

Collaborative curriculum design in teacher teams: foundations

Author(s)

Voogt, Joke; Pieters, Jules; Pareja Roblin, Natalie

Publication date

2019

Document Version

Final published version

Published in

Collaborative curriculum design for sustainable innovation and teacher learning

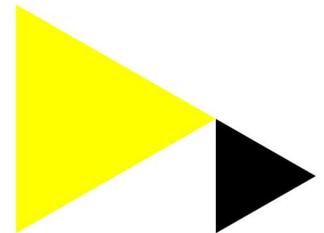
License

CC BY

[Link to publication](#)

Citation for published version (APA):

Voogt, J., Pieters, J., & Pareja Roblin, N. (2019). Collaborative curriculum design in teacher teams: foundations. In J. Pieters, J. Voogt, & N. Pareja Roblin (Eds.), *Collaborative curriculum design for sustainable innovation and teacher learning* (pp. 5-18). Springer, Cham. https://doi.org/10.1007/978-3-030-20062-6_1

**General rights**

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please contact the library: <https://www.amsterdamuas.com/library/contact/questions>, or send a letter to: University Library (Library of the University of Amsterdam and Amsterdam University of Applied Sciences), Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

Jules Pieters • Joke Voogt • Natalie Pareja Roblin
Editors

Collaborative Curriculum Design for Sustainable Innovation and Teacher Learning

 Springer Open

Editors

Jules Pieters
ELAN Department of Teacher Professional
Development
University of Twente
Enschede, The Netherlands

Joke Voogt
Department of Child Development
and Education
University of Amsterdam
Amsterdam, The Netherlands

Natalie Pareja Roblin
University of Applied Sciences
Amsterdam, The Netherlands



ISBN 978-3-030-20061-9 ISBN 978-3-030-20062-6 (eBook)
<https://doi.org/10.1007/978-3-030-20062-6>

© The Editor(s) (if applicable) and The Author(s) 2019. This book is an open access publication.

Open Access This book is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence and indicate if changes were made.

The images or other third party material in this book are included in the book's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the book's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG.
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Chapter 1

Collaborative Curriculum Design in Teacher Teams: Foundations



Joke Voogt, Jules Pieters, and Natalie Pareja Roblin

Introduction

A curriculum is a plan for learning (Taba, 1962) in which goals and content for teaching and learning are organized in a particular way (Walker, 2003). Such a plan for learning is often reflected in concrete curriculum materials. What goals and content are worth teaching, because of their relevance for students and society, is a core curriculum question (Tyler, 1949). Answers to this question include views on the heritage of the past and the aspirations for the future (Williamson, 2013). Discourse on the substantive perspective of curriculum is thus an important part of curriculum as a field of study, in particular in our present times of rapid changes in the labour market and the rapid production of knowledge. However, according to Stenhouse (1975), what is essential for curriculum study is not only discourse about what needs to be taught and learned, but also (and primarily) developing an understanding of the relationship between curriculum as intention and as reality. This implies that we need to understand the processes involved in curriculum design and implementation. The focus of this chapter is on these processes. Specifically, we are

J. Voogt (✉)

Department of Child Development and Education, University of Amsterdam,
Amsterdam, The Netherlands
e-mail: j.m.voogt@uva.nl

J. Pieters

ELAN Department of Teacher Professional Development, University of Twente,
Enschede, The Netherlands
e-mail: j.m.pieters@utwente.nl

N. Pareja Roblin

University of Applied Sciences, Amsterdam, The Netherlands
e-mail: n.n.pareja.roblin@hva.nl

© The Author(s) 2019

J. Pieters et al. (eds.), *Collaborative Curriculum Design for Sustainable
Innovation and Teacher Learning*, https://doi.org/10.1007/978-3-030-20062-6_1

particularly interested in the ways teachers are involved in the processes of designing and implementing curricula.

As many recent curriculum innovations result in disappointing outcomes (e.g., Alexander & Flutter, 2009; Haug, 2003; Niederhauser et al., 2018), Stenhouse's argument is still relevant today. There is a need to better understanding how to realize sustainable implementation of curriculum innovations. Curriculum design, as an important subdomain of curriculum study, aims at bridging the gap between curriculum intentions and implementation. In other words, it is the study of how to make curriculum innovations work in practice. Curriculum design is an iterative process, in which knowledge about design procedures and knowledge about indicators of curriculum quality is intertwined with socio-political interests and the realities of many different stakeholders, teachers in particular. Scholars increasingly agree that the process of curriculum design needs to be understood as a process of systemic change (Fullan, 2008; Van den Akker, 2003). From this perspective curriculum is far more than a simple plan for learning. Curriculum is a social cultural practice, which meaning progresses through the active involvement of teachers and other stakeholders in design - and action research.

