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Title   **Pre-service teachers as designers in the context of advertising literacy education**

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Abstract   The present study describes how teacher design teams (TDTs) in pre-service education were set up to create in-school programs about advertising. A multiple case-study design was employed to reveal what kinds of input-, process-, and output-related factors facilitate or hinder the collaboration of three voluntarily participating teams of pre-service teachers. By combining pre-TDT questionnaire data with an analysis of audiorecorded team design discussions and reflective data collected after the design process, we found that the participating student teachers (1) were unfamiliar with design assignments at the start of the project, but were all intrinsically motivated to take part; (2) especially express practical concerns when designing learning materials, and (3) argue that TDTs positively contribute to their professional development. As this study revealed both facilitating and hindering factors, recommendations for future organization of and research on TDTs in pre-service education are offered.

Pre-service teachers as designers in the context of advertising literacy education

Britt Adams, Tijs Rotsaert, Tammy Schellens, Martin Valcke

1.0 Introduction

As society changes, educational aims are also constantly changing, requiring 'a permanent redefinition of teachers' tasks and competencies' (Carlgren, 1999, p.44). To embed societal changes in schools, a growth of teachers' design work has been advocated for several years (Boschman, McKenney, & Voogt, 2014; Carlgren, 1999). Recent research work about this matter focuses particularly on the collaboration among teachers when designing educational materials; in other words, teacher design teams (TDTs) form the basis of a considerable amount of current literature. It is established that high active involvement in design tasks can contribute positively to both teacher professionalization and the effective implementation of the designed products (at larger scale) as TDTs produce concrete educational materials which are largely in line with realistic classroom practices (Binkhorst, Handelzalts, Poortman, & van Joolingen, 2015; Boschman et al., 2014). To optimize the effectiveness of TDTs, several studies have attempted to identify factors that facilitate or hinder collaborative design processes, summarized by Binkhorst et al. (2015) in a descriptive framework for TDTs (see Figure 1). However, although Carlgren (1999) argued that the growing design aspects of teachers' work entail new challenges for teacher education programs, very little is currently known about what factors are important when bringing student teachers together in TDTs. This study seeks to obtain data which will help to address these research gaps.

The context of this study is advertising literacy education, or the design of educational materials aimed at learning primary school children how to recognize and deal critically with new advertising formats (Eagle, 2007; Hudders et al., 2017; Rozendaal, Lapierre, van Reijmersdal, & Buijzen, 2011). Nowadays, advertisers are constantly introducing new child-oriented persuasion strategies. As a consequence, day in and day out, children are confronted not only with traditional advertising formats (e.g., 30-second television spots), but also with non-traditional advergames[1] and product placement[2]. These new formats are typically characterized by their integration of commercial content into the media content and their interactive and engaging nature; which are two features that distinguish them from traditional advertising formats (Hudders, Cauberghe, & Panic, 2015). Therefore, new advertising formats are more difficult to recognize, possibly leading to an unconscious and unwilling influence on children (Owen, Lewis, Auty, & Buijzen, 2013).

[1] Advergames are games that are designed and created to promote an existing brand, product, service or idea and that are offered for free by the advertiser (Daems & De Pelsmacker, 2015, p. 35)

[2] Product placement is the paid inclusion of branded products or brand identifiers through audio and/or visual means within media programs (Daems & De Pelsmacker, 2015, p. 33)

To reduce children's susceptibility, scholars have repeatedly stressed the role of education (Eagle, 2007; Nelson, 2015; Rozendaal et al., 2011). During the past decades, a few in-school advertising programs have been developed in Western societies. However, after thoroughly analysing these learning materials, researchers revealed two general limitations. First, Meeus, Walrave, Van Ouytsel and Driesen (2014) discovered that many educational resources have not been updated since their creation; consequently, most of them only discuss traditional formats and ignore recent advertising trends. Second, Rozendaal et al. (2011) emphasized that there is a strong focus on cognitive advertising competences (e.g., ad recognition, understanding advertising's intent or persuasive tactics) in existing educational programs, to the prejudice of affective advertising competences. Today, particular attention must be paid to the latter since children are easily impressed by the overwhelming character of new advertising formats, demotivating them to think critically about how advertisers try to convince (young) consumers (De Pauw, De Wolf, Hudders, & Cauberghe, 2017; Rozendaal et al., 2011).

In sum, while the TDTs design socially relevant teaching materials about advertising, this study aims to provide insight into important aspects that should be kept in mind when organizing TDTs in pre-service teacher education. In what follows, the use of TDTs is theoretically framed.

1.1 Theoretical framework: TDTs in Pre-Service Teacher Education

In line with design-based research - i.e., a practical research methodology with a focus on bridging the gap between educational research and practice (McKenney & Reeves, 2019) - a collaborative partnership between researchers and practitioners is particularly valuable when developing learning materials (Anderson & Shattuck, 2012; McKenney & Reeves, 2019). While researchers are usually capable to determine the effectiveness of an intervention, they are often insufficiently aware of complexities that play in educational practice (Anderson & Shattuck, 2012), which can have a detrimental impact on a successful large-scale dissemination of designed educational materials. If teachers perceive that an educational program might not fit their needs and classroom practice, they can be quick to resist (Boschman et al., 2014; McKenney & Reeves, 2019).

