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Under Pressure: Stress in Early Career Teachers in the Netherlands

A qualitative research using System Dynamics to analyse the systemic structure of stress

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Abstract

In the Netherlands, there is shortage of teachers. Two reasons for this shortage are that there is too little inflow of early career teachers (ECTs) and a high attrition rate. In previous research, stress has been linked to (teacher) attrition. Especially ECTs are more vulnerable to such pressures. This thesis investigates the interrelationships between key variables influencing the stress of ECTs.

Using System Dynamics, a causal loop diagram (CLD) was made based on a literature study. This model was validated using disconfirmatory interviews ($n = 5$). Interviewees were asked to create a model, which was used as a boundary object. Changes were made to the CLD based on the disconfirmatory interviews and the boundary objects.

In the final CLD, there are six feedback loops, five reinforcing and one balancing. Important variables in these feedback loops are *stress*, *workload*, *personal characteristics*, *self-efficacy*, *the relation between teacher and student*, *professional identity tensions*, and *the professional identity*. One important finding was that that stress does not have a direct relation to attrition. Stress is an indirect cause of the doubts ECTs have regarding their future. These findings have the potential to analyse the effectiveness of possible solutions for ECT stress and their possible attrition.

Key variables: System Dynamics, disconfirmatory interviews, early career teacher, stress, teacher attrition.

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1. Introduction

The teaching profession is a highly stressful profession. People in the teaching industry are experiencing more job-related stress than people working in other industries (Worth & van den Brande, 2019). In particular, teachers in the early stages of their career, within the first three years of teaching, are more vulnerable to the pressures of the profession compared to more experienced teachers (Harmsen, Helms-Lorenz, Maulana, & van Veen, 2019a). In research, a link has been found between stress and attrition, as stress is detrimental for teacher's well-being (Harmsen, Helms-Lorenz, Maulana, & van Veen, 2018). In the Netherlands, (beginning) teacher attrition is a significant problem. In 2021, there is a shortage of 1.706 FTE in secondary education, and this amount is expected to rapidly increase, before it will flatten (Ministerie van Onderwijs, Cultuur en Wetenschap, 2021). One of the reasons for this shortage is that there is too little inflow of people studying to become a teacher and a high attrition rate of teachers (Ministerie van Onderwijs, Cultuur en Wetenschap, 2021).

In order to find and implement interventions to reduce this shortage, research has been done regarding (beginning) teacher attrition. As this is a broad topic, in depth-research has been done in subsections of the problem. One of the subsections was the early career teacher (ECT), which are licensed teachers who have at most three years of experience. In-depth research has been done to gain insights into specific parts of ECT attrition, stress, and wellbeing (e.g. induction arrangements (Helms-Lorenz, Slof, & van de Grift, 2013), causes of stress (Montgomery & Rupp, 2005), and how to measure teacher stress (Harmsen, Helms-Lorenz, Maulana, van Veen, & van Veldhoven, 2019b)).

Stress in general, but particularly stress in ECTs, is a well-researched topic, but there is no established definition that is systematically used. Previous research has found two perspectives on (teacher) stress, namely (1) stress responses are a result of something outside of the individual, external factors, and (2) stress is internal; it is what goes on inside the individual as they interpret or react to what is going on around them (Harmsen, Helms-Lorenz, Maulana, van Veen, & van Veldhoven, 2019b; Kyriacou, 2001). Some researchers define stress as a combination of both the internal and external factors (Harmsen, Helms-Lorenz, Maulana, & van Veen, 2019a; Kyriacou, 2001). As there is no systematically used definition on (teacher) stress, there is ambiguity in the results of the current research. In addition, numerous terms are proposed, such as tension, stress outcomes, stress causes, stress responses, and strain, which are all related to stress. Nevertheless, past research has only focused on either one or a select few of these concepts at the same. Furthermore, multiple researchers have proposed the concept of

stress causes, but there is no consensus on what it exactly entails. This study aims to create a holistic overview on the concept of early career teachers' stress, and therefore, the following research question is proposed:

How can the systemic structure of stress in ECTs in secondary education in the Netherlands be described?

As there has been done in-depth research in specific aspects in teacher stress, this literature will be reviewed and, with the use of System Dynamics, the empirical insights of the research will be combined to create a causal loop diagram (CLD). During the validation of System Dynamics models, it is of importance to use qualitative data and human judgement (Forrester & Senge, 1980; Sterman, 2000). Therefore, disconfirmatory interviews with ECTs will be conducted to validate the model.

The CLD will help create the holistic overview, of which there is currently a lack in the research on (early career) teacher stress. The model can potentially be used in future research to find leverage points to reduce the negative effects of the experienced stress by ECTs, and thus, reduce the ECTs' attrition.

2. Theoretical approach

In this chapter, an elaboration on some of the concepts related to stress is given (section 2.1-2.5). These concepts are the *stress cycle*, *stress causes*, *stress responses*, *tension*, and *stress outcomes*. The decision for elaborating on these concepts is based on the frequency of occurrence in the literature. Subsequently, two models regarding (teacher) stress that have previously been made will be explained in more detail (section 2.6 and 2.7).

2.1. Stress cycle

The Theory of Preventive Stress Management (TPSM; Quick, Quick, & Nelson, 1998), states that there is a stress cycle, which flows from *stress causes* to *stress responses* to *stress outcomes* (Helms-Lorenz & Maulana, 2016; Helms-Lorenz, Slof, & van de Grift, 2013). Within TPSM, the causal factors (demand), which can be environmental or self-imposed, are referred to as stress causes. When an individual experiences a stress cause, it triggers the stress response of the individual to either fight or flee (Quick & Spielberger, 1994). As a result, the stress response is causing a range of stress outcomes, which can either be positive or negative (Helms-Lorenz & Maulana, 2016; Helms-Lorenz, Slof, & van de Grift, 2013). Positive stress outcomes include *heightened alertness* or *enhanced performance*, while negative stress outcomes include *psychological* or *behavioural distress*.

2.2. Stress causes

There is a lack of consensus on both the definition and the categories within stress causes. One definition of stress causes is that it is the collection of aspects of the *work content* and the *work situation* that influence employees at a cognitive, motivational, and emotional level (Harmsen, Helms-Lorenz, Maulana, van Veen, & van Veldhoven, 2019b; Harmsen, Helms-Lorenz, Maulana, & van Veen, 2019a). Another definition is given by Helms-Lorenz and Maulana, which states that stress causes refer to the causal factors (demand), which can be self-imposed or environmental (2016).

Numerous articles have identified causes of stress for teachers and ECTs. Some causes state similar variables, while others have more generic categories. An overview of the different stress causes that have been given in different articles can be found in Table 1. In the article by Kyriacou (2001), ten causes have been identified. These causes can be triggered by two variables, namely *difficult or excessive demands* and *concerns linked to one's self-image*. This can be compared to the categories given in the article by Helms-Lorenz and Maulana (2016), where the two categories are *demanding job-related environments* and *personal characteristics*.

Table 1. Difference in stress causes identified by researchers

Greenberg, Brown & Abenavoli, 2016	Harmsen et al. 2019b	Harmsen et al. 2018	Kyriacou, 2001	Helms-Lorenz & Maulana, 2016
Job demands	Education specific workload	High psychological demands	Time pressures and workload	High workload
School organization	Student misbehaviour	Negative pupil aspects	Teaching pupils who lack motivation	Pupil misbehaviour
Work resources	Role ambiguity	Negative organizational aspects	Role conflict and ambiguity	Poor pupil motivation
Teacher social and emotional competence	Lack of job autonomy	Negative social aspects	Poor working conditions	Lack of support by administrators and mentors
	Poor school ethos	Lack of developmental opportunities	Administration and management	Poor relationships with colleagues
	Poor relationships at work		Dealing with colleagues	Low self-efficacy
			Being evaluated by others	Low educational qualifications
			Self-esteem and status	
			Maintaining discipline	
Coping with change				

2.3. Stress responses

Stress responses is the second part of the stress cycle and on this topic, there is not as much discussion as on the stress causes. Stress responses can be defined as the results of the employees' mental interpretation when experiencing stress causes (Harmsen, Helms-Lorenz, Maulana, van Veen, & van Veldhoven, 2019b; van Veldhoven, 1996). Three important components of stress responses are identified, which are *discontent*, *negative emotions*, and *tension* (Harmsen, Helms-Lorenz, Maulana, van Veen, & van Veldhoven, 2019b). *Job tensions* is the extent of reported mental and emotional worries, or the amount of psychological discomfort someone experiences on the job, while *job discontent* refers to the extent of reported dissatisfaction and lack of commitment experienced on the job (Helms-Lorenz & Maulana, 2016).

2.4. Tensions

Tensions, which have previously been introduced as one of the three important components of stress responses, have been defined as the internal struggles between the situation-as-is and the situation-as-preferred as well (Schaap, van der Want, Oolbekkink-Marchand, & Meijer, 2021). Other research has defined job tension as the amount of psychological discomfort experienced on the job (Helms-Lorenz & Maulana, 2016).

Stress causes can lead to feelings of tension, which eventually may result in *negative stress outcomes* (Harmsen, Helms-Lorenz, Maulana, van Veen, & van Veldhoven, 2019b). When comparing this to the stress cycle, tension would be similar to stress responses. In the article by Harmsen, Helms-Lorenz, Maulana and van Veen (2019a), tensions are categorized as a stress response, because it concerns the need for recovery, rumination, poor sleep quality, and tiredness during work.

Research by Schaap, van der Want, Oolbekkink-Marchand and Meijer (2021) states that tensions affect both the *well-being* and *stress levels* of ECTs, as well as the way in which they experience tension, which can contain formation about their self-image. This can be negative, but it can also serve as the starting point for reflection and professional development, and therefore, tensions are not necessarily bad. In the article by Van der Wal, Oolbekkink-Marchand, Schaap and Meijer (2019) multiple themes of tensions were identified, namely: *job security; classroom management; organizational culture and structure; workload and work-life balance; interactions with colleagues, interactions with parents; role as a teacher; interactions with students; and in-class activities*. Some of the themes of tensions, which has been defined as a stress response, are comparable to the stress causes in Table 1.

