A Blueprint for Teacher Design Teams to Create Professional Development Interventions

Lysanne S. Post (iD)
Leiden University, Leiden, the Netherlands

Anouschka van Leeuwen (iD)
Utrecht University, Utrecht, the Netherlands

Ditte Lockhorst (iD)
Oberon, Utrecht, the Netherlands

Wilfried Admiraal (iD)
Oslo Metropolitan University, Oslo, Norway

Liesbeth Kester (iD)
Utrecht University, Utrecht, the Netherlands

To cite this article:

International Journal on Studies in Education (IJonSE) is affiliated with
International Society for Technology, Education, and Science (ISTES): www.istes.org

A Blueprint for Teacher Design Teams to Create Professional Development Interventions

Lysanne S. Post, Anouschka van Leeuwen, Ditte Lockhorst, Wilfried Admiraal, Liesbeth Kester

Article Info	Abstract
	An effective way to stimulate teachers' engagement and involvement in educational innovations is by employing teacher design teams (TDTs, Vangrieken et al, 2013). The design activities that TDTs engage in should be chosen carefully, and a facilitator should be available to support the TDTs (Becuwe et al, 2016). So far, little attention has been paid in the literature to the nature and role of such design activities (Vangrieken et al, 2013; Brouwer et al, 2012). Therefore, the goal of this paper is to provide guidelines for the design activities of TDTs aimed at teachers' professional development. A series of design activities to support TDTs in five secondary schools in the Netherlands was constructed and evaluated through audio recordings of each session, logbooks, and interviews about teachers' perceptions of the design process and activities. In this article, we present and discuss the resulting blueprint for TDT activities aimed at teachers' professional development.

Introduction

Innovation and change are inherent to and necessary for keeping the educational system up to date. Secondary schools are no exception, and frequently deal with the challenge to innovate their practices, for example by implementing new technological tools. Whether innovations succeed is largely dependent on the engagement and involvement of teachers (Admiraal et al., 2017).

An effective way to stimulate teachers' engagement and involvement in educational innovations is by employing teacher design teams (TDTs, Vangrieken et al., 2013). TDTs are small groups of teachers who take part in the design of an innovation. In a recent study with preschool to upper secondary school teachers, Bergmark (2020) stresses the importance of context-specific, bottom-up and collaborative teacher professionalisation – all elements that are present when working with TDTs. The collaborative process of TDTs has been studied extensively. For example, Brouwer et al. (2012) conducted a review of design principles for TDTs in secondary schools. Based on both literature and a case study, these authors provide an overview of which types of interaction are beneficial for the design process.

Adequate support is needed for TDTs to function and collaborate well (Voogt et al., 2016). First, a *facilitator* should be available to support the TDTs (Becuwe et al., 2016). Facilitators are important to provide logistic

support, and to monitor and scaffold the design process (Becuwe et al., 2016). Second, the activities that the TDTs engage in should be chosen carefully. Literature shows that the design activities that are chosen can be beneficial for eliciting the interactions between the members of a TDT (Brouwer et al., 2012; Kali, McKenney, & Sagy, 2015; Vangrieken et al., 2013). Svihla and colleagues (2015) for example studied several case studies and deduced that design activities can fulfill the following roles:

1) Model effective practices in teaching and design,

2) Support dialogue between teachers in their design process,

3) Scaffold the design process,

4) Help to design for real-world use.

Svihla et al also provide several examples of activities that TDTs could engage in. The exact way that design activities should be shaped remains a topic for further research. We therefore try to build on earlier studies that have observed collaboration in teacher teams. Our approach is, based on literature, to formulate expectations for what types of design activities are effective, and to evaluate the activities in five case studies.

In the remainder of section 1, we review literature that formed the basis for our construction of the design activities. In section 2, we describe the method of the theory-based construction and evaluation of the design activities carried out by five TDTs. In section 3, we report the findings of the evaluation which provided practice-based feedback to improve the series of design activities. The resulting theory- and practice-based blueprint for design activities is presented in section 4. We conclude with an overall discussion in section 5.

Effective Collaboration

Two lines of research informed the creation of the design activities for teachers in our study: research on collaborative activities and educational design research. First, we consulted literature concerning collaborative activities. The effectiveness of a team largely depends on the type of interaction that occurs during collaboration (Damşa, 2014; Lipscombe, Buckley-Walker, & McNamara, 2019). Therefore, we focused in particular on how to structure collaborative design activities in a way that stimulates beneficial interactions between team members.

In general, two core principles for structuring collaborative activity effectively are *individual accountability* and *positive interdependence* (Johnson & Johnson, 1998). Individual accountability means that every group member feels responsible for contributing to the achievement of the team's shared goal. When group members feel accountable, they are more likely to participate in a constructive way.

Methods for stimulating individual accountability include dividing responsibilities for the work into an individual and collaborative component, or randomly assigning the work to one of the group members so that every group member feels responsible to add their share. Positive interdependence means that the group result depends on the input of each of its members, and that group members see that their efforts are individually and collectively beneficial. This can be achieved, for example, by choosing group members with different, specific strengths, or by assigning members a different, specific role. Implementing these principles helps to achieve

effective interaction by stimulating equal and constructive participation. Activities that support individual accountability and positive interdependence can be set up in a way that invites team members to present arguments for their opinions, and to respond to each other's arguments. For example, by first asking teachers in a TDT to write down their own ideas, and then asking team members who teach in other domains to respond from their point of view.

When teachers collaboratively work on a project in a TDT, the product they work on – such as a report or prototype (Damşa, 2014) – serves as a *shared collaborative object* (Packer & Goicoechea, 2000). This object may guide the collaborative process because it serves as a tangible representation of what is being generated by the group of teachers, and thus as a representation of the progress (or lack thereof) that is made (Damşa, 2014).