A promising strategy to develop curriculum materials that are compatible with authentic classroom practices seems to be TDTs (Binkhorst et al., 2015), which can be defined as 'a group of at least two teachers, from the same or related subjects, working together on a regular basis, with the goal to (re)design and enact (a part of) their common curriculum' (Handelzalts, 2009, p.7). Existing literature has identified a number of success factors that must be taken into account when organizing TDTs. As illustrated in Figure 1, Binkhorst et al. (2015) subdivided these factors into three stages: input, process and outcome. Concerning the input stage, both contextual and individual characteristics play a role. On the one hand, the contextual support of

the school, going from scheduling time for participation to recognizing team members efforts, is of great importance (Gast, Schildkamp, & Veen, 2017).
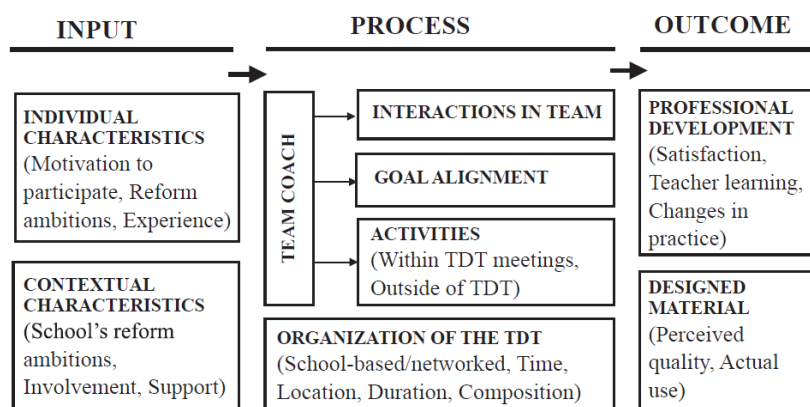

Figure 1. Binkhorst et al.`s descriptive framework for TDTs

On the other hand, individual teacher characteristics include, among other things, (1) motivation to participate (the higher the intrinsic motivation, the more likely a teacher successfully participates in a TDT), and (2) experience with designing (Binkhorst et al., 2015). Related to the latter, Huizinga, Handelzalts, Nieveen, and Voogt (2014) argued that teachers are novice designers; they usually lack the knowledge and skills to complete a design process. As often in the past, teachers' activities inside the classroom were seen as the real work; however, 'seeing curriculum making and the designing of school work as a virtual practice which is different from teaching in the classroom opens new ways of seeing (and organizing) teacher education programmes' (Carlgren, 1999, p.43).

Because today's teachers are challenged to do something that they have rarely done before, an important process-related factor in a TDT is the support of a team coach, most of the time an expert in the field, who can fulfil three roles: (1) offering logistic support (e.g., scheduling appointments or reserving meeting rooms), (2) monitoring the design process by stimulating group interaction, and (3) providing scaffolds to structure the design process (Becuwe, Tondeur, Roblin, Thys, & Castelein, 2016). About the last role, Handelzalts (2009) recommended to rely on existing typologies related to curriculum development. A first useful typology is the curricular spider web of Van den Akker (2003), in which the relationship between ten curriculum components (such as aims and objectives, content, learning activities, teacher role, etc.) is visualized in a clarifying way. A second typology to structure the design process is based on research of Gustafson and Branch (2002) who analysed instructional design (ID) models and concluded that nearly all include five core elements: Analysis, Design, Development, Implementation and Evaluation, referred to with the acronym ADDIE.

Next to the presence of a coach, Figure 1 shows that team interaction is another factor at the process level. Although very little is known

about the nature and content of collaborative conversations (McKenney, Boschman, Pieters, & Voogt, 2016), this is an interesting source of information as it reflects how teachers think when trying to solve design problems and portrays which argumentations underpin design decisions (Boschman et al., 2014; Stempfle & Badke-Schaub, 2002). To better understand designers' reasoning, Stempfle and Badke-Schaub (2002) captured team communication in detail and argued that design talk can be split up by interactions on both the task itself and the group process, with the respective ratio 2/3 and 1/3. More concretely, related to content-directed communication, it can vary from goal clarification to analysing and evaluating preliminary design solutions thoroughly (Stempfle & Badke-Schaub, 2002), whereby teachers' argumentations often fall in the realm of practical concerns (Boschman et al., 2014).

Finally, factors at the level of team organization can facilitate or hinder collaborative design processes, for instance the time element. As mentioned earlier, team participants need to get enough time of their school, but they also need to make time themselves to meet and work together on a regular basis (Handelzalts, 2009). A second organizational characteristic is the composition of the group. A general guideline prescribed by Handelzalts (2009) is that effective teams consist of a minimum of two to a maximum of six participants to ensure that it is small enough to know everyone and large enough to have a range of knowledge and ideas. Other issues related to team composition are: mono-disciplinary versus multidisciplinary teams, experienced versus beginning teachers, etc. (Binkhorst et al., 2015). For example, while experienced teachers have more difficulty with giving up their autonomy, beginning teachers exhibit fewer problems with collaboration, but they still struggle with other aspects as their new position as teacher and classroom management (Handelzalts, 2009).

Taken together, the outcome of TDTs is twofold: it has the potential to (1) support professional development as teachers share and apply competences while addressing design problems, and (2) lead to practically implementable educational resources. However, as summarized in the framework of Binkhorst et al. (2015), there are many factors that determine the success or failure of TDTs. These factors were taken into account when concretizing the research design of the present study.

1.2 Purpose of the study & research questions

This paper describes how TDTs in pre-service education were set up for the development of learning materials to raise fourth and fifth graders' advertising literacy. By doing so, this study provides both a practical and a theoretical contribution. For one thing, it will lead to learning materials that are directly applicable in practice, and for another, it will broaden theoretical knowledge about (success) factors for organizing TDTs (in teacher education). In the research questions,

we therefore zoom in on some specific factors of Binkhorst et al.'s input-process-outcome framework:

> **RQ1**: Which individual characteristics typify student teachers at the start of the design process? [input]
>
> > a. What are pre-service teachers' motivations to participate and personal reform ambitions?
> > b. What are pre-service teachers' existing design experiences?
>
> **RQ2**: How do team interactions evolve during the design process of an in-school program about advertising? [process]
>
> **RQ3**: How do pre-service teachers reflect on [outcome]:
>
> > a. The use of TDTs?
> > b. Their designed learning materials?

2.0   Methods

2.1   Design, procedure and participants

After distributing an open call to all second-year pre-service primary school teachers of one university college, ten students (♂: 2; ♀: 8; age range: 19 - 45 years) expressed interest in the assignment to design learning materials aimed at enhancing primary school children's advertising literacy. In other words, student teachers could sign up voluntarily. In return, they were exempted from two courses, which emulated similar competences as the project (e.g., conducting research in practice and working collaboratively). In this way, an important contextual characteristic - namely that educational institutions need to be supportive by giving the participants enough time to take part - was achieved.

