Changes in teaching due to COVID-19 for secondary school teachers in the Netherlands

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Abstract

This research describes the changes that teachers experienced during the COVID-19 closing of schools, and how teachers adapted to these changes. March 2020, the Netherlands switched to distance education through digital tools (technology-based learning) during the COVID-19 closing of schools. From May 11th 2020 until June 1st 2020, a survey questionnaire was filled out by 160 secondary school teachers of all school courses across the Netherlands. The survey shows that distance education complicated interaction and required a bigger time investment by teachers. As a result lessons were condensed to the core content. This left teachers feeling a loss of control over their students learning process. They dealt with this loss by leaving more responsibility with the student, by more formative assessment, and by letting students hand in homework through digital tools. The forced distance education led to a more positive opinion of teachers towards technology-enhanced learning. Teachers intend to keep these changes even after schools open again. School organizations can help teachers by providing support on the elements of time and interaction. This support could be provided by facilitating collaboration between teachers, training on technological pedagogical knowledge, consolidating the psychological transition, providing technical support and materials, and encouraging innovation.

Keywords: technology-enhanced learning, technology-based learning, distance education, COVID-19, digital tools, classroom interaction, school support

Introduction

Situation

The worldwide pandemic of the virus COVID-19 made the Dutch government decide that all schools in the Netherlands would be closed until further notice, starting on Monday March 16th 2020. Schools were expected to provide distance education during this period. Teachers that provided ordinary face-to-face classroom education were suddenly faced with having to provide technology-based learning. The distance education lasted until June 1st 2020, when Dutch schools were allowed to reopen their doors. Technology-based learning here refers to the acts of teaching and learning through technology means, instead of face-to-face. Whereas technology-enhanced learning is the application of technology in the classroom as a means to enrich and enhance face-to-face learning).

Relevance

This unique situation caused by the COVID-19 closing of schools forced teachers to provide distance education through technology-based learning. This caused an instant educational change across the Netherlands. Schools changed their educational ways completely within the course of a few weeks, which is riveting because educational change is usually a sluggish process (Fullan, 1992, 2005). This situation offers an unprecedented large-scale view into distance education teaching through technology-based learning. This educational change is significant because the way of teaching in distance education is strikingly different than normal classroom teaching, as a lot of teachers noticed (Teng & Wu, 2021; van der Spoel et al., 2020). This is also my personal experience, and what I heard back from my professional network. Peachey (2017) depicted this as well by writing that "Experienced classroom teachers can find the move to the online environment very challenging. Teaching online demands a new and extended skill set". Wolcott (1995) accurately illustrated this back in 1995 already, which portrays the philosophy behind this research:

As a departure from the familiar, distance teaching presents new problems which challenge one's routine approach to teaching. What has worked in the past may not be adequate for dealing with the unique situation presented; customary classroom practices applied in the distant teaching and learning environment may fail to effectively bridge the distance. Solving problems posed by distance teaching requires more than experience with face-to-face teaching (Sparkes, 1983). Distance teaching prompts reflection. (Wolcott, 1995, p. 41)

Research questions

The COVID-19 closing of schools created a new, yet to be documented situation. The gap this situation opened up is evident from the calls for research by journals and researchers (Bakker & Wagner, 2020; "EERJ- Open Call for papers: Education in Europe and the COVID-19 Pandemic", 2020; "IAFOR Journal of Education Special Issue: COVID-19: Education Responses to a Pandemic", 2020). Teachers put in an immense amount of work to provide distance education through technology-based learning. They gained valuable experiences on the topic of learning with technology. This has led to the following research question: *How do Dutch secondary school teachers' with technology-based learning due to COVID-19 affect their long-term intentions for implementing technology-enhanced learning?* Answering this question can provide insight for school management, educational policymakers, teachers, and possibly technology vendors.

Even though distance education during COVID-19 was completely technology-based, there might be lessons in those experiences that could apply to technology-enhanced learning as well. To find these lessons, first the current experiences have to be investigated. Thus, subquestion one is: *What changes did teachers face when designing and executing technology-based learning due to the COVID-19 closing of schools?* Finding out what teachers learned from the situation requires investigating how they dealt with this situation. Subquestion two is: *How did teachers adapt to these changes due to the COVID-19 closing of schools?*

Teachers' experiences during the COVID-19 closing of schools might show them the potential of technology-enhanced learning and thus trigger them to implement this more in the future (Babić et al., 2020; van der Spoel et al., 2020). Some experiences could influence internal teacher factors and might trigger long-term effects. Therefore, subquestion three is: *What are teachers' intentions for the long term implementation of technology-enhanced learning based on the newly formed experiences with technology-based learning?* Research has shown external teacher factors such as school support and the availability of resources are also important for the implementation of technology-enhanced learning (e.g. Hixon & Buckenmeyer, 2009; Warschauer et al., 2014). The support of school organization is important during the COVID-19 closing of schools as well as long-term. To describe what that support could look like, subquestion four is: *How can teachers be supported for the long term implementation of technology-enhanced learning?*

Focus

This research focusses on teachers in higher secondary education in the Netherlands. Research on technology-enhanced learning usually focusses on learners: their learning success, feelings, motivation, and requirements. The part teachers play in technology-enhanced education has rarely been researched (Schweighofer & Ebner, 2015). That is why Schweighofer and Ebner (2015) recommend technology-enhanced learning research to focus on teacher-related aspects as future work, after a wide-scale literature research of the technology-enhanced learning field. Lindqvist (2015) also recommends research focusing on the teacher perspective, incorporating how teachers take up and use digital tools in the classroom. A similar plea is evident from the field of distance education, where the focus is mostly on the students experience (Murphy & Rodríguez-Manzanares, 2009). The usual sample demographic for distance education research is students and teachers in postsecondary education (Bozkurt et al., 2015; Means et al., 2010; Murphy & Rodríguez-Manzanares, 2009; Smith et al., 2005). This is why secondary education was chosen here. Notable is that Lindqvist (2015) pleads for a shift from technology towards pedagogy in technology-enhanced learning research. This plea is taken into account for the chosen focus of this research, emphasising the pedagogical aspects in this research.

Theoretical Background

Educational change

Educational change can be triggered by both factors within and outside the school. Factors within the school consist of the people, their tasks, the organizational structure, and the available technology (Leavitt, 1964, as cited in Yilmaz & Kılıçoğlu, 2013; Rossouw et al., 2021). Factors outside the school are the laws and regulations of the government, globalization, demographic characteristics, social pressure, and improvements in technology (Dawson, 2003; Kreitner & Kinicki, 2010). Yilmaz and Kılıçoğlu (2013) conclude that educational change in schools is often triggered by factors outside the school. This is affirmed by the head of the OECD, who stated that "real [educational] change takes place in deep crisis" (Anderson, 2020). Yilmaz and Kılıçoğlu assert that school organizations should be prepared to adapt to those external demands in order to keep providing education. The COVID-19 closing of schools and the resulting sudden external demand of distance education is supposedly not what Yilmaz and Kılıçoğlus intended, but the situation is an uniquely fitting example of the writers' assertions. Anderson (2020) described the COVID-19 closing of schools as "the world's biggest education technology experiment in history […] the experiment will reshape schools, the idea of education, and what learning looks like in the 21st century".

Distance education

The sudden closure of schools forced school organizations to organize distance education in a very short amount of time. Distance education is not a new concept. Some of the earliest research articles on distance education using computers stem from the 1980's (Bramer, 1980; Holmberg, 1980; Keegan, 1980). Nowadays, the improvement of technology offers a lot more possibilities in distance education. However, concepts described in older research such as those by Holmberg and Keegan are still often used by present research. In current research, distance education through computers seems to be analogous to e-learning or technology-based learning. However, technology can also be used in combination with face-to-face teaching, resulting in a less extreme form of e-learning such as blended learning constructions and technology-enhanced learning.

Blended learning usually combines synchronous face-to-face classroom instruction with asynchronous technology-based learning. Technology-enhanced learning however, focusses on the practice of using technology within the normal classroom setting as an enhancement and enrichment. The term "digital tools" used in this research refers to the 'technology' part of technology-enhanced learning and technology-based learning. This includes software like electronic learning environments, digital teaching materials, and interactive presentation software. This also includes hardware like laptops, smartphones and tablets.

Issues with distance education

Distance education poses a number of issues. One of the most influential issues is the lack of interaction in distance education (Parker, 2020). Interaction seems to be more complicated because of less nonverbal and nonvisual information (Kerka, 1996). Murphy & Rodríguez-Manzanares (2009) describe the issues in comparable categories as Wolcott (1995):

- Interaction (reduction in the amount and frequency of interaction)
- Social presence (increased interpersonal distance)
- Communication (loss of feedback and interference in message transfer)

While the emergence of better technology and videoconferencing tools might weaken these effects, it is a possibility that the complication of interaction is also a relevant factor in teaching during the COVID-19 closing of schools. Another factor might include the heightened self-responsibility for students because teachers are literally and figuratively further away (Tuckman, 2007; Wang et al., 2008). Not every student is able to handle this responsibility themselves, and the diminished interaction results in them becoming less motivated, participate less, and procrastinate more (Kulesza et al., 2011; Lim & Kim, 2003; Murphy & Rodríguez-Manzanares, 2009; Rovai et al., 2007; Smith et al., 2005; Tuckman, 2007; Visser et al, 2002).

Distance education teaching requires an unique set of skills that not every classroom teacher necessarily has. Davis and Roblyer (2005) argue that distance education teachers should be proficient in several unique areas. This proficiency is acquired with experience, suggesting a learning curve that teachers go through. David and Roblyer (2005) specify the following areas:

- Course planning and organization that capitalize on distance learning strengths and minimize constraints
- Verbal and nonverbal presentation skills specific to distance learning situations
- Collaborative work with others to produce effective courses
- Ability to use questioning strategies
- Ability to involve and coordinate student activities among several sites

Teaching approach

Dealing with these issues might require a different teaching approach. The lesson design and teaching style has important role in distance education and technology-based learning. Research on these topics often include the distinction between synchronous and asynchronous teaching, and between teacher-centred and student-centred approaches (e.g. Bernard et al., 2004; Ertmer et al., 2001; Ertmer et al, 2012; Hixon & Buckenmeyer, 2009; Murphy & Rodríguez-Manzanares, 2009, 2011; Yeung et al., 2012). Synchronous learning happens when the teacher gives instruction at a set time, to all learners simultaneously and with concurrent pacing. This is most common in the classroom, but is also possible through digital tools. Teaching all students simultaneously through video conferencing is also synchronous. Bernard et al. (2004) described this practice as "a poorer-quality replication of classroom instruction". Although a positive effect of synchronous learning is that it may increase motivation as compared to asynchronous learning (Murphy & Rodríguez-Manzanares, 2011). A well-grounded pedagogical approach is an important component for all forms of distance education (Anderson & Dron, 2012). The chosen medium does appear to play a bigger part in synchronous distance education, while pedagogy is the leading factor for asynchronous distance education (Murphy & Rodríguez-Manzanares, 2011). Asynchronous learning happens when learning can be planned by the student and is self-paced. The teachers is less of a deliverer of information and more of a coach and/or facilitator. (Koller et al., 2006). Asynchronous learning and student-centred learning are tied together in that way. Hixon and Buckenmeyer (2009) write that increased use of technology will mean that teachers have to release some control over the students' learning process, which is in line with a more student-centred teaching approach. Drent and Meelissen (2008) conclude the same, by observing that teachers with innovative technology use in the classroom have a student-centred teaching approach.

Different practices per teaching style are described by Ertmer et al. (2012). Interaction increases the quality of both teacher-centred and student-centred teaching. The level of interaction is influenced more by pedagogy than by media (de Freitas & Neumann, 2009; Kirkwood & Price, 2014; Murphy & Rodríguez-Manzanares, 2011). So the appropriate teaching style is of influence to the effectivity of technology-based and technology-enhanced learning. However teachers tend to stick to their usual pedagogical style (Cuban, 2013), which might not be the optimal solution. As Fabry and Higgs (1997) put it: "not only must [teachers] learn how to use technology, but they must also fundamentally change how they teach". Lindqvist (2015) suggests: "From the teacher perspective, how teachers design their teaching activities for the uptake and use of digital technologies in the digitalized classroom will be of importance to investigate in future research. […] In addition, how teachers, through the uptake and use of digital technologies in the classroom work, toward the move from technology to pedagogy will continue to be an important question for future research."