Lastly, it is important that *group cohesion* exists within a collaborating teacher team. Otherwise, the teacher team may become victim of so-called social pitfalls (Kreijns, Kirschner, & Jochems, 2003). As Kreijns and colleagues describe, it should not be taken for granted that effective collaboration of teachers will occur simply because the activity makes it possible. The social dimension of collaboration needs to be taken into account and stimulated to create group cohesion, trust and respect within the group (Admiraal, Lockhorst, & Van der Pol, 2012; Bronkhorst, Meijer, Koster, Akkerman, & Vermunt, 2013; Kreijns et al., 2003). Especially when teachers in a group are not acquainted with each other, it is important to pay considerable attention to this aspect, for example by creating opportunities for social, off-task communication (Kreijns et al., 2003). This recommendation does not only apply in the onset of the collaboration, but throughout the process.

Educational Design Research and the ADDIE-model

The second line of research that informed the construction of the design activities in our study concerned educational design research. This type of research aims at designing an intervention in a real-world education context through an iterative, cyclic approach (Van den Akker, Gravemeijer, McKenney, & Nieveen, 2006). It is theory-, process- and utility-oriented, meaning that the design is partly based on theory, has a focus on understanding and improving interventions, and is measured by its practical use in a given context. An example of a well-known educational design research model is the one proposed by McKenney and Reeves (2012) which consists of four parts: (1) analysis & exploration, (2) design & construction, (3) evaluation & reflection, and (4) implementation & spread.

McKenney, Nieveen, and Van den Akker (2006) argue that educational design research can not only contribute to curriculum development, but also to teachers' professional development. Because the current project is about designing an intervention aimed at teachers' professional development, the most logical choice for structuring the design activities would be a design research model such as the one by McKenney and Reeves (2012) or an instructional design model, such as the ten steps to complex learning described by Van Merriënboer and Kirschner (2007). An overarching abstraction of such models that is well-known by many researchers, but also among teachers, is the ADDIE-model. Even though its origin is not exactly clear, it was first mentioned in the eighties (Molenda, 2015). Molenda (2015) concludes that even though there is no original document or author

of the ADDIE model, it has become an umbrella term that refers to instructional models with a common underlying structure. This structure contains elements of educational design research and is easy to understand. Therefore, the ADDIE-model – a curriculum design approach – is used to set-up professional development interventions in the current project.

The model's name is the abbreviation of the five steps of design that most design models include, namely Analysis, Design, Development, Implementation, and Evaluation. Figure 1 demonstrates the ordering of and relation between these five steps. The basis of the model is quite straightforward: A design process usually starts with the analysis phase, consisting of the analysis of the problem and the desired outcome. After this phase, the process of instructional design continues with the design, development, implementation, and evaluation phases. However, as shown by its central position and the arrows in Figure 1, evaluation should take place throughout the process. The model can also be used iteratively for prototypes of the design, for example by piloting a prototype, evaluating this and, if necessary, adjusting the overall design before developing a new prototype and implementing it.
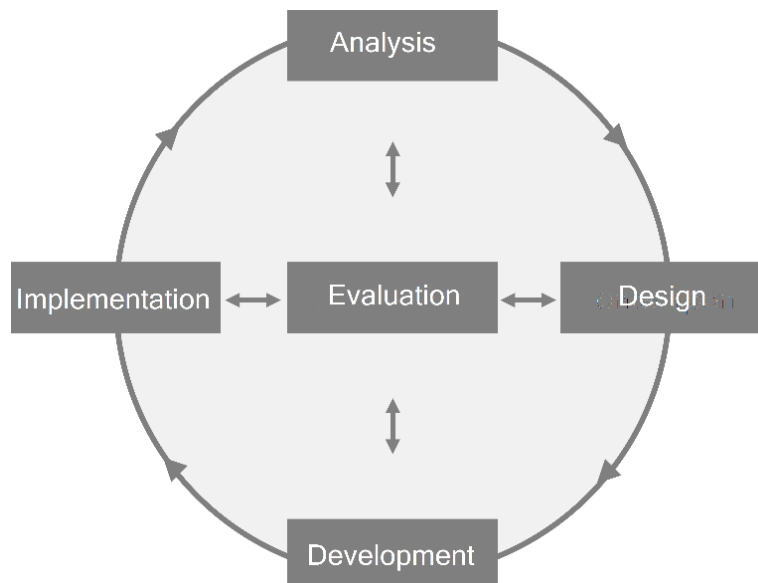

Figure 1. ADDIE-model (retrieved and translated from the Dutch curriculum development center, SLO, 2021)

The Present Study

Teacher design teams (TDTs) have been studied extensively. It is clear that TDTs are capable of designing high quality educational products and that they increase teacher engagement. It is also clear that TDTs need adequate support to be successful, both concerning direct support from a facilitator as well as support in the form of carefully chosen design activities.

The goal of this study is to provide a blueprint for design activities that support TDTs. We aimed to create a blueprint with activities based on both the theoretical knowledge from the literature and our TDTs experiences with the activities. In order to do this, we took the role of activity designer, facilitator of the TDTs, and

researcher: We constructed a series of design activities using the ADDIE-model and guidelines from the studies mentioned above concerning TDT-support (i.e., facilitator guidance) and collaborative learning (i.e., individual accountability, positive interdependence, use of shared objects, and group cohesion). Next, we implemented and evaluated the series of design activities. Finally, we used our experiences and the evaluation data to turn our initial activity series into the Blueprint that is presented in this article.

Method

Context

The context of this study was a project carried out by a research consortium consisting of three educational research institutes and five secondary schools in the Netherlands. These schools expressed a wish to implement the use of learning analytics to support differentiated teaching in class. In order to facilitate this, the schools planned to set up a professional development program for their teachers. TDTs were initiated within the five schools to design this professional development program as a group. The three research institutes took on the role of developing, facilitating and evaluating the design activities for the TDTs, which is what we report on in this article.

Characteristics of the Teacher Design Teams

At each of the five participating secondary schools, situated in various parts of the Netherlands, one TDT participated. Each TDT consisted of four or five teachers (who received time in their schedule to work on the project). The characteristics of the TDTs are displayed in Table 1.