This book starts from the premise that teachers are core stakeholders in curriculum innovation and in the complex process of curriculum design because, as Fullan (1991) has stated, in the end, 'educational change depends on what teachers do and think – it's as simple and complex as that' (p. 117). We argue that teachers' active involvement in curriculum design is a promising avenue for bridging the gap between curriculum intentions and reality, because it offers opportunities for teacher learning and develops a sense of ownership in teachers for the curriculum innovation at stake (Penuel, Fishman, Yamaguchi, & Gallagher 2007; Voogt et al., 2011,). Therefore, curriculum design that contributes to the effective and sustainable implementation of curriculum innovations is related to and closely dependent on teachers' professional learning.

In this first chapter we set the stage for the research presented in this book. We consider curriculum design and teacher learning as interdependent. Thus, the interaction between teachers and curriculum is central in the way curriculum is understood throughout the studies presented in the book. In the subsequent section we discuss how views on the *curriculum design process* have evolved, and consider the roles for teachers in these different views on curriculum design. Next, the focus is on the relationship between teachers and the main *outcome of curriculum design*, the curriculum materials. In the final section of this chapter, these two perspectives (i.e., curriculum design *processes* and *outcomes*) are brought together. Because effective teacher professional development is *situated and collaborative in nature* (e.g., Penuel et al. 2007; Putnam & Borko, 2000; Voogt et al., 2015), we elaborate on the theoretical conceptualizations underlying collaborative curriculum design in teacher teams.

Roles for Teachers in Approaches to Curriculum Design

Based on an extensive study of the practice of educational design, Visscher-Voerman and Gustafson (2004) distinguished four paradigms that guide curriculum design processes: the instrumental paradigm, the communicative paradigm, the artistic paradigm, and the pragmatic paradigm. The first three of these paradigms are grounded in theoretical views about curriculum and curriculum design and the fourth, the pragmatic paradigm, emerged from the field of software engineering. While analysis, design, development, implementation and evaluation (ADDIE) are all essential elements of the design process across these four paradigms, their specific sequence as well as the types of design activities involved differ (Visscher-Voerman & Gustafson, 2004). In this section, we discuss teachers' role in the curriculum design process in each of these four paradigms and add some recent views and elaborations.

The *instrumental paradigm* is embedded in prescriptive theories. Prescriptive theories deal with questions about how to design the best possible curricula (Marsh & Willis, 2003). These theories focus on the development of heuristics that guide a high quality design process. Tyler's approach to curriculum design is a classical example (Tyler, 1949). He shifted the discussion from what teachers should do (teacher behaviour) to what students should learn (student behaviour). Tyler formulated four basic questions a curriculum designer must answer: (1) what is the purpose of education, resulting in the selection of objectives; (2) how to select learning experiences that foster the attainment of the objectives; (3) how to organize these learning experiences and (4) how to evaluate them on their effectiveness. Answers to these questions may be sought in philosophy, psychology, and from subject specialists. In addition, students' test results can help to diagnose needs and determine the outcomes of education. Tyler's approach is characterized as rational-linear, and is used for curriculum design at the school level, as well as for large-scale curriculum design and projects that are initiated outside the school. In Tyler's view, the teacher was responsible not so much for the ends of the curriculum (the purpose and the selection of objectives), but for the means (the selection and organization of learning experiences) (Clandinin & Connelly, 1992). Taba, another representative of the rational-linear approach, saw teachers as the ones who provide a supportive environment for learning (Marsh & Willis, 2003). Visscher-Voerman and Gustafson (2004) found that professional curriculum designers following the instrumental paradigm tried to get a clear picture of the needs of their clients as a first step in the design process (*analysis*), often with a focus on the needs of the end users (mostly students). *Design* and *development* activities focused on the creation of the products. *Evaluation* of the design often occurred only when the products were about to be finished and during *implementation* with users; the main concern of designers

adhering to the instrumental approach was how end users (often students) used the products. In their view, teachers mediated the designed materials. In Chap. 2, Pareja Roblin and McKenney discuss teachers' involvement and roles in projects based on the Research, Development & Diffusion (RD&D) model, which represents a specific form of a rational-linear approach to curriculum design. In summary, in the instrumentalist paradigm, teachers are seen above all as implementers of curriculum; but, having said that, there is room for teachers to actively design learning experiences, possibly by making use of externally developed curriculum products. McKenney, Kali, Markuskauskaitė, and Voogt (2015) analysed how teachers can be supported in technology-rich lesson design from an instrumental paradigm perspective. They identified powerful design heuristics that may help teachers design technology-rich lessons.