Goal of technology in education

Distance education now happens through technology, but it is important to make the goal of technology use explicit. This counts for technology-enhanced learning as well as technology-based learning. Kulesza et al. (2011) are big advocates of the notion that technology use in education should always have a goal, saying that: "the key to successfully integrating technology into the classroom depends upon the appropriateness of its use, and the specific function it should perform". It is easy to forget that technology is just a tool, and its effectiveness is dependent on the way it is used (Bray, 2007; Dunleavy et al., 2007; Hixon & Buckenmeyer, 2009; Kulesza et al., 2011; Teo, 2010; Warschauer et al., 2014).

Technology in education can have three global roles: a delivery method, a resource, and a management tool (Musawi, 2011). Teachers use technology mostly as a resource: to prepare lessons, and to make information and instructions available to students. The management role is the second most common: to organize classroom data and to monitor students (Perrotta, 2013). The delivery method is last. The delivery method in normal schools is mostly face to face. When providing distance education through technology-based learning, the delivery method is mostly

through digital tools. During the COVID-19 closing of schools, the delivery role of technology became more prominent. It is worth noting that the term "delivery" indicates a one-way channel. That might not do justice to the role technology can play in communication, especially during the COVID-19 closing of schools. A term describing a two-way channel, such as "Communicatory role" might be more appropriate. Though as previously described, one cannot expect the same level of interaction through technology as a main delivery method, compared to standard face to face teaching. As Cuban (1997) stated: "Teaching relies on the human touch to make lasting changes in what students know, can do, and how they behave ... [and] ... what reformers ignore is that introducing a half-dozen machines into classrooms changes social relationships". Teachers that do not have experience with technology-based learning might not be fully prepared for this shift in the delivery role and its implications.

Effects on the teacher

The sudden shift in the technology role will throws teachers in a completely new teaching situation, an instant educational change. This will give them new experiences in teaching with technology. It is possible that these new experiences might cause long-term educational change. This determined by internal and external teacher factors, now and in the future. Internal factors are personal per teacher. They include attitudes & beliefs and knowledge & skills. External factors for teachers include support from the school organization and colleagues, as well as the provision of resources such as time and tools (Ertmer et al., 2012; Li, 2017) Temporary use of technology can give teachers positive experiences. Those positive experiences strengthen internal teacher factors by influencing teachers attitudes & beliefs on digital tools (Babić et al., 2020; Ertmer, 2005; Kafyulilo et al., 2015; Yeung et al., 2012). Still, that might not be enough to stimulate continued use without addressing other internal teacher factors such as knowledge & skills, as well as external factors such as support and resources. That could be why interventions aiming to improve technology-enhanced learning usually only have a temporary effect. (Kafyulilo et al., 2015; Underwood & Dillon, 2011).

Attitudes and beliefs (internal)

The current educational change to technology-based learning might be externally triggered, the internal teacher factors should not be ignored. Change has a huge impact on the

individuals within the school organization (Schein, 1980). The current COVID-19 closing of schools made (temporary) educational change to distance education inevitable. Yet teachers have their own attitudes and beliefs that influence the adoption of educational change (Babić et al., 2020; Eickelmann & Vennemann, 2017; Ertmer et al., 2012). It is not unthinkable that teachers were still reluctant to provide distance education. Especially because they were forced (Underwood & Dillon, 2011; Yilmaz & Kılıçoğlu, 2013), as well as that technology-enhanced and technology-based learning are often faced with opposition (Cuban, 2001; Underwood & Dillon, 2011; Williams, 2008). Even when change is implemented for valid reasons, organization members might still react with resistance due to pressure, stress, and uncertainty (Armenakis & Bedeian, 1999; Boohene & Williams, 2012; Yilmaz & Kılıçoğlu, 2013). Failing to acknowledge the effect on the individual often leads to a failed attempt to change (Devos et al., 2007; Kavanagh & Ashkanasy, 2006). Managing teachers psychological transition is paramount for sustainable educational change (Armenakis & Bedian, 1999; Martin et al., 2005). School organizations can facilitate the psychological transition with education and communication, participation and involvement, facilitation and support, negotiation and agreement, manipulation and co-optation, explicit and implicit coercion (Kotter & Schlesinger, 1979). Attention for the teachers' psychological process is logically even more urgent in an externally triggered forced change such as the COVID-19 closing of schools, though it is unclear if schools provide this support. Ertmer et al. (2012) showed that positive experiences with digital tools can positively impact the opinion of technology use in the classroom. The current forced use of digital tools for teaching might create a sustainable shift in teachers attitudes and beliefs in the long run if their psychological transition is adequately managed.

Knowledge and skills (internal)

Still, a shift in attitudes and beliefs is not enough without the other internal factor of teachers knowledge and skills. How teachers perceive their own technical knowledge and skills is also addressed as their digital self-efficacy. Higher digital self-efficacy has a positive correlation with the implementation of digital tools in the classroom (Babić et al., 2020; Hatlevik I.K.R. & Hatlevik O.E., 2018). Those teachers also experience more positive emotions when using digital tools in the classroom (Moreira-Fontán et al., 2019). It is even possible that increasing teachers technological efficacy might also change their attitudes and beliefs towards

technology (Yeung et al., 2012). Digital self-efficacy for pedagogy specifically is more relevant than general digital self-efficacy (Hatlevik I.K.R. & Hatlevik O.E., 2018). This is in line with the TPACK model from Mishra and Koehler (2006), which describes the knowledge domains needed to for the successful application of technology in the classroom. The domains are: technological knowledge, pedagogical knowledge, content knowledge, and by extension several combination of those domains.

Mishra and Koehler (2006) describe that there is the tendency to only look at the technology and not at how it is used. As argued above, technology use should always have a distinct goal. Mishra and Koehler (2006) believe that a clear relationship between technology and teaching can help teachers in developing their knowledge and skills. This model asserts that technological pedagogical content knowledge is central for teachers' digital efficacy. That assertion is in line with the theoretical background that shows using technology in the classroom should be well-grounded in pedagogy. Schools could facilitate this by focussing on pedagogy (e.g. TPACK) in technological teacher training (Babić et al., 2020; Georgina & Olson, 2008; Goeman et al., 2015).

School support (external)

Next to internal factors, teachers are also influenced by external factors for the (continued) implementation of technology. When looking at external factors, support from the school organization and colleagues are critical elements (Baldwin & Ford, 1988; Eickelmann, 2011; Perrotta, 2013; Warschauer et al., 2014; Yilmaz, 2013). Teachers need to feel that their school organization and colleagues support technology use and innovation. School organizations especially, have an influential role in the uptake and continuation of technology in the classroom (Dexter, 2008; Eickelmann, 2011; Hatlevik & Arnseth, 2012; Kafyulilo et al., 2015, Perrotta, 2013; Sheppard & Brown, 2013). On the one hand, school organizations can provide a stimulating atmosphere for innovation with clear policies (Ertmer et al., 2012; Moreira-Fontán et al., 2019; Perrotta, 2013). On the other hand, they can also make sure technical support is available, which is a stimulating factor in technology use (Babić et al., 2020; Drent & Meelissen, 2008; Drayton et al., 2010; Ertmer et al., 2012; Perrotta 2013). The experienced support seems to be independent from internal teacher factors, as Moreira-Fontán et al. (2019) showed that

teachers' satisfaction with school support only depends on the perceived amount of that support. In reverse, explicit school support does positively influence emotions when using digital tools in the classroom (Moreira-Fontán et al., 2019).

Resources (external)

Additionally to support, school organizations can also provide resources. The availability of technology is a logical resource for technology-enhanced learning. Access to suitable technology influenced the integration of digital tools in the classroom (Badia et al., 2014; Buabeng-Andoh, 2012; Ertmer et al., 2012; Hixon & Buckenmeyer, 2009). This can include hardware, software, and the school ICT infrastructure such as Wi-Fi. Another vital resource turns out to be the availability of time. Teachers need time for different activities. One time intensive activity that influences technology integration is teacher training and professional development (Buabeng-Andoh, 2012; Drent & Meelissen, 2008; Goeman et al., 2015; Hixon & Buckenmeyer, 2009; Kafyulilo et al., 2016; Lindqvist, 2015; Mishra & Koehler, 2006). A second activity that costs time is that teachers need the opportunity to confer and collaborate with colleagues in order to discuss content, students work, pedagogy, and technology (Drayton et al., 2010; Drent & Meelissen, 2008; Ertmer et al., 2012; Ertmer & Ottenbreit-Leftwich, 2013; Hixon & Buckenmeyer, 2009; Peachey, 2017; Towndrow & Wan, 2012; Warschauer et al., 2014).

Method

Design

This research aims to describe teachers experiences with technology-based learning during the COVID-19 closing of schools, and the long-term effects of those experiences. This is done through a mixed-methods approach, combining both a qualitative exploration of the experiences as well as a quantitative analysis to define and rank the prevalence of those experiences. A survey was used as the method of data collection, in the form of a online questionnaire. The questionnaire consisted of open questions in order to find and explain experiences qualitatively, as well as closed questions to define and rank the prevalence. A questionnaire was chosen over interviews, because there is a time-sensitive aspect. The data is most accurate when gathered during the COVID-19 closing of schools. Teachers were still in the middle of the situation which means they would better recall their challenges and solutions. The questionnaire allowed for more responses in a shorter amount of time. The larger intended sample size (>100) was needed to be able to allow for quantitative analysis. This larger sample size would have been very difficult to reach with interviews given the practical limitations of this research such as the timeframe and available resources.

Participants

The participants for the questionnaire were secondary school teachers that teach on higher secondary education level (HAVO & VWO) in the Netherlands. All Dutch secondary school courses are included in order to give a more complete picture. The research used in the theoretical background usually also include all courses. The professional network of the researchers was used for convenience sampling and combined with snowballing and a voluntary response approach to increase sample size. This means that all the secondary school teachers in the researchers network were approached to fill in the questionnaire, and asked to forward the questionnaire to their network of secondary school teachers. The questionnaire was also posted on websites and in newsletters for secondary education. Participants were promised the opportunity to receive the results of the research as an incentive to fill in the questionnaire. The texts used to reach teachers can be found in appendix B.

Questionnaire

The survey was in Dutch and created and distributed using Qualtrics.. The questionnaire was active during three weeks, from May 11th 2020 until June 1st 2020. The end date coincided with the date the secondary schools in the Netherlands were allowed to reopen their doors. This guaranteed that participants were still in the situation of the COVID-19 closing of the schools and minimized recollection issues.

Each subquestion was used to identify what topics should be asked in order to answer that specific subquestion. These topics were then worked out in separate questions and the answer type was identified. For example, The first subquestion required the identification of changes teachers experiences when providing distance education. Topics include typical lessons, experiences changes, and inexecutable lesson activities. Questions from the questionnaire contained open questions Q1, Q7, Q8, and Q12 for instance. Questions Q1 and Q7 asked for a typical lesson before and during distance education. These questions were not based on a specific framework, but served to get the respondent in the right mindset and offered background and explanation for qualitative insight. Open question Q8 asked for the biggest differences between these described typical lessons, and open question Q12 asked for any other differences in teaching before and during distance education. Based on the theoretical background, possible coding categories to analyse included: interaction, interpersonal distance/social presence, communication(e.g. feedback and message transfer), and self-responsibility of students" (Peachey, 2017; Murphy & Rodríguez-Manzanares, 2009; Tuckman, 2007; Wang et al., 2008; Wolcott, 1995). Multiple response question Q9 dove more deeply into experiences changes by asking the respondents which lesson activities are not executable in their old format anymore during distance education. The response options were based on answers given in the pilot.

The second subquestion looked for ways teachers adapted to these changes. Topics include different lesson activities, teaching approach, preparation during respite, and differences in preparation and afterwork. For example, teachers might have sought solutions for the inexecutable lesson activities in question Q9. Open question Q10 asked teachers if they have an alternative approach for these activities, and multiple response question Q11 asked what lesson

activities teachers newly started doing during distance education. Generally speaking, it was expected that teachers adapted by adapting their teaching approach. Dealing with distance education and technology-based learning issues might require a different teaching approach, as explained in the theoretical background. Ertmer et al. (2012) describe the effects of a teacher-centred versus a student-centred teaching approach. Slider questions Q6, Q13, and Q15 were based on this theory, and asked the respondent for the balance between a teacher-centred versus a student-centred approach in their teaching style before, during and intended after distance education. Questions Q16, Q17 and Q18 served to describe the preparation process before starting distance education (Peachey, 2017). Closed question Q16 asked for the length of respite before starting distance education. Multiple response question Q17 asked for the undertaken activities during that time (answer options based on the responses in the pilot). Open question Q18 asked what teachers deemed most helpful when preparing.

