**

Data revealed six types of informal professional development activities and five types of formal activities (presented in italics). Table 2 shows the typology and frequencies. A complete overview of the results is provided in Appendix B. The subsequent paragraphs list the type of informal or formal development activities, sequenced from most to least coded. To elucidate these activities, results are presented with a description of the activity. This is substantiated with quotes and examples from learner reports.

#### **Informal development activities**

Firstly, informal professional development activities in *the primary process of teaching and coaching students* encourage teachers to develop. This type of activities involve teaching a subject in class and coaching students in practice in cooperation with others, such as workplace supervisors. A business teacher gives an example of learning while coaching individual students:

**Table 2.** Frequencies of informal and formal professional development activities.

	f	Type of TPD activities	f	Subtype of TPD activities
Informal	292	The primary process of teaching and coaching students	82	(co-)teaching and coaching, (co-)marking students
		Interaction, discussion, collaboration and sharing with others	64	Collaborating, receiving feedback
		Engaging in tasks, roles, and extracurricular activities	53	Coordinating and organising, coaching colleagues and student teachers
		Consulting (offline/online) information sources	37	Reading and studying, researching
		Experimenting and innovating	33	Designing new educational programme, (digital) experimenting in curriculum activities
		Reflection and evaluation	23	Reviewing the curriculum, receiving collegial consultation
Formal	94	Professional development programmes	58	Participating in a school (online) learning activity, taking part in (online) professional training or course organised by experts
		Courses for a degree or credits	18	Attending a programme for a degree, taking part in a course for professional development credits
		Receiving structural coaching	11	Receiving coaching, participating in peer coaching
		Attending a professional conference	4	Visiting an educational conference, visiting a vocational conference
		Participating in formal teacher collaboration	2	Participating in a professional learning community in school, participating in a teacher network

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I visited a student during her internship, together with her supervisor we discussed her learning process. . . . This conversation showed that you can look at student actions differently than only from a school perspective.

Coaching students is not a solitary undertaking; teachers mentioned significant others in these learning activities. For example, one business teacher mentioned talks with his student and several others:

One of my students has an anxiety disorder. We meet with the student, the student-care coordinator and the students' father every month. . . . This meeting showed me how to guide this student and how to anticipate the signs.

Participants mentioned several collaborative teaching activities, both with colleagues of their school, universities of applied sciences, or vocational practice, that encouraged their learning, including co-preparing curriculum activities, co-teaching, and co-assessing students.

Secondly, teachers mentioned activities in which they *interact, discuss, collaborate and share with others*, inside and outside of school as triggers for learning. Inside schools, these activities are mostly about the social environment of their teacher team or school and about the process of teaching, for example dealing with the continuous flow of innovations or using a new online teaching tool. Such activities are often spontaneous meetings in the hallway, planned meetings, or projects with colleagues or students. During these conversations with others, teachers ask and receive feedback on their daily work. A welfare teacher illustrated the value of feedback from a student-teacher in her teacher team:

I asked my colleague, a student-teacher, to observe me during my daily work. . . . I received feedback about my physical posture in front of the classroom. Because of this feedback, I have become more aware of the way I carry myself. This sharpens my skills as a teacher.

Outside of school, triggers for learning are meetings and collaborations with colleagues from other vocational schools and workplaces. As this business teacher illustrated:

I talked to a workplace supervisor about vocational education. He explained that students need skills and qualifications other than currently taught. . . . The insights were instructive for me. It encouraged me to approach other companies to further investigate vocational developments.

Thirdly, vocational teachers mention that they learn from *engaging in tasks, roles, and extracurricular activities*. Executing tasks and roles are for example coordinating students' internships, organising training for colleagues, and coaching colleagues or student teachers. Extracurricular activities are for example going abroad and applying for roles and tasks outside their own teacher team. Other actors involved in these activities include colleagues from their own (and other) vocational schools or universities of applied sciences, students, stakeholders, or external experts. Such activities are mostly about the organisational structure and social environment in schools and can be characterised by contacts with stakeholders. A welfare teacher gives an example of learning through executing tasks and roles:

Within the teacher team, I have the task of coordinating students' internships. During my search for internships, I entered a conversation with an organisation. . . . I learned how to take the initiative and I now look differently at the collaboration between education and the professional field.