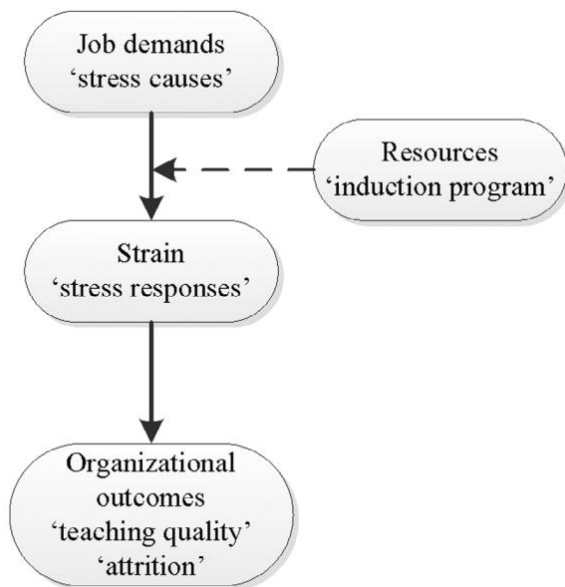
2.5. Stress outcomes

On the concept of stress outcomes, literature shows more agreement than on other variables related to stress. Harmsen et al. (2019b) state that stress outcomes result from persistent stress causes and responses. This corresponds to the stress cycle, where stress response leads to a range of stress outcomes. Such outcomes can either be positive, such as an *enhanced performance* or *heightened alertness*, or negative (Helms-Lorenz & Maulana, 2016), such as *psychological* or *behavioural distress*, which is the non-specific symptoms of stress, anxiety, and depression (Viertiö, et al., 2021). In addition, one of the outcomes of persistent stress is the decision of teachers to *leave the profession* (Harmsen, Helms-Lorenz, Maulana, & van Veen, 2018).

2.6. JD-R model

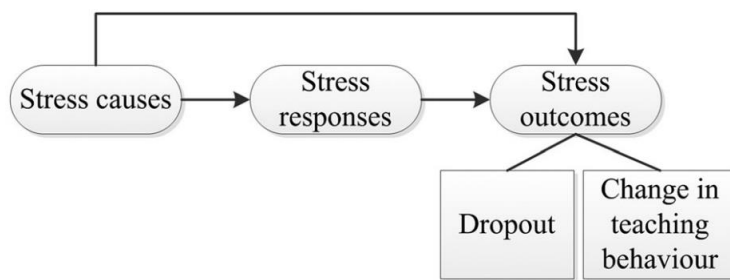
In current literature about teachers' stress, multiple conceptual models have been proposed to test hypotheses. Some of these models have greater similarity than others, such as the two models in Figure 1 (Harmsen, Helms-Lorenz, Maulana, & van Veen, 2018; Harmsen, Helms-Lorenz, Maulana, & van Veen, 2019a) and Figure 2 (Harmsen, Helms-Lorenz, Maulana, van Veen, & van Veldhoven, 2019b). Both models have similar variables, but the relations identified between the variables are not identical. In Figure 2, there is a relation between stress causes and stress outcomes, whereas in Figure 3 (Bakker & Demerouti, 2007), this relation is not present. Both models are concerning the so-called *health-impairment process*, which is one of the two processes in the Job Demands-Resources model (JD-R; see Figure 3; Bakker & Demerouti, 2007).

Figure 1. Model on (beginning) teacher stress



Note: Taken from “The relationship between beginning teachers’ stress causes, stress responses, teaching behaviour and attrition”, by R. Harmsen, M. Helms-Lorenz, R. Maulana, & K. van Veen, 2018, *Teachers and Teaching*, 24(6), p.628 (10.1080/13540602.2018.1465404) and “The longitudinal effects of induction on beginning teachers’ stress”, by R. Harmsen, M. Helms-Lorenz, R. Maulana, & K. van Veen, 2019, *British Journal of Educational Psychology*, 89, p.262 (10.1111/bjep.12238)

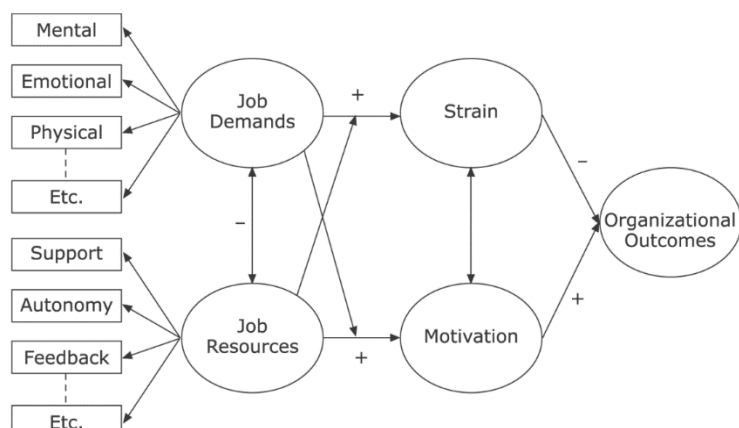
Figure 2. Model on (beginning) teacher stress



Note: Taken from “Measuring general and specific stress causes and stress responses among beginning secondary school teachers in the Netherlands”, by R. Harmsen, M. Helms-Lorenz, R. Maulana, K. van Veen, & M. van Veldhoven, 2019, *International Journal of Research & Method in Education*, 42(1), p.100 (10.1080/1743727X.2018.1462313)

The JD-R model assumes that risk factors associated with job stress can be classified in two categories, namely *job demands* and *job resources*. The model can, thus, be applied to various occupational settings. Job demands are those aspects of the job that require sustained physical and/or psychological effort or skills. Job resources refer to those physical, psychological, social, or organizational aspects of the job that are either/or (1) functional in achieving work goals, (2) reduce job demands and the associated physiological and psychological costs, (3) stimulate personal growth, learning and development. The second assumption of the JD-R model is that there are two underlying psychological processes present that play a role in the development of job strain and motivation. The first process is the *health impairment process*, which states that employees’ mental and physical resources are exhausted by poorly designed jobs or chronic job demands, which may result in the depletion of energy and to health problems. The second process is the *motivational process*, which assumes that job resources have motivational potential and lead to higher work engagement, low cynicism, and excellent performance. The model can be found in Figure 3.

Figure 3. The Job Demands-Resources model



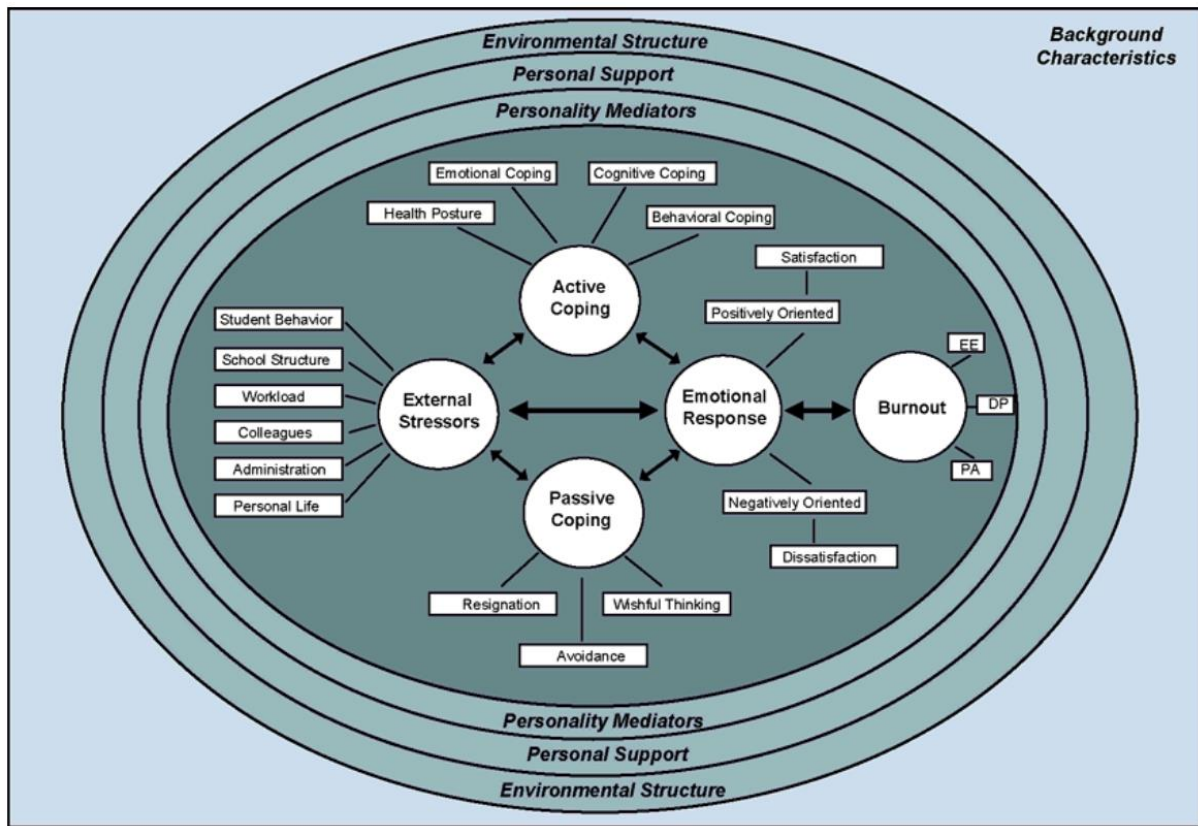
Note: Taken from “The Job Demands-Resources model: state of the art”, by A. Bakker & E. Demerouti, 2007, *Journal of Managerial Psychology*, 22(3), p.313 (10.1108/02683940710733115)

2.7. Montgomery and Rupp model

Another model that is proposed in literature is from Montgomery and Rupp (Figure 4; 2005). This model has similar features when comparing it to the models regarding the health impairment process (Figure 1 and Figure 2). The variables *external stressors*, *emotional response*, and *burnout* are comparable to the variables stress causes, stress responses and stress outcomes. However, the model in Figure 4 differs from the other models by having the relations go both ways, instead of only one way, which can be seen in the model by the use of the equivalence symbol. Furthermore, the model is more elaborate than the other models, as the *coping mechanism*, and different mediators are taken into account. However, after this model was created, more research has been done regarding individual links that have been proposed in this model (e.g. Harmsen, Helms-Lorenz, Maulana, & van Veen, 2018; van der Wal, Oolbekkink-Marchand, Schaap, & Meijer, 2019; Helms-Lorenz & Maulana, 2016).