Table 1. Table with Participant Characteristics

School	Size TDT	Gender	Age (in years)	Teaching experience (in years)
1	4	3 female	$M = 37.67, SD = 8.74$	$M = 7.33, SD = 5.13$
2	4	1 female	$M = 40.00, SD = 1.00$	$M = 12.00, SD = 5.20$
3	5	1 female	$M = 36.50, SD = 16.98$	$M = 15.25, SD = 17.63$
4	4	1 female	$M = 44.00, SD = 18.65$	$M = 22.25, SD = 20.69$
5	5	2 female	$M = 38.80, SD = 12.15$	$M = 12.00, SD = 3.54$

Construction of Design Activities

In this section, we describe the process of how the design activities for the TDTs were constructed. The first two authors started the process of constructing design activities and created initial versions of the design activities, informed by the design principles derived from literature. The remainder of the author team provided feedback and suggestions, leading to the versions of the activities that were implemented and evaluated in the schools.

Through the design activities, the TDTs progressed through each of the five steps in the ADDIE-model. The set-up contained five TDT sessions, each corresponding roughly to one of the steps in the ADDIE-model.

Additionally, some of the five steps required action outside of TDT team meetings (especially the step of "Implementation"). Each session was designed to last for about 2.5 hours, allowing for in-depth collaboration and discussion.

Within each of the five sessions, the design activities were constructed in such a way that they adhered to the guidelines derived from literature concerning TDT-support and collaborative learning (section 1.1). Those guidelines are: Facilitator guidance, individual accountability, positive interdependence, group cohesion, and use of shared objects such as an online platform where the results of the TDT could be shared. In the presentation of the final blueprint in section 4, it is specified which guidelines were relevant for which activities.

Guidance was provided to the TDTs with both implicit and explicit guidance. To provide an explicit support structure, the TDTs were guided by a facilitator (one of the researchers) who provided logistical support and monitored and scaffolded the design process (Becuwe et al., 2016). Concerning the implicit guidance of the design activities of the TDTs, the five sessions slowly decreased in the amount of support from the first to the last session. In the initial sessions, the design activities more heavily leaned on providing the TDTs with input and material to support their collaborative process. In the last sessions, the focus was more on activities that invited the TDTs to share their own ideas and input.

Based on the above, a series of design activities was created and evaluated in the five participating schools. Section 4 contains the final blueprint that resulted from this theory-based series of activities and the evaluation of these activities in practice. The materials for the sessions and activities can also be found as activity packages on www.project-doen.nl (in Dutch).

Evaluation of Design Activities

To evaluate how the constructed design activities functioned in practice, data have been collected in several ways: field notes, logbooks, and interviews. These three instruments probed the facilitators' impressions, as well as the teachers' evaluations immediately after the sessions and on a general level after all sessions were completed. The sessions were also audio-recorded. This way, a reference source was available to clarify the other data if needed.

The facilitators made field notes from the enacted sessions after each session. The field notes were about 1 page per session and included notes about the facilitator's perceptions of the activities and whether any special circumstances occurred (such as a team member having to leave early).

Teachers completed digital logbooks about their perceptions of the design process at the end of each session. In these logbooks, teachers were asked how they evaluated today's session, whether they had specific tips for improving the activities, and what progress they thought their team had made as a result of the session.

Two teachers of each TDT were interviewed after the design process had been completed using a structured interview guideline. The interview guideline included questions relating to teachers' perceptions of the design process in general, perceptions of each design activity separately, and perceptions of the role of the facilitator. The interviews lasted between 30 and 45 minutes and were audio recorded.

The field notes, logbooks, and interviews were analyzed with a qualitative analysis, more specifically, using a matrix methodology (Miles & Huberman, 1994). As a starting point for the analysis, we created a matrix in which we included each of the activities in the five TDT sessions as the rows. Three columns were created:

- one for positive aspects,
- one for negative aspects, and
- one for general remarks about the activity.

In the cells, fragments from the field notes, logbooks, and interviews were transcribed so that all data was categorized as a specific comment about one of the activities. This process thus resulted in an overview table of the data from all data sources with the perceptions and observations for each of the activities. After this process, we created a fourth column in which we summarized all data for each activity by listing the most important considerations in terms of what elements of the activity to retain or adjust. This summary was the practice-based input to improve the theory-based series of activities resulting in the blueprint, which is presented in section 4.

Evaluation Findings

The evaluation of the design activities resulted in general conclusions and recommendations as well as specific adaptations to particular activities. The implications of these findings are incorporated in the final blueprint in section 4. In order to shed light on the evaluation findings, we describe the general outcomes in the current section.

The first general conclusion is that most teachers evaluated the process of collaborating in a TDT as positive, constructive, and an enrichment of their experiences as a teacher. They did emphasize that proper preparation was necessary for the success of the TDT: it is important to select teachers that are willing to invest time and energy, and it is important that there is a clear goal for the TDT to strive towards (i.e., what will the TDT be designing and for what purpose). That goal needs to be agreed upon with the school management team to ensure support for the result of the design process and for ensuring the availability of resources for the TDT.

On a smaller scale, it was also essential that each session and each activity was accompanied by an explanation of the goals so that the teachers knew why they engaged in a certain activity or what the envisioned goal for a session was. Teachers mentioned in the interviews and logbooks that the relevance of an activity sometimes only became clear in hindsight. Thus, more time should be reserved at the beginning of each session and activity to ensure everyone is on the same page.

The second general finding is that the design sessions are essential for moving the TDTs forwards in their design process. As time was limited during the sessions, the TDTs were expected to work on their designs in

between sessions as well. Many teachers mentioned that they would have liked to have more time during the sessions to collaborate with their teammates. They suggested sending the team information to study in advance of the sessions, so that the facilitator would not need to explain everything during the sessions. Doing so could also help to increase the teachers' knowledge of the design process and their content knowledge of the object that they are designing.

The third general finding is that the teachers sometimes felt like their team lacked the expertise to design an appropriate professionalization program, and the facilitator fulfilled a role in providing that expertise. Thus, by having team members engage in more preparatory reading, the activities during the sessions could be more effective.