Fourthly, teachers point out that they *consult offline or online information sources* to seek, read, and study information about the developments in the occupational field, teaching, and the characteristics of students, for example about how to stimulate students' self-efficacy. Such information is consulted based on a research question, evaluation question, learning question or a general interest in a topic. A teacher from the welfare domain illustrates:

A GPS-watch ensures the safety of people in need and enables them to continue to live at home. This is a part of our educational programme. To teach about this, I took this watch home and explored its functions. . . . I now know how it works and how it contributes to freedom of people in need.

Although these activities are mostly individual undertakings, teachers mentioned their own colleagues and experts outside of the school as actors in this type of activity.

*Fifthly, experimenting and innovating* involves designing and trying out new things and has different scopes and degrees of complexity. These activities are mostly about teaching and characteristics of students. Teachers' own colleagues, students, and colleagues from universities of applied sciences were mentioned as actors in these activities. An example from the welfare domain, of learning during experimenting in their own lessons is:

I tried out a different group composition. . . . This setting made it possible for me to coach students better during lessons. I learned I need to focus more on group composition when preparing and performing lessons.

Teachers also mention implementing technological and digital innovations, for example experimenting with a new assessment tool or implementing new healthcare technology

in educational programmes. An example of learning during experimenting outside their own lessons from the business domain is:

In our school, we started a new educational concept: students learn through integrated vocational assignments. All curriculum activities must connect to these assignments. This is a challenge for me and my colleagues. . . . I learned that a shared vision and leadership are essential to succeed in this kind of major changes.

Finally, teachers *reflect and evaluate* when looking back on and looking forward to collaboration, curriculum activities, tasks, projects, or lessons. These reflection and evaluation activities are mostly about the social environment of their teacher team or school and about teachers' personal insights into their own learning, such as coping with their workload or exploring personal career development ambitions. Teachers mention others who participate in these activities, for example colleagues, students, vocational stakeholders, and professionals outside the work context, such as a career coach. An example of learning during an evaluation session with colleagues from the business domain is:

In our teacher team, we scheduled an evaluation of our educational programme. My colleagues and I feel the urge to innovate, but we are limited in terms of what we can influence. . . . I learned that there is a discontinuity in what my colleagues say and what they actually do.

### **Formal development activities**

Firstly, formal professional development activities that encourage the learning of teachers are organised *professional development programmes*. These activities mostly relate to the process of teaching, student characteristics, and developments regarding teaching in vocational education, for example about a new educational design for education. A teacher from the welfare domain explained:

The training was together with my colleagues, provided by the examination supplier. . . . I learned the importance of objectivity in the assessment process and which questions activate students' reflection.

Vocational teachers also described formal activities organised as part of a hobby, voluntary work, or other jobs as activities that encouraged them to develop as teachers. An example from the business domain:

As part of a training for new city councillors, I prepared and executed a pitch for people I did not know. . . . I learned to step out of my comfort-zone. And because I experienced it myself, I think I'm better able to coach and assess students for their pitches.

Secondly, teachers mention learning during *participating in organised courses* that result in degrees or credits. This includes attending a master's degree programme, in which teachers' own colleagues and experts, such as supervisors, are actors. As a welfare teacher put it:

As part of a master's degree programme, I conducted research into how to map and anticipate to the support needs of student groups. . . . I gained knowledge about the research process itself.

This type of formal development activities are mostly about teachers' personal insights into their learning and about new developments in vocational teaching, for example a course about talent-focused teaching.

