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Multilevel design considerations for vocational curricula at the boundary of school and work

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Abstract

This study focuses on the school–work connection from the perspective of curriculum design. The aim was to uncover considerations underpinning the design of learning environments in vocational education. The research took place in the Netherlands. A focus group methodology was chosen to elicit designers' considerations, which generally remain largely implicit. These considerations concern the designable elements of learning environments: epistemic, spatial, temporal, and social elements. Design considerations were uncovered at each of the aggregation levels of a curriculum. At the macro-level, considerations referred to the connectivity between the contexts of school and work. Based on these considerations, different designs were chosen along the school–work continuum. At the meso-level, another continuum was found: the complexity in terms of practices involved in the learning environment. At the micro-level, concrete design considerations were revealed that designers take into account to strengthen the school–work connection. Thus, design considerations at three levels were made explicit. Moreover, the need for alignment between the designable elements and the curriculum levels became more apparent, leading to a deeper understanding of curriculum design for vocational education. This paper adds understanding of ways to strengthen the school–work connection and design future-proof vocational curricula.

KEYWORDS

Educational development; curriculum design; vocational education; alignment; workplace learning

Introduction

Curriculum development or curriculum design is a multilevel and cyclic decision-making process, which involves a variety of stakeholders and multiple decisions on how to deliver the curriculum or plan for learning (Huizinga et al., 2014; Thijs & Van Den Akker, 2009; Van Den Akker, 2003). A large part of this decision-making process is implicit (Kirschner et al., 2002). As a consequence, knowledge related to curriculum development is not easily accessible: educational designers' understanding remains implicit in the decisions they make and in the resulting educational designs (Edelson, 2002; Van Den Akker, 2003).

When developing vocational curricula, designers strive to construct learning environments in which learners can develop the required qualifications for their (future) occupation. These designs generally include provisions in the context of school and provisions in the context of work (Billett, 2014). Educational research on vocational education, that is, on education that prepares learners for occupational practice, suggests that a school context may be more suitable for students to learn certain types of formal and general knowledge, while a work context is more suitable to learn

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situated knowledge and skills (Billett, 2006; Schaap et al., 2012). A combination of both contexts is usually chosen. However, the quality of the connection between the school and work contexts remains problematic (De Bruijn et al., 2017; Grollmann, 2018): when learners are active in two different contexts, they need to cross the boundaries between different social, cultural, and physical practices. While crossing those boundaries, learners may experience discontinuities, for instance, because prior knowledge turns out to be incompatible with the knowledge needed to perform tasks at the workplace (Lehtinen et al., 2014), or because learners experience the frequent changes in roles and perspectives as challenging (Akkerman & Bakker, 2011). Efforts to (re-) establish continuity in action or interaction across different practices are referred to as 'boundary crossing', which is typical of vocational curricula (Bakker & Akkerman, 2019). Thus, one of the kernel issues in the design of vocational curricula is to facilitate the integration of learning experiences across the contexts of school and work (Baartman et al., 2018; Choy et al., 2018a; Stenström & Tynjälä, 2009). Failing to address this issue means that learners will continue to experience problems crossing the boundaries and connecting the experiences arising in the various contexts.

In the last decade, several studies have addressed the issue of facilitating the school–work connection in vocational education. Research has focused, for instance, on specific connective training activities (Berner, 2010; Veillard, 2012) or strategies for supporting boundary crossing (Arts & Bronkhorst, 2020). From the perspective of partnerships, studies have shed more light on how school-industry partnerships can be regulated to promote connectivity (Flynn et al., 2016; Sappa & Aprea, 2014). At the level of learning environments, design principles have been advanced for specific manifestations, such as hybrid configurations: social practices at the interface of school and the workplace, built around ill-defined, authentic tasks (Cremers et al., 2016). However, more understanding of the design considerations is needed to support reflection and decision-making during the design of learning environments at the boundary of school and work in vocational education.

The present study aims to uncover considerations underpinning the design of learning environments in vocational education, thus contributing to existing design knowledge for developing vocational curricula at the school–work boundary. The study uses a focus group methodology to understand both the explicit and implicit design considerations underpinning learning environment design in vocational education. This is done by exploring which considerations (dilemmas and choices) designers face when designing vocational learning environments. The specific context of the study is Dutch vocational education. The next sections explain the relevant theory for this study and place the study in an international perspective.

The central question of this study is: which design considerations do educational designers take into account when designing learning environments at the boundary of school and work in vocational education?

Theory

Vocational education from an international perspective

Vocational education is organized and regulated differently across different countries (Billett, 2011; De Bruijn et al., 2017). Differences are related to tradition and culture, government policy and regulation (e.g. national qualification frameworks, funding, etc.), and institutional factors. Depending on these factors, the 'form and nature' of the vocational provisions varies: some countries mainly have school-based vocational programmes, while for other countries (e.g. Germany and Switzerland), apprenticeships are more or less a 'default option' (Billett, 2011, p. 34). Despite the international differences, vocational education worldwide intends to meet occupational-specific requirements and to equip learners for working life (Billett, 2011, 2015). For this purpose, a close relationship between educational institutions and (future) work practice is seen as vital (Guile & Unwin, 2019). However, this relationship also implies a fundamental tension between production

and learning, that needs to be managed (De Bruijn et al., 2017; Vaughan, 2018). Workplaces may have limited possibilities to afford learning activities (Billett, 2014; Istance & Kools, 2013), and workplace demands can override pedagogical goals (Fjellström & Kristmansson, 2019). Facilitating connectivity between work-based and school-based provisions is seen as a way to work around such limitations (Griffiths & Guile, 2003).