The *communicative paradigm* is rooted in descriptive theories about curriculum design (Marsh & Willis, 2003). Descriptive theories study what people actually do when they design curricula and are particularly concerned with how people arrive at answers. These theories are concerned with how decisions are made in the curriculum design process and provide a deep understanding of the complexity of the design and development process. Walker's (1971) deliberative approach to curriculum design is a prominent example of the communicative approach. He studied the decision-making processes taking place in large-scale curriculum design projects and found that the personal beliefs and values of those involved influence the curriculum design and development process. Walker argued that these values and beliefs need to be acknowledged and become explicit. In his view, curriculum design was basically a process of negotiation among key stakeholders. He proposed beginning with a platform for open discussion of ideas about the design task among all those involved, with the aim of reaching shared understanding and consensus. Only then could deliberations about concrete courses of action and design decisions occur. The transition from the platform of ideas to the phase of curriculum deliberations was fluid. Deliberations led to core decisions, which informed the design. Visscher-Voerman and Gustafson (2004) found that in a communicative approach, curriculum design is not seen as only the responsibility of professional designers, but that major stakeholders are often invited as co-designers. Other authors have also emphasized the importance of developing shared understanding about the design task among stakeholders, such as teachers. For example, McKenney et al. (2015) discussed how important it is to understand how teachers design and what their thinking is, in order to be able to provide them with appropriate support during the design process. Other studies in this book address the importance of a shared understanding of the design task by teacher designers (e.g., Handelzalts in Chap. 9 and Huizinga, Nieveen, & Handelzalts in Chap. 10). Kessels and Plomp (1999) reported about the importance of a relational (communicative) approach in curriculum design for realizing external consistency. External consistency refers to a shared understanding by the main stakeholders involved of the problem that needs to be solved in the curriculum design process. Their study showed that such shared understanding contributed to teamwork and active involvement in the implementation of the problem solution. Albashiry (Chap. 19) and Akomaning (Chap. 6) in this book

confirm the importance of external consistency in collaborative teacher design. Walker's views have also been used in smaller curriculum design studies. For example, Boschman, McKenney, and Voogt (2014) used Walker's approach to analyse the design talk of kindergarten teachers when designing technology-rich activities to foster early literacy. They found that pedagogical practical considerations guided the design decisions of kindergarten teachers, and not so much up-to-date subject matter knowledge. To conclude, in a communicative approach to curriculum design the knowledge, beliefs and values of major stakeholders about the design task are shared and efforts are undertaken to reach consensus. Teachers are actively involved as major stakeholders in the design process, either as co-designers (in large-scale projects) or collaborating in a teacher team to design school-based curriculum innovations.

The essential starting point in the *artistic paradigm* is the individual process of construction of meaning, often based on the expertise and experience of the connoisseur (Visscher-Voerman & Gustafson, 2004). In essence, this paradigm can be assumed to be rooted in the theory of situated cognition (Greeno, 2011; Greeno et al., 1998; McKenney et al., 2015). This theory claims that knowing is rooted in social activities, context and culture. This view leads to questions such as how and why the curriculum has developed as it has and how it could be developing (Marsh & Willis, 2003). Eisner is a well-known representative of the artistic paradigm. He emphasized the artistry of curriculum making and emphasized that the curriculum is not static but dynamic, and constructed and reconstructed by those who enact it (Marsh & Willis, 2003). Eisner does not differ much from Tyler with regard to what must be addressed when designing curriculum, but in contrast to Tyler he did not see the design process as a linear process, but as an open-ended process in which means and ends are interdependent (Marsh & Willis, 2003; Visscher-Voerman & Gustafson, 2004). Eisner emphasized the complexity and the unexpected character of curriculum design and realized that in the end it is the teacher who decides what is being taught. In the artistic paradigm the teacher as designer of curriculum brings in his practical knowledge, his 'wisdom of practice', which is often implicit and tacit (Shulman, 1986). McKenney et al. (2015) argued teachers' who are designing need a basic understanding of what design and development work entails facilitates the design process. Huizinga, Nieveen, and Handelzalts (see Chap. 7) discuss the need for and scope of teacher design expertise. Thus, it seems important that teachers who are involved in design and development practices learn to make their knowledge explicit and relate it to the specific activities that are involved in curriculum design processes.