Thirdly, planned *coaching* sessions with a buddy, professional career coach, psychologist, occupational physician, or a confidential counsellor support and encourage teachers and teacher teams in their professional development. An example from the welfare domain:

Within the teacher team, I have a buddy [colleague] who helps me figure out where my development points and learning goals lie. I was able to express this concretely in conversation with her. . . . I started thinking more consciously about my own development. I realised that I can influence that myself.

This type of formal development activities are mostly about teachers' personal insights about their own learning and about the social environment of their teacher team, for example about the culture and management style influencing professional development.

Fourthly, teachers describe *attending a conference* as 'an opportunity to gain more knowledge and theoretical information, and to connect it to my own teacher practice' (welfare teacher). Attending conferences is not an individual endeavour; teachers mention their colleagues, experts, and stakeholders from vocational practice as actors in these activities. Teachers mentioned two types of conferences, namely conferences about teaching or learning in the context of vocational education and conferences about the developments in a vocational domain or labour market, for example about online marketing in business domain.

Finally, *formal teacher collaborations* can take the shape of professional learning communities, study groups, or teacher networks other than the teachers' own teacher team, for the purpose of learning, improving teaching, and innovating educational programmes. Teachers mention these activities are about the way of working together in their schools and developments in the vocations students are being educated for. Teachers mention colleagues from their own or other vocational schools, experts, and teachers from universities of applied sciences as actors in these types of collaborative activities. An example from the business domain:

I participated in a learning community with colleagues from other teacher teams. An expert chaired these meetings. Our community focused on innovating the educational programmes in the domain of economics. . . . During this process, I learned about other perspectives on education from my colleagues and I gained more knowledge on the influence of management on changes in school.

## Conclusions and discussion

In this study, the research question of what type of formal and informal professional development activities vocational teachers engage in was addressed. The findings reflect activities relevant and specified for teaching in vocational education. We identified 11 types of activities that encourage their development. In line with previous research on TPD (e.g. Gairín Sallán et al., 2022), three quarters of the 386 activities teachers reported could be characterised as informal. The remaining 94 activities could be characterised as formal. The number of described activities indicate that experienced vocational teachers,

unlike some researchers state (see Kyndt et al., 2016), stay active in participating in both informal and formal activities, are eager to learn, and find TPD evident as their careers progress.

Creating a typology of formal and informal activities revealed an important distinction in the nature of formal and informal activities as well as in the manner in which these activities are usually conceptualised and distinguished in research on TPD. On the one hand, formal professional development activities are usually described as pre-designed *settings* which may encourage teacher learning. The design of such settings ideally incorporates elements of effective professional development described in a large number of studies (e.g. Wildeman et al., 2022) that are likely to contribute to the actual learning processes or activities of teachers themselves. The learning processes and activities occurring within these settings are harder to pinpoint in many of those studies. On the other hand, the activities described to be undertaken by teachers in informal professional development can often be regarded as actual *learning activities*: the teacher performs an activity, such as reading, interacting, or experimenting, and this learning takes place during their daily work. This distinction can be nuanced by the observation that formal activities may also provide teachers with opportunities to engage in a variety of informal development activities in their workplace context (Spaan et al., 2016). In our view, the distinction between formal and informal development contributes to understanding TPD in the context of vocational education and provide school leaders and policy makers with a rich overview of both formal and informal professional development activities that can be fostered. In our view, this is at odds with the traditional views on TPD in Dutch vocational education, which is mostly formal in nature.

Our qualitative research illustrates that TPD has characteristics that appear to be specific to teaching in vocational education. Firstly, our findings show vocational teachers mostly develop themselves in the primary process of teaching, particularly related to coaching students. Dutch vocational teachers often consider themselves to be both coaches and teachers as opposed to merely teaching students (Wesselink & Zitter, 2017). In contrast to teachers in primary and secondary education, coaching (groups of) young and adult students in both school and in vocational practice is a vital element of vocational teachers' work. For example, they teach vocational subjects in school, coach career learning, and coach work-based parts of educational programmes (Andersson et al., 2018).