Connectivity at the school–work boundary

'Connectivity' refers to the creation of close connections between different contexts, 'bringing together things that have earlier been separated' (Stenström & Tynjälä, 2009, p. 12). Connective curriculum frameworks are based on strong school–work connectivity (Guile & Griffiths, 2001) and are designed to meet typical challenges of vocational education, regarding fragmentation of knowledge and experiences (Zitter & Hoeve, 2012) and lack of alignment between school-based activities and practice-based activities (Messmann & Mulder, 2015; Poortman et al., 2014). Connective frameworks aim to support learners to cross the boundaries between 'school' and 'work', to deal with socio-cultural differences and with the frequent changes of roles and perspectives (Schaap et al., 2012). Thus, connectivity can enable boundary crossing between school and work by different actors (Wesselink, De Jong et al., 2010).

Connectivity is not easy to achieve: learners need to be supported with appropriate arrangements for integration (Choy et al., 2018b). The quest to design such arrangements has led to a variety of 'fruitful alternatives' to workplace learning (Poortman et al., 2014), such as school-based vocational learning (Lindberg, 2003), work-integrated learning programmes (Veillard, 2012), or hybrid curricula (Zitter et al., 2016). Despite the variety of learning environments that connect the contexts of school and work, few studies have focused on their design (Wesselink & Zitter, 2017).

Although footholds have been presented about improving the connectivity between learning in school and in the workplace (Wesselink, De Jong et al., 2010), more understanding is still needed about design considerations of vocational curricula to support curriculum development and exploit the learning potential of the school–work boundary (Bakker & Akkerman, 2019).

Curriculum development in vocational education

Curriculum development implies taking into account the interest of all stakeholders involved (government, trade unions, social organizations, educational institutions, students, vocational teachers, curriculum designers), who may have different expectations of the curriculum (Thijs & Van Den Akker, 2009) and different motives for engaging in curriculum design (Manwaring et al., 2020). This challenge of taking into account the interest of all stakeholders is especially evident in vocational education, where stakeholders are found to have different viewpoints (Sappa & Aprea, 2014; Tyson, 2016), and where stakeholders from the 'world of work' have a considerable interest in the curricula that are designed to prepare and develop their (future) workforce (Choy, 2018).

Moreover, curriculum development implies searching for coherence between the different components of the curriculum. This coherence is difficult to achieve due to the mutual connection and dependency of the components, which has been visualized as a spider web (Thijs & Van Den Akker, 2009). The spider web is useful to design learning environments in a single context, such as a classroom in a school context, but seems less suitable to deal with typical design issues of vocational education, concerning both contexts of school and work. Indeed, the curricular spider web does not focus on specific designable elements that may support the school–work connectivity, namely, the epistemic, spatial, instrumental, temporal, and social elements that shape the activities that emerge at the school–work boundary in vocational education (Bouw et al., 2020; Markauskaite & Goodyear, 2017; Zitter & Hoeve, 2012).

The relation between the design of learning environments and the emergent activity within the learning environment has been conceptualized in an Activity Centred Analysis and Design (ACAD)

model that illustrates that activities may emerge as a consequence of the design (Carvalho & Goodyear, 2018). The ACAD model has been extended by Yeoman and Wilson (2019), who included three aggregation levels to the model (macro, meso, and micro) to highlight the challenge of connecting macro-level aspirations with the concrete design at the micro-level (Yeoman & Wilson, 2019). In the present study, we also adopt the distinction between the three aggregation levels, applying them specifically to a vocational context, in order to examine the design considerations regarding the school–work connection. Such considerations will need to regard choices about what elements of each of the contexts should be included. Thus, we will study the design considerations of educational designers in vocational education at macro, meso, and micro levels.

Three categories of learning environments at the school–work boundary

The present study builds on previous research on curriculum development, but focuses specifically on designable elements, and includes different types of learning environment designs at the school–work boundary. In previous scholarly work three categories of learning environment designs were identified at this boundary: 1) designs based on alignment between the two different contexts of school and work; (2) designs based on incorporation of elements from school into the work context or of elements from work into the school context; and (3) designs based on (partial) hybridisation of the two contexts (Bouw et al., 2019).

The three categories represent different ways to establish connectivity between the contexts of school and work. Several studies have focused on the first category of designs, that is, on designs based on school–work alignment, for instance, by presenting ways to improve alignment during apprenticeships or internships (Choy, 2018; Fjellström & Kristmansson, 2019; Messmann & Mulder, 2015; Poortman et al., 2014). Attention has also been paid to the more integrative categories of designs: studies have presented insights into designs based on incorporation, such as workplace simulations (Jossberger et al., 2015) and hands-on simulations (Khaled et al., 2016) and into designs based on hybridization, for example, concerning the hybrid nature of vocational curricula (Zitter et al., 2016) and design principles for hybrid learning configurations (Cremers et al., 2016). Although these studies present relevant design frameworks, they do not uncover considerations of designers as such. The present study will explore these considerations to better understand the process of developing different types of learning environments in vocational education.