The third subquestion explored possible intentions teachers might have for after distance education. Topics include change in view on digital tools, lesson activities, advantages of digital tools, and teaching approach (Babić et al., 2020; van der Spoel et al., 2020). The change in view on digital tools was measured with closed question Q22, and is based on the internal teacher factor of attitudes and beliefs. Multiple response question Q24 aims to identify if and which lesson activities teachers would like to keep doing with digital tools. Answer options are based on the pilot. Open question Q25 elaborates on this by asking that the regarded added value of digital tools is for these lesson activities. The answers are coded using categories described by Perrotta (2013). Slider question Q15 investigated a possible intended shift for the teaching approach.

The fourth subquestion functions to investigate how teachers could be supported. Topics include support during distance education, support after distance education improving digital self-efficacy, and the role of school organizations (Peachey, 2017). Multiple response question Q20 asked what school organizations did to support their teachers during distance education. Answer options are based on the elements mentioned in the theoretical background under the external factors school support and resources, and supplemented with responses from the pilot. Support after distance education is explored with open question Q28, asking what teachers would

need in order to reach their intentions after distance education. Answers are coded using the elements from the internal and external teacher factors as mentioned in the theoretical background (Ertmer et al., 2012). Scale questions Q4 and Q13 ask teachers how equipped their feel to efficiently use digital tools in the classroom, in order to measure the digital self-efficacy and a possible shift thereof during distance education. Multiple response question Q27 elaborates on this by asking what teachers need to increase their digital self-efficacy. The answer options are split up according to the TPACK categories, such as "training on the pedagogical-didactical possibilities of digital tools". The answer option "practice" does not belong to a specific category but is added based on feedback of the pilot. The role of school organizations specifically is investigated with multiple response question Q29, asking what school organizations can do to aid teachers in reaching their intentions after distance education. The answers are coded using the elements from the external teacher factors, such as providing time, resources, and innovation support.

Socio-demographic questions were included in the questionnaire because previous research has shown these are significant factors for the teachers' implementation of technology-enhanced learning (Badia, Meneses, Sigalés and Fàbregues, 2014; Papanastasiou & Angeli, 2008). These factors were used to determine if there are differences in answer patterns between groups of respondents, discriminating between age and gender. The questions were reordered into three timeframes for a better flow: the situation before the COVID-19 closing of schools, the situation during the COVID-19 closing of schools, and the prospects after the COVID-19. The questions were then translated to Dutch. The questionnaire was checked with a pre-test in the form of pilot interviews. Five Dutch teachers filled in the questionnaire while thinking out loud and commenting on the structure of the questions. These thoughts and comments were recorded and used to make the questionnaire clearer and more concise. The final questionnaire can be found in Appendix A.

Pilot

The pilot was held with 5 teachers across 4 different secondary schools in 4 different regions. All participants are female and teach STEM courses. The pilot took approximately 45 minutes per person. The participants filled in the questionnaire while thinking aloud, and

commenting on things that puzzled them and/or that could be improved. The participants were asked to comment on the content of the questions and if all relevant aspects are included. Next to that, they were also asked to pay attention to: spelling and grammar, the logical order of the questions and the clarity of formulation. The answers given during the pilot would also be used to rephrase some open questions to a multiple response format with preselected answer options. This would simplify the answering process. The questionnaire was also discussed with an expert in this field: Francine Behnen, MSc. of the NHL Stenden. She has been researching the use of digital tools for teachers for years. She is currently spreading a similar questionnaire as a part of her multi-year research into the usage of digital tools amongst teachers.

Some question-specific comments arose from the pilot. For example, some participants remarked that it might be insightful to ask if the schools changed their lesson times. This was added in a separate question. The question of the percentage of digital tool usage was regarded as unnecessary, because all the lessons are giving through digital tools due to the COVID-19 closing of schools. None of the participants and researchers had heard of a case where no digital tool was used. This question was therefore removed from the questionnaire. There was a question that asked teachers how long they had taken to prepare for digital distance education, it was unclear to the participants what was meant here. The intention was to ask teachers how long they did not provide lessons in the period from Sunday, March 15th 2020 to the first digital lesson they taught. The participants noted that their daily lesson preparation took longer too in the current situation. There was a separate question added for changes in daily preparation time to further investigate this.

There were some general remarks as well. One participant noted that it might be interesting to investigate if teachers were more or less satisfied with their lessons during the COVID-19 closing of schools. This was not added because the survey is already quite long and the resulting data was less directly related to the research questions than the other elements of the questionnaire. Two participants would have liked the sliders to have 5% increments instead of 10% increments, in order to be able to answer with 25% and 75%. However, the 5% increments would severely decrease the clean layout and mobile friendliness, and were not needed when considering the qualitative nature of this research, so the sliders were kept on 10% increments.

The expert also had some minor remarks, next to the feedback made by the pilot participants. For instance, she argued that the question asking teachers how they would increase their feeling of competence for the implementation of digital tools was a bit vague. This was solved by adding a preselection. The expert brought up the Rubric for Assessing Interactive Qualities in Distance Courses (RAIQ) by Roblyer and Wiencke (2010). She adapted the five factors of interactivity form the rubric to Dutch for her research. This was regarded a possibly effective instrument to classify the intended goals of digital tools and might have given insight in the shift in digital tools and their goals during the COVID-19 closing of schools.

Data Analysis

The data was checked and bad responses were removed (respondents who filled gibberish answers with random characters for instance). Only fully completed questionnaires were included in the analysis. The essay questions where teachers are asked to describe their average lesson before and during COVID-19 are used to get teachers into the right mindset for the questionnaires, and function as an overview and insight for the teaching situation that is specified in the other questions. These do not have a specific analysis approach but can be used to support and enrich results. Answers given here are used as quotations backing the results, and helped to form possible explanations of the results.

The questionnaire contains two multiple choice questions which are analysed using descriptive statistics. There are a number of multiple response questions, which are analysed using frequency analysis. The multiple response questions have pre-formulated categories based on the survey pilot, but there is the option: "Other, namely:… " where respondents can add to the categories if these do not cover their answer. Those answers are then categorized using the inductive approach. Answer options from multiple response questions are not coded into separate variables used independently to find patterns together with the other data, because that would require independence of the responses which cannot be assumed here. These multiple response questions are therefore intended to be analysed qualitatively in combination with frequency analysis. When calculating the average number of answers, "no answer" "nothing" and "don't know" answers are counted as 0.

Then there are follow-up questions that serve to deepen the qualitative aspects of the multiple response questions and ask the respondents to give their opinion, elaborate, and explain. These questions are analysed using inductive coding. For instance, coding categories for Q18 were created inductively based on patterns from the answers. Answers were grouped together based on similar principles, and a common theme was formulated. The themes were checked by an external researcher. The answers were then coded in those themes.

There interval questions are repeated for multiple moments in time. These help determine a general shift in perceived self-efficacy and teaching approach in a qualitative manner.

There were three questions that asked for the used digital tools and their intended goal across three moments in time (before, during, and after distance education). These questions were based on the theoretical framework for interactive quality of technology-based learning (Roblyer & Wiencke, 2010). However, participants noted in the remark box on the survey that these questions were flawed. This is also evident in the responses. For example, only 7 percent of the respondents completed the last of these three questions. Excluding these three questions from the analysis increased the completion rate of the survey to 50%. These three questions are therefore not included in the analysis. The final two questions of the questionnaire are also left out of the analysis because upon evaluation, it was concluded that they did not contribute in the answering of the research question. Those questions ask for the long-term intentions of the school organization, and not the long-term intentions of the teachers.

Results and discussion

Descriptives

There are 160 respondents, from across 77 different places in the Netherlands. The places of Amersfoort and Baarn are overrepresented in the data (15,5% and 13,8% of the responses respectively). Probably because most people in the personal and professional network of the researchers live and work here. This is a common effect of convenience sampling.

Most of the respondents teach a STEM course (69%), of which 42% teach math. Fifteen percent teach a language, though there are no French teachers in the sample. Fourteen percent teach a social science. Only one respondent teaches PE. There were no respondents for the course category art & music in the sample.

The age categories of the respondents fairly evenly distributed, with a slight dip in the youngest and oldest category (see figure 1). The age distribution of the sample is comparable to the age distribution of the population (OECD, 2020, table D5.3)
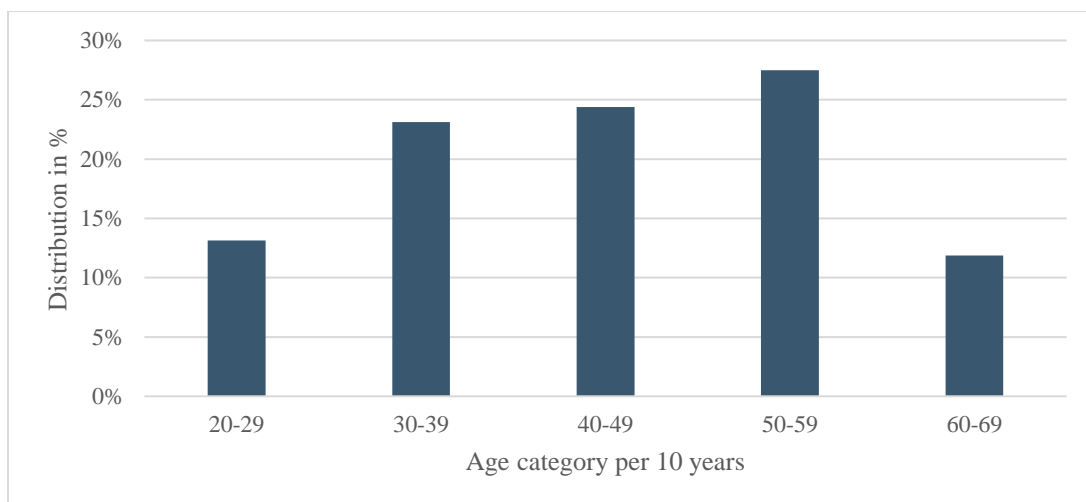
Figure 1. Age distribution of respondents

There is an overrepresentation of responses by female teachers (106 female = 66,3%, 54 male = 33,8%). This is not due to an uneven gender distribution in the target population, which

was 51% female teachers and 49% male teachers in 2018 (Dienst Uitvoering Onderwijs, 2018). One possibility for this uneven distribution is that the main researcher might have had more females than males in her professional network, being female herself. Another possibility is that female teachers are more likely than male teachers to voluntarily fill in a questionnaire. This is mentioned because the sample is not equally distributed compared to the population, which might influence the validity and reliability of the conclusions.

No significant answer patterns were found when looking at the age and gender of the respondents. There are also no differences found based on school-characteristics, which is in line with other research (Badia et al., 2014).

What changes did teachers face?

Loss of interaction

The main obstacle for teachers providing distance education is that they experienced less interaction with their students. Half of the respondents reported less interaction in their lessons in the open questions asking for the biggest differences between a typical lesson before and during distance education (Q8), and any other differences teachers experienced with teaching while providing distance as compared to before distance education (Q12). This is both social interaction as well as classroom interaction. Respondents say they feel "blind", "can't walk by and look in their notebooks anymore" and "have more difficulty reading from a screen if the information landed instead". The respondents described that this lead to difficulties with assessing and monitoring the students. Twenty-three percent of the teachers felt they had less control and 16% found it harder to assess their students work and progress.

One of the reasons for this feeling of missing interaction is that nonverbal communication is diminished when there is no physical presence. Respondents explain in open question Q12 that it is difficult for them to interpret students body language through a camera and/or microphone. Especially when cameras and microphones are often turned off by students. Body language seems to be a key aspect for teachers in a number of teaching processes: assessing students comprehension of the content, monitoring their work mentality and progress, and gauging their mood, health, and wellbeing. Forty-three percent of respondents report less nonverbal

communication among the biggest differences in teaching. They feel like "they are standing blind in front of the classroom". Physical presence also allowed teachers to apply quick ways of formative assessment and control such as making rounds and checking notebooks.