The central component in the model represents the intra-individual process of a teacher reacting to stressful events. The most important assumption of this model is that a teacher, reacting to outside events, is the core agent throughout the entire model. As can be seen in the model, there is a so-called stress cycle present, which starts at the variable “*external stressors*”. These external stressors emerge from different aspects of a teacher’s life, whether that is the professional or the personal life. After the external stressors have been appraised, the teacher implements *active and/or passive coping strategies*. Active coping strategies include cognitive strategies, behavioural strategies, and emotional strategies, and they manifest themselves in individuals’ physical responses or health posture. Passive coping strategies are characterized by a lack of direct engagement with the stressful event toward its resolution. The teacher experiences *emotional responses*, which can be either positively or negatively oriented, depending on the (lack of) application of the coping strategies and sometimes as a consequence of the external stressor itself. This intra-individual process is mediated by multiple characteristics, namely: the *personality mediators*, which are considered to be the inner stressors; the *personal support*, whether that is within the professional or the personal environment; and the *environmental structure*, which include the teacher’s grade level, class size, educational qualifications, and years of experience.

Figure 4. Theoretical-empirical model of construct relationships of teacher stress



Note: Taken from “A Meta-analysis for Exploring the Diverse Causes and Effects of Stress in Teachers”, by C. Montgomery & A. Rupp, 2005, *Canadian Journal of Education*, 28(3), p. 464 (10.2307/4126479)

2.8. System Dynamics

As can be seen in the previous sections, an holistic overview of the concepts relating to ECT stress is missing. Different parts are researched in detail, while other researchers try to create a simple model, leaving out details. This trade-off between simplicity and specificity results in many published articles. A consequence of this lack of holistic overview is that it is more difficult to show the impact of certain interventions on all parts of ECT stress.

System Dynamics can be used to create an overview of the results of these articles. Understanding the basic structure of a system and how the objects in the system interact with each other is the central concept in System Dynamics (Sterman, 2000). Previous research has focussed on the basic structure and individual objects in the system of ECT stress. However, how these objects interact with each other has not been clarified. An holistic overview of the interacting parts of ECT stress can increase the understanding of ECT stress and how to reduce it. A commonly used tool in System Dynamics is the causal loop diagram (CLD). A CLD is easier to comprehend than other tools used in System Dynamics, while showing the dynamics of the entire system.

3. The theoretical model

The aim of this research is to combine relevant theories related to ECT stress into one model, in order to create a holistic overview of the concept of stress. In this chapter, an explanation is given as to how the theoretical model is created. Furthermore, the CLD will be explained in more detail, specifically the most central nodes.

3.1. Constructing the conceptual model

This research uses an inductive research approach. By using an inductive research approach, general principles are developed from specific observations (Babbie, 2014, p. 23). Creswell and Plano Clark define inductive reasoning as “working from the bottom-up, using the participants’ view to build broader themes and generate a theory interconnecting the themes” (2007, p. 23). The holistic overview of the concept of stress in ECTs, in the form of a model, can be viewed as the theory interconnecting the themes that have been previously researched, such as specific stress causes, professional identity development, and induction arrangements.

The beliefs behind System Dynamics have similarities with qualitative research. Therefore, a qualitative approach is used for this research. Qualitative theorists “believe in multiple constructed realities that generate different meanings for different individuals, and whose interpretations depend on the researcher’s lens” (Onwuegbuzie & Leech, 2005, p. 270). One of the main constructs of System Dynamics is the use of mental models to create an explicit model that can be communicated and compared. These mental models are an individual’s representation of the reality. The facilitator (or: researcher) interprets these mental models and combines them into one mental model, which is the explicit model. Another similarity between qualitative research and System Dynamics, specifically Participatory System Dynamics (PSD), is the relationship between the researcher and the participants. Both in qualitative research and in PSD this relation is important to understand the observable event.

Grounded Theory Method (GTM) enables a theory to emerge from the data and it is often used in social sciences for qualitative research. It enables System Dynamics to explicitly link the main elements and causal relations of the model to information collected from stakeholders (Eker & Zimmermann, 2016). Therefore, the analysis is based on this method.

Textual data is used for model creation. As has previously been explained, extensive research has been done regarding specific aspects of teacher stress. Therefore, the textual data is in the form of articles. An elaboration on the collection of articles and a description of the analysis of

the articles and how to form a model based on this analysis can be found in the following section.

3.1.1. Turning theoretical insights into a Causal Loop Diagram

Articles and reports were found using keywords. Keywords included, but not limited to, (beginning) teacher stress, teacher attrition and stress causes. When a suitable article or report was found, the reference list was checked to find other potentially suitable literature. A total of 36 articles and reports were selected based on their abstract. When reading the introduction, discussion, and conclusion, 25 articles and reports remained relevant to the research. A list of the articles and reports can be found in Appendix 1, including which are included and excluded in this study.

Textual data has previously been used for model conceptualization in System Dynamics (Eker & Zimmermann, 2016). Kim and Andersen (2012) have introduced a five-step method to analyse data systematically. The first step is to (i) use open coding to identify themes in the data, following (ii) the identification of individual causal relationships, (iii) visualizing the relationships in words-and-arrow diagrams, (iv) generalizing and simplifying these diagrams, and lastly (v) recording the links between the final causal map and the data source explicitly in a data source reference table. However, as this process is labour intensive, some of these steps are changed to reduce the amount of time needed to complete the entire process.

Open coding is used for all relevant articles to identify themes in the data. With these open codes, a short summary is made for each article regarding the relationships between the various variables and their definitions. Therefore, step 1 and 2 of the five-step method are partly combined. Next, for each article separately, a simple diagram is made using a software programme (Vensim). This is step 3 of the method. Afterwards, diagrams with similar themes are identified and combined with each other to create bigger diagram. Then, each diagram is connected to create a final causal map, a Causal Loop Diagram (CLD). This can be compared to step 4 of the method. Step 5 is left out. As a result of the changes made in the five-step method by Kim and Andersen, there is less confidence in the model. Nevertheless, this confidence can be restored by validating the model with ECTs. The final causal map can be found in Figure 5 (Chapter 4).

A CLD consists of variables that are connected with arrows. These connections are either positive (+) or negative (-). A positive link means that the effect variable increase (or decreases) when the cause variable increases (or decreases). When the effect variable decreases while the

cause increases, or the other way around, this is a negative link. Another characteristic of a CLD is the presence of feedback loops. Feedback loops are formed when changes in a variable affect the sequence and, finally, affect the same variable (Meadows, 2008). There are two types of feedback loops, namely balancing, in which the system moves to a stable equilibrium, and reinforcing, resulting in exponential behaviour (Sterman, 2000).

3.1.2. Notes and considerations

To connect the individual, simple, causal diagrams to create one big causal map, changes needed to be made to improve readability. These changes include changing, adding, and omitting variables or links. Certain variables are not included in the model because of the trade-off between specificity and readability. Another reason to omit certain links or variables is because of disagreement in the literature. This is explained in more detail in Chapter 3.2.1.

Furthermore, some links and variables were added. There are multiple reasons to add links and variables, such as to visualize that one variable is part of another, bigger, variable. An example is that of the interpersonal identity, which is part of the professional identity. An elaboration on these variables is given in Chapter 3.2.1. Another reason to add a variable is to increase the correctness of the model. Some variables that are used in the literature, such as *teaching subject* are not variables that can be used in the System Dynamics approach. When possible, the variable's name is changed to a fitting variable name. Nevertheless, this may not always be possible. In these situations, either the variable is omitted, or the variable is made more specific, which means adding links and variables. An example of this can be seen in the model by the professional identity. By itself, it is not a correct variable by the standards of System Dynamics. Nonetheless, this variable is extended by creating a feedback loop with a discrepancy between two other variables.

3.2. Explanation of the model

These central nodes, or variables, are *stress*, *professional identity development*, *self-efficacy*, *workload*, and *attrition*. The CLD can be found in Figure 5. In the model, four feedback loops are present, which are all balancing feedback loops. There are two shadow variables in the model, which are *induction* and *self-efficacy*. Shadow variables are variables that are defined somewhere else in the model, and they are used to reduce clutter and increase the clarity of a sketch. In the model, they are displayed as <*induction*> and <*self-efficacy*> in a grey colour.

3.2.1. Stress

As has been explained in Chapter 2.1, the stress cycle contains *stress causes*, *stress responses*, and *stress outcomes*. All variables with an orange colour are *stress causes*, with a purple colour are *stress responses* and with a blue colour are *stress outcomes*.

A trade-off needed to be made between readability and specificity. Therefore, not all stress causes, responses, and outcomes discussed in Chapter 2, specifically Table 1, are included in the model. Three generalized themes are included in the model. These themes include most of the stress causes, but they are not specifically mentioned in the model. The three themes are the *professional identity*, *workload*, and *conflicts*. They can be found in the literature as well, e.g. in the article by García-Carmona, Dolores Marín, & Aguayo (2019). A teacher's competence, development, self-esteem, self-efficacy, and educational qualifications are all stress causes present in Table 1 that can be categorized as the professional identity. The workload, which includes the job demands and the job resources, can be found in all articles in Table 1, the JD-R model and the model by Montgomery and Rupp. Lastly, the general theme of conflict can include conflicts with the school on an organizational level, colleagues, parents and/or pupils.