Another general finding is that although the teachers in the TDTs were colleagues, not all of them knew each other well, especially when the teachers taught in different subject domains. Most teachers valued the activities aimed at creating a positive group atmosphere. As the sessions progressed, some hiccups in collaboration also occurred, for example when some team members were absent. Still, the teachers continued to report in the logbooks that they experienced a strong sense of group cohesion and that there was a shared goal within their TDT.

From both interviews and logbooks another general finding was that the facilitator fulfilled an essential role. The facilitator clarified the goals of the sessions and activities, guided the collaboration process in the TDT, kept an eye on time and alignment between sessions, and provided content- and process-related feedback during activities.

Besides these general findings, we also obtained specific findings for each activity. Some activities were considered highly positive and conducive to the group process, such as an activity in which teachers quickly had to answer a number of questions about the conditions (such as available time and budget) of the intervention they were designing. Other activities were evaluated less positively, and these activities were adjusted for the final blueprint. For example, in one activity teachers create the initial timeline for their intervention. Evaluations showed that this activity offered teachers too much freedom, which left them drifting. Thus, in the final blueprint the options that are offered to teachers in this activity are more restricted.

The Blueprint

The final blueprint for activities to support TDTs based on our initial theory-driven design and the evaluation of its use in practice consists of the structure outlined in Figure 2 and the explanation of each element below that Figure. The blueprint consists of 5 sessions in which the TDTs meet (the solid numbered circles in Figure 2) and some activities outside of those sessions (the circles with dotted lines in Figure 2). The colors indicate the 5 main phases in the ADDIE-model. In the remainder of this section, it is explained how the principles from the collaboration literature are represented in the activities.
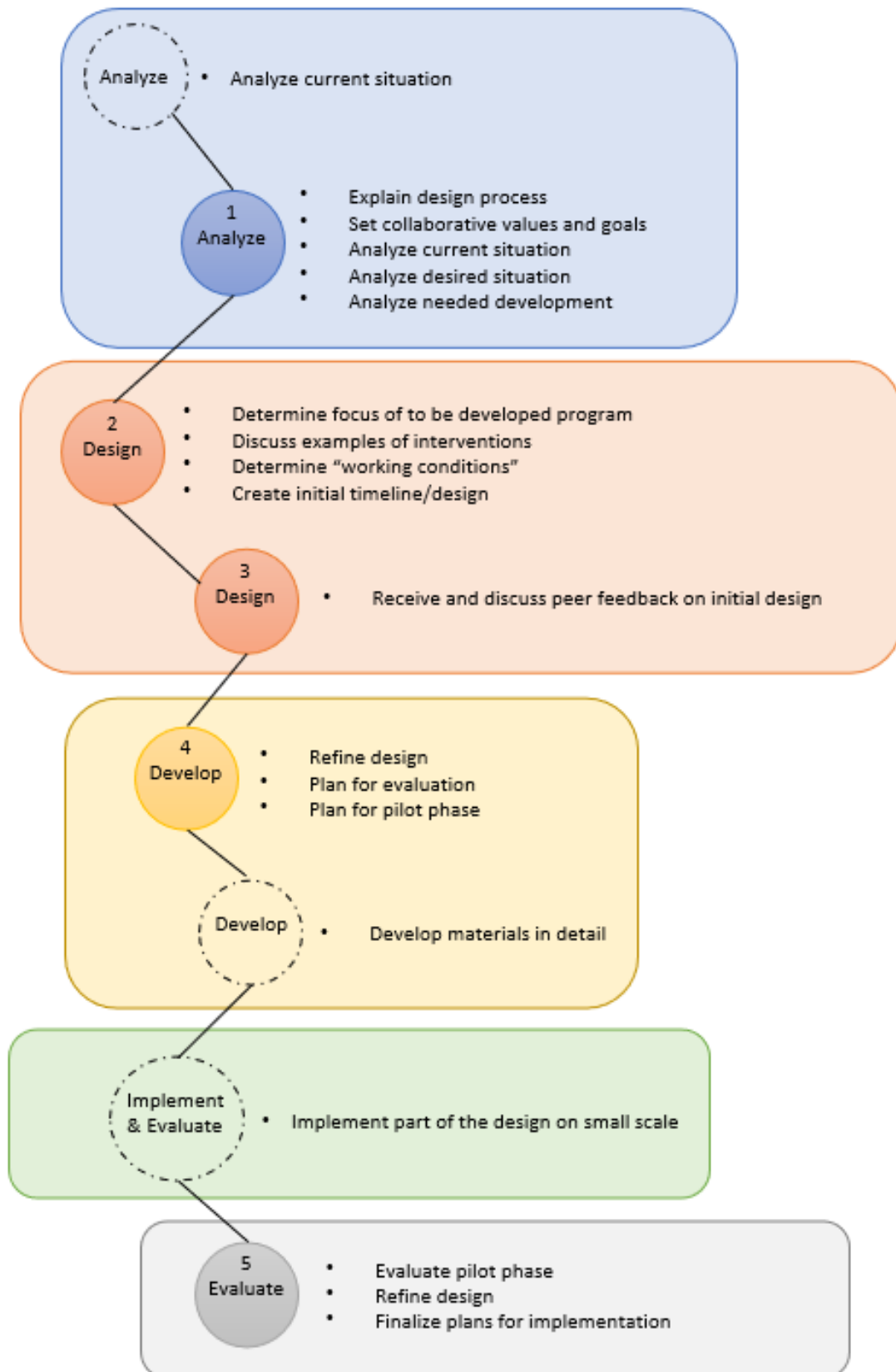
Figure 2. Blueprint for Design Sessions for TDTs

Note. Colors indicate the ADDIE-phases, circles with numbers denote the TDT sessions, and circles with dotted lines are activities in between TDT sessions.

Session 1: Analysis

In Table 2, the goals and corresponding activities for a preparatory activity and session 1 are displayed. For each activity it is also listed in Table 2 which of the guidelines that we derived from literature on collaborative learning are relevant for that activity.