Design considerations

The present study combines two main research strands within educational design research: the technical strand, focusing on the design process, and the realist strand, focusing on design expertise (McKenney et al., 2015). Our research is not intended to provide prescriptive or normative guidelines for curriculum design. Instead, we intend to explore considerations underpinning the design of learning environments in vocational education. For this purpose design knowledge needs to be elicited: we need to understand 'what designers actually do, how they do it and why they do it' (McKenney et al., 2015, p. 188). Uncovering design knowledge in general is not an easy quest (Lawson, 2012) since design knowledge is coupled to the actual person/designer (Savanović & Zeiler, 2007). Design knowledge is largely implicit, grounded in experience and useful for practical (design) decisions; it is part of designers' 'working knowledge' (Lehtinen et al., 2014). To make this design knowledge available to other designers, it has to be made explicit, objectified, validated, understood, and generalized (Van & Reitsma, 2019). In educational contexts, it is important to make design knowledge available to support novice teachers and enhance their design expertise (Huizinga et al., 2014). The present study contributes to the understanding of educational design by exploring both explicit and implicit considerations of educational designers who design different types of learning environments at the school–work boundary in vocational education. This exploration was done in the context of Dutch vocational education.

Context of the study: Dutch vocational education

This study was done in the Netherlands. Dutch vocational education and training (VET) encompasses two educational levels qualifying students for occupational practice (De Bruijn et al., 2017; Cedefop, 2016):

- Mbo (*middelbaar beroepsonderwijs*; senior secondary vocational education at VET schools or regional colleges), which corresponds with Levels 3 and 4 of the International Standard Classification of Education (ISCED) and Level 4 of the European Qualification Framework (EQF).
- Hbo (*hoger beroepsonderswijs*; higher, or tertiary, professional education at universities of applied sciences), which corresponds with ISCED Level 5 and EQF Levels 5 (for the short cycle programmes) and 6.

In the Dutch system, vocational education institutions and social partners cooperate to provide labour market-relevant education that prepares students for society and for further study (De Bruijn et al., 2017). The curricula of Dutch vocational education include mandatory forms of workplace learning and other forms of work-related learning to support learners to acquire future-proof professional competences (Hoeve et al., 2019). Educational designers strive to establish connective relationships between workplace learning and learning in schools (Onstenk, 2017). In the Netherlands schools have relative freedom to design their curricula and designers, in turn, are given a high degree of autonomy to make design decisions about the learning environment (Thijs & Van Den Akker, 2009). Though the present research is carried out in the context of Dutch vocational education, the results are expected to be relevant for all education in which connectivity between the contexts of school and work is an important issue.

Methods

To explore design considerations of learning environments in vocational education and to also make implicit design knowledge explicit, a focus group methodology was applied (Parker & Tritter, 2006; Plummer-D'Amato, 2008a). By having participants explain dilemmas and choices regarding the design of learning environments familiar to them, we explored both the implicit and the explicit design considerations involved in the design process. This method has similarities with experimental vignette methodology (Aguinis & Bradley, 2014). However, we added realism to our approach by inviting participants to first describe a learning environment familiar to them according to a given format. This section explains our research method and the applied techniques to meet important criteria of qualitative research throughout all phases: credibility (plausibility), transferability (the degree to which findings can be transferred to other contexts), dependability (consistency), and confirmability (neutrality) (Anney, 2014).

Focus group design

A stepwise approach was applied to develop our focus group protocol. This was done to ensure credibility through structural coherence (i.e. a systematic and consistent approach). The stepwise process included an expert consultation round with expert designers, a pilot test, and an ethical assessment.

The expert consultation round was done as 'peer examination' to further enhance the credibility of the focus groups (Anney, 2014). In this round, four expert designers were interviewed. Expert-designers with different backgrounds were approached through the network of the authors' research group: (1) a researcher-educational designer working at a university of applied sciences; (2) a PhD in educational research with expertise in designing multi-stakeholder learning arrangements in vocational education; (3) a school principal of an institution for vocational education; (4) an

independent educational designer who works with a large variety of organizations. All four experts have broad experience in collaborating with others during the design and study of learning environments and are thus used to explaining their considerations. Consequently, the expert consultation served as a starting point to elicit relevant design considerations and to develop the focus group protocol. An in-depth interview took place with each expert. During the interviews, insights from previous research were discussed and representations of learning environment designs were developed and tested. Reports of the interviews were member-checked (Birt et al., 2016), leading to minor adaptations of the reports. The expert consultation round resulted in a set of representations to be used during the focus group sessions.

The next step in the development of the focus group protocol was a pilot test with a group of researcher-practitioners who provided the research team with useful feedback, which led to adjustments to the focus group protocol. Next, the focus group protocol was submitted to an ethical committee who approved the protocol (data collection approach, consent forms, and procedures for data storage), thus confirming that our protocol was in accordance with the prevailing standards regarding both how participants are informed and how research data are processed and stored.[1]

Focus group participants

Purposeful sampling was used to enhance the transferability of the findings. This technique helps to focus on the most knowledgeable informants and provides greater in-depth findings than other sampling methods (Anney, 2014). Furthermore, purposeful sampling supports the collection of relevant and rich data in relation to the research question (Plummer-D'Amato, 2008a). The sample needed to include practitioners and designers of vocational education with a minimum of five years of relevant experience in vocational education. Furthermore, practitioners from both school and work needed to be represented, as well as expert designers with a helicopter view of educational design. Moreover, we searched for a balanced selection for each focus group in terms of represented institutions and occupational domains.