The stress outcomes in the model, which are strain, (decreased) psychological well-being, burnout, attrition, and positive stress outcomes are all explained previously in Chapter 2.5. Burnout is only mentioned as a stress outcome in the model by Montgomery and Rupp.

3.2.2. Professional identity

The first theme is the *professional identity* and its *development*. This process can be found in the lower left quadrant of the CLD. It has two balancing feedback loops, the *professional identity development* loop (B3) and the *organizational socialization* loop (B4). Professional identity is regarding how teachers see themselves as teachers based on their interpretations of their continuing interaction with their context (Canrinus, Helms-Lorenz, Beijaard, Buitink, & Hofman, 2012). This can be seen in feedback loop B3, the *Professional Identity Development* loop. If there is a *discrepancy* between how the teacher sees themselves (*situation-as-is PID*) and what they expect a teacher to be (*situation-as-preferred PID*), this leads to *tensions*, in the model this is called *professional identity tensions*. These tensions can lead to *stress*.

The *teacher-student relationship* is one important part of the professional identity, and it is called the *teacher's interpersonal role identity* (van der Want, et al., 2015). Therefore, this affects how the teacher sees itself in relation to the pupils. Nonetheless, this is not the only part of the professional identity, as the teaching subject and the teachers' role conception are the

two other main features of the professional identity (van der Want, et al., 2015). Research by Beijaard (1995) identified 14 themes that are relevant for shaping the professional identity of teachers, of which the majority is related to the teacher-student relationship. Therefore, only the teacher-student relationship is included in the model.

In the model, one other important variable affecting the *situation-as-is PID* is the *personal characteristics*. This variable is defined as the characteristics that are helpful when teaching and they, for example, include the *educational qualifications* of the ECT and the *self-efficacy*. *Organizational socialization*, which is defined as “the process by which an individual acquires the social knowledge and skills necessary to assume an organizational role” (van Maanen & Schein, 1979, p. 211), is an important part of the personal characteristics. Especially for ECTs, organizational socialization is of importance, as the ECTs become socialized into the workplace and learning as a member of a community is better than as an individual (Kearney, 2015).

3.2.3. Self-efficacy

The model shows that *self-efficacy* is a central node in the dynamics regarding stress. Self-efficacy can be defined as the extent to which the teacher believes that they are capable to affect desired outcomes of student engagement and learning (van der Want, et al., 2019). It is an important variable, as it influences the *professional identity development* (via *personal characteristics*), the *coping mechanism*, *conflict*, *affective commitment*, *psychological well-being* (see shadow variable) and *attrition* (Helms-Lorenz & Maulana, 2016; Helms-Lorenz, Slof, & van de Grift, 2013; Canrinus, Helms-Lorenz, Beijaard, Buitink, & Hofman, 2012; De Neve & Devos, 2017). In addition, in the final report of Begeleiding Startende Leraren 2014-2019, a positive relation has been found from *induction arrangements* to *self-efficacy* (Helms-Lorenz, et al., 2020).

3.2.4. Workload

The second theme of stress causes that is identified in the model is regarding *workload*. In the upper right corner of the model, the variables included in this theme can be found. This part of the model is based on the JD-R model, which has been explained in Chapter 2.6. In the JD-R model, there is a link between *job demands* and *strain*, with *job resources* influencing this relation. Greenberg, Brown and Abenavoli (2016) state that *job demands* and *work resources* are two of the main sources of *stress*, and McCarthy, Fitchett, Lambert and Boyle (2020) identified a positive relation between heavy *workloads* and *stress*, which means that an increase in the *workload* increases the *stress*. However, Helms-Lorenz, Slof and van de Grift (2013)

state that poor characteristics of the work environment, which includes a high *workload*, constrains the *coping mechanisms* to deal with *job stress*.

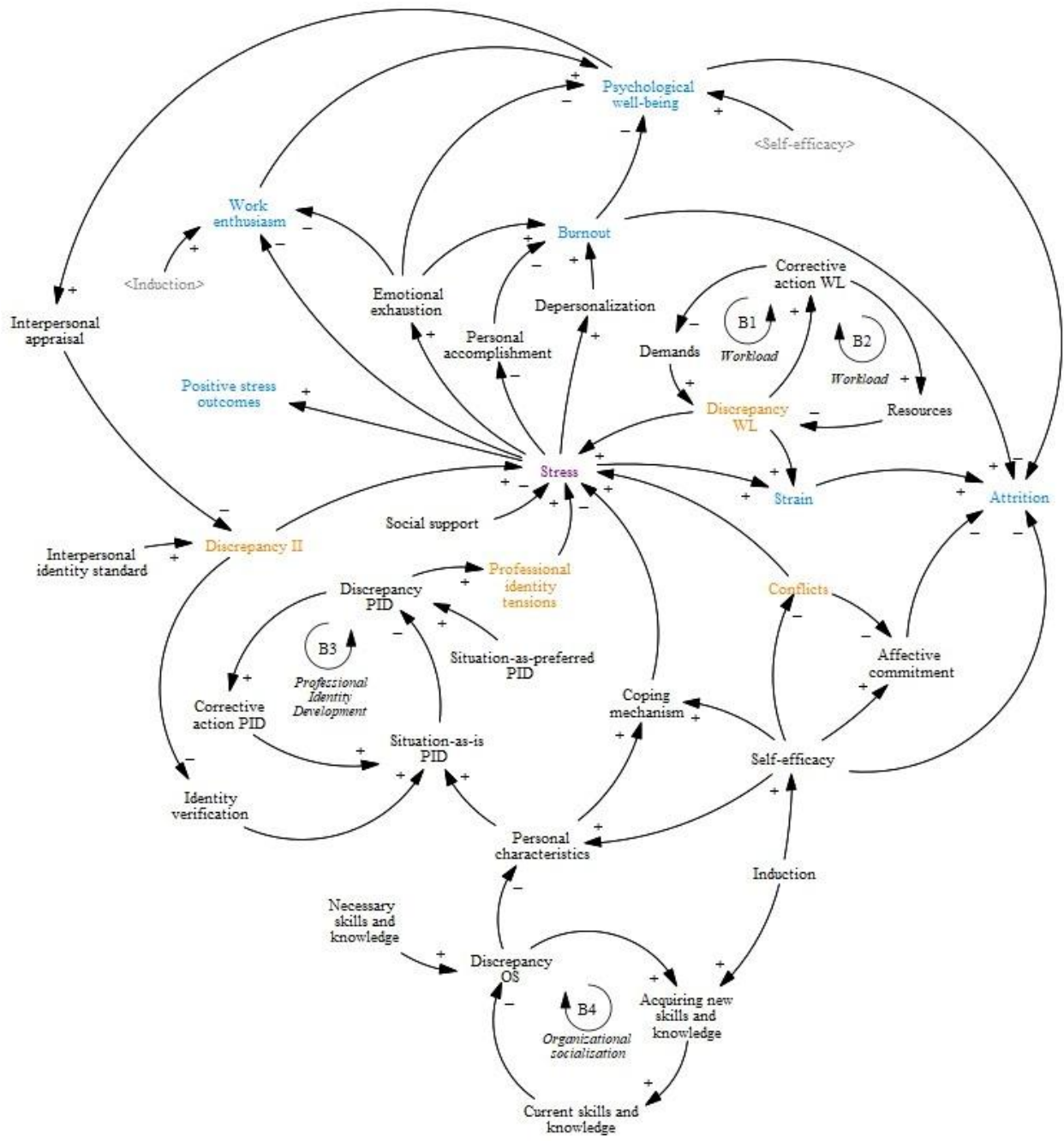
Because different links can be found between *workload* (including demands and resources) and *stress*, this has been modelled with two balancing feedback loops (B1 and B2). The *discrepancy* between the *job demands* and the *job resources* influences both *stress* and *strain*. *Corrective actions* can be taken for both the *demands* and/or the *resources*, which completes the feedback loops. As research has not shown one specific link between workload and stress, workload is an important variable to validate in the disconfirmatory interviews.

3.2.5. Attrition

Attrition is directly influenced by five variables, namely *affective commitment*, *self-efficacy*, *psychological wellbeing*, *burnout*, and *strain*. Affective commitment and self-efficacy are psychological states representing the personal goals and/or beliefs about one's capacities and one's context (De Neve & Devos, 2017). Meyer, Allen, and Smith (1993) refer to affective commitment as the positive emotions towards the profession. It is negatively related to (intended) *attrition* (De Neve & Devos, 2017), meaning that the higher the affective commitment, the lower the (intended) attrition.

Psychological well-being has a negative link to attrition as well, as an increase in the psychological wellbeing decreases the attrition (ref). This variable is influenced by the variables *work enthusiasm* and *emotional exhaustion*, *self-efficacy*, and *burnout* (Rafsanjani & Rahmawati, 2019; van der Want, et al., 2019). Furthermore, *burnout* itself has a direct positive relation to *attrition*, as the higher the burnout levels, the higher the attrition rates (Skaalvik & Skaalvik, 2017).

Figure 5. Theoretical CLD



4. Methodology

In this chapter, the method that is used to validate the theoretical model is explained. The model is validated by using disconfirmatory interviews with ECTs. An explanation is given as to what disconfirmatory interviews entail. Furthermore, the method to analyse the data is described in this chapter.

4.1. Validation of the theoretical model

During the validation of System Dynamics models, it is of importance to use qualitative data and human judgement (Forrester & Senge, 1980; Sterman, 2000). Therefore, disconfirmatory interviews are held to increase the validity of the model. Disconfirmatory interviews have three broad purposes, namely (i) increasing user confidence in the structure and behaviour of a model, (ii) supporting efforts to improve model structure by leading to concrete suggestions on how to improve the current version, (iii) and helping a client focus on the practical question of what should be done in the policy domain (Andersen, et al., 2012). In this case, the first two purposes are relevant to this research.