Prior to session 1, it is recommended to conduct an initial investigation at the school to examine the current situation regarding the subject of the intervention. As TDTs usually consist of early adopters or teachers who are generally optimistic and enthusiastic about the innovation that they are involved in, analyzing the current situation may benefit from including the opinion and experiences of a broader range of teachers in a school. In our specific project, for example, we (the authors in our role of facilitators) therefore opted for doing this research among a broader teacher sample before the first session. Our aim was to obtain a representative idea of the situation in the entire school. We asked teachers at the schools to complete questionnaires and logbooks about their current use of learning analytics for differentiated teaching (Van Leeuwen, Post, Lockhorst, Admiraal, & Kester, submitted). We analyzed the data before the first session. Such a prior analysis can also be done on a smaller scale, but in any case, we recommend having the TDTs and/or facilitator at least engage in a prior conversation with the school leaders to make sure everyone is on the same page regarding the goals of a TDT.

Table 2. Goals and Activities for Preparatory Activity and Session 1 (Analysis)

Session	Main goals	Activity	Guidelines from CL literature
Preparatory activity: Analysis	*Analyze current situation*	*Conduct initial investigation at the school (e.g., questionnaires)*	-
Session 1: Collaboration initiation & Analysis	Explain design process	Presentation by facilitator	Facilitator guidance
	Set collaborative values and goals	Padlet brainstorm. Result is used as reminder in each session	Group cohesion Individual accountability
	Analyze current situation	Share results of prior investigation	Facilitator guidance
	Analyze desired situation	"On the cover" activity	Positive interdependence
	Analyze needed development	Skill hierarchy	Shared object

Session 1 of the blueprint addresses the first step of the ADDIE-model (Analysis), but also forms the first session in which the TDTs come together as a team. Therefore, considerable time should be scheduled for explaining what a TDT entails and for creating the setting for collaboration. In our example, the TDT members

were asked in a brainstorm activity to first provide their core values for collaboration on post-its individually. Then, as a group, they compared and categorized the post-its to arrive at a set of values that everyone agreed on. These values were entered onto a digital padlet, so that it could be used as a reminder in each subsequent session.

After introductory activities, the TDTs start with Analysis. Analysis typically consists of three steps, namely (1) establish the current situation, (2) establish the desired situation (the goal of the TDT), and comparing the first two steps: (3) what development is needed to reach the desired situation? TDTs first need to establish the current situation. As described above, in our specific project, this had been prepared prior to the TDT sessions by the facilitator. The facilitator presented the findings to the TDTs in Session 1.

Next, TDTs describe the desired situation. We recommend an activity called "on the cover" (gamestorming.com/cover-story; see top of Figure 3) that requires TDTs to describe the best possible outcome of the whole trajectory for their school as a newspaper article. They should frame it in such a way that the desired situation is newsworthy enough to appear on the cover of a newspaper. For example, in our project, we asked the TDTs to describe what the desired situation would look like concerning the use of analytics in the school. The evaluation findings showed that teachers tended to take the student perspective by describing a news story in which each student received personalized education, whereas the aim of the project was to professionalize *teachers*. Therefore, we deem it important to stress what perspective the TDT should take in framing the story. Thus, the facilitator plays an important role in reminding the TDT of the focus and providing feedback on the activity accordingly.
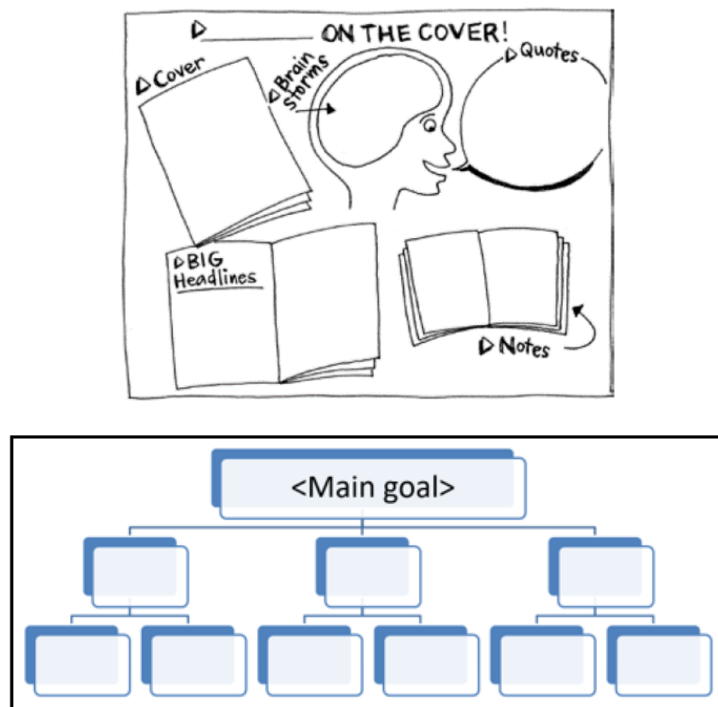

Figure 3. Screenshots of Materials Used for the Activities in Session 1 (top: "On the cover", bottom: skill hierarchy).

The final activity for the step Analysis is to compare the current situation to the desired situation. Our TDTs did so by creating a skill hierarchy (see bottom of Figure 3), with the desired situation on top as the main goal, and beneath it, an explanation of the skills needed to accomplish that goal. Then, by looking again at the analysis of the current situation, the TDTs judged which skills were not yet sufficiently present within their context and thus withheld them from reaching their desired situation. By making this comparison, the TDTs narrowed down the specific skills to work on. The skill(s) that the TDTs decided to focus on constituted the ultimate goal for which they were going to be designing during in the upcoming sessions. For example, one of the teams in our project concluded that their colleagues lacked the specific skill to interpret different kinds of metrics or analytics related to students' learning processes. This prevented them to effectively use the learning analytics. Thus, their goal was to design a professionalization program on this particular skill.

At the end of the first session, the TDTs should have a design goal in mind that is going to be addressed in the subsequent sessions. It is important that the facilitator keeps explaining the goal of each activity in advance and making clear for the TDT what the end goal of the session is. We emphasize this, because our impression of this first session, which was congruent with the teacher logbooks, is that the relevance of the activities leading up to this last part was not always clear for all members of the TDT throughout the initial stages of session 1.