Secondly, teaching in vocational education is anything but an individualistic profession and is not limited to schools. In contrast to Kyndt et al. (2016), we found that vocational teachers develop themselves not only with the help of their colleagues, moreover, others like students, stakeholders from vocational practice, and professionals outside of their own school are partners in TPD. Most importantly, co-teaching, co-designing, and co-assessing, together with colleagues and workplace supervisors, characterise the daily work of teachers and encourage them to develop. In this respect, Andersson and colleagues (Andersson et al., 2018) refer to the 'boundary-crossing character' of vocational teachers' work: they constantly cross the boundary between the community of the school and the community of the vocational practice. Working together with stakeholders from vocational practice is shown to provide vocational teachers with opportunities for learning about innovations in the vocational domain, labour market developments, or vocational subject matter, which helps them to keep

their vocational expertise up to date (Andersson & Köpsén, 2018). While vocational teachers generally learn in interaction with others, an exception can be made for consulting (offline/online) information sources as a more individualistic informal activity. These results are congruent with our situated perspective on TPD and support a mainly collective approach to TPD in vocational education (cf. Ballangrud & Nilsen, 2021).

Thirdly, experimenting in lessons and innovating educational programmes elicit professional development of vocational teachers. Research from primary and secondary education emphasises experienced teachers' learning through experimenting (Kyndt et al., 2016). Our study in vocational education makes visible that innovating is an important part of Dutch vocational teacher's daily practice, requiring them to continuously adapt and re-design vocational curricula based on developments in occupational practice, new views on education, and student diversity. In line with Lambriex-Schmitz and colleagues (Lambriex-Schmitz et al., 2020), our study makes clear that teachers' play an active role in school innovations and, therefore, function as a key factor for adaptability and quality of vocational education.

Finally, we found that the learning of vocational teachers does not solely relate to improving teaching practice or gaining more insights into developments in vocational practice; it also relates to their development as a professional. For example, teachers learn about how to cooperate with colleagues and stakeholders, or they gain insight into their own learning process which helps them professionalise. This could be explained by their career stage, as TPD of more experienced teachers tends to focus less on teaching practice and more on the wider context of their job (cf. Kyndt et al., 2016). This wide range of professional learning content accentuates the dependence of TPD on individual tasks and roles, and diverse learning needs of vocational teachers.

In sum, our findings show that TPD in vocational education is encouraged in a way specific for the context of vocational education and its characteristics. Although there are some similarities to TPD in primary and secondary education, our results show that TPD in vocational education is connected to multiple actors inside and outside schools and to continuously re-designing curricula. These conditions of teaching in vocational education are reflected in the focus of TPD activities, which—like in primary and secondary education—are tailored to the specific teachers' needs and work context.

### ***Limitations and suggestions for further research***

Our study has some limitations. Firstly, this study was conducted in the Netherlands, in which the vocational programme is part of the formal public education system and is predominantly school-based. We think our findings are relevant for countries in which vocational education is more or less similar positioned, for example in Scandinavian countries, however, our study might also be relevant for countries with dual systems, for example in Germany (Busemeyer & Trampusch, 2012). A follow-up study could focus on TPD activities in these systems. Secondly, the research was limited to teachers' self-reported professional development activities. Future research could use additional research methods, such as observations, to further enrich our data with the actual performance of the activities by teachers. Thirdly, the learner report was designed to collect single self-reported professional development activities. Teachers described development activities independently from other development activities. The possible connections between activities undertaken,

or so-called activity chains (Leeferink et al., 2019), were not part of this study. Further research could study long-term learning processes including all development activities and their interrelations. Finally, why teachers learned and detailed information on what teachers learned, was not included in this study. Future research could address these issues.