4.1.1. Data collection

Sample

For this research, non-probability sampling is used. This approach of sampling involves selecting participants in a non-randomized matter. One of the disadvantages of this strategy, is that the participants are selected in a non-representative matter. Quota sampling will be used to increase the representativeness (Babbie, 2014, p. 188). As this research is regarding ECTs of secondary education in the Netherlands, ECTs of all types of secondary education in the Netherlands need to be included, meaning the vmbo, havo, and vwo. Furthermore, gender is taken into account as well in the quota sampling. In 2020, 55% of teachers in secondary education was female (Ministerie van Onderwijs, Cultuur en Wetenschap, 2021). Therefore, the sample should contain around 55% of female interviewees. ECTs in secondary education are interviewed. ECTs are defined as licensed teachers who have at most three years of experience. The sample size is five, three males (60%) and two female (40%). One interviewee was in their third year of teaching and four were in their first year of teaching. Two interviewees taught at a havo/vwo secondary school, one interviewee taught at a vmbo secondary school, and two interviewees taught at a secondary school where all types (vmbo, havo, vwo) were present.

Interview setup

Andersen et al. (2012) identified seven distinct features of DIs, namely using artifacts as boundary objects to structure the interviews; anchoring respondents with concrete and specific information; using the deference effect to focus clients on disconfirmation; organizing the interview around the model's structure, behaviour, and structure-behaviour connections; tailoring the interview to the audience; having individual, not group, interviews; and explicitly articulating changes. It is important that these features are all present during the interviews because it increases the validity of the method of using disconfirmatory interviews.

The interviews are semi-structured. First, general questions regarding employment are asked, such as at what kind of school the interviewee teaches and how many years of experience the interviewee has. Then, for each theme, the same questions are asked. These questions include what the interviewees think are possible causes and effects. Then, the interviewee is asked to link these variables back together, to create a more elaborate model. In addition, after each theme, the question is asked how this stress affects the interviewee. The interview guide can be found in Appendix 2.

One important aspect of this part of the interviews is that the interviewees receive a pen and a piece of paper. On this paper, the interviewees are asked to draw relations that they find important. The paper acts as a boundary object. A boundary object is a tangible representation – such as text, a diagram, or a formal process – of dependencies across disciplinary, organizational, social, or cultural lines (Star & Griesemer, 1989). It keeps representations of the problem visible (Black, 2013), which enables the interviewee to remember their previous thought processes. As a result, the thought process can be advanced, because the interviewee can build on what they previously said.

Two pilot interviews have been done to check whether using a drawing as a boundary object was effective. In both cases, the interviewees stated that they liked to draw relations because they felt in charge. Another positive aspect of the boundary object that came forward during the pilot interviews is that it can divert the attention away from the possibly sensitive questions. As stress is a potential sensitive topic for people, the interviewee can focus on the boundary object instead of only focussing on the interviewer. The pilot interviewees stated that they felt like they could share more because they could divert their attention on drawing relations instead of shutting down when the questions became too sensitive. Two points of improvement came forward during the first pilot interview. These are (i) using one big paper instead of multiple smaller ones, and (ii) having different colours to make a distinction between causes and effects.

These changes were implemented, and the second pilot interview was conducted. The second pilot interviewee stated that they liked the different colours and the one big piece of paper to create a big, comprehensible overview of their thought process.

4.1.2. Data analysis

The interviews are partly summarized and the parts where the interviewee discusses the relations between variables are fully transcribed. This choice is made because the parts that are most important for model improvements are discussed in the discussions on how variables relate to each other. The pieces of paper that acted as boundary objects during the interviews are included in the analysis as well. The visual representations made by the interviewees are digitalized and they are extended by adding links that have only been stated verbally by the interviewee, which they did not visually represent. The reason for this is that the interviewees had no previous knowledge of System Dynamics and modelling, and these verbally stated links are of importance for the validation. With these individual models, an aggregated model is made. This is done by comparing whether links between variables have been mentioned by multiple interviewees. If there is a link only mentioned by one interviewee, then this link is not added in the aggregated model. A link mentioned more than once is added into the aggregated model. When interviewees indirectly link variables while other interviewees link them directly, either one of the two links is added.

4.1.3. Model refinement

Revisions to the model are made based on the differences that are found between the theoretical model (Figure 5) and aggregated model. This is done in a similar way as the individual models. This means that variables themselves are compared, e.g. whether there are variables not present or whether a different name is used. Next, the links between the variables is compared. Because the aggregated model will be less detailed than the theoretical model, because of a limited number of questions that could be asked in the interviews, the prediction is that there are less links in the aggregated model, which makes it harder to compare all the links of the theoretical model with the aggregated model.

4.2. Ethics

When conducting the interviews, participants are first told that there is voluntary participation, meaning that they are free to opt out of the interview at any time. In addition, the goal of the study is explained, as well as what happens to the data, for example who will have access to the data. It is important to mention to the participants that the interviews are anonymous, but that

that the level of experience in the teaching profession and at what kind of school the interviewees teach (vmbo/havo/vwo), is not anonymous, as this could be influencing the dynamic process, which makes it a necessary characteristic in the data analysis. Furthermore, the participant is asked whether they accept to have the interview recorded. Afterwards, they can have both the transcript of the interview to check whether they agree with it, as well as the results of the research if the interviewees want to.

5. Validation of the theoretical model

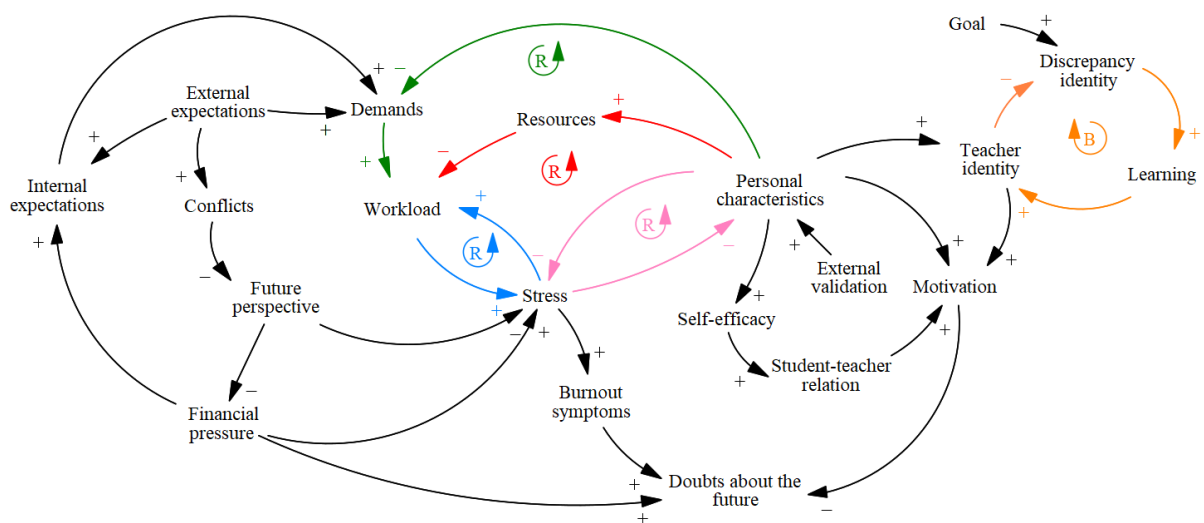
In this chapter, the aggregated model is reported on. In addition, similarities and differences between the aggregated model and the theoretical model are discussed. Afterwards, the theoretical model is refined based on the findings of the aggregated model.

As has been discussed previously, the aggregated model is based on the individual models. The individual models can be found in Appendix 9.3 The aggregated model can be found in Figure 6.

5.1. Interview results

In each interview, questions were asked regarding three themes, namely workload, conflicts, and the teacher identity. Therefore, for each theme separately, the links are discussed as well as how the answers of the interviewees are incorporated in the aggregated model. Lastly, the variable stress is discussed separately.

Figure 6. Aggregated model



5.1.1. Workload

The first thing that should be noticed about the variable *workload* is that in the aggregated model, a division is made between the *demands* and the *resources*. One interviewee stated that workload was the difference between how much you have to do and how much time and support you get to do the tasks you have to do. Another interviewee was less direct in stating this division, but in the entire interview, they made all connections directly or indirectly to workload, and how they deal with the tasks and the tasks themselves. Therefore, this distinction is added into the model by including links from demands and resources to workload.

Four interviewees stated that the *expectations of others* are one of the most important causes of a high workload. Interviewee 5 stated: “If there are too many or high expectations of others, you get more tasks on your plate. This causes your workload to increase, and this leads to stress”.

Another variable affecting the workload is the *personal characteristics*. Multiple interviewees stated that they have an *urge to prove themselves* and that this results in more tasks (*demands*), and thus, a higher workload. In the model, this urge to prove is incorporated in the personal characteristics of the teacher. The personal characteristics influence the resources as well, as two interviewees stated that *your ability to deal with many tasks*, if you *procrastinate* or not, are important variables to take into account. These are incorporated into the *personal characteristics* variable as well. Therefore, these links are included in the aggregated model. This results in two reinforcing feedback loops, which can be found in the model by their green and blue colour.

One of the interview questions was how the interviewee thinks stress and workload are connected to each other. All interviewees stated that they believed that a high *workload* results in *stress*. Three out of the five were of the opinion that *stress* also increases the *workload*. Interviewee 3 stated: “Workload has a direct link to stress, and it also has a link back to workload. Stress can be a causative agent”. Interviewee 1 was of a different opinion: “I believe they interact with each other, but it always begins at a high workload”. Because a majority of the interviewees were of the opinion that workload leads to more stress and stress results in a higher workload, both links are added in the aggregated model. The resulting reinforcing feedback loop can be found in the model by the blue colour.