Figure 2 presents the way TDTs were operationalized in the present study. At the start of this project, a general, theoretical session was organized by three experts in the advertising literacy (education) field to familiarize the participants with the concept advertising literacy and new advertising formats. Next to subject-related information, based on the ADDIE model (Gustafson & Branch, 2002) and Van den Akker's curricular spider web (see section 1.2), important aspects related to designing learning materials were explained during this session.
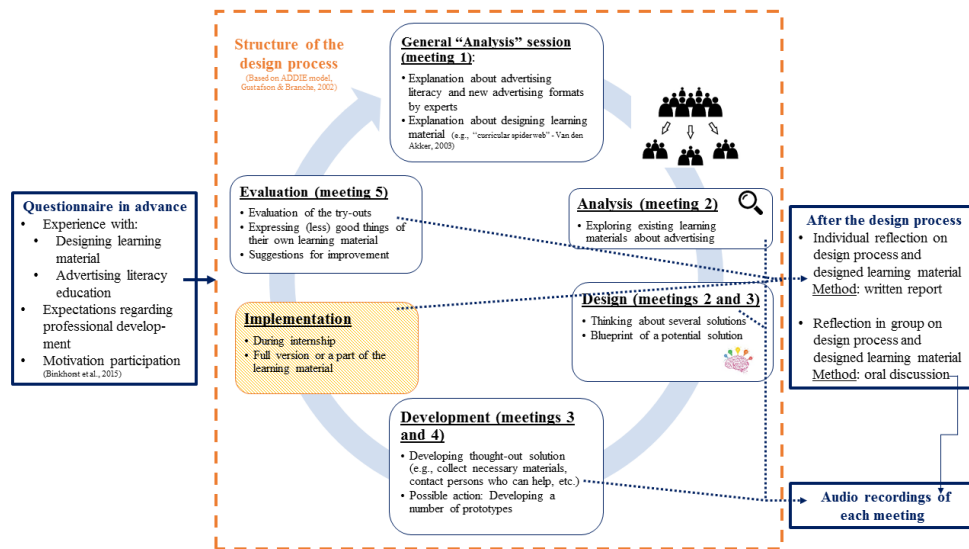
Figure 2. Design and procedure of the study

Afterwards, the participants were asked to divide themselves into three design teams (Team A: n = 3; Team B: n = 3; Team C: n = 4), and three-hour meetings were planned with each group (i.e., multiple case study design). The three teams were supported by the same team coach (i.e., the first author of this paper), who was familiar with novelties in the advertising landscape and had an educational background. This team coach had a triple range of duties, going from providing logistic support to monitoring and structuring the design process, parallel with the five core elements of ID models (Gustafson & Branch, 2002; see Figure 2).

More concretely, in the analysis phase, the team participants were challenged to brainstorm in order to generate initial ideas about the design of their in-school program. To get inspired, the pre-service teachers could rely on existing learning materials about advertising. After that, the TDTs had to make blueprints of (a) potential solution(s), and via prototypes, they came to the development of their thought-out solution. During an internship period, the student teachers had the opportunity to try out a part or the full version of their learning materials. Based on this experience, positive and negative aspects as well as suggestions to improve their educational package were discussed in an evaluative session.

2.2 Measurements and analysis

2.2.1 Pre-TDT questionnaire

To answer RQ1, a pre-TDT questionnaire - based on research of Binkhorst and colleagues (2015) - was sent to all participants (n = 10). First, next to collecting some demographic information, the questionnaire began with two open-ended questions that asked the participants to indicate their experiences with both (individually versus collaboratively) designing learning materials and advertising literacy education. Second, student teachers' motivation to participate was assessed by an open question and 6-point Likert scale (1 = strongly

disagree; 6 = strongly agree) items (e.g., 'I would feel guilty if I did not participate' or 'I participate because my teacher obliged me to do it'). Third, the participants were asked to complete the open question 'Related to your professional development as a teacher: What do you expect to learn in the coming semester through your participation in the TDTs?' as well as seven personal goal items measured on a 6-point Likert scale (1 = strongly disagree; 6 = strongly agree; e.g., gaining new didactic insights - based on Binkhorst et al., 2015).

2.2.2 Audio recordings of each meeting

All data for RQ2 were gathered via audio recordings of the meetings, for which informed consent was obtained. All participants gave their permission after they read the ethical letter.

With the aid of verbatim transcriptions, a directed content analysis of the TDT conversations was performed; in other words, previous research was used to develop an initial coding scheme prior to data analysis (Hsieh & Shannon, 2005). The main categories of the coding scheme were derived from Stempfle and Badke-Schaub's model (2002). With the differentiation between content and process, these researchers emphasized that TDTs must deal with both the design task itself and the organization of the group process. As can be seen from the Appendix, more concrete interaction steps were subdivided under each main category. For this, an appeal was made to the work of Boschman et al. (2014), Rapanta et al. (2013), Stempfle and Badke-Schaub (2002), and Walker (1971). The transcripts of the different meetings of the three teams were analysed sentence-by-sentence, allowing to ascribe single utterances to categories of the coding scheme. By doing so, it is possible to describe teacher design talk from a macro and a micro perspective (Stempfle & Badke-Schaub, 2002; Walker, 1971). The macro perspective refers to the ratio between content- and process-directed interactions, and the micro perspective aims to gain insight into which content- and process-related communicative acts occur more or less frequently [RQ2]. All the content analysis work is carried out using NVivo 11, and is predominantly performed by the first author of this paper. With help of a second, independent researcher, doubtful single utterances were discussed and appointed to the coding scheme.