Session 2 & 3: Design

After the Analysis phase, the Design phase follows. Sessions 2 and 3 focus on Design. Table 3 outlines the goals, activities, and guidelines from the literature for these sessions.

Table 3. Goals and Activities for Session 2 and 3 (Design)

Session	Main goals	Activity	Used guidelines from CL literature
Session 2: Design	Determine focus of intervention to be developed	Group discussion	Group cohesion Facilitator guidance
	Discuss examples of interventions	Presentation by facilitator	Facilitator guidance
	Determine "working conditions"	Quick answers sheet	Positive interdependence
	Create initial timeline for intervention	Timeline sketch + Materials sheet	Positive interdependence Shared object
Session 3: Design	Receive and discuss peer feedback for initial design	Plenary exchange session between schools	Group cohesion Individual accountability

Session 2 starts with an activity to decide on the specific focus of the to-be designed professionalization program. In our project, TDTs discussed the branches of the skill hierarchy made in session 1, with skills that are needed to achieve the general goal of the professionalization program (in our case, to use learning analytics to differentiate in class). In a group discussion, TDTs decided which specific skill or skills needed most improvement and would thus be the focus of the innovation.

Next, we recommend that the facilitator provides an explanation and examples of various types of interventions that TDTs can consider as inspiration for the professionalization program they are designing. In our project, the TDTs received a list of all intervention types as a preparation for the meeting. During the facilitator's presentation of the intervention types, the TDTs were instructed to think about which types of intervention could be appropriate for their school and to bear in mind the focus of the professionalization program they agreed upon in the previous activity. TDTs were encouraged to discuss the intervention types during the presentation.

Before proceeding to activities aimed at actual Design, it is important that TDTs establish conditions for implementation of the professionalization program. They need to discuss issues such as whether there is budget for materials, for an external trainer, and for training of an internal trainer. They also need to discuss whether certain aspects are desirable or not, such as a long duration of the professionalization program (i.e., a few months), a multiple day intervention (e.g., summer school), or an intervention outside of the school (e.g., a workshop with a company of a learning analytics tool). In our project, the design-activity for the establishment of boundary conditions was a very efficient and short group discussion guided by a quick answer sheet. The TDT was presented with a list of 12 questions. In a maximum of two minutes per question, they had to decide whether the answer is yes, no, or needs further attention (at a later moment). For example, one question was "Is there a budget for an external speaker?". If TDTs knew the answer, they answered yes or no. Otherwise they chose the "needs further attention" option and wrote down some relevant keywords and who was responsible for resolving this issue. The facilitator made sure the TDTs proceeded to the next issue when two minutes had passed. The evaluation findings revealed that both TDTs and facilitators appreciated this activity very much. Thus, this activity is highly recommended to establish boundary conditions.

The remaining time of session two is dedicated to the actual Design of the professionalization program. In this design-activity the TDT makes a first draft of a design of the professionalization program in an extensive group discussion. In our example, the TDT members were assigned different roles to boost the collaborative process and maximize this activity's result. One of the team members had the role of "creator". This person drew the timeline based on the ongoing discussion, see Figure 4. Another team member was the "facilitator". This person created a list of materials with everything that was needed to develop the professionalization program from the timeline. The third team member was the "annotator" and wrote down the argumentation for each aspect of the program. Lastly, the fourth team member was the "devil's advocate" and asked critical questions during the discussion. If the teams consisted of more than 4 people, multiple people held the same role. In this activity, it turned out to be important to restrict the freedom the TDT has by only allowing a specific set of "elements" to put on the timeline, such as "plenary meeting" or "workshop". Otherwise, the TDT risked getting stuck in discussions about details which would not have been beneficial at this point of the Design process.
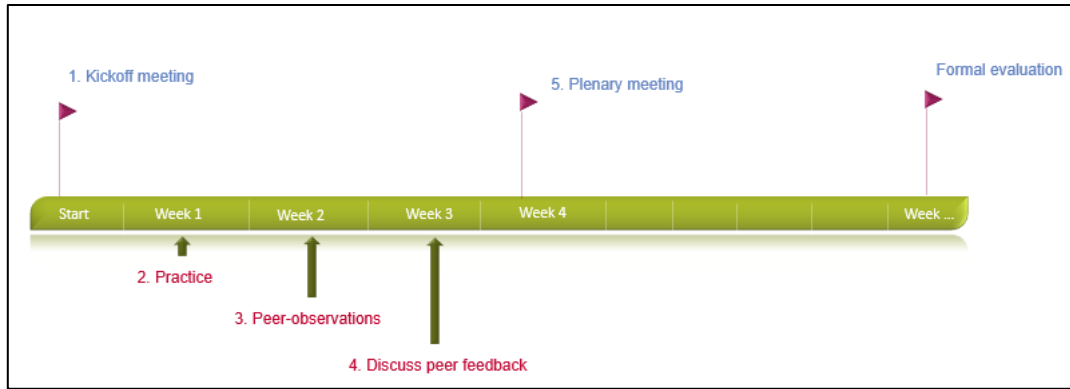
Figure 4. Template with Examples of Intervention Components Used for the Timeline Activity

After session 2 and in preparation for session 3, the TDTs finish the initial design of the professionalization program without the presence of the facilitator because session 3 is meant for receiving peer feedback. If it is not possible to engage in a peer feedback session with other TDTs, peer feedback can also be obtained by asking teachers outside of the TDT in the same school to provide feedback on the initial design. In case of our project, peer feedback during session 3 was facilitated by having the TDTs from all 5 schools present their initial designs to each other and providing feedback on the other teams' designs. To the TDTs this activity was worthwhile not only to discuss the questions they had concerning their designs, but also to gain the recognition that they were not the only ones struggling with certain issues. With regard to this activity, we recommend creating sufficient time for the TDTs to engage in discussion with each other after the presentations.

Session 4: Development

In session 4, the TDTs move from Design to Development, meaning that the initial design is developed into a more concrete form. Table 4 outlines the goals, activities, and guidelines from the literature for this session.