5.1.2. Conflicts

The variable *conflicts* has fewer links to and from other variables than the variable *workload*. Within the aggregated model, a direct link is present from *external expectations* to *conflicts* and then from *conflicts* to *future prospects*. Interviewee 2 stated: “Too much is expected of the teachers. Every student has an individual manual that you have to follow, otherwise you will have discussions again [with management or parents].”. Interviewee 4’s statement is similar, stating that too high expectations lead to conflicts because the teacher can never do it right in the eyes of the parents.

One important thing to note regarding the future prospects of ECTs is that in the first two years of teaching, they do not have a fixed contract. Even though in the Netherlands there is currently

a shortage of teachers, ECTs still do not get a fixed contract after two years of working, resulting in them having to leave the school. Two interviewees stated that they believe conflicts, especially with management, result in them having lower chances of getting a fixed contract. This can be seen in the following quote by interviewee 2: “I felt like I sometimes could not say what I want to say in a conflict because I was scared that they would take this into account when deciding about my fixed contract”.

5.1.3. Teacher identity

The variable *teacher identity* was defined similarly by the first two interviewees. Interviewee 1 stated that “I know I am currently this way, which is not yet what I want to be later on in my career, but if I do not have any goals or ideals, then you have nothing to work for.” Interviewee 2 stated that: “[The teacher identity] is a growing thing. I am now not yet on my ideal level, but I also don’t have to be”. This process of learning, even though the interviewees have not stated it in a direct linked way, has been included in the model by a balancing feedback loop, which can be identified in the model by its orange colour.

Personal characteristics has an influence on the identity of the teacher as well. Two examples of personal characteristics that can be found in the individual models are the *experience* a teacher has and their *age*. Interviewee 3 explained that they want to be better at recognizing when students are putting on a mask and are not feeling well, but the interviewee is not worried about currently not having this skill, as they know this skill will become better over time with experience. In addition, interviewee 4 and 5 both stated that experience helps with knowing how to deal with certain situations, such as difficult children or entitled parents.

The identity of the teacher has been found to be a cause of the motivation of a teacher by two interviewees. One interviewee stated that they felt like their age, and how this meant that they could relate better to their students, resulted in a higher motivation to make lessons more fun. Another interviewee mentioned briefly that because they are still young, they still have a lot of motivation to make students learn, whereas for more experienced teachers, the interviewee felt like their lessons were more like a routine.

5.1.4. Stress

In the aggregated model, the variable *stress* has some links that have not been explained yet. Interviewee 1 and 2 stated that they felt like a high level of stress would increase burnout symptoms, and as a result, they would be more likely to have doubts to continue teaching, either in general or at the specific school they are currently teaching. One of these interviewees has

experienced burnout symptoms during their first year of teaching, but they stated that they have not thought about quitting the profession, but they have thought about switching schools.

Stress has an effect on the *personal characteristics* as well. Two interviewees were of the opinion that stress was a cause of *insecurity*. Interviewee 4 stated: “Because of the stress I experienced, I was always doubting if I was handling a situation correctly, but this insecurity caused me stress as well.”. Interviewee 3 has similar views on this topic: “Stress can cause doubt and insecurity, sort of like the imposter syndrome, where you feel like you are not as capable as others think. This can then also cause stress”. Personal characteristics can have another effect on stress as well, especially when looking at characteristics such as the ability to deal with stress, which has been mentioned by two interviewees. This results in a reinforcing feedback loop, which can be found in the model by the pink colour.

Some of the causes of stress are the *future prospects* and the *financial pressure*. Future prospects, or lack thereof, have previously been explained. Two interviewees have directly linked the *future prospects* to *stress*. Financial pressure has been mentioned by three interviewees as well, where one interviewee wanted it to be included in the *future prospects* variable.

5.2. Final model

The aggregated model in Figure 6 is compared to the theoretical model in Figure 5. There are multiple similarities between the two, with regard to the variables themselves, such as self-efficacy, as well as individual links, such as the *professional identity* feedback loop. Nevertheless, there were numerous differences. Changes were made to the theoretical model concerning the variable names. Examples of such changes are *attrition* to *doubts about the future* or taking the individual burnout symptoms (*emotional exhaustion*, *personal accomplishment*, and *depersonalization*) into one variable, namely *burnout symptoms*. Furthermore, variables such as *strain* are excluded in the final model, because, even when specifically asked to, interviewees did not mention any links to either stress or attrition.

In the final model, which can be seen in Figure 7, there are six feedback loops. Five out of the six feedback loops are reinforcing (R), and one is balancing (B). The balancing loop, which can be identified in the model as the bright pink loop, is identical to the *professional identity development* feedback loop in the theoretical model. Therefore, an explanation of this loop can be found in Chapter 3.2.

The first reinforcing feedback loop is the green loop. The positive relation between *workload* and *stress* is present in both the theoretical model and the aggregated model. The positive relation from *stress* to *workload* is only present in the aggregated model and not in the theoretical model.

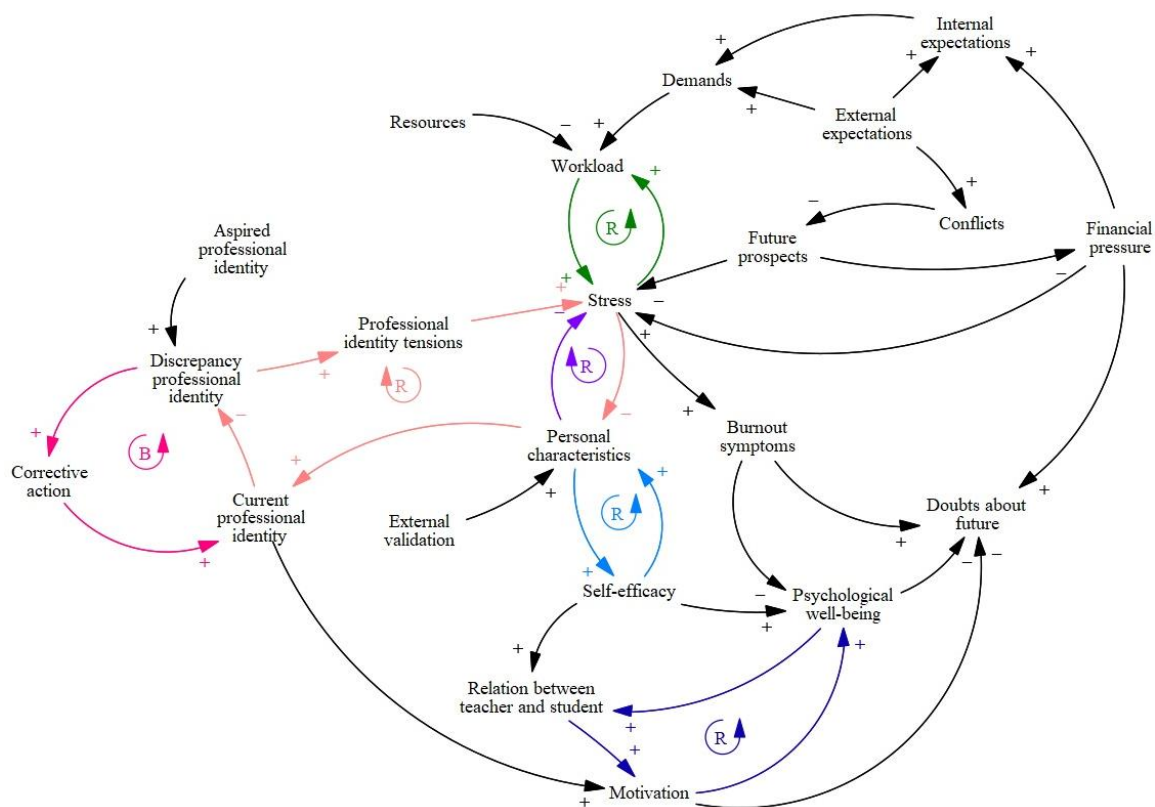
The next feedback loop is the purple feedback loop. The *personal characteristics* variable is defined as the characteristics that are helpful when teaching, such as being confident. Insecurity, which is an often-mentioned variable in the interviews, is the opposite of a helpful teaching characteristic. In the model, there is a negative relation between *stress* and *personal characteristics*. This means that the more stress an ECT experiences, the lower the helpful characteristics get. To give an example, if an ECT has a lot of stress, they might experience more insecurity (or: less confidence). As a result of this lower confidence (or lower helpful personal characteristics), the experienced stress of an ECT increases again.

The light blue feedback loop includes the *personal characteristics* variable as well. Within this loop, the more helpful personal characteristics, the more *self-efficacy* an ECT experiences. As a result of the higher *self-efficacy*, there is an increase in the helpful *personal characteristics*. In the theoretical model, only the link from self-efficacy to personal characteristics is present. In the aggregated model, only the reversed link was present. Therefore, both links are present in the final model.

The next reinforcing feedback loop is the soft pink loop. This loop contains five different variables, and it goes from stress to *personal characteristics* to *current professional identity* to *discrepancy professional identity* to *professional identity tensions*, and then back to stress again. As has been explained in the purple loop, the more *stress*, the lower the helpful *personal characteristics*. These lower helpful *personal characteristics* decrease the *current professional identity*, which, in turn, increases the *discrepancy* between the current professional identity and the aspired professional identity. This is because the lower your current identity, the more far away your desired identity is. An increase in this *discrepancy professional identity* results in an increase in the *professional identity tensions* as well. This variable is not mentioned in the aggregated model, as no interviewee specifically mentioned tensions regarding their identity. However, during the interviews, three interviewees stated that there is first tensions before there is stress. When these tensions are too high, this results in stress. This is similar to the theoretical model, in which the variable of *professional identity tensions* was used. Therefore, this variable is included in the final model as well.