2.2.3 Reflection instruments

Regarding RQ3, the student teachers were expected to write an individual reflection paper prior to the last meeting in which a group discussion (see Figure 2) was held. To semi-structure the individual reports and the group discussions, a topic list existing of four general categories and specific guiding questions was developed: (1) The extent to which TDTs contribute to professional development (e.g., Which didactic insights did you acquire during this process?), (2) Reflection on the group process (e.g., What would you do differently next time?), (3) Implementation of the designed learning materials in practice (e.g., Give reasons for lesson parts that went less well.), and

(4) Designed learning materials in general (e.g., How satisfied are you with the end result?).

3.0 Results

3.1 Which individual characteristics typify student teachers at the start of the design process? [input]

3.1.1 Motivation to participate and personal reform ambitions?

Given the fact that all participants (n = 10) strongly disagreed statements related to imposed participation in the pre-TDT questionnaire, it is clear that the student teachers were intrinsically motivated to be part of the project. Consequently, all of them shared the opinion that it seems interesting/fun to participate and that the project makes it possible to achieve some (personal) goals, as gaining new didactic insights (rather to strongly agree: n = 9) and learning how to develop an educational package in group (rather to strongly agree: n = 8). The open question measuring student teachers' motivation revealed that underlying reasons can be grouped into five categories: (1) fascinated by the subject (n = 5), (2) more instructive compared to the theoretical courses of the standard curriculum (n = 4), (3) getting insight into curriculum materials' design process (n = 3), (4) social added value, i.e., raising children's awareness of the influence of advertising (n = 3), and (5) learning more about new advertising formats (n = 1).

3.1.2 Existing design experiences?

With the exception of two pre-service teachers, pretest results show that all participants (n = 8) already had experiences with designing learning materials individually, more specifically worksheets for pupils. Two of them also indicated that they previously designed learning materials in group. Through reflection on their previous design experiences, the pre-service teachers affirmed to have difficulties with being original (n = 3) and that it is a time-consuming process (n = 3).

Regarding experiences with advertising literacy education, two student teachers remembered lessons about advertising they received in primary or secondary education, for example: "In the first year of secondary education, in Dutch class, we looked at different commercials and had to fill in characteristics in a table. We also had to design a product ourselves and made a commercial for it" (Student 2 - Team C). Surprisingly, three of the ten pre-service teachers declared that they taught about advertising during their first internship, as one of them wrote down: "Last semester, I gave a lesson about advertising in grade 1. The pupils were very young and I noticed that the pupils had difficulties with this content" (Student 3 - Team A).

3.2 Analysis of TDT interactions [process]

Before answering RQ2, aimed at reaching a better understanding of student teachers' design reasoning, we first present the basic ideas of the in-school programs that were developed by the three teams.

3.2.1 Overview of the learning materials developed by the three TDT´s

Team A's educational program consists of two parts (• 100 minutes): (1) pupil groups are expected to become expert in one specific advertising format with the aid of worksheets (and answer keys); (2) the groups make their own soda advertisement in the format that they examined, and present their advertisement and advertising format to each other.

Team B developed a two-part package (• 100 minutes): (1) pupil groups complete four corners, e.g., corner 'game of the goose' in which pupils learn about logos and slogans, and the corner 'look for advertisements' in which attention is paid to new advertising formats as product placement. The most important aspects of each corner are repeated by the teacher during a 10-minute class discussion; (2) pupils create their own advertisement.

Team C's educational package exists of three parts (• 150 minutes): (1) 'snacking from advertising' presents general information about advertising (i.e., who is responsible for advertising, why is advertising made, etc.); (2) 'playing with advertising' includes an educational board game (called Publi Ville) with six corners (see Figure 3), e.g., the focus is on advertising in games in the 'skatepark'; and (3) 'creating advertising' allows pupils to design their own advertisement about a product assigned to them.

Figure 3. Teams C`s educational board game Publi Ville

Thus, by looking at the general outline of the three designed in-school programs, we can identify similarities and differences. For example, although it was interpreted differently by the three teams, they all opted for collaborative learning that requires a teacher who act as a

coach orchestrating the classroom practice. Another striking aspect is that the exercise 'design your own advertisement' is embedded in each educational program. In the next section, the TDT conversations preceding the development of those in-school programs are analyzed in order to grasp fundamental arguments that have encouraged design decisions.

3.2.2 How do team interactions evolve during the design process of an in-school program about advertising? [process]

For each meeting of the three teams, the frequencies of communicative acts under the three main categories content - process - residual are summarized in Tables 1.1-1.3. Globally, the three TDTs spent more time on content-related communication than on process-related communication and social talk, with an average distribution of 68.78% [content], 14.85% [process], and 16.51% [residual]. In what follows, each main category is discussed in more detail.

Table 1.1
Analysis of Team A's conversations.

	Meeting 2: Analysis & Design (03:32:15)	Meeting 3: Design & Development (03:02:32)	Meeting 4: Design & Development (02:45:03)	Meeting 5: Development (02:36:58)	Total number of paragraphs
Number of (coded) paragraphs	1733	1480	1877	1968	7058
Content	1437 (82.92%)	1090 (73.65%)	1293 (68.89%)	1337 (67.94%)	5157 (73.07%)
- Goal clarification	62 (4.31%)	4 (0.37%)	6 (0.46%)	17 (1.27%)	89 (1.73%)
- Solution generation	402 (27.97%)	589 (54.04%)	508 (39.29%)	408 (30.52%)	1907 (36.98%)
- Analysis/Evaluation	973 (67.71%)	497 (45.60%)	779 (60.25%)	912 (68.21%)	3161 (61.30%)
Process	124 (7.16%)	188 (12.70%)	455 (24.24%)	324 (16.46%)	1091 (15.46%)
Residual	172 (9.92%)	202 (13.65%)	129 (6.87%)	307 (15.60%)	810 (11.48%)

Note. In contrast to the other teams, Team A expressed a need for an extra face-to-face meeting after a chaotic fourth meeting. This fifth meeting was also audiorecorded and transcribed afterwards, allowing to include it in the analysis.

Table 1.2
Analysis of Team B's conversations.