Finally, we briefly discuss the *pragmatic paradigm*. The basic interest of this paradigm is whether the design works in practice and is found useful by the end users (Visscher-Voerman & Gustafson, 2004). The pragmatic paradigm emerged from the practice of software engineering. Because of the increasing use of educational software in education, the pragmatic paradigm has increasingly influenced recent curriculum design practices (e.g., Schmidt & Fulton, 2016; Veletsianos, Beth, Lin, & Russell, 2016). An important characteristic of this approach is the limited attention to analysis, and the quick turn-around of prototypical products that are

formatively evaluated by end users (Tripp & Bichelmeyer, 1990). It is a highly iterative approach, which leads incrementally to the final design. These prototypical products provide a concrete visual image of the innovation that is being developed at an early stage of the design process. The deliberations about these prototypes with teachers are important not only because of their knowledge of practice, but also because in this way teachers actively participate in the design process. Cober, Tan, Slotta, So, and Könings (2015) showed how teachers acted as co-designers through commenting on prototypes and, in this way, actually contributed to the design of the final product.

This section shed light on teacher roles in curriculum design. Four approaches to curriculum design processes have been discussed. The instrumental paradigm, as advocated by Tyler, has proved to be helpful in curriculum design processes because it contributes to the quality of the design – also referred to as internal consistency (Kessels & Plomp, 1999). In this paradigm the role granted to teachers is limited to the implementation of the curriculum. The instrumental paradigm falls short in not recognizing curriculum design as a process of interaction and negotiation. This notion is much better recognized and acknowledged in the other three paradigms, which have explicit and active roles for teachers as major stakeholders in curriculum design. Such an active role for teachers is important, not only because consensus and shared understanding about what the curriculum comprises is needed for the implementation of the curriculum, but also because teachers' wisdom of practice results in curricula that are more realistic and practical to implement. In addition, teachers' active role in curriculum design contributes to their professional learning, and both curriculum design and teachers' professional learning determine the quality of implementation of a curriculum innovation.

The Interaction Between Teachers and Curriculum Materials

In the previous section we reviewed the roles teachers typically have in various approaches to curriculum design. In this section we shift our attention to the interaction between teachers and the tangible outcome of the design process: curriculum materials. Curriculum materials are often considered an important means in realizing curriculum innovation, because they provide concrete support and suggestions for the enactment of the curriculum in classroom practice (Brown, 2009; Carlson & Anderson, 2002; Carlson, Davis, & Buxton, 2014).

Curriculum materials are tools that mediate teachers' activity in the classroom and can afford, but also constrain, the teacher's actions (Brown, 2009). The primary function of curriculum materials is to support teachers in enacting the curriculum. However, it is the teacher who decides how to use the materials. The teacher-curriculum encounter is a complex one. Ben-Peretz (1990) distinguished between the objective and the subjective interpretation of curriculum materials. The objective interpretation refers to the use of the materials as intended by the curriculum designers, while the subjective interpretation refers to the interpretation of

curriculum materials by the teacher. The objective interpretation suggests that curriculum materials are used faithfully and serve as a means in realizing curriculum implementation. The underlying assumption is that the curriculum is fixed and should be implemented with *high fidelity*. In the subjective interpretation, curriculum materials are seen as embodiments of the potential of curriculum, which may be realized through teacher interpretation and professional imagination (Ben-Peretz, 1975). The subjective interpretation perceives curriculum materials from the perspective of teachers' active interpretation and work with curriculum materials (Brown, 2009; Remillard, 2005), and depends on experience, beliefs and context. This perspective allows for *mutual adaptation* and an *enactment perspective* on curriculum. Mutual adaptation refers to the evolution of the curriculum through the mutual learning and reshaping of the curriculum by designers and teachers (cf. Dede, 2006). The enactment perspective sees the teacher as a curriculum maker (Clandinin & Connelly, 1992), with regard to both the design and the implementation of curriculum.

Brown (2009) advocated that curriculum materials should no longer be designed as one-size-fits-all documents, but that they should be designed to support different modes of use by teachers. The need for this was confirmed in a study of Shaver (2010), who studied how experienced teachers interpreted and used curriculum materials. She found three types of relationships teachers had with curriculum materials: developers, makers and transmitters of curriculum. These three positions aligned well with a mutual adaptation, enactment or fidelity perspective on curriculum implementation (Snyder, Bolin, & Zumwalt, 1992). In each position, the teachers used specific strategies to cope with curriculum innovations and use curriculum materials. Most teachers in her study were *curriculum developers*. They adapted, expanded and supplemented the curriculum when they saw a need. They did that by using the curriculum materials as a framework for their teaching, adapting or skipping parts of the materials and using other sources when needed. *Curriculum makers* started with a needs analysis, designed their own curriculum materials and evaluated them. They referred to the curriculum, more than to specific curriculum materials, as the basis for their decisions. Finally, *curriculum transmitters* strictly followed the curriculum materials. Similar findings were observed in a study by Remillard and Bryans (2004). Thus, teachers display different relationships with curriculum materials, yet little is known about why these relationships differ and how they may impact teacher practices and student learning.