The final sample included a variety of institutions and domains. During the selection, we kept in mind that groups should be homogenous enough for participants to feel comfortable expressing their views, and varied enough to allow for contrasting opinions (Plummer-D'Amato, 2008a). Three participant groups were distinguished: (1) educational practitioners with design experience in vocational education; (2) expert designers with a solid background in both studying and designing learning environments; and (3) workplace practitioners with experience in designing vocational learning environments in a work context, in collaboration with educational partners. To counterbalance the effect of conformity (Plummer-D'Amato, 2008b), five focus groups were conducted. The group sizes varied between four and nine participants (Table 1).

Focus group procedure

In line with the credibility criterion, a stepwise approach was used for data gathering: prior to each focus group meeting, participants were informed about the purpose and expectations of the meeting. At the beginning of each meeting, participants were reassured that there were no right or wrong answers, thus curtailing any concerns they might have about their knowledge of the topic of discussion (Plummer-D'Amato, 2008a). To minimize the effect of censoring, participants were informed about how the data would be used and about the procedures to maintain confidentiality and protect their identities. All focus groups followed the same protocol and started with a brief introduction and two 45-minute discussion rounds about design considerations of real-life learning environments. Representations were used to elicit participants' views (Umoquit et al., 2011) and implicit design knowledge. During the focus group meetings, participants were invited to add annotations to the representations. In the expert designers focus group (ED3) the representations

Table 1. Focus group participants.

Focus groups		Number of participants	Background of participants	Domains represented
EP focus groups	EP1	9	Educational practitioners (EP) in vocational education and training (mbo)	Built Environment, Business education, Healthcare, Facility Management, Marketing & Communication
	EP2a	7	Educational practitioners (EP) in higher professional education (hbo)	Healthcare, Technical education, Horticulture and Agribusiness, Pedagogy, ICT, Education
	EP2b	4		Healthcare, Social Work, Physiotherapy, Education
ED focus group	ED3	6	Expert designers (ED) in the broad field of vocational education (mbo, hbo)	Built Environment, Business education, Healthcare, Facility Management, ICT Educational science as main research expertise
WP focus group	WP4	4	Workplace practitioners (WP) who design professional education in a work context, in collaboration with educational partners	Built Environment Healthcare, Maternity care, Facility Management

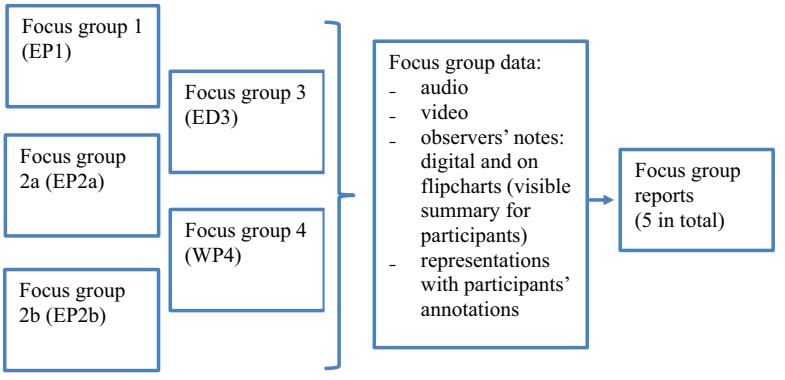

Figure 1. Data gathering and data processing.

were enriched with data extracted from the previous focus groups, in analogy to the vignette-method (Hughes & Huby, 2004).

All focus groups were moderated by the first author of this paper, assisted by a well-briefed observer who took notes to aid analysis of the recordings, thus enhancing the confirmability and credibility of the focus group data (Plummer-D'Amato, 2008a). Both the moderator and the observer were trained in conducting focus groups, which contributed to a skilful organization and moderation of the meetings. To further ensure credibility, the moderators' background was disclosed in each meeting and all meetings were recorded (audio and video). These measures help to ensure credibility because they increase transparency, minimize the risk of moderator bias (Plummer-D'Amato, 2008a) and allow for conclusions based on participants' original data (Anney, 2014). After each focus group meeting, the raw data (audio, video, notes, and representations) were converted into reports (Figure 1): recordings were processed together with the observers' notes (order of speakers and main themes and ideas). These notes were matched and complemented with the first authors' notes and transcriptions of participants' comments during the focus groups.

To further ensure dependability the reports were presented in accessible ways to the participants to encourage them to engage in member checking (Birt et al., 2016). This was done by using plain

Table 2. Analysis matrix.

	EPISTEMIC	SET	TEMPORAL	SOCIAL
MACRO (strategic)				
MESO (tactical)				
MICRO (operational)				

Table 3. Themes of the design considerations.

		Designable elements			
		Epistemic *What*	Set *Where, With what*	Temporal *When*	Social *Who*
Aggregation levels	MACRO Strategic	Objectives	Location	Time in context	Stakeholders
	MESO Tactical	Nature of practices	Spaces	Time in programme	Actors from practices
	MICRO Operational	Tasks	Artefacts	Time in interaction	Roles

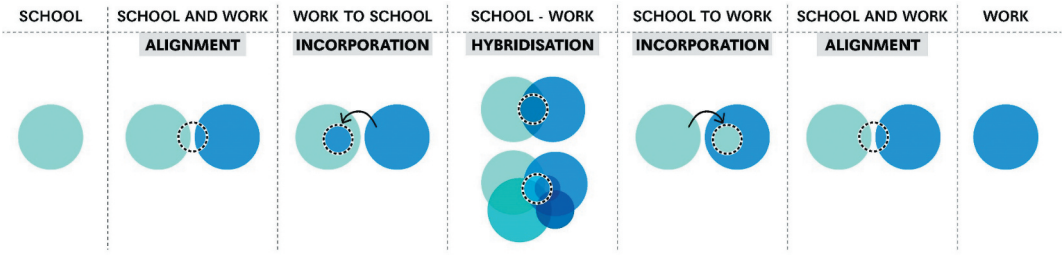

Figure 2. Continuum of learning environment designs at the school–work boundary.

and concise language and by including relevant representations. The majority of the participants engaged in member-checking. Minor adjustments to the reports resulted from the member-checks.