	Meeting 2: Analysis & Design (02:46:47)	Meeting 3: Design & Development (03:19:00)	Meeting 4: Development (03:31:09)	Total number of paragraphs
Number of (coded) paragraphs	2770	2404	4193	9367
Content	2199 (79.38%)	1557 (63.52%)	2180 (51.99%)	5936 (63.37%)
- Goal clarification	197 (8.96%)	3 (0.20%)	3 (0.14%)	203 (3.42%)
- Solution generation	661 (30.06%)	576 (37.72%)	529 (24.27%)	1766 (29.75%)
- Analysis/Evaluation	1340 (60.94%)	948 (62.08%)	1648 (75.60%)	3936 (66.31%)
Process	342 (12.35%)	509 (21.17%)	469 (11.19%)	1320 (14.09%)
Residual	229 (8.27%)	368 (15.31%)	1544 (36.82%)	2141 (22.86%)

Table 1.3
Analysis of Team C's conversations.

	Meeting 2: Analysis & Design (03:02:42)	Meeting 3: Design & Development (01:32:37)	Meeting 4: Development (02:56:59)	Total number of paragraphs
Number of coded paragraphs	2081	1200	2286	5567
Content	1560 (74.96%)	842 (70.17%)	1631 (71.35%)	4033 (72.44%)
- Goal clarification	24 (1.54%)	3 (0.36%)	6 (0.37%)	33 (0.82%)
- Solution generation	465 (29.81%)	239 (28.38%)	508 (31.15%)	1212 (30.05%)
- Analysis/Evaluation	1071 (68.65%)	600 (71.26%)	1117 (68.49%)	2788 (69.13%)
Process	261 (12.54%)	181 (15.08%)	412 (18.02%)	854 (15.34%)
Residual	260 (12.49%)	177 (14.75%)	243 (10.63%)	680 (12.21%)

With regard to content-related communication, a similar distribution in all TDT conversations occurred when studying the number of paragraphs that were assigned to the several subcategories. In the observed meetings of the three TDTs, the least amount of team

communication was related to goal clarification (2.15%). As depicted in Tables 1.1-1.3, the few conversations in which is referred to the general learning goal(s) of their educational program took place during the first meeting. Additionally, 32.30% of all content-related communication is concerned with solution generation. In particular, over the three TDTs, Figure 4 illustrates that new ideas were especially generated in the first individual meetings. These ideas arose partly on the basis of inspiration gained from existing teaching materials or information found on the Internet, as indicated by the high number of paragraphs belonging to the category 'Illustration'. For example, in Team B, student 3 said "There is a website for teaching ideas that I often use, KlasCement, do you know this? I was looking for something about World Orientation, and suddenly I saw something about advertising literacy". From the graph below, we can also see that the general teaching ideas were further specified from the first meeting onward. During the second and third meeting, more and more verifying paragraphs were found, in which TDT participants asked for clarification to figure out whether or not (s)he understood a design idea correctly.
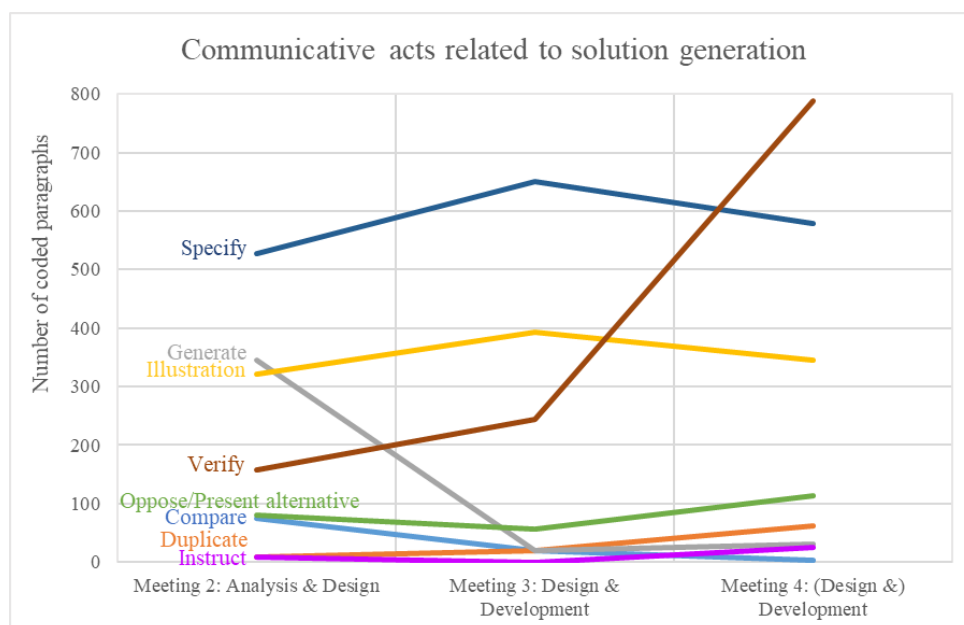

Figure 4. Communicative acts related to solution generation

Note. Given the extra meeting of Team A, the number of paragraphs of their fourth and fifth meeting were aggregated and included in meeting 4 in the graph.

Lastly, most of the content-related team communication was associated with the analysis and evaluation of design ideas (65.35%). As presented in the Appendix, the coding scheme includes several subcategories related to 'analysis & evaluation'. How often paragraphs from the transcripts of the TDT conversations could be assigned to these subcategories is set out in Table 2. It is apparent from this table that little is referred to existing orientations. However, closer inspection of the transcripts made clear that existing orientations can refer to both content and pedagogical knowledge. An example of the

latter is integrated in Table 2, the first is exemplified in a transcript of Team A (Meeting 2): "When my sisters, who are in the second and fourth grade, are allowed to choose biscuits, they come home with Maya the Bee biscuits, and they are not aware of it" (Student 1). Based on this, the decision is made to pay attention to merchandising in their educational program.