The last reinforcing feedback loop can be found in the model by the dark blue colour. This loop goes from *psychological well-being* to *relationship between teacher and student* to *motivation* and then back to *psychological well-being* again. Each relation has a positive nature, meaning that an increase (or: decrease) in the cause variable results in an increase (or: decrease) in the effect variable. In the interviews, it has been stated that the relation between a teacher and a student has an impact on the motivation of a teacher. When there is a good relationship present, the teacher experiences a higher level of motivation, which can be seen in the aggregated model by the positive link between the two variables. In the theoretical model, the links between the three variables of *motivation*, *student-teacher relation* and the *psychological well-being* are less straightforward. This is because, in the theoretical model, the teacher-student relation is divided into two parts, namely the interpersonal identity standard and the interpersonal appraisal. In addition, motivation is not directly present in the theoretical model as well, but *work enthusiasm* is part of *motivation*, and this variable is present. *Work enthusiasm* has a positive link to *psychological well-being*, which has a positive link to one part of the teacher-student relation. In the final model, this is represented by the positive links from *psychological well-being* to *relationship between teacher and student* to *motivation* back to *psychological well-being*.

Figure 7. Final model



6. Conclusion

In this chapter, the results of the previous chapter are interpreted to answer the research question. Furthermore, the contribution to the knowledge is given, as well as the practical implications this research has on the topic of ECT stress.

6.1. Interpretation of results

This research aimed to describe the systemic structure of stress experienced by ECTs in secondary education in the Netherlands. Based on a literature study, a CLD was made. By using disconfirmatory interviews, changes to the model were made to validate it. Based on this final model, it can be concluded that there are multiple reinforcing feedback loops that cause (negative) exponential behaviour over time. These feedback loops include multiple different aspects of the problem of stress, namely workload, personal characteristics or the self-efficacy, and the motivation of the ECT. Stress is an important, but indirect, part of the doubts ECTs have regarding their future and whether they want to continue teaching for the rest of their professional career. Therefore, it is important that a solution is found to reduce the experienced stress or to give ECTs coping mechanisms to deal with their stress. However, the results indicate that there is not one clear solution for this problem, because of the interrelated nature of the problem. To give an example, a possible negative side effect of reducing the workload is that there is more financial pressure. As a result, this leads to more stress because of the financial pressure. Therefore, each possible solution needs to be included in the model to identify possible negative side effects on other parts of the model instead of only looking at the direct effect. This has to be done to create an effective solution.

6.2. Contribution to knowledge

This research contributes to the current knowledge in two ways, regarding methodology and the subject of ECT stress. The first contribution is regarding the method. Textual data has previously been used for model conceptualization in System Dynamics, however, the method used in this research differs from previous research. The five-step method proposed by Kim and Andersen (2012) (Chapter 3.1.1) has been changed to limit the time needed to finish the steps. Therefore, this new, faster method is a contribution to the current knowledge.

The next contribution to the current knowledge regarding the method concerns the disconfirmatory interviews. The use of boundary objects as a way to let the interviewees make the models themselves, to represent their thought process, has not been used previously. Therefore, this novel approach is a contribution to the knowledge.

The last contribution to the current knowledge is regarding the subject of ECT stress. As has been explained in Chapter 2, current knowledge is often only regarding a specific topic of (ECT) stress. This research adds to the current knowledge by combining past research into a model to create a holistic overview of the concepts relating to ECT stress.

6.3. Practical implications

The practical implication of this research is a social implication, which is the ability or potential of research to impact society in visible ways. As has been explained previously, the goal of this research was to describe the systemic structure of stress experienced by ECTs in secondary education in the Netherlands. By doing this, the interrelated nature of the problem has become clearer. Possible solutions to parts of the problem, such as workload or pay, can be included in the model to analyse whether they are effective.

7. Discussion

In this chapter, the limitations of this research are elaborated on. These limitations are regarding the method and the validation of the model. In addition, recommendations for future research are given. These recommendations are mostly regarding the method, but recommendations for future research are given concerning the subject of ECT stress as well.

7.1. Research limitations

The first methodological limitation is regarding the articles used to create the theoretical model. As there is a large body of literature on stress, not all articles can be taken into account when making the theoretical model due to time constraints. However, a diverse set of articles needs to be analysed for the model to still be representative. Therefore, a mix was made between recent articles on (ECT) stress and articles on theories that have been known to be impactful, such as the JD-R model explained in Chapter 2. As there was limited time available for this research, the theory on which the model is created is based on a literature study instead of a literature review. A limitation of a literature study is that there is a selection and evaluation bias (Ferrari, 2015).

The next limitation regarding methodology is concerning the disconfirmatory interviews. These interviews are an important element, as they validate the model. However, the interviewees need to represent the actual division of ECTs. As it was difficult to find ECTs in general, a representative set of ECTs was even more difficult to obtain. The actual division was 60% male and 40% female, while in the Netherlands 55% of teachers are female. In addition, a mix of ECTs teaching at different levels of education (vmbo/havo/vwo) was interviewed. However, because of the low number of interviewees, the representability of the interviewees can be taken into question.

The third methodological limitation is regarding the data analysis. Coding is a subjective process, which increases the risk of researcher bias (Babbie, 2014, p. 408). However, transparency during the process reduces this risk. Therefore, the five-step method of Kim and Andersen (2012) is important to follow. However, their method is based on purposive data, which they identified as having the following characteristics: (i) arising from a discussion involving key decision makers or stakeholders in the system under study, (ii) capturing the participants' focused discussion on the system and the problem at hand, and (iii) reflecting a frank and unfeigned conversation of the decision-making group (p. 312). Their purposive text data were verbatim transcripts. By Kim and Andersen's definition, articles are not purposive

text data, and therefore, the five-step method might not be completely suitable. Nevertheless, the ideas behind the five-step method can be used to create a method for the systematic coding of articles to generate causal maps for System Dynamics modelling.

Another limitation of this study is that some links that have been made in the theoretical model are based on the literature, but they cannot exactly be found in the literature. An example of this is that names of concepts have been changed a bit to be a more useful variable with regard to System Dynamics. Within System Dynamics, a variable used in a CLD should be able to increase and decrease, otherwise it is not a useful variable. This was the case for the *professional identity development* feedback loop. This was first only called the professional identity of the teacher, but this is not a 'correct' System Dynamics variable. To make it a better variable, the entire feedback loop was created to show the process of the identity development. Nevertheless, this did not work for every variable. In both the theoretical model as well as the final model, the variable *personal characteristics* is used. This is not a 'correct' System Dynamics variable, but with the explanation that it includes the characteristics that are helpful when teaching, such as being confident, this incorrect variable is used in the model, because it is an important node in the model.

The last limitation of this research is the number of interviews that were conducted. A higher number of interviewees was desired, but three ECTs cancelled interviews because they did not have enough time because of their high workload. Unfortunately, a rescheduling was not possible because of holidays and the submission deadline of this thesis. Nevertheless, this shows that a high workload is an important concept in the life of an ECT. Another problem regarding the interviews was that they had to be conducted in person. A number of ECTs only agreed to conduct the interviews online, resulting in them not being able to participate in this research. In addition, a COVID-19 infection caused another cancellation of two already rescheduled interviews. Even though the five interviewees had similar opinions, a higher number of interviewees was preferable to validate the theoretical model better.

7.2. Recommendations

The possible future recommendations are both regarding the method, as well as the subject of ECT stress. The method used to create the CLD is based on the five-step model by Kim and Andersen. However, this altered method is not used before, and to see whether this altered method is useful, it needs to be validated by other research. Another recommendation regarding

the CLD is that a more extensive literature review can be done to create a more substantiated basis for the CLD, as this research only used a literature study.

Another recommendation regarding the methodology is that more testing is needed with regard to letting the interviewees create a model. To validate the usefulness of using this type of boundary object, more extensive research should be done with this method.

The last recommendation for future research concerns the subject of this research, stress of ECTs. More in-depth interviews are needed to confirm other parts of the theoretical model that have not been tested. This can be done by conducting interviews specifically into one part of the model, such as the professional identity, or the motivation of an ECT.

8. References

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9. Appendix

9.1. List of articles and reports

Author(s)	Title	Year	Included
Bakker, A. B., & Demerouti, E.	The Job Demands-Resources model: state of the art	2007	Yes
Borman, G. D., & Dowling, N. M.	Teacher Attrition and Retention: A Meta-Analytic and Narrative Review of the Research	2008	Yes
Canrinus, E. T., Helms-Lorenz, M., Beijaard, D., Buitink, J., & Hofman, A.	Self-efficacy, job satisfaction, motivation and commitment: Exploring the relationships between indicators of teachers' professional identity	2012	Yes
De Neve, D., & Devos, G.	Psychological states and working conditions buffer beginning teachers' intention to leave the job	2017	Yes
Fimian, M. J., & Blanton, L. P.	Stress, burnout, and role problems among teacher trainees and first-year teachers	1987	No
García-Carmona, M., Dolores Marín, M., & Aguayo, R.	Burnout syndrome in secondary school teachers: A systematic review and meta-analysis	2019	Yes
Garner, J. K., & Kaplan, A.	A complex dynamic systems perspective on teacher learning and identity formation: An instrumental case	2019	Yes
Greenberg, M. T., Brown, J. L., & Abenavoli, R. M.	Teacher Stress and Health Effects on Teachers, Students, and Schools	2016	Yes
Harmsen, R., Helms-Lorenz, M., Maulana, R., & van Veen, K.	The relationship between beginning teachers' stress causes, stress responses, teaching behaviour and attrition	2018	Yes
Harmsen, R., Helms-Lorenz, M., Maulana, R., & van Veen, K.	The longitudinal effects of induction on beginning teachers' stress	2019	Yes
Harmsen, R., Helms-Lorenz, M., Maulana, R., van Veen, K., & van Veldhoven, M.	Measuring general and specific stress causes and stress responses among beginning secondary school teachers in the Netherlands	2019	Yes
Helms-Lorenz, M., & Maulana, R.	Influencing the psychological well-being of beginning teachers across three years of teaching: self-efficacy, stress causes, job tension and job discontent	2016	Yes
Helms-Lorenz, M., Slof, B., & van de Grift, W.	First year effects of induction arrangements on beginning teachers' psychological processes	2013	Yes