After member-checking and analysis of the individual focus groups, cross-focus group analysis started: all design considerations were clustered and condensed using a matrix display technique (Averill, 2002; Miles & Huberman, 1994), thus facilitating the display, interpretation, and discussion of the findings. The analysis matrix was based on the concepts presented in the theory section, namely, the designable elements (epistemic, set, temporal and social) and the distinction of three aggregation levels (Table 2).

To condense the design considerations, we used a method derived from Malterud's systematical text condensation method (Malterud, 2012). During this process, dependability and confirmability were safeguarded through repeated discussions between the first and the second author to identify tacit rules and check consistency between the raw data and the (preliminary) findings. The matrix and the preliminary findings were also discussed with the third author. During the third and last analysis round, the raw data of the focus groups was revisited, to look for examples and counter-examples of the key-considerations, leading to the findings reported in the next section.

Results

All focus groups discussions revealed considerations at each of the aggregation levels of a curriculum design. Table 3 presents the central themes of the design considerations that emerged at each level and for each of the designable elements. These themes reveal the kernel issues of the focus group discussions about the strategic, tactical, and operational design considerations.

Design considerations at the macro-level

At the macro-level, focus group discussions centred around the relation between the objectives of the design, the stakeholders involved, and the level of connectivity between the contexts of school and work. The level of connectivity was discussed with the aid of a representation of the school–work continuum that emerged from the expert consultation preceding the focus group meetings (Figure 2). During the focus group discussions, this continuum appeared to correspond with key considerations at the macro-level, namely: considerations about the **objectives** of the learning environment and considerations about the **stakeholders** of the learning environment.

Discussions between participants revealed that considerations about the stakeholders and about their objectives influence the learning environment design. The design can be nearer to school as a context or nearer to work as a context. Which design is most fitting, was said to depend largely on whether stakeholders' objectives were learning, production, or both. If the main stakeholder is from the world of school and the main objective is learning, the design will display more characteristics that are typical for school as a context. School-based simulations, for example, were mentioned as

designs that are suitable to provide continuity and avoid dependency on business fluctuations in work practice (e.g. in ICT, EP2a).

If the main stakeholder is from the world of work and the main objective is production, the design will show more features that are typical of work as a context. For instance, work-based learning environments can be characterized by a strong focus on work, especially in times of labour market shortages (e.g. in Healthcare, EP1). If, however, stakeholders from school and work are equally represented and the objectives of learning and production can be combined, without obstructing either, the design will have features of both school and work as a context. From the focus group discussions it became clear that in such a design, learners can contribute to reaching targets at the workplace, while also receiving guidance and support in a safe learning environment (e.g. in Social Work, EP2b).

Focus groups emphasized the dynamic nature of the learning environment design on the school–work continuum, indicating that when (re)considering the objectives and stakeholders' interests, the design may need to move to the left or to the right on the school–work continuum. This dynamic aspect was explained by a continuous search for balance between external demands (from the ministry of education, professional associations in the field, etc.) and the interests of the local stakeholders. When educational interests prevail, designs may need to include more features of school as a context. When interests related to production prevail, the work context can become more pronounced and the learning scope may lose priority, which may lead to designs with more features of work as a context. Learning environments with the twofold scope of both contributing to students' learning and, for instance, contributing to regional development, would fit with a design based on hybridisation (ED3). Focus group data further revealed that designers also take into account learners' interests: educational programmes may provide different learning environments for different groups of learners, for instance, a school-based curriculum for learners who prefer to be supported to learn in a familiar and safe learning environment, and a hybrid or work-based route for learners who prefer to learn in a learning environment that corresponds with or closely resembles their future workplace (EP1, EP2A, EP2B). Thus, designers take into account that learners may be attracted to a more incorporated or a more hybrid design, depending on their preferences: not all students thrive well in a fully work-based learning environment (e.g. in Healthcare, EP1).

A key consideration that emerged at the macro-level regards the partnership between stakeholders from school and work (EP1, EP2a). Agreements between the stakeholders were mentioned to secure scalability and durability of the design: can collaboration still be secured if the number of learners increases or decreases? Written agreements were sometimes chosen to safeguard the continuity (EP1, EP2a). Such agreements would preferably be based on a shared view between stakeholders of the professional field and the developments in the near-future (EP2a)

The abovementioned macro-epistemic and macro-social considerations about objectives and stakeholders have implications for the macro-set considerations (location) and macro-temporal considerations (time in context). When regional contribution is a desired feature of the learning environment, designers seem inclined to physically locate the learning environment close to regional stakeholders (macro-set) to facilitate frequent interactions between all partners involved (EP2a, ED3). Participants indicated that such macro-level agreements between stakeholders generally include agreements about time (e.g. how much time of an educational programme is allocated to each of the contexts of school and work). Focus group discussions revealed that the time that learners are planned to spend in each context depends on educational standards, frameworks and guidelines, but is also influenced by the wishes and expectations of the stakeholders involved in the learning environment (EP1, EP2a, EP2b, ED3, WP4). These expectations may include, for instance, the possibility of adjusting the learning environment to the needs of the industry, such as seasonal work in agricultural contexts (EP2a) and special events in marketing and communication (EP1).