Another reason is that out of necessity, students got more personal responsibility for their learning process. Twenty-six percent of teachers reported this change in open questions Q8 and Q12. Even though students have more responsibility and independence, the respondents describe students to be less proactive. The respondents noticed students are more reluctant to answer questions from the teacher, which complicates (formative) assessment. "There is a higher threshold for students to say something", "a much higher threshold to ask questions", "no reaction from students", "I miss the input from students". Students also reach out less to the teacher to ask questions. This was problematic for teachers. On the one hand they could not rely on their own senses anymore, and on the other the students showed less initiative that could help teachers with monitoring and assessing. "It asks a lot more of the students' independence and honesty". It was noted that there seems to be a dividing factor where "better" students thrive with the personal responsibility, and the students that require more attention from the teacher struggled even more than usual. Twenty-three percent of teachers were worried about the differences between different groups of students.

Aside from having less teacher-student interaction, 6% also reported less interaction between students themselves. Those teachers explained that students did not study together anymore in ways they do in the classroom, discussing and learning from each other. For instance, there were fewer collaborative assignments given. Most teachers (except one) did not stimulate the contact between students.

Effects of less interaction

Next to general loss of interaction, social interaction specifically was also diminished. Respondents missed the social aspects of their job, the contact with students. The informal moments disappeared. They had more difficulty implementing humour into their lessons. Twelve teachers describe the contact with students as mainly focussed on the lessons and materials, and miss the opportunity to ask students about their weekend or family. Quotes from the responses to

Q8 and Q12 describe lessons as "boring" and "clinical". Three responses linked the missing social interaction to the lack of physical presence, saying it is harder to "walk by and chit-chat" or "It is difficult with their screens turned to black", "It is like talking to a black box". Surprisingly, only one teacher talked about the effect this had on their personal relationship with the students.

A positive change of less interaction is that there was less need for conventional classroom management. Eleven percent reported less need for classroom management as a notable change in Q8 and Q12 saying "you're not distracted by disturbing attitudes of students anymore" and "students are less distracted by each other". This was mentioned by the respondents as time-saving, which might have been a small compensation for other activities that cost more time (individual attention, assessment and monitoring, shortened lesson times). However, there was still a reduced amount of classroom management necessary and three teachers noted struggling with classroom management in this form. They explained that technology allowed students to disturb lessons in ways that were new to teachers and they were not prepared for. Eight percent responded to Q8 and Q12 that they had trouble with the technology, such as "microphones not working", "unclear images", "troublesome systems" and "noise/static", which they find time-consuming as well. The distance education also triggered screen fatigue according to four teachers.

Changes in lesson practice

Most prominently, 96% of teachers found it difficult to execute some of the normal lesson activities during distance education due to physical constraints and more complicated interactions. Eighty-two percent experienced the cancellation of excursions due to the physical impossibilities. This is evident from the responses to multiple response question Q9 asking which lesson activities are not executable in their old format anymore, of which the results are shown in table 1. Class discussions were a loss to 73% of teachers as well. 63% also saw a dissipation of summative assessment.

Table 1

Lesson activities that were not executable in their old form due to distance education.

Answer	% of respondents (n=160)	Count
Excursions	82%	132
Class discussion	73%	116
Summative assessment	63%	100
Differentiation	31%	49
Collaboration assignments	28%	46
Practical assignments	20%	32
Other	20%	32
Answering questions in class setting	18%	28
Individual support	16%	27
Frontal instruction	14%	23
Handing in homework	5%	8
Formative assessment	4%	7
No answer	4%	6
Total		602

Note. Results from Q9 (multiple response). An average of 3.71 activities are given per respondent.

The described changes forced teachers to adapt to a new reality. Every teacher describes their own process of finding their way and dealing with the situation. That process often challenging, as illustrated by some of the quotes from responses to open questions Q10 (asking if the respondents had an alternative approach to inexecutable lesson activities) and Q12: "I find it difficult to deal with the changes. [...] Powerlessness (because of a lack of time) is the most fitting word for that. I have resigned to that fact that it is different now", "Too different to describe, it is surviving now and hoping that the schools will open soon" and: "Direct contact, the acceptance of this loss". The process of adaptation takes time. Another said" "There is not yet one typical lesson. I'm still searching". Even though most teachers were able to describe a typical lesson for them during distance education, it is evident that no typical lesson can be extracted across teachers. Every teacher has their own style and preferences when providing

distance education, just like face-to-face teaching. These personal factors make it hard to identify patterns. There are however, some general areas recognized that teachers mentioned they modified to fit distance education.

How did teachers adapt?

Preparation during respite

Most teachers did not get more than a few days respite to adapt to the new teaching situation. The government announced on the afternoon of Sunday the 15th of March that the schools would close. Closed question Q16 asked for the length of respite before schools started up distance education. The majority of schools (69%) had started distance education after a respite of one or two working days. Twenty-nine percent of schools started distance education immediately. Of these schools without respite, some were already prepared before the official closing, others had to prepare in their own time.

During that time teachers did a number of things to prepare themselves for distance education. Table 2 shows these things as the result from multiple response question Q17 asking for the activities teachers undertook during respite to prepare for distance education. The most common activity was attending department meetings. The department meetings were appreciated because of the contact with colleagues. This is a recurring factor throughout the results. Second and third most common were getting ready to use the digital tools and getting to know the tools and filling and organizing them. This is based on the more practical side of the usage of digital tools, also a recurring theme. A majority of teachers adapted their planners and worked on finding, creating and adapting material and assignments. Apparently teaching materials are dependent on the physical teaching situation.

Table 2

Activities undertaken by teachers during respite before distance education.

Answer	Percentage of respondents	Count
Department meeting	81%	129
Getting to know the digital tools	78%	125
Filling and organizing the digital tools	74%	118
Making planners	70%	112
Making and adapting assignments	62%	99
Searching for instruction videos	51%	81
Participating in workshops/training	28%	44
Making instruction videos	28%	45
Other	12%	19
No answer	5%	8
Total		780

Note. Results from Q17 (multiple response). An average of 4.82 activities were given per respondent.

Some things were considered more helpful than others during respite in the preparation for distance education. Having contact with colleagues was acknowledged amongst the most helpful by 46% of respondents as an answer to open ended question Q18. This question asked what respondents found most helpful in the preparation for distance education. The full results of question Q18 are displayed in table 3. This is in line with departments meetings being reported as the most undertaken activity. Trying things out and practicing was found amongst the most helpful by almost a quarter of the respondents. This incorporates the activity of getting to know the digital tools and is thus also in line with the results in table 1.

An interesting addition in table 3 is that 13% of teachers found it helpful to have appointed colleagues that they could approach. Those colleagues were usually computer-savvy teachers and/or the schools IT department, who were appointed to support the teachers with distance education and the use of digital tools. A striking distinction is the category "just doing

it". A respondent also described this as the 'growth mindset'. This category of answers looks a lot like the category of "trying it out", with the difference that trying it out refers to practicing and gaining confidence before giving the actual lessons, and just doing it is describing more of a "diving in headfirst" approach. It is also worth noting that several of the most helpful things are expressed to be provided by the schools, such as appointing colleagues, providing materials, guidelines & time, and taking into account their teachers emotional wellbeing.

Table 3

Things that teachers found most helpful during respite before distance education

Answer	Percentage of respondents	Count
Contact with colleagues	46%	74
Trying it out/practicing	23%	36
Having appointed colleagues assigned to help	13%	21
Finding information on the internet	13%	20
Participating in workshops/training	11%	17
Just doing it	10%	16
Having materials provided by school	9%	14
Leaning on own experience	8%	12
Attention for emotional wellbeing	5%	8
Time	4%	6
Getting guidelines from school	3%	5
Nothing	4%	5
Making planners	1%	2
Getting tips from students	1%	2
Don't know	1%	2
Helpful contact from social circle	1%	1
Empty	3%	5
Total		246

Note. Results from Q18 (open ended). An average of 1.46 helpful things were given per respondent.

Adaptation of lesson preparation and afterwork

When the teachers started providing distance education after respite, in the first place their time investment increased compared to their normal practice. Differences in lesson preparation and afterwork are disclosed in response to open ended question Q19 and can be viewed in table 4. This question asked the respondents to explain the biggest differences in lesson preparation and afterwork during distance education as compared to before. Thirty-nine percent of teachers found lesson preparation and afterwork more intense during distance education compared to before and/or reported that they invested more time. Especially lesson preparation cost more time and effort. In part because of lessons that were given for several years and were perfected in such a way that they ran them on auto-pilot, now suddenly needed preparation and re-thinking again. Other explanations can be found in that 35% of the teachers reported being busy with creating materials and/or updating their materials to be more extensive. This was necessary to provide students with quality materials during self-study and when they missed (parts) of the lesson. Teachers also found more elaborate materials helpful for themselves, to have a better foundation for their distance education video classes. Presentations such as PowerPoints were the most mentioned materials to be created and adapted, but more extensive answer sheets were also frequently mentioned.

Next to that, 18% reported spending more time on their planning. This can be the study planner for several weeks, but also the planning of the structure within the distance education lesson itself. Those teachers said they found it more difficult to adapt their planning to the students pace. A few reports also mentioned slowing down the pace (in spite of shorter lessons) to make sure every students would be able to keep up. The more elaborate planning could have been a result of teachers feeling like they needed more grip, a better foundation, during the distance education lessons. This need for a better foundation might be explained with the reports of teachers that mentioned they feel like they cannot rely on intuition anymore. Respondents said they dared not improvise and to adapt based on interaction like they would have done before.

Aside from preparation, also the work after a lesson generally cost teachers more time. Sixteen percent of teachers spent more time contacting students. Sometimes beforehand, to tell

them were to find the materials for example. But most of the contact with students was spent on individually answering questions and providing guidance.

Two positive effects of distance education on planning and preparation were that 9% of teachers reported using more formative assessment, and some teachers said the situation challenged their creativity. Noteworthy is that 9% of teachers reported that there were (almost) no differences for them in lesson preparation during distance education as compared to before. It is worth mentioning that 3% of teachers could actually decrease their preparation, mostly because students learned by self-study and the lessons were designated for answering questions and individual guidance. Though this decrease in preparation is only the case if there was already extensive and qualitative material available for students to use during self-study.

Table 4

The biggest differences in lesson preparation and afterwork according to teachers

Answer	Percentage of respondents	Count
More intensive	39%	63
Creating (more extensive) materials	35%	56
Planning (lessons and lesson structure)	18%	28
More (individual) contact with students	16%	25
Less by heart (improvisation/intuition)	13%	20
Loading materials into the digital tools	11%	18
Making videos	11%	17
Condensing lessons to core content	10%	16
Small to no differences	9%	15
More formative assessment	9%	14
Checking homework	9%	14
Less room for creative/interactive assignments	8%	13
Finding the right digital tool	6%	10
Providing feedback to students	6%	9
Struggling with the computer/digital tools	5%	8

Answer	Percentage of respondents	Count
More administration	4%	7
Reduction in emotional wellbeing	4%	6
Less distinction between work and private life	3%	5
Less preparation	3%	5
Screen fatigue	3%	4
Creatively finding alternatives	2%	3
Contact with colleagues is more difficult	2%	3
Empty	7%	11
Total		370

Note. Results from Q19 (open ended), with additions from Q8 (open ended), Q12 (open ended) and the "other, namely…" category from Q9 (multiple response). An average of 2.15 differences were given per respondent.

Time management during lessons

Time management and distribution during the lessons themselves was also adapted. Most importantly, at least 59% of teachers were required revise their time distribution because school organizations had reduced lesson times in order to counteract the intensity of distance education. Open question Q21 asked for any changes in lesson times, and teachers opinions on it. The responses showed that the lesson time reduction helped with the intensity of distance education, but also posed a new puzzle of fitting everything in the given timeframe. A complicating factor was that some activities actually took more time than before.

Especially interaction and individual attention took more time. As explained, interaction with students was more difficult. The respondents that mentioned in Q7 that they tried to include interaction in their lessons found it more time intensive. Eleven percent of teachers reported having to reduce the amount of individual attention at Q8 and Q12, because there was no time left during the lesson, and/or because students were unreachable. Some of the teachers chose to deal with this by devoting their lessons to providing individual attention, giving less or no instruction at all during the lessons. The teachers that report giving more individual attention

note that this is very time consuming unless they greatly reduce class-wide moments. They provide the individual attention outside of the normal lesson times, or replaced the act of presenting information during the normal lesson times with providing individual attention. Teachers that provide both class-wide moments and individual attention sacrificed their personal time to create space for this.