Well-designed curriculum materials help teachers to enact the curriculum as intended. However, research has shown that many textbooks and teacher guides often fail to help teachers understand the rationale behind the suggestions they offer for teaching and for monitoring student progress (Ball & Cohen, 1996; Valencia, Place, Martin, & Grossman, 2006). A strand of studies has focused on the potential of curriculum materials to help teachers to better understand the curriculum innovation and to provide them with specific support for enacting essential, but vulnerable elements of the curriculum innovation (Ball & Cohen, 1996; Davis & Krajcik, 2005; Van den Akker, 1988). The assumption underlying these studies is that curriculum materials designed with this purpose in mind can foster teacher learning and

contribute to the implementation of curriculum innovations. Findings have shown that such curriculum materials indeed help teachers to change their teaching practice and provide a successful experience when teaching the innovative curriculum (e.g., Davis, Palincsar, Smith, Arias, & Kademian, 2017; Pareja Roblin, Schunn, & McKenney, 2018; Schneider & Krajcik, 2002; Van den Akker, 1988). However, researchers in this strand have also acknowledged that materials alone are not enough to realize the sustainable implementation of curriculum innovations. To have an impact on teacher behaviour and student learning in the long run, teachers' active involvement in their own professional learning is needed, so that they can adapt materials to their specific context and needs, based on an understanding of the intentions of the curriculum (Davis et al., 2017; Schneider, Krajcik, & Blumenfield, 2005; Thadani, Cook, Griffis, Wise, & Blakey, 2010).

Theoretical Conceptions Underpinning Collaborative Curriculum Design in Teacher Teams

In the two previous sections we discussed different roles for teachers in the process of curriculum design and we elaborated on the interaction between teachers and the product of the design process, the curriculum materials. In this section we discuss the importance of teacher involvement in curriculum design to produce curriculum materials that support curriculum implementation. Based on theoretical conceptions, we argue that collaborative curriculum design in teacher teams is essential for bridging the gap between curriculum intentions and realization, and for realizing a curriculum innovation with an important additional effect: teacher learning. Our work on collaborative design in teacher teams is informed by sociocultural theories about teacher learning and change. Three elements characterize these theories: learning is mediated through activity, learning is social in nature, and learning is situated and culturally embedded. Below, we elaborate on each of these elements.

Curriculum design is characterized by the development of concrete curriculum materials through active discourse. The joint feature of these materials is that they incorporate a plan for learning (Taba, 1962) that is the result of negotiation among involved stakeholders. These negotiations take place when teachers collaboratively design curriculum for targeted learners with specific objectives and content. The two basic elements of curriculum design, materials (tools) and discourse (speech), make curriculum design capable of being seen as a mediated activity (Vygotsky, 1978). Vygotsky (1978) argued that such mediated activity, the interaction between the curriculum materials (tools) and the articulated reflection on the purpose of the materials through discourse (speech), leads to learning. Thus, when teachers are actively involved in the process of curriculum design they develop a relationship

with the curriculum through the curriculum materials that leads to teacher learning (Brown, 2009; Remillard, 2005).

The importance of collaboration between teachers during the design process is grounded in the social nature of the learning that takes place in collaborative design. Wenger (1998) introduced the concept of community of practice for a group of people with shared interests in a specific domain. As a community, they develop joint perspectives by sharing knowledge and experiences in solving problems they encounter, and they learn from each other in this process. Collaborative design in teacher teams is an example of a community of practice. During the process of collaborative curriculum design, teachers need to solve problems and make decisions (Walker, 1971). They need to articulate their (often tacit) practical knowledge (Verloop, Van Driel, & Meijer, 2001; Shulman, 1986) in order to develop a shared understanding of the problem and its possible solution. This process of interpretation and negotiation is not linear but iterative in nature, and leads to individual and collaborative learning (Clarke & Hollingsworth, 2002; Greeno, 2011; Wenger, 1998). Voogt et al. (2011) have shown that the interaction of teacher design teams with the external expertise brought in by a facilitator positively contributes to the quality of the design and to teachers' learning. Such external expertise can also take the form of existing curriculum materials, which can serve as examples to support teams of teachers in articulating their understanding of the innovation and the design task (Binkhorst, Poortman, & Van Joolingen, 2017). The importance of external expertise relates to Vygotsky's (1978) notion of the 'zone of proximal development'; a concept that Vygotsky (1978) used to describe the interaction between learning and development. In his view, learning takes place when actual development expands through interaction with experts and peers who bring in new knowledge. This notion of the 'zone of proximal development' is also relevant when to understand teacher learning when they interact with curriculum materials. Studies on effective professional development confirm the importance of collaboration for teacher learning (Garet, Porter, Desimone, Birman, & Yoon, 2001; Whitcomb, Borko, & Liston, 2009).