With regard to external priorities, only a few paragraphs are coded under the categories 'conceptual framework & research' and 'stakeholders'. Related to the category 'conceptual framework & research', TDT participants sometimes asked for clarification about new advertising formats throughout the conversations (e.g., Student 3: What was the term for that? Team coach: Product placement [Team B - Meeting 2]) as well as they took into account recent theoretical underpinnings from the advertising literacy field (see the clarifying quote in Table 2). Related to the category 'stakeholders', it can be seen from Table 2 that Team C had made a conscious choice concerning the structure of their educational program in order that it will be easier for teachers to implement it in practice. Additionally, 'objectives' is a third subcategory belonging to 'external priorities'. Surprisingly, in the transcripts of meeting 4 (especially in Team B's transcript), most references to 'objectives' were registered. In other words, the national standards about advertising did not form the basis of design decisions. On the contrary, the TDTs worked out an in-school program, whereupon a link is made between the thought-out exercises and the national standards.

When analyzing and evaluating design elements, most discussions were held about practical concerns. More precisely, TDT participants struggled mainly with organizational issues. By way of illustration, an extract from a conversation of Team B (see Table 2) shows that student teachers find it difficult to estimate how much time children need to finish specific exercises. Another organizational issue is that the school infrastructure must be taken into account. For instance, a student teacher from Team A (Meeting 2) responded to a design proposal as follows: "But, it will be a problem in my school, because I only have two computers". This quote illustrates that the lack of technology also had an influence on the choice how to present subject-matter to pupils in a practically feasible way. Another example of a discussion that belongs to the category 'curriculum materials and instructional strategies' is Team C's talk about whether or not to develop a pupils' reference book (see Table 2). Fewer paragraphs were assigned to the practical concerns' subcategory 'relationship students-activity'. Based on the extracts integrated in Table 2, it becomes clear that the TDT participants challenged themselves to develop fun learning materials in order to positively stimulate pupils' motivation. Hence, the TDTs also paid attention to the difficulty level of their in-school programs by, for example, thinking about the use of English advertising terms and messages.

Table 2

Communicative acts related to analysis and evaluation.

	Meeting 2: Analysis & Design	Meeting 3: Design & Development	Meeting 4: Development	Total number of paragraphs	Examples
Number of coded paragraphs	3376	2045	4456	9877	
Existing orientations	317 (9.39%)	139 (6.80%)	458 (10.28%)	914 (9.25%)	"It's no longer the case that the teacher is in the front of the classroom and says everything while the children are quiet. They must discover it for themselves. I think that we need to develop something so we don't say too much, just make the assignment and say 'do it' […]. They learn more in this way." [Student 3 - Team A - Meeting 2]
External priorities_ Conceptual framework & research	280 (8.29%)	155 (7.58%)	83 (1.86%)	518 (5.24%)	"I wouldn't address the affective dimension [of advertising literacy] in the work bundles, but rather the cognitive dimension and only a few critical thinking exercises so they are prepared to think critically in the final assignment." [Student 3 - Team A - Meeting 2]
External priorities_ Objectives	171 (5.07%)	6 (0.29%)	932 (20.92%)	1109 (11.23%)	Student 3: And, they realize that their behaviour is influenced by advertising [= reference to a national standard for the learning area World Orientation]. Student 2: Ok, and to which post does that belong? [Team B - Meeting 4] Student 3: Maybe we should make sure that these different parts can be taught separately […]. In the introduction of the package, we might say: 'there're different ways to use this package', so the teachers immediately think 'wow'. Then, it's possible … to teach it in one week, to split it or shake it up […]. Student 2: So we make sure that it's flexible. [Team C - Meeting 2]
External priorities_ Stakeholders	43 (1.27%)	17 (0.83%)	17 (0.38%)	77 (0.78%)	Student 3: I don't know how that, we've to think about how long it'll take. Student 2: I think 4 hours. Student 3: 4 hours, do you think? Student 2: I would count 2 hours for developing the advertisement, they've to think about it, they need to fill in a checklist, when they want to film it or take pictures. 1 hour, no, that will be too short. [Team B - Meeting 3]
Practical concerns_ Organizational issues	1338 (39.63%)	718 (35.11%)	1289 (28.93%)	3345 (33.87%)	Student 4: I'm just thinking, is it necessary that they get a kind of reference book of what they've learned? Student 2: I don't think it's necessary. Student 4: Is it sufficient that it's treated without the subject matter is written down somewhere? I don't know. Student 1: I really don't think so. […] Student 3: But the question is: how are we going to evaluate it? Are we going to evaluate it in a test? Student 4: But, is it necessary to evaluate it? Student 3: You need to have a method, no? [Team C - Meeting 2]
Practical concerns_ Curriculum materials and instructional strategies	783 (23.19%)	684 (33.45%)	1211 (27.18%)	2678 (27.11%)	Example 1: Student 3: I especially want something original for the children. Student 2: Yes, a game for example. It's easy to say, but it's not easy to think up something original. But, certainly not a boring bundle. [Team B - Meeting 2] Example 2: "Is it in English? Oh yes, that's a pity […]. It's not suitable for children." [Student 1 - Team A - Meeting 4]
Practical concerns_ Relationship student-activity	444 (13.15%)	326 (15.94%)	466 (10.46%)	1236 (12.51%)	

Note. Given the extra meeting of Team A, the number of their fourth and fifth meeting were aggregated and included in meeting 4 in the Table

Compared to the time spent on content-related communication, only about 15% of the design talk was dedicated to *process-related communication*. Most paragraphs were coded within the category 'planning' (Team A: 62.60%, Team B: 74.92%, Team C: 63.11%). Here,

a distinction can be made between communication about the planning inside (e.g., "Okay, will we move to part 3 now? The evaluation?" [Student 4 - Team C - Meeting 3]) and outside the physical meeting:

> Student 2: Regarding the exercise "looking for seven advertisements" on a picture, do we try this at home separately, or do we come together to make it?
>
> Student 1: I would do that separately.
>
> Student 3: We could try it separately and if it doesn't work, we can give advice to each other?
>
> Student 1: I think this is the most easy way, I will try to do it this weekend.
>
> Student 3: And we can put the photos on Facebook [private group], then we can already see each other's pictures. (Team B - Meeting 3)

Next to the face-to-face meetings, the fragment above shows that the TDT participants were using Facebook to discuss and share project matters in the meantime. Not only Team B, but also the two other teams had chosen to stay in touch via this online medium.