There were a few aspects of distance education that did save time during the lessons. Lab activities and projects were virtually impossible to execute during distance education. Just like collaboration assignments and other practical assignments. Ten percent of teachers reported at Q19 that they condensed their lessons to the core content. Teachers generally had to spend less effort on classroom management, which also saved time. The lack of questions from students might also have saved time during the lessons. Perhaps those aspects balanced the lesson time reduction and the time costly activities a bit.

Adaptation of lesson activities

Some teachers tried to find new formats for their lesson activities, even though there were physical restrictions, interaction restrictions, and time restrictions. Table 1 showed lesson activities that could not be executed in their old format anymore. Thirty-eight percent of teachers said in response to open question Q10 that they did not have an alternative format for these lesson activities, so those activities were cancelled, delayed until distance education was over, or replaced by other lesson activities.

The restrictions did spark teachers to search for other possibilities. Table 5 shows activities that teachers said they started doing for the first time because of distance education. These results are answers to the multiple response question Q11, asking what lesson activities teachers newly started doing during distance education that they did not do before. Fifty-four percent of teachers started letting students hand in their homework (through digital tools) whereas they did not require this before. Another interesting development is that 31% started doing formative assessment. They had explained at Q10 that they started doing formative assessment because summative assessment was restricted in distance education. The lesson

activities with a lower count could have been reported less because teachers already did these things before distance education, as well as the physical impracticalities evident in table 1.

Table 5

New activities teachers started doing during distance education

Answer	Percentage of respondents	Count
Handing in homework	54%	86
Formative assessment	31%	49
Other	19%	31
Individual support	6%	10
Practical assignments	4%	7
Frontal instruction	4%	7
Differentiation	4%	6
Collaboration assignments	3%	4
Answering questions in class setting	1%	2
Excursions	1%	2
Summative assessment	1%	2
Class discussion	1%	1
No answer	20%	32
Total		239

Note. Results from Q11 (multiple response). An average of 1.22 new activities were given per respondent.

Adaptation of teaching style

Overall, the new situation caused teachers to re-evaluate their teaching style. The scale question asking what the balance was between a teacher-centred approach and a student-centred approach in teachers' lesson style was repeated three times: for the situation before, during and after distance education (Q6, Q15, and Q26 respectively). One third of the teachers reported working more teacher-centred in their lessons, evident in figure 2. Fifty-one percent adopted a more student-centred approach. Sixteen percent did not change their teaching style at all. This was measured on a scale from 0 to 100 with increments of 10. The lowest score of 0 meant the

learning process was regulated entirely by the teacher and thus teacher-centred. The highest

score of 100 meant the learning process was regulated entirely by the student and thus student-

centred.
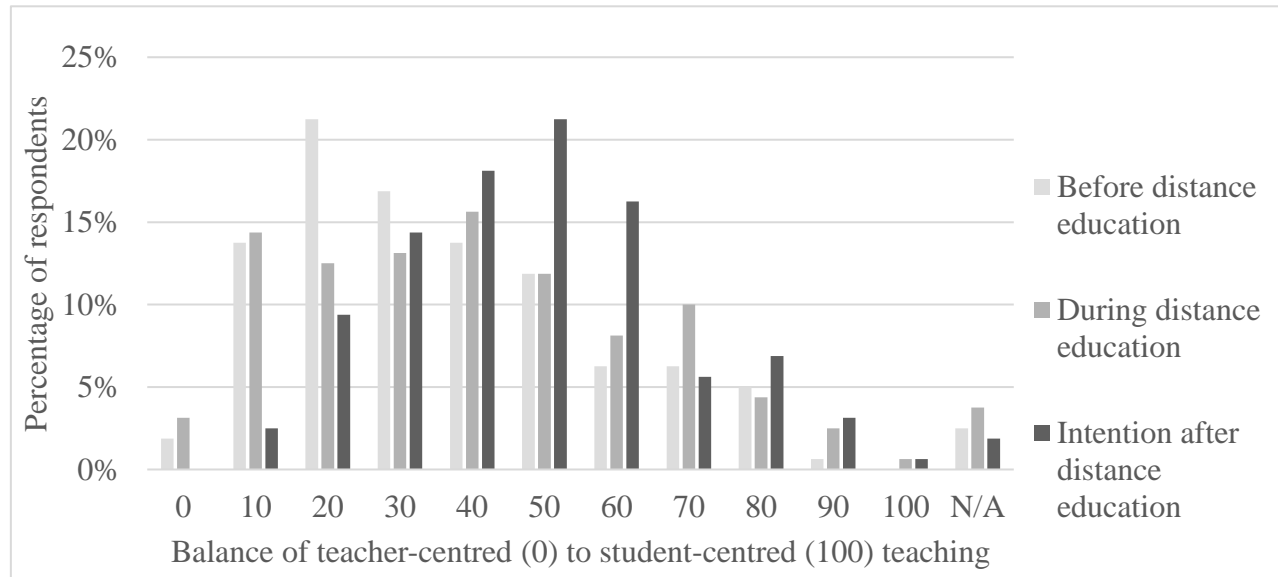
Figure 2. Development of the balance between teacher-centred (0) to student-centred

(100) learning. (Q6, Q15, & Q26, scale)

Generally speaking, the personal responsibility of students was higher during distance

education. It was a necessity for teachers to transfer some of the responsibility to the student. The

lack of physical presence and the resulting diminished nonverbal communication made it very

difficult for teachers to monitor and manage their students learning process. Interaction and

individual attention were much more difficult. The lack of possible consequences further

increased this feeling of leaving responsibility with the student as respondents explained in Q8

and Q12. Even if teachers had alternative ways of monitoring students, the (negative) external

motivators for students were gone (e.g. extra work, detention). A teacher could seek contact with

a student, but the student could easily disengage without consequence. Students had to find ways

to find their intrinsic motivation and self-discipline, in order to adequately respond to the

personal responsibility. It is unclear if there are differences in results between teachers who

leaned in to student-centred learning versus teachers who clasped to teacher-centred learning.

Effect on digital self-efficacy

There are a number of adaptions teachers might have gone through which did not lead to significant conclusions. Slider questions Q4 and Q13 tried to identify a possible shift in digital self-efficacy of teachers by asking to what extent the respondents felt equipped to effectively apply digital tools in the classroom, before and during distance education. The results were quantitively analysed but did produce a significant shift. As seen in figure 3, 32% of teachers did not report a shift in digital self-efficacy at all.
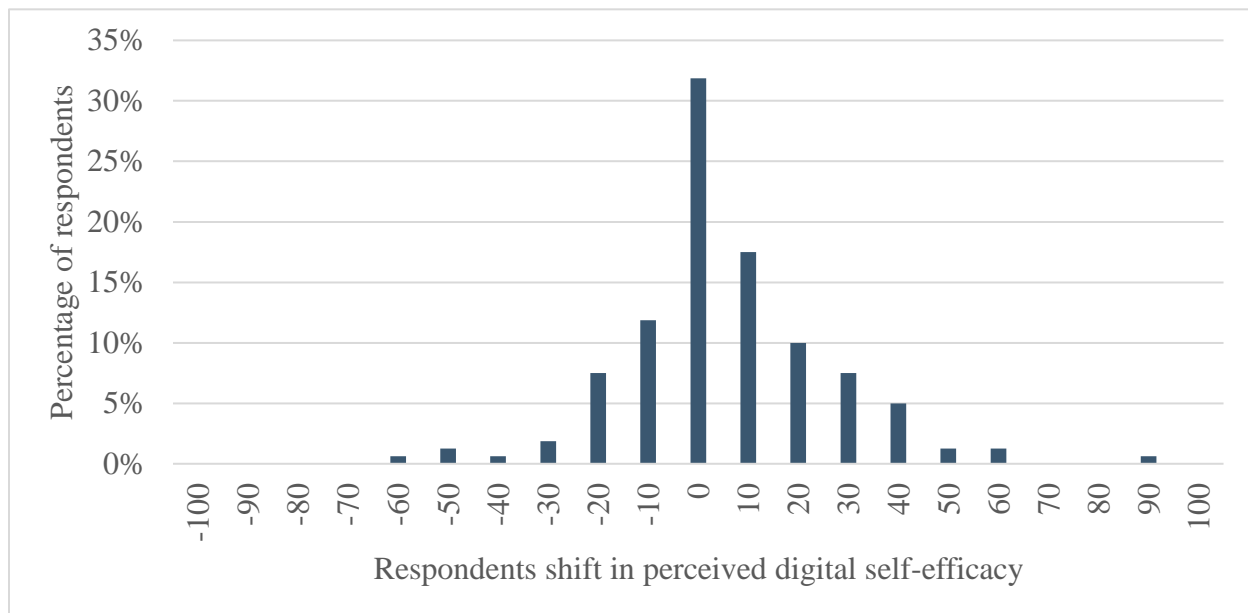

Figure 3. Respondents shift in digital self-efficacy during distance education as compared to before distance education. (Q4 & Q13)

What are teachers long-term intentions?

Opinion on digital tools

The corona crisis seemed to stimulate positive teacher views on the use of digital tools in the classroom, see figure 4. Closed question Q22 asked if respondents' opinion on the usage of digital tools had changed during distance education. This lead to the result that the average view on the use of digital tools in the classroom became more positive. Thirty-eight percent of teachers answered that their view became somewhat more positive and 19% said their view became much more positive. Another 38% has answered that their view has stayed the same. Only seven respondents reported that their view had become more negative. On average, the view on the usage of digital tools in the classroom has become more positive with an average of

0.7, on a scale from -2 (My view on the usage of digital tools in the classroom has drastically become more negative) to 2 (My view on the usage of digital tools in the classroom has drastically become more positive).
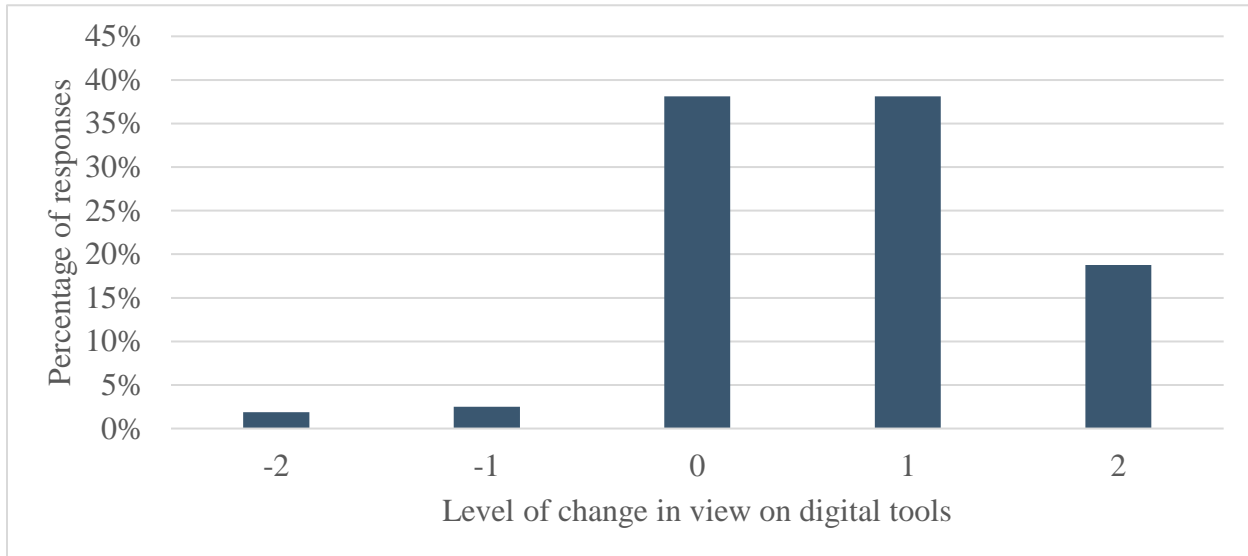

Figure 4. Change in view of the usage of digital tools in the classroom. (Q22)

Intended lesson activities with digital tools

Teachers do intent to keep executing several lesson activities using digital means in the long term. On average, teachers want to keep doing 2.72 activities through digital tools as asked in multiple response question Q24. This question asked what lesson activities teachers would like to keep doing through digital means. As can be seen in table 6, formative assessment is mentioned most frequently. Using digital means as a way for students to hand in homework is also popular. This is in line with a lot of teachers adopting those two activities during distance education, as was shown in table 5. It is peculiar to note that even though teachers experience a lot of difficulties during distance education, many teachers do want to keep doing certain lesson activities with digital tools, even activities one would expect to require a lot of interaction.