Table 4. Goals and Activities for Session 4 (Development)

Session	Main goals	Activity	Used guidelines from CL literature
Session 4: Development	Refine design	Timeline sketch + Materials sheet	Positive interdependence Individual accountability Shared object
	Plan for evaluation	Group discussion	Facilitator guidance
	Plan for pilot phase	Group discussion	Individual accountability Facilitator guidance
Development	*Develop materials in more detail*	*Team members work on creating the required materials*	Individual accountability

The first goal of session 4 is to refine the designs. Based on the peer feedback received in session 3, the design is further developed. For our example, this meant that in terms of the timeline that TDTs created, activities were

added, deleted, and/or shifted along the timeline based on the received feedback. In this activity, the design was also extended by adding specific materials to the list of materials needed to implement the design. Also, a new column was added to the materials sheet in which the teams specified who was responsible for each element and when it would be finished.

The second goal of session 4 is to make a plan for evaluation of the professionalization program that the TDTs design. In order to create a sustainable innovation, it is not only important that the TDTs have a solid plan for carrying out the professionalization program, but also for evaluating it. The TDTs in our project therefore engaged in a group discussion in which they decided at what timepoints on their timeline they would add evaluation activities such as questionnaires or observations.

The final goal of session 4 is to plan a pilot to implement and evaluate the professionalization program on a small scale. In our example, the TDTs were free to choose specific elements of the professionalization program that they were going to experiment with. Agreements were made about which team member would test which element of the design through a group discussion.

After session 4, in preparation for the pilot, the TDTs work on developing the actual materials for the intervention.

Pilot and Session 5: Implementation and Evaluation

After session 4, the TDTs engaged in small-scale pilots of the designs they created. Session 5 is the final session before actual implementation. Its goals, activities, and guidelines from the literature are outlined in Table 5.

Table 5. Goals and Activities for Pilot and Session 5 (Implementation and Evaluation)

Session	Main goals	Activity	Used guidelines from CL literature
Pilot test phase (Implementation)	*Implement parts of intervention on small scale*	*Dependent on specific design*	
Session 5: Evaluation	Evaluate pilot phase	Group presentation	Individual accountability
	Refine design	Timeline sketch + Materials sheet	Positive interdependence Shared object
	Finalize plans for implementation	Create role division and specific plans	Individual accountability

The first goal of session 5 is to evaluate the pilot. In our project, the TDTs presented the outcomes of the pilot to the facilitator. Based on the TDT's findings, the professionalization program is further refined in the second activity. This refinement will mostly concern the materials that the TDTs require for implementing their design. For example, one of the TDTs in our project piloted the peer feedback system they wanted to implement and

found that they needed to change the feedback form to include more guidance for the teachers who would be working with it. Refinements to the design were made on the timeline and materials sheet. Here the iterative nature of the design process is clearly visible, as the Design, Development, and Evaluation phases go hand in hand. The final goal of session 5 is to go through the plans for implementation and to create a role division and deadlines for any remaining preparations.

Discussion

Literature stresses the benefits of teacher design teams (TDTs). By having teachers engage in designing parts of innovations or curriculum at school, not only does the school benefit from the designed products, but teacher involvement also increases, and chances of successful implementation are higher (Vangrieken et al, 2013). Literature also shows that the specific activities TDTs engage in can stimulate the design process (Svihla et al., 2015). The specific activities that are chosen, form an implicit type of guidance for TDTs by structuring the collaboration process. Our findings confirm and extend earlier studies that concluded that the design activities should be chosen carefully (Kali, McKenny, & Sagy, 2015; Svihla et al., 2015). In this paper, we extended earlier studies by presenting a blueprint for design activities informed by literature and by testing it in an evaluation with five TDTs.

The blueprint was based on literature concerning collaborative learning (e.g., Johnson & Johnson, 1998) and models for educational design research and instructional design (i.e., the ADDIE-model). To support TDTs and stimulate effective collaboration, we incorporated facilitator guidance and principles underlying effective collaboration. We indeed found that teachers experienced working in a TDT as constructive and an enriching experience in their teaching profession. We made sure all TDT members felt individually responsible for the design process and contributed to the design, for example by making use of individual and collaborative components and assigning members specific roles.

We used the ADDIE-model as the basis for the steps to be taken in the design sessions. The design process is iterative, especially in later stages when design and evaluation thereof go hand in hand. Svahli et al. (2015) identified several functions that design activities can fulfill for TDTs. Our study confirms that especially *supporting dialogue* and *scaffolding the design process* are important functions that the design actitivies fulfill.

A finding from the evaluations is that both guidance offered by the facilitator and guidance in the form of the activities are essential elements for the TDT's success. It is not a question of which type of guidance is more important, but rather of how both types of guidance are combined and integrated. The choice of activities determines the role that the facilitator needs to take to support the TDT. For example, in one of the activities we found that if the activity itself clearly demarks the possible actions of the TDT, the result is that facilitators need to be less heavily involved in steering the discussion.

Another aspect of the balance between explicit and implicit guidance is that the TDT takes more responsibility for the design process in the later steps of the ADDIE-model, meaning that the implicit guidance of the design

activities becomes less prominent. This is apparent in the blueprint by the balance shifting from elaborate activities including materials and explanations offered by the facilitator, towards activities in which group discussions and input from the TDT are at the forefront. These insights concerning the role of explicit and implicit guidance form an addition to existing descriptions of the importance of guidance of TDTs (Voogt et al., 2016).

Conclusion

In this paper, we constructed and evaluated a blueprint for design activities in the context of TDTs. To conclude, this paper served two purposes: First and foremost, it fulfils a very practical function by presenting a blueprint for design activities that schools may use as they see fit to give shape to their own TDTs. The blueprint is set up in the specific context of our project but can be adjusted to the context of other schools, for example concerning the choice to split sessions for each phase of the design process, or the choice to perform research into the current situation prior to or during the first session. Second, the paper demonstrates the importance of a careful choice of design activities. Even if schools do not use the blueprint one-on-one as we present it here, we hope the paper arms them with the information they need to create their own activities. Third, on a theoretical level, this study provided insight in the relation between collaborative learning aspects and specific design activities. To the best of our knowledge, there was no literature on how to translate specific theoretical aspects of collaborative learning into specific TDT-activities for developing a professionalization program.