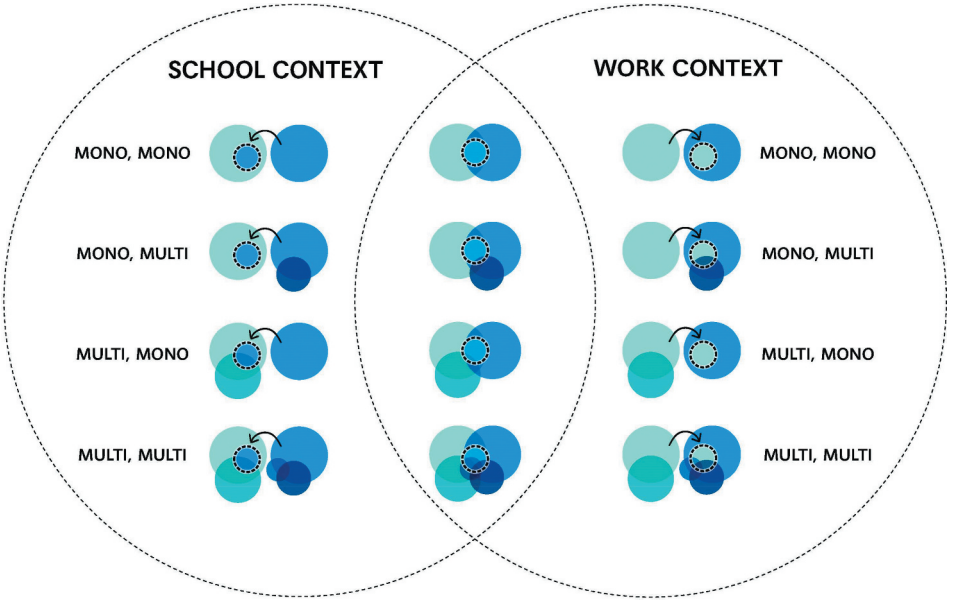

Figure 3. Configurations of school and work practices.

Design considerations at the meso- level

Considerations at the meso-level revolve around the following central themes: the amount and nature of the practices involved, the spaces selected for the learning environment, the timeframe of the learning environment within an educational programme, and which actors are involved from different programmes (i.e. school practices) and organizations (i.e. work practices).

In the expert consultation preceding the focus groups, the school–work continuum was expanded with another dimension: the complexity of the configuration of **practices** involved. A two-dimensional typology resulted, based on a horizontal school–work dimension and a vertical dimension related to the complexity of the configuration (Figure 3).

Figure 3 was discussed in the focus groups. In all focus groups, participants had experience designing learning environments involving practices from school and work, but the complexity of the resulting configurations differed from mono, mono (consisting of one school practice and one work practice), to multi, multi (involving multiple schools an and multiple work practices). Meso-level considerations underpinning these choices relate to the **nature of the practices** needed for students to develop the relevant competencies (meso-epistemic) and the amount and type of actors that need to be present in the learning environment (meso-social): if contact with real customers, patients or pupils is essential for the profession, a real-life work practice will be part of the learning environment (e.g. in Healthcare and in Education, EP2a). Such tactical considerations are closely related to the macro-level objectives of the learning environment: if students only need to have a general idea of what a practice looks like, a mono learning environment may be sufficient; if students need to be fully immersed in an innovative setting, then a multi-type may be more suitable (EP2b). Sometimes designers choose a mono learning environment at the beginning of the educational programme and a more complex, multi learning environment in the third year of their programme (e.g. in Physiotherapy, EP2b). Educational practitioners tended to prefer a curriculum in which students are given the opportunity to participate in different (configurations of) practices in the course of their educational programme (EP1, EP2b).

The type of configuration chosen has consequences for considerations about the set design: when multiple practices are involved, designers make tactical decisions about which (digital and

analogue) **spaces** to use. Sometimes a lab is needed for learners to perform specific tests and designers look for the most suitable practice for lab-work (EP2a). However, not all domains turned out to have specific needs for physical spaces; in the ICT domain, the meso-set considerations are focused on digital spaces, since activities are more independent of the physical location (EP2a).

Regarding meso-temporal considerations, focus groups indicated to take into account the time-frame of the learning environment within the educational programme (i.e. the **time in programme**). From the real-life examples discussed, it appears that multi, multi configurations are more frequent in a late stage of an educational programme, to allow senior students to become involved with a diversity of practices. In contrast, in some educational programmes such configurations were intentionally placed in an early stage of the programme to have students engage with multiple professions from the start (EP2a).

Although the configurations in Figure 3 may be useful to determine the relationship between practices at an abstract level, they do not necessarily give an exact representation of real-life manifestations. Focus group discussions also revealed that the overlap between the practices involved in real-life learning environments may differ from the diagrams above: several work practices may be connected to a school practice, without the work practices mutually overlapping (EP2a). Other work practices may be only loosely related, but still essential for the learning environment, e.g. in the case of suppliers of materials in the built environment or facility services (EP1, WP4). Educational and work-place practitioners' focus groups (EP1, EP2a, EP2b, WP4) also pointed out that, depending on which practice initiates collaboration, practices may have a more central role in the configuration or a more peripheral role. School practices may be initiators of collaboration or become involved in existing structures (EP2a, WP4). Nonetheless, identification of the continua and reflection on the consequences of choices on both the school–work continuum and the complexity continuum were seen as relevant for choices about the configuration of school and work practices.