The theory of situated cognition (Greeno, 2011; Greeno et al., 1998) postulates that the behaviour of individuals can be understood from the behaviour of the social system to which the individuals belong. Hence, the behaviour of individual teachers is deeply embedded in the system called school (Sarason, 1996). The school as a social system for the teacher becomes reality in the specific contextual experiences of a specific teacher as well as in the accumulated experiences of all teachers. What a teacher brings to the design process is thus mainly determined by the specific and universal demands, opportunities and constraints of the school (Janssen, Westbroek, Doyle, & Van Driel, 2013). This situative view implies that teacher learning and change through curriculum design can only be meaningful when the culture and context of the school are an integral part of the process. We argue that the process of collaborative curriculum design by teachers is, by its nature, culturally embedded and situated, and therefore offers a perfect environment for teacher learning.

Teachers bring their knowledge and experience to the design process, they negotiate solutions for the design problems they face, they develop concrete curriculum materials and they (ideally) formatively evaluate these (interim) products through implementing them in their teaching practice. These specific characteristics of collaborative curriculum design thus guarantee a learning process that is situated and culturally embedded. Several studies reflecting on effective characteristics of teacher professional development have pointed to the importance of embedding teacher learning in actual teaching practice (e.g., Borko, 2004; Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009; Penuel et al. 2007; Putnam & Borko, 2000).

Teacher learning and the consequent change processes taking place in collaborative curriculum design activities are cyclical in nature. This type of learning is captured in the model of expansive learning proposed by Engeström (2006). According to this model, the learning and change process consists of a sequence of epistemic actions, going from questioning aspects of the existing practice, to analysing the situation, modelling alternatives in a visible and transmittable medium, examining the model, experimenting with it to grasp its actual contour and possible limitations, implementing the model with enrichments and conceptual extensions, and then reflecting on the process and consolidating it toward becoming a stable form of new practice (Engeström & Sannino, 2010). This process, when done collaboratively, brings about agency that is both collective and distributed. Expansive cycles correspond to a learning process that includes both internalization and externalization. When teachers are designing new curriculum or new learning activities, they need to engage in reflective analysis of what exists (internalization) and to design and implement new models (externalization). Thus, in collaborative curriculum design, teachers have a key role in curriculum design and innovation. On the one hand, they are participating in a social learning process that has an impact on their professional learning and on their sense of ownership of the innovation. On the other hand, they realize a high quality curriculum innovation through their participation as a community in a collaborative design process that aims at the design of curriculum materials that are relevant, consistent, feasible and effective (Nieveen, 2009).

This Book

In this book, we present studies that start from the perspective that teachers are curriculum makers who actively design curriculum in collaboration with colleagues. The conceptualizations above have shown that both the process and products of curriculum design may contribute to teacher learning. We also showed that through their active involvement in shaping curriculum materials, teachers assume agency for how the materials transform their teaching and may contribute to student

learning. When teachers collaboratively design curriculum, they share this agency. Voogt et al. (2015) used the term *shared transformative agency* to describe this process. They argued that teacher involvement in collaborative curriculum design increases the chance that teachers as a team develop ownership for the design and that shared responsibility contributes to sustainable implementation of the design in classroom practice. The contributions in the present book aim to deepen our knowledge of collaborative curriculum design in teacher teams and its impact on teacher learning and sustainable curriculum implementation.

References

- Alexander, R. J., & Flutter, J. (2009). *Towards a new primary curriculum: A report from the Cambridge primary review. Part 1: Past and present*. Cambridge, UK: University of Cambridge Faculty of Education.
- Ball, D., & Cohen, D. (1996). Reform by the book: What is – or might be – the role of curriculum materials in teacher learning and instructional reform? *Educational Researcher*, 25(9), 6–8. 14.
- Ben-Peretz, M. (1975). The concept of curriculum potential. *Curriculum Theory Network*, 5, 151–159.
- Ben-Peretz, M. (1990). *The teacher-curriculum encounter*. Albany, NY: State University of New York Press.
- Binkhorst, F., Poortman, C., & van Joolingen, W. (2017). A qualitative analysis of teacher design teams: In-depth insights into their process and links with their outcomes. *Studies in Educational Evaluation*, 55, 135–144.
- Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher*, 33, 3–15.
- Boschman, F., McKenney, S., & Voogt, J. (2014). Understanding decision making in teachers' curriculum design approaches. *Educational Technology Research and Development*, 62, 393–416.
- Brown, M. (2009). The teacher-tool relationship: Theorizing the design and use of curriculum materials. In J. T. Remillard, B. Herbel-Eisenman, & G. Lloyd (Eds.), *Mathematics teachers at work: Connecting curriculum materials and classroom instruction* (pp. 17–36). New York: Routledge.
- Carlson, J., & Anderson, R. (2002). Changing teachers' practice: Curriculum materials and science education reform in the USA. *Studies in Science Education*, 37(1), 107–135.
- Carlson, J., Davis, E. A., & Buxton, C. (2014). *Supporting the implementation of the Next Generation Science Standards (NGSS) through research: Curriculum materials*. Retrieved from <https://narst.org/ngsspapers/curriculum.cfm>
- Clandinin, J., & Connelly, F. (1992). Teacher as curriculum maker. In P. Jackson (Ed.), *Handbook of research on curriculum* (pp. 363–401). New York: Macmillan.
- Clarke, D., & Hollingsworth, H. (2002). Elaborating a model of teacher professional growth. *Teaching and Teacher Education*, 18, 947–967.
- Cober, R., Tan, E., Slotta, J., So, H.-J., & Könings, K. D. (2015). Teachers as participatory designers: Two case studies with technology-enhanced learning environments. *Instructional Science*, 43, 203–228.
- Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad*. Washington, DC: National Staff Development Council.
- Davis, E., & Krajcik, J. (2005). Designing educative curriculum materials to promote teacher learning. *Educational Researcher*, 34(3), 3–14.