Table 6

Activities teachers intend to keep doing through digital means in the long term

Answer	Percentage of respondents	Count
Formative assessment	61%	97
Handing in homework	49%	79
Individual support	36%	58
Frontal instruction	27%	43
Differentiation	25%	40
Collaboration assignments	19%	30
Practical assignments	14%	22
Answering questions in class setting	12%	19
Summative testing	10%	16
Other	8%	13
Class discussion	4%	6
Excursions	0%	0
No answer	12%	19
Total		442

Note. Results from Q24 (multiple response). An average of 2.59 activities were given per respondent.

Advantages of digital tools

There are a number of reasons mentioned for wanting to keep using these digital means for the lesson activities shown in table 6. These reasons were investigated with open question Q25 asking for the added value of using digital tools for lesson activities mentioned in Q24 . The most prominent answer given by the respondents is that the digital tools allow flexibility in location and timing. This quality holds in multiple situations. It could be that the teacher or student has broken a leg for example and can't travel, digital tools allow the continuation of education in that scenario. Another aspect is that students have more options to work according to their own schedule. It also means that teachers can provide individual support from home. In that regard, the flexibility in location and time is a positive quality that is also connected to some of added values lower in table 7, such as possibilities for differentiation, providing individual

support, that it is faster to reach students through digital means outside of normal lessons, and that materials are continuously accessible.

Next to the flexibility, teachers also appreciate the control and insight digital tools give. Eighteen percent named that digital tools give a clear overview of students work, attendance, progress and results. In line with that, teachers value the resulting insight into the students' progress and results that they get with digital tools. Nine percent mentions explicitly that the digital tools give teachers more control over handed in (home)work. Ten percent of teachers identified the added value of digital tools as generally more efficient.

A surprising effect is that 8% of teachers report that digital tools lead to more attentive students, because they are more easily engaged by a video compared to a teacher lecturing, and because digital tools add some variety in the classroom. Some teachers noted that digital tools seem to lower the students threshold for asking questions, because they can more easily be asked outside of the classroom.

Table 7

The added value of digital tools according to teachers

Answer	Percentage of respondents	Count
Flexibility in location and time	29%	47
Clear overview	18%	28
Ease of providing feedback	18%	28
Getting insight	13%	21
Continuous accessibility of materials	12%	19
Efficiency	10%	16
Possibilities for differentiation	9%	15
More control over handed in work	9%	14
Providing individual support	8%	12
More attentive students	8%	12
Nothing	8%	12
For student collaboration	4%	7

Answer	Percentage of respondents	Count
To lower student threshold for asking questions	4%	7
To provide handy learning tools	4%	6
Faster to reach students outside of lessons	3%	4
Would use it more with more suitable technology	3%	4
No answer	11%	18
Total		270

Note. Results from Q25 (open ended). An average of 1.59 added values were given per respondent.

How can teachers be supported?

Teachers experienced the added value of using digital tools in the classroom during distance education. Whilst they would like to go back to live education instead of distance education, there are some elements from the distance education period that they intend to keep. School organizations can support their teachers to reach these intentions, and help them with the implementation of technology-enhanced learning.

Support during distance education

Most teachers reported that their schools undertook activities to help them during distance education. There seems to be a relation between the amount of support and the time schools were closed in preparation of distance education. As mentioned before, the majority of schools (69%) had started distance education within one or two working days after the announced closing on the 15th of March. While these school organizations gave teachers less time to prepare for distance education by starting so soon, they did do more to support their teachers. Multiple response question Q20 asked for the support school organizations gave to their teachers during distance education. Schools that started distance education immediately undertook 3.1 activities on average to support their teachers. This lowers gradually with schools that took longer to open, with schools that opened after 2 weeks or more undertaking 1.6 activities on average. The things school organizations did to support their teachers can be viewed in table 8.

Table 8

Things school organizations did to support their teachers during distance education

Answer	Percentage of respondents	Count
Sending regular updates and tips	60%	96
Reducing lesson times	59%	94
Appointing colleagues to provide support	56%	90
Offering workshops/training	29%	46
Providing accessories	23%	36
Other	17%	27
Holding study days (no lessons)	15%	24
No answer	8%	13
Total		426

Note. Results from Q20 (multiple response). An average of 2.54 activities were given per respondent.

Improving teachers' digital self-efficacy

School organizations tried to support their teachers during distance education, but teachers also need help to reach their intentions with digital tools after distance education. Multiple response question Q27 asked what the respondents would need to improve their self-perceived digital efficacy. Most importantly, 54% of teachers say they would just need extra practice, some of these teachers specified this as needing the time to practice (see table 9). Needing time is an evident theme across survey answers. Thirty-eight percent of teachers would also like to be trained in the pedagogical-didactical possibilities of digital tools. The teachers report that they have trouble with seeing the possibilities for implementation in the classroom, even when they are proficient in the separate domains of technology, pedagogy and content (as described in the TPACK framework). Even when the teachers do see possibilities for implementation, the time investment and learning curve is sometimes too steep. Hence, the training on pedagogical-didactic possibilities of tools should not only give examples on possible implementation, but also on efficient execution. The same applies to the training on filling and organizing the digital tools that 29% of teachers would like to follow. Teachers want to get training that does not only show possibilities which require a big investment, but something that

will actually be effort-saving when implementing digital tools in the classroom. A quarter of teachers mentioned something other than the given answer options. These other answers mostly mention outside factors instead of factors that directly relate to the self-perceived efficacy. This could indicate that the question might have been formulated ambiguously.

Table 9

What teachers need to improve their self-perceived efficacy on the usage of digital tools after distance education

Answer	Percentage of respondents	Count
Practice	54%	87
Training on the pedagogical-didactic possibilities of digital tools	38%	61
Training on filling and organizing the digital tools	29%	47
Other	25%	40
Training on technological knowledge in general	14%	22
No answer	9%	15
Total		272

Note. Results from Q27 (multiple response). An average of 1.60 things were answered per respondent.

Other ways to support teachers after distance education

There are a number of external factors that could help teachers, next to the improvement of self-perceived digital efficacy described above. The answered items to open question Q28 asking what else teachers would need to reach their intentions after distance education are listed in table 10. The most mentioned item is time. This ties in with practice and time mentioned in table 9. A significant percentage of 16% says they need nothing else next to what was already mentioned above, an additional two teachers say it is just the issue of actually doing it. Another theme which also recurs in table 10 is the need for a better digital environment, such as the availability of devices, and that some digital tools do not live up to the requirements of teachers. Next to that, it seems like teachers experience the school environment as restricting. Eight percent of teachers want clearer guidelines, and another eight percent report that they would need

more cooperation from the school organization and/or their colleagues. This ties in with the teachers wanting to have more contact with colleagues on the subject of digital tools. Apparently these social factors within the school environment are important to teachers when evolving their lesson practice to include more technology-enhanced education.

Table 10

Other things teachers need to fulfill their intentions for the usage of digital tools in the classroom

Answer	Percentage of respondents	Count
Time	26%	42
Nothing	16%	25
Devices	9%	15
Better digital tools	8%	13
Clear guidelines	8%	12
Cooperation from school organization and colleagues	8%	12
Contact with colleagues	6%	9
Don't know	4%	6
Education	3%	4
Support from an expert	3%	4
A place to work	1%	2
More IT savvy students	1%	2
Just doing it	1%	2
No answer	20%	32
Total		180

Note. Results from Q28 (open ended). An average of 0.73 things were answered per respondent.

What school organizations can do

School organizations can support teachers in reaching their intentions for the usage of digital tools in the classroom. The specific things that teachers indicate school organizations could do to help them are reported in table 11, as was answered at multiple response question Q29. That question asked what the school organization could do to aid teachers in reaching their intentions for the usage of digital tools in the classroom. The three previous themes of investing in digital tools and devices, providing time to practice, and social factors within the school environment also recur here. Investing money and time seems to be a key factor in helping teachers reach their technology-enhanced learning intentions.

Table 11

What school organizations can do to aid teachers in reaching their intentions for the usage of digital tools in the classroom

Answer	Percentage of respondents	Count
Money to acquire digital tools and devices	43%	68
Providing time during study days for digital tools	38%	61
Improving the IT environment in school	33%	53
Offering workshops/training	31%	49
Other	21%	33
More motivation/stimulation to use digital tools in the classroom	20%	32
Improving the communication with the schools' IT department	13%	20
No answer	15%	24
Total		340

Note. Results from Q29 (multiple response). An average of 1.60 things were answered per respondent.

Discussion and Conclusions

Limitations

There are several limitations of the research. It should be taken into account that there were several open questions, where respondents had to come up with an answer instead of checking which options applied for them. Respondents might have forgotten elements which did apply to them but were of lesser importance. This form of questioning can give an indication of a relative ranking of most important topics, but does not give an accurate picture of the absolute magnitude of each topic. This is correspondent with the mixed-methods approach, but is important to take into account when looking at separate elements of the results. A second limitation is that this research is only focussed on the first COVID-19 closing of schools from March 16th 2020 until June 1st 2020. The second closing from December 16th 2020 onwards, and any later closings, are not taken into account. Any further closings could influence the described long-term implications. A third limitation is that results might be influenced by voluntary response bias and convenience bias, because of the chosen sampling methods.

Conclusions

What changes did teachers face when designing and executing technology-based learning due to the COVID-19 closing of schools? When designing and executing technology-based learning due to the COVID-19 closing of schools, teachers were faced with diminished interaction and the constraints of physical distance. This is in line with results from van der Spoel et al. (2020). The diminished interaction was evident from the decline in interaction-dependent lesson activities, the discontinuation of improving the relationship with students, and the perceived loss of control over the students learning process.

How did teachers adapt to these changes due to the COVID-19 closing of schools? Teachers coped by increasing their time investment and trying to adapt their teaching approach. The time investment originated from the need to practice with digital tools, the need to adapt their lessons and materials to this situation, the desire to confer and collaborate with colleagues, the delays resulting from technology trouble, and the extra time it takes to talk to students

individually. These activities confirm the propositions of Peachey (2017). The adaptation of their teaching approach originated from the need to condense the lessons to the core content, and the feelings of losing control over the students. Generally speaking, teachers adopted a more student-centred teaching approach, which connects to research done by Ertmer et al. (2012) and Drent and Meelissen (2008) as seen in the theoretical background. The feeling of losing control created an interplay between diminished interaction and trying to get a grip on the students. This means on one hand, that teachers left more responsibility with the students which is in line with the research from Hixon and Buckenmeyer (2009), on the other hand, teachers started different lesson activities such as formative assessment and handing in homework through digital tools.

What are teachers' intentions for the long term implementation of technology-enhanced learning based on the newly formed experiences with technology-based learning? The COVID-19 closing of schools is likely to have sustainable effects in the long term, as is also expected by van der Spoel et al. (2020) and Babić et al. (2020). Teachers formed a more positive view on using digital tools in the classroom during the COVID-19 closing of schools, which correlates to their intention to implement digital tools in the classroom after distance education (Babić et al., 2020). Named advantages of digital tools are the flexibility in location and timing, and the overview and insight digital tools can provide. Teachers intend to keep doing formative assessment and handing in homework through digital tools after schools have opened again, which correlates with the results from van der Spoel et al. (2020). Another possible sustainable effect is that teachers intend to adopt an even more student-centred teaching approach after the schools have opened again. There was no significant change in the digital self-efficacy of the respondents, in contrast to the theoretical background.

How can teachers be supported for the long term implementation of technology-enhanced learning? School organizations can provide support during distance education and after, in order to help teachers reach their technology-enhanced learning intentions. This support relates to the internal and external teacher factors as described in the theorical background. Support could for instance be provided by freeing up time, facilitating collaborations and conferring between colleagues (Drayton et al., 2010), and offering training that is practical and aimed towards TPACK (Mishra & Koehler, 2006). Teachers could use guidance and encouragement from the

school organization in the form of psychological support, innovation support and technical support (as proposed by Hixon & Buckenmeyer, 2009, and Warschauer et al., 2014).