Design considerations at the micro-level

Important considerations at the micro-level relate to the operational level, that is, the concrete realization of the learning environment design in terms of tasks, artefacts, time in interaction, and roles. However, data from the focus group discussions indicate that decisions at this level depend to a large extend on decisions made at the strategic (macro) and tactical (meso) levels.

Regarding micro-epistemic considerations, focus group data reveal designers' ambitions to design **tasks** that correspond with learners' needs, taking into account the objectives of the stakeholders at the macro-level and the nature of the practices at the meso-level. Learners may be required to learn additional competences to meet the requirements agreed between the stake-holders involved, for example, to ensure safety and responsible use of materials at the workplace in the built environment (WP4). Sometimes the chosen work practice imposes limitations on the tasks learners can do. For instance, at a residential facility for senior citizens, students can only perform specific tasks and need to make sure that they do not cause any inconvenience for the residents (FG2b).

Focus groups discussed micro-set considerations about the **artefacts**: designers try to anticipate which artefacts are needed for learners to perform the selected tasks, taking into account the facilities of the spaces at the meso-level. Simultaneously, focus groups expressed trying to influence learners' behaviour (in line with the objectives at the macro-level) by intentionally introducing professional artefacts. Such artefacts are intended to serve as a way to ensure that the 'look and feel' of the learning environment closely corresponds with the profession, such as professional chef clothing in the hospitality industry (EP2a). An artefact may also serve to support the integration of school-subjects and professional tasks, for example, by having learners in the built environment contribute to building progress reports with the aim to activate their writing skills (EP1).

With regards to micro-social considerations, focus groups indicated searching for roles that correspond with the selected tasks. This level includes decisions about horizontal and vertical

cooperation between actors, such as senior-junior links to learn from and with each other. Furthermore, designers consider possibilities for role-rotation, to have learners practise with different tasks and different degrees of responsibility. In several of the real-life learning environments discussed during the focus groups learners are expected to fulfil roles as 'chefs' or senior colleagues. This is the case, for instance, in facility services, where such roles are fulfilled across educational levels (EP1). Decisions also need to be made about the support learners need. While in some learning environments learners are closely supervised, in other learning environments they are allowed to operate independently, for instance, when meeting a potential client for a business assignment (EP1). It is also important to decide which actors perform which roles. For example, guidance may be done by workplace actors or actors from school (ED4). In relation to the more hybrid designs, it was mentioned that a multi-professional team is often called for to fulfil all the roles within the learning environment (EP1) and that sometimes additional training is needed for actors to fulfil the roles that are designed for them (EP2a). Lastly, designers also indicated that they regularly consider introducing rules of conduct, such as a dress code, to stimulate learners' professional behaviour within the learning environment.

Similar considerations are also made at the micro-temporal level. From focus group discussions it became clear that decisions about the **time in interaction** are largely based on considerations about what is customary in the relevant work practices. Consequently, designers try to implement certain relevant temporal elements, such as performing under time pressure (EP1). A recurring dilemma that was mentioned in the focus groups was whether learners' tasks could be scheduled according to a school-schedule or a work-schedule (EP1, EP 2a, EP2b, WP4).

Discussion

Vocational curricula designs need to take into account the need of connecting school and work practices to facilitate learning across boundaries (Griffiths & Guile, 2003; Sappa et al., 2018; Unwin, 2009). More understanding is needed of learning environment design at the school–work boundary (Wesselink & Zitter, 2017). The present study helps our understanding by exploring design considerations of designers in vocational education. We did so through expert consultation and five focus groups in which explicit and implicit design considerations were elicited. The focus in this study was on design considerations related to the school–work connection. Our findings show that considerations can be found at three levels (see Table 4).

Table 4 may be seen as a variation of the earlier introduced curricular spider web model (Thijs & Van Den Akker, 2009). The need for alignment between and within the various components

Table 4. Design framework for learning environments at the school–work boundary.

		Alignment between designable elements			
		EPISTEMIC *What*	SET *Where,* *With what*	TEMPORAL *When*	SOCIAL *Who*
Alignment between design levels	MACRO	Objectives What are the objectives of the design?	Location Which locations are suitable? (school, work, third location)	Time in context How is the time divided between different contexts?	Stakeholders What kind of partnership should be established?
	MESO	Nature of practices Which school and work practices need to be involved?	Spaces Which spaces are required?	Time in programme What is the time frame within the educational programme?	Actors from practices Which actors from school and work need to be involved?
	MICRO	Concrete tasks What learning and working tasks are suitable?	Artefacts Which resources are needed?	Time in interaction Which schedule and temporal aspects are feasible?	Roles How can roles be divided and rotated between actors?

corresponds with the concept of 'constructive alignment': all components of a system should be aligned to each other (Biggs & Tang, 2007). However, the framework presented in our study extends the concept of alignment to include alignment between the designable elements and design levels that are particularly relevant for the context of vocational education, since they relate to the school–work connection. The framework invites designers to consider which settings, practices, actors, tools etcetera should be included from each of the contexts of school and work. Thus, a contribution of this study is that it presents an additional understanding of constructing vocational curricula and of considerations that should be taken into account when designing cross-boundary learning environments (Zitter et al., 2016).