### **Practical implications**

Following from the results, we suggest that both formal and informal activities should be supported by school management and policymakers. This study can create more awareness, specifically about informal professional development. The typology used in this study can function as a tool to reflect on policy for TPD and its implementation. We suggest that schools foster informal professional development by encouraging and calling on teachers to work, teach, experiment, and innovate together with significant others as much as possible. Our findings underline the importance of customising the form, as well as the contents of TPD. The learner report used in this study can be used as a tool to stimulate dialogue in teacher teams about TPD and might help to gain more insight into individual TPD.

### **Conclusion**

As our study has shown, vocational teachers learn through a wide range of both informal and formal professional development activities. In line with our situated perspective on professional development and specified for Dutch school-based vocational education, we can conclude that these activities are rooted in and encouraged by the dynamics of the workplace of vocational teachers and differ per teacher. As we continue to expand our understanding how to stimulate vocational teachers' professional development, a next step in research is to examine how informal and formal learning can be encouraged and facilitated in order to utilise its full potential. The results of the present study indicate which activities within the work environment would be beneficial to a learning process specifically for the context of vocational education.

### **Disclosure statement**

No potential conflict of interest was reported by the author(s).

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## Appendix A. Guideline for the Learner Report

Section	Question
1) Stimulating and inventory	What have you done in the past six to eight weeks or which situations have you experienced in the context of your professionalisation or your development as a vocational teacher?
2) Selecting learning and useful situations	Select one to five situations from those mentioned in question 1 that you found useful or encouraged you to learn. Give these situations a short title.
3) Description of the situations	Describe the situation(s) as clearly and specifically as possible. <ul style="list-style-type: none"> <li>• What was the situation and what was it about?</li> <li>• What was the cause and aim of the situation (if any)?</li> <li>• Who were present and/or involved in the situation? What were their roles and positions?</li> <li>• What did you do in this situation?</li> </ul> Did you intend to learn in this situation beforehand? Who initiated the situation? Where did the situation take place?

## Appendix B. Professional Development Activities of Vocational Teachers

	Type	Subtype	Description and examples
Informal development activities	The primary process of teaching and coaching students	Teaching	Carrying out planned lessons and/or curriculum activities. For example: differentiating within the lesson based on student aptitude, changing over to online lessons or teaching adult students.
		Co-teaching	Carrying out planned curriculum activities with one or more colleagues and/or a guest lecturer. For example: teaching together with a vocational practitioner.
		Co-preparing	Preparing and organising curriculum activities (lessons), tests and exams together with a colleague. These colleagues can be from the own school of the vocational teacher, but also from other schools and/or the professional practice. For example: preparing a curriculum project together with a colleague, developing a nationwide practical exam together with colleagues from other vocational schools.
		Coaching and mentoring students in school	Planned coaching, guiding and mentoring of student(s) in school. Sometimes in the presence of parents and/or in presence of other professionals such as social workers, external coaches or student counsellors. For example: conversation with a student about his progress in school.

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Type	Subtype	Description and examples
	Coaching and mentoring students during workplace learning in occupational practice	Planned coaching, guiding and mentoring of student(s) in the context of workplace learning in occupational practice. Usually in the presence of the internship supervisor. Assessments can be part of this. For example: a meeting to evaluate an internship in occupational practice together with a student and a vocational supervisor.
	Examining students' work	Viewing, assessing, reading, and checking students' work. On paper or digitally. For example: assessing students' work together with a colleague from higher vocational education in the context of a joint project.
	Co-assessing	Assessing at school or in occupational practice. Multiple assessors may be present, for example the vocational supervisor. The teacher is assessor. For example: assessing students' presentations during a vocational internship.
	Excursion/field trip	Scheduled field trip outside the school context with students and/or colleagues. For example: a field trip to a company in the Economic domain.
Interaction, discussion, collaboration and sharing with others	Interacting/collaborating/discussing/sharing with colleagues	Interacting/collaborating/discussing/exchanging knowledge, views, ideas, and expertise with colleagues within school, (and/or staff, other vocational schools) in team meetings, projects, and more spontaneously in informal meetings. For example: team meeting, discussion about students, meeting with teachers with a specific task, daily start of the day with the team, conversation with colleagues in the teachers' room.
	Interacting/collaborating/discussing/sharing with the professional field	Interacting/collaborating/discussing/exchanging knowledge, views, ideas, and expertise with one or more professionals from the field in meetings, projects, and more spontaneously in informal meetings. For example: discussing developments in the vocational field during a workplace visit.