Helms-Lorenz, M., van de Grift, W., & Maulana, R.	Longitudinal effects of induction on teaching skills and attrition rates of beginning teachers	2016	No
Helms-Lorenz, M., van der Pers, M., Maulana, R., van der Lans, R., Moorer, P., & Flens, P.	Opschaling van inductie en het pedagogisch-didactisch handelen van beginnende docenten in het voortgezet onderwijs	2019	No
Helms-Lorenz, M., van der Pers, M., Moorer, P., Harmsen, R., & Verkade, A.	Inductie in het Noorden: Eindrapportage 2014-2019	2020	No
Helms-Lorenz, M., van der Pers, M., Moorer, P., Lugthart, E., van der Lans, R., & Maulana, R.	Begeleiding startende leraren 2014-2019: Eindrapportage	2020	Yes
Kearney, S.	Reconceptualizing beginning teacher induction as organizational socialization: A situated learning model	2015	Yes
Kyriacou, C.	Teacher Stress: Directions for future research	2001	Yes
Kyriacou, C., & Sutcliffe, J.	A Model of Teacher Stress	1978	Yes
Maulana, R., Helms-Lorenz, M., & van de Grift, W.	A longitudinal study of induction on the acceleration of growth in teaching quality of beginning teachers through the eyes of their students	2015	No
Maulana, R., Helms-Lorenz, M., & van de Grift, W.	Pupils' perceptions of teaching behaviour: Evaluation of an instrument and importance for academic motivation in Indonesian secondary education	2015	No
McCarthy, C. J., Fitchett, P. G., Lambert, R. G., & Boyle, L.	Stress vulnerability in the first year of teaching	2020	Yes
Ministerie van Onderwijs, Cultuur en Wetenschap	Lerarenagenda 2013-2020: de leraar maakt het verschil	2013	No
Ministerie van Onderwijs, Cultuur en Wetenschap	Tendrapportage Arbeidsmarkt Leraren po, vo en mbo 2021	2021	No
Montgomery, C., & Rupp, A. A.	A Meta-analysis for Exploring the Diverse Causes and Effects of Stress in Teachers	2005	Yes
Pillen, M. T.	Professional identity tensions of beginning teachers	2013	No
Rafsanjani, M. A., & Rahmawati, E. D.	Stress Exposure and Psychological Well-being: Study on Beginning Teacher	2019	Yes
Schaap, H., van der Want, A. C.,	Changes over time in the professional identity tensions of Dutch	2021	Yes

Oolbekkink-Marchand, H. W., & Meijer, P. C.			
Skaalvik, E. M., & Skaalvik, S.	Dimensions of teacher burnout: relations with potential stressors at school	2017	Yes
Struyven, K., & Vanthournout, G.	Teachers' exit decisions: An investigation into the reasons why newly qualified teachers fail to enter the teaching profession or why those who do enter do not continue teaching	2014	Yes
van der Pers, M., & Helms-Lorenz, M.	Regional school context and teacher characteristics explaining differences in effective teaching behaviour of beginning teachers in the Netherlands	2019	No
van der Wal, M., Oolbekkink-Marchand, H. W., Schaap, H., & Meijer, P. C.	Impact of early career teachers' professional identity tensions	2019	Yes
van der Want, A. C., Den Brok, P., Beijaard, D., Brekelmans, M., Claessens, L. C., & Pennings, H. J.	Teachers' Interpersonal Role Identity	2015	Yes
van der Want, A. C., Den Brok, P., Beijaard, D., Brekelmans, M., Claessens, L. C., & Pennings, H. J.	The relation between teachers' interpersonal role identity and their self-efficacy, burnout and work engagement	2019	Yes
Worth, J., & van den Brande, J.	Teacher Labour Market in England: Annual Report 2019	2019	No

9.2. Interview guide ECT

Introduction	<p>Hi, I'm Anne and I am currently working on my master's thesis. My thesis is about stress in beginning secondary education teachers. First of all, I would like to thank you for agreeing to this interview. The goal of this interview is to gain a deeper insight into the stress you experience as a beginning teacher. It is really regarding your own experiences, so there are no wrong or right answers.</p> <p>Participation in this interview is completely voluntary, and you can stop the interview at any moment if you want to do so. Furthermore, the interview is anonymous. In a moment, I will ask some general questions, but your identity cannot be deduced from these answers. Next, I would like to ask you whether you agree to the interview being recorded.</p>
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	The interview will consist of multiple parts. First of all, I will ask some short, general questions. After this, three themes will be discussed regarding stress, namely workload, conflicts, and the identity of a teacher. These will be explained in more detail later on.
Background questions	How many years have you been teaching after getting your degree? At what kind of school do you currently work? Did/do you have a mentor during your first years as a teacher? Do you experience stress because of your work?
Explanation	In a moment, I will ask you some questions regarding the first theme. In front of you, there is a big piece of paper and some pens with different colours. At a certain moment during the interview, I will ask you to the causes and consequences of workload. I would like you to write these things down on the paper, at the moment when I ask you these questions, and to draw arrows from and to <i>workload</i> . It could be useful to use different colours for causes and responses, but it is not necessary. You can do what you like. The first few questions are general questions, so you do not have to write these down on the paper.
Theme 1: Workload	How would you define workload? Can you tell me something about your workload? What are some factors that influence your workload? What do you experience as positive/negative consequences of this workload? What does the school do to help you with this workload? How do you think workload and stress are related? How does this specific stress affect you? In your daily life? In your work life?
Explanation	We are now going to the second theme, which is conflicts. This subject is very broad, as it is regarding all sorts of conflicts you can have at your work, e.g. conflicts with colleagues, the (vision of the) school, parents, or students. The set-up is the same as for the last theme. First, I will ask a general question, and then we will go to the drawing of the arrows.
Theme 2: Conflicts	Can you tell me something about conflicts at your work? What are some factors that influence conflicts? What do you experience as positive/negative consequences of such conflicts? How do you think conflicts and stress are related? How does this specific stress affect you? In your daily life? In your work life?
Explanation	The third theme is regarding the identity of a teacher. This concept is a bit vague, but it is about what you think a good teacher is. Because this is somewhat vague, it can be more difficult to draw this on the paper, so if this does not work out, it is no problem.
Theme 3: Teacher identity	How do you see yourself as a teacher? How would you like to be as a teacher? If there are differences: how do these differences affect you? How do you think teacher identity and stress are related? How does this specific stress affect you? In your daily life? In your work life?

Other:	<p>Do you experience stress because of other things than we have previously discussed (workload, conflict, and role identity)?</p> <p>Are there more negative aspects of stress that we have not yet discussed?</p> <p>Are there more positive aspects of stress that we have not yet discussed?</p>
End	<p>Do you have any additions, questions, or remarks?</p> <p>This is the end of the interview. Thank you for participating!</p>

Introductie	<p>Hoi, ik ben Anne en ik ben op dit moment bezig met mijn master scriptie. Mijn scriptie gaat over stress bij beginnende docenten die lesgeven op de middelbare school. Allereerst wil ik je bedanken voor dit interview. Het doel van het interview is om meer inzicht te krijgen in de stress die jij ervaart als beginnende docent. Het gaat dus echt om jouw ervaringen, er zijn geen goede of foute antwoorden.</p> <p>Dit interview is volledig vrijwillig en het kan op elk moment gestopt worden als je dat wil. Daarnaast is het interview ook anoniem. Ik stel zo meteen een aantal algemene vragen, maar daaruit kan niet worden afgeleid om wie het precies gaat. Als allerlaatste onderdeel van deze uitleg, wil ik je vragen of het oké is als dit interview wordt opgenomen.</p> <p>Het interview bestaat uit een paar verschillende onderdelen. Als eerste ga ik je een aantal korte, algemene vragen stellen. Daarna komen er drie verschillende thema's aan bod, namelijk werkdruk, conflicten en de identiteit van een leraar. Deze worden later in het interview wat meer uitgelegd</p>
Achtergrondvragen	<p>Hoeveel jaar werkt u al sinds dat u uw diploma heeft gehaald?</p> <p>Op wat voor school werkt u nu?</p> <p>Heeft/had u een mentor/begeleider tijdens uw eerste jaren als docent?</p> <p>Ervaart u wel eens stress?</p>
Uitleg	<p>Zo meteen ga ik je vragen stellen over het eerste thema. Voor je ligt een groot vel papier en meerdere gekleurde pennen. Op een gegeven moment ga ik je vragen naar oorzaken en gevolgen van werkdruk. Ik zou graag willen dat je deze dingen, pas op het moment dat ik de vragen stel, ook op het papier wil zetten en dan wil gaan linken met pijltjes naar <i>werkdruk</i>. Het kan misschien handig zijn om verschillende kleuren te gebruiken voor oorzaken en gevolgen, maar dat hoeft niet. Kijk maar wat fijn is voor jou. De eerste vragen zijn nog wat algemener, en deze hoeft je dus ook nog niet op het papier neer te zetten.</p>
Thema 1: Werkdruk	<p>Wat verstaat u onder werkdruk?</p> <p>Kunt u me iets vertellen over uw werkdruk?</p> <p>Wat zijn factoren die invloed hebben op uw werkdruk?</p> <p>Wat ervaart u als positieve/negatieve gevolgen van deze werkdruk?</p> <p>Wat doet de school om u te helpen met deze werkdruk?</p> <p>Hoe denkt u dat werkdruk en stress met elkaar verbonden zijn?</p> <p>Hoe beïnvloedt deze specifieke stress u in het dagelijks leven en op het werk?</p>
Uitleg	Uitleg thema 2

9.3.5. Interview 5