The presented framework (Table 4) can be categorized as a 'learning design framework' that may serve both to analyse a design product and to further guide a design (Muñoz-Cristóbal et al., 2018). Our framework specifically supports the (re)design of learning environments at the school–work boundary. As such, it can be used alongside other tools with a reflective purpose, like the instrument to analyse competence-based study programmes presented by Wesselink et al. (Wesselink, Dekker-Groen et al., 2010), the overview of hierarchical categories of competence-based education (Koenen et al., 2015), and Bakker and Akkerman's boundary analysis (Bakker & Akkerman, 2019). These tools can help to identify possible areas of improvement concerning the stakeholders' ambitions, for example, to develop a more competence-based curriculum (Koenen et al., 2015), to make more effective use of the learning potential at the school–work boundary (Bakker & Akkerman, 2019), or to take into account the different conceptions of the stakeholders to support connectivity (Wesselink, De Jong et al., 2010). Our framework adds to these tools a set of specific design considerations that may support the (re)design. Next to epistemic and social elements presented in Wesselink et al's study, such as agreements about the tasks, roles and responsibilities of the actors involved, our framework includes additional elements, namely, temporal and spatial elements. Moreover, our study adds understanding by distinguishing different aggregation levels of the design.

Nonetheless, further studies are needed to deepen the insights into the alignment of design considerations, as has been done, for example, regarding the alignment of the set design and the epistemic design by Van Merriënboer et al. (Van Merriënboer et al., 2017). Van Merriënboer et al.'s study describes a participatory design process that helps to realize physical spaces that support specific visions of learning and pedagogy. Similar studies examining alignment issues could focus, for example, on the interrelation between the set design and the social design (e.g. to develop an understanding of how actor-proximity may influence emergent learning activities) and between the social design and the epistemic design (e.g. focusing on the relation between grouping and knowledge acquisition).

Another potentially fruitful way forward is to investigate the relation between design characteristics and students' learning outcomes, as has been done for example, in multidisciplinary student groups (Oonk et al., 2017). Furthermore, at the meso and macro design levels, current understanding of the dynamics of school–work partnerships could be investigated more profoundly, as has been done, amongst others, by Flynn et al. (Flynn et al., 2016).

From a practical perspective, the presented framework can guide educational practitioners and designers in their efforts to develop curricula that connect the school and work contexts. The representations of different learning environment types forwarded in this paper, together with the design considerations, can be used in several stages of the designing process: (1) for aligning stakeholders' ambitions at the start of the design process; (2) for checking whether the progress is in line with the ambitions during the design process; and, (3) for evaluating the quality of the design when it is realized and in-action. As such, the presented insights can support practitioners and designers to make informed decisions on how to improve the connectivity between school and work.

Limitations

From a methodological point of view, the focus group approach of the present study was set up in line with key criteria of qualitative research (credibility, transferability, dependability, and confirmability; Anney, 2014). However, some of the common issues related to focus groups may still have occurred, because of the voluntary participation, or because of the focus groups' dynamics and moderation. Although only experienced practitioners and designers were selected, some differences in knowledge and experience were inevitable and may have led to participants not freely expressing all their considerations. Furthermore, despite the thorough preparation of the moderator and the observer, some participants may have refrained from expressing their opinion because they felt it to differ too much from those of other participants (Gawlik, 2017). To counterbalance these group effects, participants were approached individually for written member checks after the focus group sessions (Birt et al., 2016).

Regarding the transferability of the findings, input was generated from practitioners and designers in the context of Dutch vocational education. Although the school–work connection is relevant in many other educational systems, design considerations are bound to differ depending on the educational system in which the designers operate. For instance, the high degree of autonomy regarding curriculum design in the Netherlands may have consequences for designers' considerations (Thijs & Van Den Akker, 2009). We have attempted to enhance transferability by explaining both the more universal elements of vocational education and by giving explicit information about the Dutch educational context. Nevertheless, additional understanding of the design issues in vocational education could be achieved through the exploration of design considerations of designers in other countries.

Conclusions

Designing future-proof vocational curricula that support learners to cross the school-work boundary is challenging. The multilevel design framework that we have presented may help to meet these challenges. The framework is specifically aimed at supporting the design of learning environments that connect the contexts of school and work. It is based on design considerations that generally remain largely implicit since they are part of the 'working knowledge' of the designers involved. By eliciting designers' design considerations, we have uncovered relevant considerations at three levels: macro, meso, and micro. These considerations regard the epistemic, set, temporal and social design of learning environments at the school–work boundary. At the macro-level, strategic design considerations come into play, dealing with overall, long-term and future-oriented issues, such as the formalization of the partnerships between different stakeholders. At the meso-level, the considerations are more oriented towards tactical decisions, for instance, about the nature of the practices that need to be involved and about the timeframe that is available for the learning environments. At the micro-level, design considerations concern more concrete aspects, needed to actually realize the learning environment, for example, the concrete tasks that learners need to perform of the roles that they are expected to fulfil within the learning environment. The results suggest that design considerations at one of the design levels have implications for design decisions at the other levels. Alignment seems to be called for, both between and within the design levels and the epistemic, set, temporal and social design to meet the challenge of designing future-proof vocational curricula that support learners to connect what is learned in each of the contexts of school and work.

Disclosure statement

No potential conflict of interest was reported by the authors.

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