Future research

There is still much to learn from the COVID-19 closing of schools. Teachers noted that there was an even bigger split between higher performing and lower performing students. Further study is required to see if the COVID-19 closing of schools (and the resulting distance education) indeed increased this gap, and if this is related to students self-regulatory capabilities. The data showed that schools that had a shorter respite before providing distance education did more to support their teachers. Some teachers described that they felt like their school organization had faith in them that they could handle the challenge of shifting to distance education through technology-based learning. It is still unknown what caused some schools to have a shorter respite and other schools a longer respite, and if the mentality of the school organization and the teachers is a factor in that difference. The stories of teachers suggest an intricate interplay between diminished interaction, feeling loss of control, lesson preparation, and less improvisation by teachers. Further study could perhaps create some insight into influential factors and possibly causal relationships. Lastly, the COVID-19 closing of schools directed teachers attention towards digital tools for education. This could theoretically create a market pull influencing the development of educational technology. Definitive effects might be of interest to the field of technological change.

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Appendix A

Onderzoek veranderingen lespraktijk door COVID-19

Start of Block: Introductie

I1

Beste havo/vwo docenten,

Jullie zijn gedurende de coronacrisis keihard aan het werk om jullie lessen in een hele korte periode te digitaliseren. Daar gaat een hoop tijd en moeite in zitten. Dit onderzoek gaat over het proces wat jullie doormaken, het aanpassen van je lessen voor afstandsonderwijs vanwege de coronacrisis en de ervaringen die jullie daarmee op doen. Er wordt gekeken naar de invloed die de coronacrisis heeft op de inzet van digitale middelen. Door die informatie te bundelen kan daar weer van geleerd worden. Zo zorgt jullie tijd en moeite weer voor kennis en inzichten. Maar ook als je maar weinig of niets veranderd hebt in je lespraktijk vanwege de coronacrisis is je deelname waardevol! Deze vragenlijst is bedoeld voor middelbare school docenten die lesgeven op havo en/of vwo niveau. Voor basisschooldocenten en vmbo docenten is het helaas niet mogelijk deel te nemen aan het onderzoek.

We weten dat jullie het druk hebben, en daarom willen we u alvast bedanken voor het invullen van de vragenlijst. Het invullen duurt ongeveer 15 minuten.

Uitleg van de begrippen   Met digitale middelen wordt bedoeld: alle websites, applicaties en multimedia die via een computer, smartphone, of digibord beschikbaar zijn. Denk aan Magister/SOMtoday, een elektronische leeromgeving, Youtube, Kahoot, Videochat, etc.
        Met afstandsonderwijs wordt bedoeld: Het voorzien van lessen en lesmateriaal zonder de fysieke aanwezigheid van docent of leerling. In deze vragenlijst wordt dan voortzetting van onderwijs tijdens de sluiting van de scholen door COVID-19 bedoeld.
        Met coronacrisis wordt bedoeld: De periode van sluiting van de middelbare scholen vanaf zondag 15 maart 2020 opgelegd door de overheid vanwege het coronavirus (COVID-19).

Voor vragen of opmerkingen over dit onderzoek kunt u contact opnemen met:
T. Notenboom, t.notenboom2@students.uu.nl

T. Notenboom BSc | Universiteit Utrecht | Graduate School of Teaching | Master Student Science Education and Communication | Computer Science Teacher | t.notenboom2@students.uu.nl |

        End of Block: Introductie

Start of Block: Informed consent

I2
De antwoorden worden vertrouwelijk behandeld en beveiligd opgeslagen. Uw antwoorden of gegevens worden niet aan derden verstrekt. De resultaten worden gedeeld op een anonieme manier die niet naar u te herleiden valt.

U kunt op ieder moment afzien van deelname en uw antwoorden en gegevens laten verwijderen, u hoeft hier geen reden voor op te geven. Bewaar de persoonlijke code die u hieronder krijgt, om af te kunnen zien van deelname. Het is op ieder moment mogelijk af te zien van deelname door een mail met uw persoonlijke code te sturen naar: t.notenboom2@students.uu.nl

Uw code is: ${e://Field/Random%20ID}

I3 Gaat u akkoord met het verwerken van uw antwoorden voor wetenschappelijke doeleinden volgens de hierboven beschreven voorwaarden?

○ Ja (1)

End of Block: Informed consent

Start of Block: Algemene vragen

T6 De volgende vragen zijn sociaal-demografische vragen die nodig zijn voor het trekken van betrouwbare conclusies.

D1 Wat is uw geslacht?

○ Man (1)

○ Vrouw (2)

○ Non-binair (3)

D2 Wat is uw leeftijd?

_____

D3 Hoeveel jaar heeft u tot nu toe voor de klas gestaan? Graag naar boven afronden.

_____

D4 Op wat voor soort school werkt u? (Denk aan: Openbaar, algemeen bijzonder, evangelisch, antroposofisch, montessori, etc.)

_____

D5 In welke plaats staat de school waar u werkt?

_____

D6 Wat voor vak geeft u? (Als u meerdere vakken geeft graag alle vakken noemen gescheiden door een komma.)

_____

End of Block: Algemene vragen

Start of Block: Lespraktijk voorheen

T1 De volgende vragen gaan over uw lespraktijk **vóór** de start van de coronacrisis op zondag 15 maart 2020. U wordt verderop gevraagd de verschillen te beschrijven tussen uw lespraktijk vóór de coronacrisis en uw lespraktijk tijdens de coronacrisis.

Q1 Beschrijf in ongeveer 5 regels hoe een typische les vóór de start van de coronacrisis eruit zag.

_____
_____
_____
_____
_____

Q2 Wat voor digitale apparaten waren er beschikbaar voor de lessen bij u op school vóór de start van de coronacrisis? U kunt meerdere antwoorden aankruisen.

☐ Smartphones van leerlingen (1)

☐ Individuele leerlingtablets (4)

☐ Individuele leerlinglaptops (2)

☐ School tablets (5)

☐ Schoollaptops/Schoolcomputers (3)

☐ Beamers (6)

☐ Digiborden/Beamers met smartboard functionaliteit (7)

☐ Overig, namelijk: (10)

_____

Q3 Welke digitale middelen werden er door de school beschikbaar gesteld vóór de start van de coronacrisis? U kunt meerdere antwoorden aankruisen.

☐ Leerlingvolgsysteem (Magister, SOMtoday, Trajectplanner) (1)

☐ Elektronische leeromgeving (Moodle, ItsLearning, Learnbeat) (2)

☐ Interactieve presentatietool (Lessonup, Prowise) (6)

☐ Digitale lesmethode voor uw vak (5)

☐ Schoolaccounts voor docenten (Google, Microsoft) (3)

☐ Schoolaccounts voor leerlingen (Google Microsoft) (4)

☐ Overig, namelijk: (7) _____

Q4 In hoeverre voelde u zich toegerust om digitale middelen op een effectieve manier in te zetten in de les vóór de start van de coronacrisis?

|	Helemaal niet toegerust	Volledig toegerust
	0 10 20 30 40 50 60 70 80 90 100	
()		
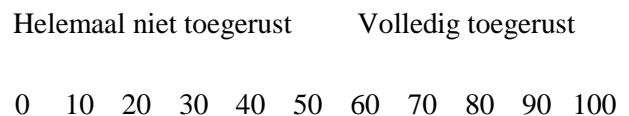
Q5 Welke 5 digitale middelen gebruikte u het meeste in uw lessen vóór de start van de coronacrisis? Geef ook aan hoe vaak en met welke mate van interactiviteit u die gebruikte.

	Frequentie:	Interactiviteit:
1: (1)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
2: (2)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback

		van de docent of externe expert(s) (5)
3: (3)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
4: (4)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
5: (5)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)

Q6 Hoe was de verhouding tussen leerlinggestuurd versus docentgestuurd werken in uw lessen vóór de start van de coronacrisis? Bij een docentgestuurde aanpak heeft de docent de regie over het wat, hoe en waar en wanneer van het leren. Bij een leerlinggestuurde aanpak maakt de leerling zelf keuzes in het hoe, wat, waar en wanneer van het leren. Dan gaat een leerling meer zelfstandig en op zijn eigen tempo aan het werk.

Volledig docentgestuurd   Volledig leerlinggestuurd

0   10   20   30   40   50   60   70   80   90   100

()
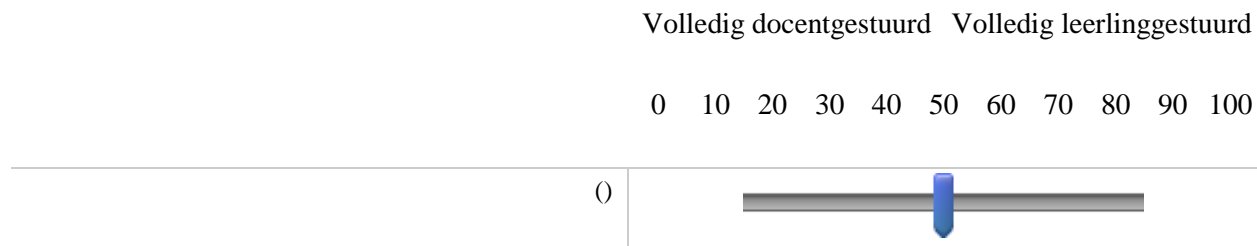
End of Block: Lespraktijk voorheen

Start of Block: Verschillen lespraktijk

T2 De volgende vragen gaan over de verschillen die u ervaart tussen uw oude lespraktijk en uw lespraktijk tijdens de coronacrisis.

Q7 Beschrijf in ongeveer 5 regels hoe een typische les gedurende de coronacrisis eruit ziet.

_____

_____

_____

_____

_____

Q8 Leg uit waar de grootste verschillen zitten tussen een typische les vóór de coronacrisis zoals u heeft beschreven bij de eerste vraag, en de typische les gedurende de coronacrisis zoals u heeft beschreven in de vorige vraag. Als er vanwege de coronacrisis veranderingen zijn aangebracht in de lestijden of groepssamenstelling kunt u die hier ook opschrijven.

_____

_____

Q9 Welke lesactiviteiten zijn vanwege de coronacrisis niet meer uitvoerbaar volgens uw oude lesaanpak van voor de coronacrisis?

- ☐ Frontaal uitleg geven (7)
- ☐ Huiswerk laten inleveren (18)
- ☐ Individuele ondersteuning (19)
- ☐ Vragen beantwoorden in klassenverband (6)
- ☐ Klassendiscussie (13)
- ☐ Samenwerkingsopdrachten (5)
- ☐ Differentiërende activiteiten (20)
- ☐ Formatief toetsen (14)
- ☐ Summatief toetsen (15)
- ☐ Praktische opdrachten (4)
- ☐ Excursies (9)
- ☐ Overig, namelijk: (17)

_____

Q10 Heeft u een alternatieve aanpak gedurende de coronacrisis voor de lesactiviteiten die u benoemd heeft bij de vorige vraag?

_____

_____

Q11 Welke lesactiviteiten die u eerst niet inzette in de les bent u vanwege de coronacrisis gaan gebruiken?

☐ Frontaal uitleg geven (7)

☐ Huiswerk laten inleveren (18)

☐ Individuele ondersteuning (19)

☐ Vragen beantwoorden in klassenverband (6)

☐ Klassendiscussie (13)

☐ Samenwerkingsopdrachten (5)

☐ Differentiërende activiteiten (20)

☐ Formatief toetsen (14)

☐ Summatief toetsen (15)

☐ Praktische opdrachten (4)

☐ Excursies (9)

☐ Overig, namelijk: (17)

_____

Q12 Ondervindt u nog andere verschillen met het lesgeven gedurende de coronacrisis in vergelijking met uw lessen vóór de coronacrisis? Hoe gaat u om met deze verschillen?

_____

_____

Q13 In hoeverre voelt u zich toegerust om digitale middelen op een effectieve manier in te zetten in de les gedurende de coronacrisis?

|	Helemaal niet toegerust	Volledig toegerust
	0 10 20 30 40 50 60 70 80 90 100	
()		

Q14 Welke 5 digitale middelen gebruikt u het meeste in uw lessen tijdens de coronacrisis? Geef ook aan hoe vaak en met welke mate van interactiviteit u die gebruikt.

	Frequentie:	Interactiviteit:

1: (1)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
2: (2)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
3: (3)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
4: (4)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
5: (5)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)

Q15 Hoe is de verhouding tussen leerlinggestuurd versus docentgestuurd werken in uw lessen gedurende de coronacrisis?