Related to the category '*residual*' (see Appendix), divergent topics were chit-chatted; from "how to make a petit-beurre cake" (Team B - Meeting 4) to a discussion about "Furbies" (Team A - Meeting 5).

3.3 Reflections of TDT participants [outcome]

3.3.1 How do pre-service teachers reflect on the use of TDTs?

Participating a TDT addresses different areas of professional development. First, our participants argued that they got a better picture of the time-consuming and multifaceted design process of curriculum materials (Student 2 - Team A; Student 1 - Team B; Student 3 - Team C). In contrast with the structured tasks that they normally have to make as part of their teacher training, the student teachers had carte blanche in designing an educational advertising literacy program; some found this autonomy difficult in the beginning (Student 2,3 - Team B), and others liked it immediately (Student 2 - Team B, Student 3,4 - Team C). Nevertheless, the importance of a team coach, who can give direction to the idea-generating sessions and supervise that no design aspects are forgotten, was mentioned in the group reflections of all TDTs. Besides monitoring the design process, student 2 of Team B considered the content expertise of the team coach as an advantage, as it was possible to get quickly a second opinion about the alignment between the advertising content and a specific didactic method. Interestingly, in all teams, the student teachers mentioned that they would not receive guidance of the lectors of their university college. Since these persons need to grade them, it may feel like a hierarchical relationship which would prevent them to speak freely. Moreover, the TDT participants are convinced that their lectors have a stereotypical idea of how an in-school program should look like. Thus, there is a chance that they would push them too much in a certain

direction, impeding TDT participants' 'out of the box thinking'. Additionally, some student teachers (Student 1 - Team B; Student 1,4 - Team C) discovered the added value of implementing a prototype of the designed learning materials in an authentic setting, and adapting it based on this experience. Yet, given the other obligations and the fact that not all student teachers succeeded in testing their learning materials in practice, it is recommended to spread a TDT project over a full academic year instead of one semester.

Next to getting insight into the design process of curriculum materials, all student teachers admitted that their content knowledge about advertising increased. Now, they are more aware of the sneaky nature of new advertising formats (Student 3 - Team C) as product placement (Student 2,3 - Team B) and advergames (Student 3 - Team B). Regarding pedagogical/didactical knowledge, student 2 of Team A argued that participating a TDT is a valuable strategy to get insight into the teaching styles and internship experiences of fellow students, and therefore advised against setting up TDTs with first-year pre-service primary school teachers. However, whereas TDTs make it possible to get acquainted with others' perspectives, these ideas are often different, making it a challenge to reconcile them when developing teaching materials (e.g., Student 2,3 - Team A; Student 3 - Team C). In line with this, in Team A and B's group reflections, the importance of free group choice is emphasized. Because these groups had already worked together, the student teachers knew that they would be on the same wavelength and could discuss disagreements. Nevertheless, student 1 of Team B plead for an interim moment allowing the several TDTs to meet each other and exchange preliminary design ideas. The risk namely exists that teams further develop the first best track during meetings, without exploring other solutions.

3.3.2 How do pre-service teachers reflect on their designed learning materials?

Through implementation in practice, the student teachers noticed both strengths and weaknesses of their educational resources that could be translated into take-home messages for future design or teaching activities. The TDT participants themselves expressed some points of attention: the learning materials were too challenging for certain pupils for the sake of both the formulation of the questions (Team A, B, C) and the use of English terms (Team A), the non-binding structure of the assignment 'design your own advertisement' (Team A), the limited ICT infrastructure in some schools (Team A, B), wrongly estimated time schedule (Team A, B), and the amount of materials that a teacher must provide (Team A, B).

4.0 Discussion and conclusion

The present study explored the use of TDTs in pre-service education for the purpose of making several contributions to the current literature about factors that determine the success or failure of collaborative design processes among (student) teachers. To achieve

this aim, a socially relevant design assignment was chosen. Concerned by the fact that today's children are hardly aware of their continuous confrontation with new advertising formats, which can lead to unconscious influences (Hudders et al., 2017), the student teachers were expected to develop an in-school program to raise fourth and fifth graders' awareness and critical thinking towards recent advertising trends.

As Binkhorst et al.'s framework (see Figure 1) shows that TDT factors can be situated on input-, process-, and outcome-level, our study findings are now discussed on these three levels. First, with regard to input-level variables (RQ1), this research found that the majority of second-year pre-service primary school teachers had little to no experience with designing learning materials in group. Yet, while Carlgren already plead for more design activities in teacher training in 1999, there is - to our knowledge - no research available in which TDTs are applied in this context. Therefore, we took up the challenge in this study. After launching a call, interested students could enrol voluntarily in our TDT project. Our pretest data revealed that only intrinsically motivated student teachers participated. This also became clear during the project; despite the fact that adjustments were made to the teacher training timetable at university college level, our participants were motivated to spend extra time and energy to accomplish their mission. In this respect, the current research further underlines the importance of motivation as the engine of TDT success. Consequently, although Carlgren (1999) suggested that teacher training offers a safe learning environment for practicing design skills, it is debatable whether or not TDT participation should be mandatory (Binkhorst et al., 2015). A suggestion for higher education institutions inspired by the idea of organizing TDTs as a(n) (mandatory) activity in teacher training: it would be interesting to offer different design problems belonging to different learning areas (e.g., language, mathematics or media literacy) from which the students can choose, as this study shows that 'fascinating by the subject' is an important motivator for TDT participation.