- Davis, E. A., Palincsar, A. S., Smith, P. S., Arias, A. M., & Kademian, S. M. (2017). Educative curriculum materials: Uptake, impact, and implications for research and design. *Educational Researcher*, 46(6), 293–304.
- Dede, C. (2006). Scaling up: Evolving innovations beyond ideal settings to challenging contexts of practice. In R. K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 551–566). Cambridge, UK: Cambridge University Press.
- Engeström, Y. (2006). Activity theory and expansive design. In S. Bagnara & G. Crampton Smith (Eds.), *Theories and practice in interaction design: Interaction design* (pp. 3–25). New York: Lawrence Erlbaum.
- Engeström, Y., & Sannino, A. (2010). Studies of expansive learning: Foundations, findings and future challenges. *Educational Research Review*, 5(1), 1–24.
- Fullan, M. (1991). *The new meaning of educational change* (2nd ed.). London: Casell Educational Limited.
- Fullan, M. (2008). Curriculum implementation and sustainability. In M. F. Connelly, M. F. He, & J. Phillion (Eds.), *The sage handbook of curriculum and instruction* (pp. 113–122). London: Sage.
- Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal*, 38, 915–945.
- Greeno, J. G. (2011). A situative perspective on cognition and learning in interaction. In T. Koschmann (Ed.), *Theories of learning and studies of instructional practice* (Vol. 1, pp. 41–71). New York: Springer.
- Greeno, J. G., & Middle School Mathematics through Applications Project Group. (1998). The situativity of knowing, learning, and research. *American Psychologist*, 53(1), 5–26.
- Haug, P. (2003, May). The evaluation of reform 97: Key findings. Paper presented at the concluding session of the Programme for the Evaluation of Reform 97, Folkets hus, Oslo, Norway.
- Janssen, F., Westbroek, H., Doyle, W., & Van Driel, J. H. (2013). How to make innovations practical. *Teachers College Record*, 115, 1–42.
- Kessels, J., & Plomp, T. (1999). A systematic and relational approach to obtaining curriculum consistency in corporate education. *Journal of Curriculum Studies*, 31(6), 679–709.
- Marsh, C. J., & Willis, G. (2003). Approaches to curriculum. In *Curriculum: Alternative approaches, ongoing issues* (3rd ed.) (pp. 66–92). Upper Saddle River, NJ: Pearson Education.
- McKenney, S. E., Kali, Y., Markuskauskaitė, L., & Voogt, J. (2015). Teacher design knowledge for technology enhanced learning: An ecological framework for investigating assets and needs. *Instructional Science*, 43, 181–202.
- Niederhauser, D., Howard, S., Voogt, J., Agyei, D., Laferrière, T., Tondeur, J., & Cox, M. (2018). Sustainability and scalability in educational technology initiatives: Research-informed practice. *Technology, Knowledge and Learning*, 23, 3.
- Nieveen, N. (2009). Formative evaluation in educational design research. In T. Plomp & N. Nieveen (Eds.), *An introduction to educational design research* (pp. 89–101). Enschede, The Netherlands: SLO.
- Pareja Roblin, N., Schunn, C., & McKenney, S. (2018). What are critical features of science curriculum materials that impact student and teacher outcomes? *Science Education*, 102(2), 260–282.
- Penuel, W. R., Fishman, B. J., Yamaguchi, R., & Gallagher, L. P. (2007). What makes professional development effective? Strategies that foster curriculum implementation. *American Educational Research Journal*, 44(4), 921–958.
- Putnam, R. T., & Borko, H. (2000). What do new views of knowledge and thinking have to say about research on teacher learning? *Educational Researcher*, 29(1), 4–15.
- Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research*, 75(2), 211–246.