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Type	Subtype	Description and examples
	Interacting/collaborating/ discussing/sharing with students	Interacting with one or more students. Usually in the role of teacher, not in the role of coach or mentor. For example: an informal conversation with a student in the halls of the school.
	Interacting/collaborating/ discussing/sharing with family and friends	Interacting with family, relatives, friends, acquaintances, sports clubs, etc. For example: talking to friends or your own children.
	Asking for and/or getting feedback from colleagues	Asking colleagues for help or advice. Specifically at the initiative of the teacher himself. Receiving feedback from a colleague at the teachers' own request or unsolicited, in a conversation situation. For example: getting feedback from a colleague or asking a colleague to explain a digital lesson tool.
	Asking for and/or receiving feedback from vocational practice	Receiving feedback from vocational field at the teachers' own request or unsolicited, in a conversation situation. For example: receiving feedback from an internship supervisor about the teacher him/herself or quality of the educational training.
	Asking for and/or receiving feedback from students	Receiving feedback from student(s) at the teachers' own request or unsolicited, in an informal conversation situation. For example: getting feedback from students about the lessons.
Engaging in tasks, roles, and extracurricular activities	Coordinating, organising and executing tasks	Coordinating and/or organising extracurricular activities based on assigned tasks and your own position. Carrying out tasks within the teacher team and/or the school. For example: organising and planning internships for students, organising a professionalisation day for colleagues or preparing for and participating in an internal audit, inspection visit or accreditation.
	Coaching and mentoring colleagues and/or student teachers	Coaching, mentoring and guiding (novice) colleagues. Coaching, mentoring and guiding student teachers as a supervisor, in planned or unplanned conversations and meetings. For example: counselling meeting with a teacher student or mentoring a new teacher colleague.

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Type	Subtype	Description and examples
	Networking	Networking activities and network meetings. For example: network meeting at a conference, network meeting in school or network meeting in the context of a (regional) project.
	Going abroad	Travelling abroad in the context of project orientation, professionalisation or an exchange project. For example: study trip to Germany.
	Applying for a job/task	Applying for a job, role, or position inside or outside of the school. For example: job interview at an exam supplier.
Consulting (offline/online) information sources	Staying up-to date: seeking, reading, studying professional information	Staying up-to-date by searching, reading and studying specific professional information, such as offline/online articles, books, and magazines. For example: studying information about your field or education.
	Research and inquiry	Doing online/offline research and inquiries in the context of a task, particular topic, target or issue. This involves retrieving information in the context of a formal or informal research question that needs to be answered. <u>Not:</u> conducting research in the context of a (master's) degree programme. For example: doing research on how to design a digital portfolio (searching for information).
	Consulting online sources: social media and newsletters	Obtaining information via social media, newsletters in your mailbox and other media you come across by scanning the information. For example: reading an article via LinkedIn or reading a digital newsletter sent to your mailbox.
	Watching TV and video	Watching TV, movies, or documentaries. For example: watching a documentary on a specific topic.
	Inspirational activities	Activities outside the school context that lead to inspiration. For example: visiting a museum or making music.
Experimenting and innovating	Designing a new educational program	Designing and preparing a new (digital) lesson series or module, often together with colleagues. For example: designing a new project or learning trajectory for students.