Compleet docentgestuurd Compleet leerlinggestuurd

0   10   20   30   40   50   60   70   80   90   100

()
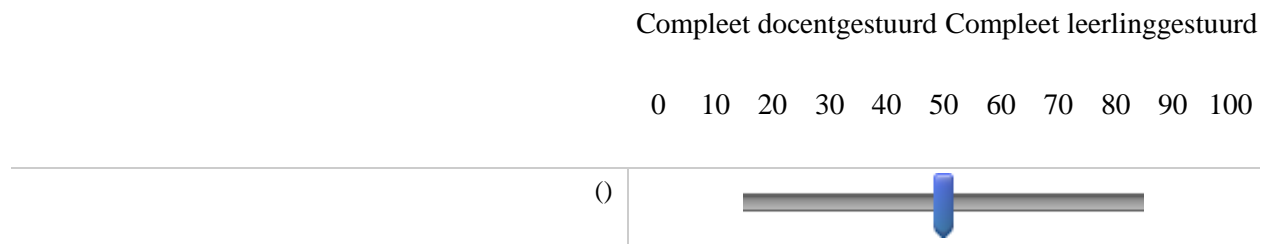
End of Block: Verschillen lespraktijk

Start of Block: Voorbereiding corona lespraktijk

T3 De volgende vragen gaan over de voorbereidingen die u aan de start van de coronacrisis getroffen heeft om afstandsonderwijs te kunnen verschaffen aan uw leerlingen gedurende de coronacrisis.

Q16 Hoeveel dagen is uw school dicht geweest ter voorbereiding van het afstandsonderwijs aan de start van de coronacrisis? Het gaat hier om het aantal dagen vanaf zondag 15 maart tot de dag dat de eerste lessen met afstandsonderwijs werden gegeven.

- ○ Mijn school is meteen begonnen met afstandsonderwijs (4)
- ○ 1 of 2 dagen (5)
- ○ 3 dagen tot 1 week (6)
- ○ 1 tot 2 weken (7)
- ○ Meer dan 2 weken (8)

Q17 Welke activiteiten heeft u in die periode uitgevoerd om u voor te bereiden op afstandsonderwijs?

- ☐ Workshops/bijscholing gevolgd (12)
- ☐ Sectieoverleg (4)
- ☐ Planningen maken (5)
- ☐ Uitlegvideos zoeken (6)
- ☐ Uitlegvideos maken (7)
- ☐ Opdrachten maken/aanpassen (10)
- ☐ Digitale middelen leren kennen (8)
- ☐ Digitale middelen inrichten (9)
- ☐ Overig, namelijk: (11)

_____

Q18 Wat heeft u het meest geholpen om u voor te bereiden op afstandsonderwijs?

_____

_____

Q19 Leg uit waar de grootste verschillen liggen in uw dagelijkse lesvoorbereiding gedurende de coronacrisis in vergelijking met vóór de coronacrisis.

_____

_____

Q20 Wat doet uw school om u te ondersteunen in het geven van afstandsonderwijs gedurende de coronacrisis?

☐ Accessoires zoals headsets verschaffen (8)

☐ Lestijden verkorten (9)

☐ Studiedagen houden (4)

☐ Regelmatig updates en tips rondsturen (5)

☐ Collega's aanwijzen die kunnen ondersteunen (6)

☐ Workshops/bijscholing aanbieden (7)

☐ Overig, namelijk: (10)

Q21 Heeft er vanwege de coronacrisis een verandering in lestijden of groepssamenstelling plaatsgevonden? Zo ja, wat vindt u hiervan?

_____

_____

_____

_____

_____

End of Block: Voorbereiding corona lespraktijk

Start of Block: Intenties

T4 De volgende vragen gaan over uw intenties voor de inzet van digitale middelen nadat de scholen weer open zijn gegaan.

Q22 Is uw mening over de inzet van digitale middelen in de les veranderd gedurende de coronacrisis?

○ Ik ben veel positiever gaan denken over de inzet van digitale middelen in de les. (1)

○ Ik ben enigzins positiever gaan denken over de inzet van digitale middelen in de les. (2)

○ Mijn mening over de inzet van digitale middelen in de les is hetzelfde gebleven. (3)

○ Ik ben enigzins negatiever gaan denken over de inzet van digitale middelen in de les. (4)

○ Ik ben veel negatiever gaan denken over de inzet van digitale middelen in de les. (5)

Q23 Welke 5 digitale middelen zou u willen blijven gebruiken na de coronacrisis? Geef ook aan hoe vaak en met welke mate van interactie u dit digitale middel zou willen gebruiken.

	Frequentie:	Interactiviteit:
1: (1)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
2: (2)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
3: (3)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
4: (4)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)
5: (5)	▼ Een of een paar keer per jaar (1 ... Elke les (4)	▼ Informatie presenteren naar leerlingen (1 ... Bijdrage/feedback van de docent of externe expert(s) (5)

Q24 Welke lesactiviteiten zou u na de coronacrisis eventueel via een (ander) digitaal middel willen blijven uitvoeren?

☐ Frontaal uitleg geven (7)

☐ Huiswerk laten inleveren (18)

☐ Individuele ondersteuning (19)

☐ Vragen beantwoorden in klassenverband (6)

☐ Klassendiscussie (13)

☐ Samenwerkingsopdrachten (5)

☐ Differentiërende activiteiten (20)

☐ Formatief toetsen (14)

☐ Summatief toetsen (15)

☐ Praktische opdrachten (4)

☐ Excursies (9)

☐ Overig, namelijk: (17)
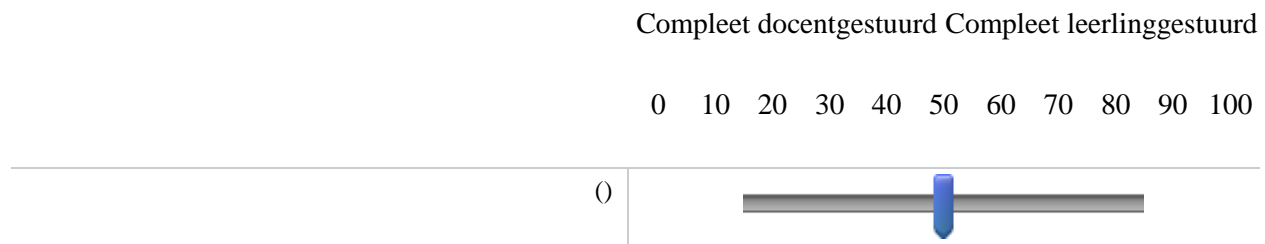
_____

Q25 Wat is voor u de toegevoegde waarde van het inzetten van een digitaal middel voor de lesactiviteiten die u bij de vorige benoemd heeft?

_____

_____

Q26 Wat is uw intentie voor de verhouding tussen leerlinggestuurd versus docentgestuurd werken in uw lessen na de coronacrisis?

Compleet docentgestuurd Compleet leerlinggestuurd

0   10   20   30   40   50   60   70   80   90   100

()

End of Block: Intenties

Start of Block: Benodigheden

T5 De volgende vragen gaan over wat u als docent nodig heeft om uw intenties voor de inzet van digitale middelen te bereiken.

Q27 Wat heeft u nodig om de mate waarin u zich toegerust voelt voor de inzet van digitale middelen te verhogen na de coronacrisis?

☐ Bijscholing over ICT in zijn algemeenheid (6)

☐ Bijscholing over het inrichten van digitale middelen (5)

☐ Bijscholing over pedagogisch didactische mogelijkheden van digitale middelen (9)

☐ Oefenen (10)

☐ Overig, namelijk: (11)

_____

Q28 Wat heeft u verder nodig om uw intenties voor de inzet van digitale middelen te bereiken wanneer de scholen weer open gaan na de coronacrisis?

_____

_____

Q29 Wat kan de school doen om u hierbij te helpen?

☐ Meer motivatie en stimulatie om digitale middelen in te zetten (9)

☐ Workshops/bijscholing aanbieden (8)

☐ Ruimte op studiedagen voor digitale middelen (4)

☐ Budget om digitale middelen aan te schaffen (5)

☐ Een verbeterde ICT omgeving (6)

☐ Verbeterde communicatie met de ICT afdeling (7)

☐ Overig, namelijk: (10)

_____

Q30 Heeft uw school gedurende de coronacrisis plannen of beslissingen gemaakt voor de inzet van digitale middelen op de lange termijn? Zo ja, wat?

_____

_____

Q31 Wat vindt u van de plannen of beslissingen van uw school die u bij de vorige vraag beschreven heeft? Als er geen plannen of beslissing zijn gemaakt, wat vindt u van de afwezigheid hiervan?

_____

_____

End of Block: Benodigheden

Start of Block: Einde

E1 Heeft u nog op- of aanmerkingen naar aanleiding van deze vragenlijst? Dan kunt u die hier achterlaten.

_____

_____

E2
Wilt u bij afronding van het onderzoek een samenvatting van de resultaten ontvangen? Dan kunt u hier uw emailadres achterlaten.

_____

E3 Dit was het einde van de vragenlijst. Bedankt voor het invullen!

Nogmaals uw persoonlijke code: ${e://Field/Random%20ID}

Het is op ieder moment mogelijk af te zien van deelname door een mail met uw persoonlijke code te sturen naar: t.notenboom2@students.uu.nl

End of Block: Einde

Appendix B

Social media tekst:

Beste docenten,

De coronacrisis heeft een grote impact op jullie werk, en vraagt veel aanpassingsvermogen. Ik denk dat we een hoop kunnen leren van jullie ervaringen en oplossingen. Daarom onderzoek ik hoe havo/vwo docenten omgaan met het afstandsonderwijs nu, en de rol die digitale middelen daarbij spelen. Als je havo/vwo docent bent, zou je dan de vragenlijst in willen vullen? Je reactie is ook waardevol wanneer er voor jou niet zoveel veranderd is. Als je benieuwd bent hoe andere docenten omgaan met het afstandsonderwijs, stuur ik je na afloop van het onderzoek de resultaten! Delen jullie de vragenlijst ook met je collega's?

De vragenlijst vind je hier: https://survey.uu.nl/jfe/form/SV_3soot8qQwQBQCpf

T. Notenboom BSc | Universiteit Utrecht | Graduate School of Teaching | Master Student Science Education and Communication | Computer Science Teacher | t.notenboom2@students.uu.nl |

Informele tekst:

Beste docenten,

De coronacrisis heeft een grote impact op het lesgeven. Er wordt veel aanpassingsvermogen van je gevraagd. Er worden een hoop oplossingen bedacht om leerlingen toch van onderwijs te voorzien. Op dit moment is er een onderzoek gaande naar de veranderingen in het lesgeven door de coronacrisis, en de rol die digitale middelen hierbij spelen. Geef je les op havo of vwo niveau? Dan zouden we graag je ervaringen horen! Je reactie is ook waardevol als er voor jou niet zoveel veranderd is. Voor de geïnteresseerden is er de mogelijkheid na afloop van het onderzoek de resultaten te ontvangen. De vragenlijst is open tot 1 juni 2020.

De vragenlijst vindt u hier: https://survey.uu.nl/jfe/form/SV_3soot8qQwQBQCpf

Met vriendelijke groeten,

T. Notenboom BSc | Universiteit Utrecht | Graduate School of Teaching | Master Student Science Education and Communication | Computer Science Teacher | t.notenboom2@students.uu.nl |

Formele tekst:

Beste docenten,

De coronacrisis heeft een grote impact op het lesgeven. Er wordt veel aanpassingsvermogen van u gevraagd. Er worden een hoop oplossingen bedacht om leerlingen toch van onderwijs te voorzien. Op dit moment is er een onderzoek gaande naar de veranderingen in het lesgeven door de coronacrisis, en de rol die digitale middelen hierbij spelen. Geeft u les op havo of vwo niveau? Dan zouden we graag uw ervaringen horen! Uw reactie is ook waardevol als er voor u niet zoveel veranderd is. Voor de geïnteresseerden is er de mogelijkheid na afloop van het onderzoek de resultaten te ontvangen.

De vragenlijst vindt u hier: https://survey.uu.nl/jfe/form/SV_3soot8qQwQBQCpf

Met vriendelijke groeten,

T. Notenboom BSc | Universiteit Utrecht | Graduate School of Teaching | Master Student Science Education and Communication | Computer Science Teacher | t.notenboom2@students.uu.nl |