- Remillard, J. T., & Bryans, M. B. (2004). Teachers' orientations towards mathematics curriculum materials: Implications for teacher learning. *Journal for Research in Mathematics Education*, 35(5), 352–388.
- Sarason, S. S. (1996). *Revisiting "the culture of the school and the problem of change"*. New York: Teachers College Press.
- Schmidt, M., & Fulton, L. (2016). Transforming a traditional inquiry-based science unit into a STEM unit for elementary pre-service teachers: A view from the trenches. *Journal of Science Education and Technology*, 25(2), 302–315.
- Schneider, R. M., & Krajcik, J. (2002). Supporting science teacher learning: The role of educative curriculum materials. *Journal of Science Teacher Education*, 13(3), 221–245.
- Schneider, R. M., Krajcik, J., & Blumenfeld, P. (2005). Enacting reform-based science materials: The range of teacher enactments in reform classrooms. *Journal of Research in Science Teaching*, 42, 283–312.
- Shawer, S. F. (2010). Classroom-level curriculum development: EFL teachers as curriculum-developers, curriculum-makers and curriculum-transmitters. *Teaching and Teacher Education*, 26(2), 173–184.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15, 4–14.
- Snyder, J., Bolin, F., & Zumwalt, K. (1992). Curriculum implementation. In P. Jackson (Ed.), *Handbook of research on curriculum* (pp. 402–435). New York: Macmillan.
- Stenhouse, L. (1975). *An introduction to curriculum research and development*. Oxford, UK: Heinemann Educational Books Ltd.
- Taba, H. (1962). *Curriculum development: Theory and practice*. New York: Harcourt, Brace & World.
- Thadani, V., Cook, M. S., Griffis, K., Wise, J. A., & Blakey, A. (2010). The possibilities and limitations of curriculum-based science inquiry interventions for challenging the "pedagogy of poverty". *Equity & Excellence in Education*, 43(1), 21–37.
- Tripp, S. D., & Bichelmeyer, B. (1990). Rapid prototyping: An alternative instructional design strategy. *Educational Technology Research and Development*, 38(1), 31–44.
- Tyler, R. W. (1949). *Basic principles of curriculum and instruction*. Chicago: University of Chicago Press.
- Valencia, S., Place, N., Martin, S., & Grossman, P. (2006). Curriculum materials for elementary reading: Shackles and scaffolds for four beginning teachers. *The Elementary School Journal*, 107(1), 93–120.
- Van den Akker, J. (1988). The teacher as learner in curriculum implementation. *Journal of Curriculum Studies*, 20(1), 47–55.
- Van den Akker, J. (2003). Curriculum perspectives: An introduction. In *Curriculum landscapes and trends* (pp. 1–10). Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Veletsianos, G., Beth, B., Lin, C., & Russell, G. (2016). Design principles for thriving in our digital world: A high school computer science course. *Journal of Educational Computing Research*, 54(4), 443–461.
- Verloop, N., Van Driel, J. H., & Meijer, P. C. (2001). Teacher knowledge and the knowledge base of teaching. *International Journal of Educational Research*, 35, 441–461.
- Visscher-Voerman, J. I. A., & Gustafson, K. (2004). Paradigms in the theory and practice of education and training design. *Educational Technology, Research & Development*, 52(2), 69–89.
- Voogt, J., Laferrière, T., Breuleux, A., Itow, R., Hickey, D., & McKenney, S. (2015). Collaborative design as a form of professional development. *Instructional Science*, 43, 259–282.
- Voogt, J., Westbroek, H., Handelzalts, A., Walraven, A., McKenney, S., Pieters, J., et al. (2011). Teacher learning in collaborative curriculum design. *Teaching and Teacher Education*, 27(8), 1235–1244. <https://doi.org/10.1016/j.tate.2011.07.003>.

- Vygotsky, L. S. (1978). Mind in society. In *The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Walker, D. F. (1971). A study of deliberation in three curriculum projects. *Curriculum Theory Network*, (7), 118–134.
- Walker, D. F. (2003). *Fundamentals of curriculum; passion and professionalism* (2nd ed.). New York: Routledge.
- Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge, UK: Cambridge University Press.
- Whitcomb, J., Borko, H., & Liston, D. (2009). Growing talent: Promising professional development models and practices. *Journal of Teacher Education*, 60(3), 207–212.
- Williamson, B. (2013). *The future of the curriculum. School knowledge in the digital age*. Cambridge, MA: The MIT Press.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