Acknowledgement

References

Admiraal, W., Lockhorst, D., & Van der Pol (2012). An expert study on a descriptive model of teacher communities. Learning Environments Research, 15, 345-361. https://doi.org/10.1007/s10984-012-9117-3

Admiraal, W., Louws, M., Lockhorst, D., Paas, T., Buynsters, M., Cviko, A., … Kester, L. (2017). Teachers in school-based technology innovations: A typology of their beliefs on teaching and technology. Computers and Education, 114, 57–68. https://doi.org/10.1016/j.compedu.2017.06.013

Becuwe, H., Tondeur, J., Pareja Roblin, N., Thys, J. and Castelein, E. (2016). Teacher design teams as a strategy for professional development: The role of the facilitator. *Educational Research and Evaluation*, *22*(3-4), 141-154. https://doi.org/10.1080/13803611.2016.1247724

Bergmark, U. (2020). Teachers' professional learning when building a research-based education: context specific, collaborative and teacher-driven professional development. *Professional Development in Education,* doi: 10.1080/19415257.2020.1827011

Bronkhorst, L. H., Meijer, P. C., Koster, B., Akkerman, S. F., & Vermunt, J. D. (2013). Consequential research designs in research on teacher education. *Teaching and Teacher Education*, *33*, 90-99. https://doi.org/10.1016/j.tate.2013.02.00717

Brouwer, P., Brekelmans, M., Nieuwenhuis, L. and Simons, R. (2012). Fostering teacher community development: A review of design principles and a case study of an innovative interdisciplinary team. *Learning Environments Research*, *15*, 319-344. https://doi.org/10.1007/s10984-012-9119-1

Damşa, C. I. (2014). The multi-layered nature of small-group learning: Productive interactions in object-oriented collaboration. *International Journal of Computer-Supported Collaborative Learning*, *9*(3), 247-281. https://doi.org/10.1007/s11412-014-9193-8

Johnson, R.T.; Johnson, D.W.; & Holubec, E.J. (1998). Cooperation in the Classroom. Boston: Allyn and Bacon.

Kali, Y., McKenney, S., & Sagy, O. (2015). Teachers as designers of technology enhanced learning. *Instructional Science*, *43*, 173–179. https://doi.org/10.1007/s11251-014-9343-4

Kreijns, K., Kirschner, P. a., & Jochems, W. (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: a review of the research. *Computers in Human Behavior*, *19*(3), 335–353. https://doi.org/10.1016/S0747-5632(02)00057-2

Lipscombe, K., Buckley-Walker, K., & McNamara, P. (2019). Understanding collaborative teacher teams as open systems for professional development. *Professional Development in Education, 46*, 373-390.

McKenney, S., Nieveen, N., & Van den Akker, J. (2006). Design research from a curriculum perspective. In Van den Akker, J., Gravemeijer, K., McKenney, S., & Nieveen, N. (Eds.). *Educational Design Research* (pp. 110-143). London: Routledge.

McKenney, S., & Reeves, T. C. (2012). *Conducting Educational Design Research*. London: Routledge.

Miles, M., & Huberman, A. M. (1994). Qualitative data analysis: An expanded sourcebook (2nd ed.). Thousand Oaks, CA: Sage.

Molenda, M. (2015). In search of the elusive ADDIE model. *Performance Improvement, 54* (2), 40-42. Doi: 10.1002/pfi.21461

Packer, J. M., & Goicoechea, J. (2000). Sociocultural and constructivist theories of learning: Ontology, not just epistemology. Educational Psychologist, 35(4), 227-241. https://doi.org/10.1207/S15326985EP3504_02

SLO (2021). Het ontwikkelproces (ADDIE-model). Vijf stappen van curriculumontwikkeling. Retrieved from: https://magazines.slo.nl/curriculumwaaier#!/ontwikkelproces

Svihla, V., Reeve, R., Sagy, O., & Kali, Y. (2015). A fingerprint pattern of supports for teachers' designing of technology-enhanced learning. *Instructional Science*, *43*, 283–307. https://doi.org/10.1007/s11251-014-9342-5

Van den Akker, J., Gravemeijer, K., McKenney, S., & Nieveen, N. (Eds.) (2006). *Educational Design Research*. London: Routledge.

Van Leeuwen, A., Post, L. S., Lockhorst, D., Admiraal, W., & Kester, L. (2020). *A typology of teachers' use of learning analytics in secondary education*. Manuscript submitted for publication.

Van Merriënboer, J. J. G., & Kirschner, P. A. (2007). *Ten steps to complex learning.* New York: Taylor & Francis.

Vangrieken, K., Dochy, F., Raes, E. and Kyndt, E. (2013). Team entitativity and teacher teams in schools: Towards a typology. *Frontline Learning Research*, *1*(2), 86-98.

Voogt, J. M., Pieters, J. M. and Handelzalts, A. (2016). Teacher collaboration in curriculum design teams: effects, mechanisms, and conditions. *Educational Research and Evaluation*, *22*, 121-140. https://doi.org/10.1080/13803611.2016.1247725

Author Information

Lysanne S. Post

https://orcid.org/0000-0001-7350-2122

Leiden University

Leiden

The Netherlands

Contact e-mail: *l.s.post@iclon.leidenuniv.nl*

Anouschka van Leeuwen

https://orcid.org/0000-0003-2970-1380

Utrecht University

Utrecht

The Netherlands

Ditte Lockhorst

https://orcid.org/0000-0002-6942-6005

Oberon

Utrecht

The Netherlands

Wilfried Admiraal

https://orcid.org/0000-0002-1627-3420

Oslo Metropolitan University

Oslo

Norway

Liesbeth Kester

https://orcid.org/0000-0003-0482-0391

Utrecht University

Utrecht

The Netherlands