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Type	Subtype	Description and examples
	Experimenting (digitally) within teaching and/or curriculum activities	<p>Experimenting (digitally) within teachers' own lessons or curriculum activities. Individually, or with one or more colleagues. This involves carrying out an experiment and/or innovation.</p> <p>This can also include colleagues from other schools.</p> <p>For example: experimenting with a different classroom approach, different methods or trying out and setting up digital tools, individually or with colleagues.</p>
	Innovating in a teacher team/school	<p>Being involved in implementing a broader innovation or change within the teacher team and/or the school organisation, matching the strategic choice of a school and/or team.</p> <p>This concerns innovations larger in scope than the teachers' own classroom or changing and updating a module. This could also be a technological innovation.</p> <p>For example: experimenting with a different assessment system within the teacher team.</p>
Reflection and evaluation	Individual reflection	<p>Self-reflection on work in general.</p> <p>For example: reflecting on limiting tasks in the teacher team.</p>
	Reflecting and evaluating with colleagues	<p>Reflecting and evaluating together with one or more colleagues or management on work, tasks, roles and/or curriculum activities in the form of intervision or collegial consultation with a specific issue: 'how do I deal with ...'.</p> <p>Conversations with a colleague about the social safety experienced in the teacher team.</p> <p>For example: a curriculum review in the teacher team, an assessment interview with a colleague or a conversation with management about the professional workload.</p>
	Reflecting and evaluating with professional outside school	<p>Work-related reflecting and evaluating with a professional, an external person outside school context.</p> <p>For example: reflecting on the personal professional development with a researcher in light of participation in a research program.</p>
	Reflecting and evaluating with students	<p>Reflecting and evaluating with students on the content of educational programmes, curriculum activities or other topics.</p> <p>For example: evaluating, in-class and with students, how things are going in the classroom.</p>

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	Type	Subtype	Description and examples
		Reflecting and evaluating with vocational practice	Reflecting and evaluating with the professional field on the content of educational programmes or other subjects, in an interactive setting. For example: evaluating with the professional field as a result of a specific training.
Formal development activities	Professional development programmes	Organised professional development activity or programme (online or offline) in vocational school	Participating in an organised activity in school for the purpose of learning and improving teaching, student learning, executing tasks, and innovations. For example: a professional development event on digital innovations in the vocational school.
		Organised professional development activity or programme (online or offline) outside school	Participating in an organised activity outside of the own VET school context for the purpose of learning and improving teaching, student learning, executing tasks, and innovations. Participating in a professional development training on creative problem-solving organised by an expert organisation. For example: an online webinar performed by a consultancy on digitisation in education.
		Organised professional development activity or programme outside work context	Participating in an organised activity for the purpose of learning and improving a personal hobby or in the context of volunteer work. For example: training in the context of executing tasks for the local council.
	Courses for a degree or credits	Courses for a degree	Taking courses as part of a degree programme. For example: taking a course to obtain a master's degree in Learning & Innovation.
		Courses for professional development credits	Taking courses to obtain professional development credits. For example: taking a course to obtain credits to supervise and assess student teachers.
	Receiving structural coaching	Formal coaching/intervision	Receiving coaching as a formal and school-sponsored activity to provide teachers with professional development. For example: receiving guidance by a professional career coach.
	Attending a professional conference	Conference about the vocational field	Attending professional conferences to present your practice or research and learn from presentations about the developments in a vocational domain. For example: visiting a regional conference on e-commerce (economic domain).

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Type	Subtype	Description and examples
Participating in formal teacher collaboration	Conference about vocational education	Attending professional conferences to present your practice or research and learn from presentations about new ideas for teaching or learning in vocational education. For example: visiting a national conference on teacher-student feedback.
	Professional learning community in vocational schools	Participating in an existing professional learning community in a vocational school for the purpose of improving teaching, learning, innovating, and executing tasks, formally organised by professional developers or by a group of teachers. For example: participating in a teacher project group within the school that manages the innovation project across teacher teams.
	Formal teacher network	Participating in an ongoing regional or national professional teacher network for the purpose of learning and innovating together. For example: participating in a formal vocational network with vocational schools and higher vocational education.