Second, as very little is currently known about teacher design conversations (McKenney et al., 2016), reflecting the way teachers reason when designing learning materials, the process-related variable 'team interaction' forms the basis of RQ2. In accordance with research of Stempfle and Badke-Schaub (2002), 2/3 of teacher design talk dealt with the content, the remaining 1/3 included both communication about structuring the group process and small talk. What stood out with regard to content-related communication was the little attention paid to goal clarification, perhaps for the reason that the general design goal was set in advance. In contrast to the goal space, most content-related talk was spent on the solution space, demonstrating a logical pattern in this study: after most ideas were generated in the first meeting, these were further specified and verified during the next meetings. When concretizing the general design ideas, our TDT participants expressed a number of

reasons/doubts/reflections why they want to retain or reject a certain proposal. Upon examination, it became clear that student teachers' design reasoning is less influenced by existing orientations (i.e., teaching experiences and beliefs about how curriculum materials are (re)designed and used) and external priorities (i.e., priorities of stakeholders other than the teachers themselves), but especially by practical concerns (see Boschman et al., 2014). More specifically, our TDT participants struggled with estimating how long a specific class activity will take and making choices related to both curriculum materials and instructional strategies. A possible explanation for this might be that student teachers have a lack of teaching experience to be able to make such practical decisions. It can therefore be assumed that the presence of an advisory, experienced teacher is valuable during one or more TDT meetings of student teachers. While teacher training lectors have often practical experiences, the TDT participants emphasized that they would not like to be guided by one of their lectors, for the reasons that (1) these persons need to evaluate them, feeling like it is not safe to say what you want, and (2) the highly personal interpretation they want to give to the educational program. Nevertheless, the TDTs in this study were closely assisted by a team coach, an expert in the field of advertising literacy education without practical teaching experiences. The student teachers preferred the supervision of someone external to their university college, and admitted that it would not be a success story without this help. Moreover, as emerged from the design talk analysis that the TDT participants dedicated a limited amount of time to process-related communication, this study indirectly confirms the team coach's triple role described by Becuwe and colleagues (2016). Because organizational agreements - such as where and when to meet as well as what to discuss per meeting - were made in advance, TDT participants could mainly focus on content-related, instead of process-related communication.

Third, our study corroborate the twofold outcome of TDTs (RQ3). First, the student teachers confirmed that TDTs are an effective and valuable strategy for professional development (e.g., Binkhorst et al., 2015; Voogt et al., 2011): from getting a better picture of the time-consuming and multifaceted design process of curriculum materials to acquiring both content and pedagogical/didactical knowledge. Therefore, all student teachers participating this study agree with the idea of setting up TDTs within pre-service education in the future. Next to the suggestions (1) to provide different design problems to students in teacher education in order to ensure that students can sign up for the project they find most interesting, and (2) to appoint external facilitators with context expertise who are not directly involved into the study program, following practical guidelines were extracted from our participants' reflections to optimize the use of TDTs in teacher education:

- Do not organize TDTs in the first year of teacher training. It is seen as a good method to get insight into fellow students' teaching

styles and internship experiences; a source of interesting knowledge that is lost when applied to 'inexperienced' first-year pre-service primary school students.

- Let participants create their own groups. The student teachers emphasize the importance of free group choice in our study. They are convinced of the fact that a design exercise works better with people you know. This would be conducive to discuss disagreements, several perspectives, etc.

- Do not spread a TDT project over one semester, but over an entire academic year. In this study, there was not enough time for some TDT participants to try out their developed in-school program during the internship period. However, this exercise is considered to be very valuable and instructive.

- Organize a kind of intervision session in which experiences and inspirations of the several design teams can be shared. This guideline anticipates on the reflection of the participating students related to the lack of insight into the design work of the other teams. It was rightly pointed out that the exchange of experiences can be inspiring and pop up new ideas with regard to their own design.

Second, the designed material itself is an important outcome. In this regard, our research responds to the lack of educational advertising literacy materials that are up-to-date (Meeus et al., 2014) and focus on affective advertising skills (Rozendaal et al., 2011). While the student teachers are proud of their results, they have learned worthy lessons by testing their in-school programs in practice, which revealed both pros and cons. For example, in two teams, it was noted that learning materials can be (too) dependent on the school's technological infrastructure.

Limitations, Implications & Future Research

Despite its exploratory nature, the findings of this study have both theoretical and practical implications. From a theoretical perspective, this research is an example of how Binkhorst et al.'s descriptive framework for TDTs can be applied in practice. Moreover, to our knowledge, it is a first, necessary attempt to integrate TDTs in pre-service teacher education, which sheds a different light on some TDT factors. Also, for the preparation of our research questions, we zoomed in on framework variables that have barely been researched. For example, research that attempts to unpack teachers' design reasoning in TDTs is still in its infancy. Therefore, we browsed existing literature about design conversations, and put it together into a coding scheme (see Appendix). This could be an useful instrument for future research.

From a practical perspective, this study offers some guidelines about how to support student teachers when designing learning materials. Our results suggest that this requires a different approach than TDTs with experienced teachers. Because of the number of practical

concerns (e.g., duration of certain class activities) that were put on the table by the student teachers, it seems that student teachers not only need a content expert as coach, but also an experienced teacher who can give practical tips and tricks. Therefore, a question raised by this study is whether mixed TDTs (beginning versus experienced teachers) would be a better formula. This would be a fruitful area for future work. Another practical implication of our study is the creation of almost ready-made up-to-date educational programs about advertising. Further quasi-experimental investigations are needed to establish the impact of an in-school program on children's advertising literacy.

Notwithstanding, a number of limitations remain with regard to the present study. First, only 10 student teachers of one university college divided over three teams were involved in this study; consequently, our sample is not representative of the population. Therefore, we plea for more research setting up TDTs in teacher education in order that the above formulated findings and implications can be confirmed, rejected or supplemented. Second, the design assignment was specific and the same for each team. In light of the generalizability of our findings, further studies with other design assignments need to be carried out. For instance, the analysis of TDT conversations revealed that design decisions were rarely based on existing orientations (i.e., teaching experiences and beliefs about how curriculum materials are (re)designed and used); however, it is not unlikely that (student) teachers make more appeal to existing orientations when designing learning materials related to topics in the field of mathematics or language that are more embedded in the standard curriculum.

Conclusions

To summarize, this study has identified the potential of TDTs in pre-service teacher education and enriched the knowledge base on factors that determine its success. Because of its exploratory nature, several questions still remain unanswered. Let them act as a source of inspiration for future research.

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