Improving cyber safety awareness education at Dutch elementary schools

Cyber safety awareness education improvement by two important actors: school management boards and educational publishers

Thesis as part of the graduation assignment for the Master Cyber Security at the Cyber Security Academy in The Hague

14th of February 2018

Name: Mr. A. Spiering
Student number: S1789902
Education: Cyber Security Academy
Educational institution: Leiden University, The Hague University of Applied Sciences & Delft University of Technology
Mentor: Mr. M.E.M. Spruit
Second reader: Mrs. S. van der Hof

Preface

As a concerned father of two young children and student of the Cyber Security Academy I searched for an interesting thesis topic. From my work as Security Officer within KPN I regularly encounter the importance of being aware of risks related to cyberspace. The idea that my children will grow up in this (sometimes) risky cyber connected world troubled me. Even though I feel primarily responsible, I questioned myself: 'what do children learn at school about safe behaviour online?' An initial interview with our elementary school headmaster troubled me and confirmed my expectations: children are not being educated to be aware of cyber risks. Additionally, it struck me that even though schools primarily rely on using standard teaching methods, provided by large educational publishers, there is hardly any attention in these methods for educating cyber safety awareness. I was interested in how I could improve this and which stakeholders play a role in educating cyber safety awareness at elementary schools, and therefore I chose this topic. I would like to thank the following persons for their knowledge and experience which contributed to the content of this thesis:

Experts digital literacy & youth and media:
Mrs. J. Pardoen, Media Literacy expert and founder of Bureau Youth & Media
Mr. P. Nikken, Lector Youth & Media University of Applied Sciences Windesheim
Mr. R. Pijpers, Strategic Advisor Digital Literacy at Kennisnet

School headmasters & management team:
Mr. M. van der Bor, director elementary school De Parel and De Bron
Mrs. G. Blikman, director elementary school Het Kompas
Mr. E. Vis, director elementary school De Bogen
Mr. B. Jansen, MT member & teacher group 7/8 elementary school Het Baken
Mr. R. van Leijenhorst, director elementary school De Brug

Publishers:
Mrs. Mirjan Albers, Advisor Digital Literacy & 21st century skills of Cubiss
Mrs. I. van Looyen, Designspecialist & Mediacoach at Noordhoff Uitgevers BV
Mr. G. Schoonderwoerd, Publisher Elementary Education at Noordhoff Uitgevers BV
Mr. R. Hylkema, Solutions Consultant and CISO at ThiemeMeulenhoff BV

Additional:
Mr. T. Douma, Chairman of O2G2 school community in Groningen, Chairman of Curriculum.nu
Mr. A. Strijker, Curriculum Developer Digital Literacy & ICT at SLO
Mr. P. Hulsen director Ouders & Onderwijs
Mr. M. van Dodewaard Advisor Learning Resources, learning resource supplier de Rolf group bv
Mrs. J. Baloo, CISO of KPN NV

A special word of thanks to Mr. Marcel Spruit who, as a graduation supervisor, was a 'sparring partner' who enhanced the structure and content of this thesis. Finally, I would like to thank my family who stood next to me in the last two years of my study.

Harderwijk 14th of February 2018

Mr. Arjan Spiering

Abstract

The initial motivation for this research is the recent media attention involving young children becoming victim of incidents related to cyber space. There is a need for more cyber safety awareness education to young children. Primarily parents are responsible for educating their children however, also school teachers can have an important role in educating children how to be safety aware in cyber space. Teachers generally use standard teaching methods from large educational publisher to educate children. The large educational publishers currently do not offer standard cyber safety awareness teaching methods. The purpose of this study is to investigate what Dutch elementary schools and large educational publishers can improve to effectively educate cyber safety awareness. The research focuses on the management boards of these two actors since they are the decision makers in an organization.

The central question of this research is: '*What are important improvements for elementary school management boards and educational publishers to enhance the cyber safety awareness education at Dutch elementary schools?*' The research question is divided into answering five sub-questions: First the current situation with regard to cyber safety awareness education is examined and the current available digital literacy models. Second, the relevant stakeholders are being mapped. Third, the problems for the lack of awareness education are identified and root causes are determined. Fourth, based on the solutions of the root causes critical success factors are determined. Finally, solutions are proposed based on the critical success factors, and for every solution there is an implementation plan developed.

The research method used is a qualitative descriptive study: Via literature study and semi-structured interviews with school headmasters, educational publishers and digital literacy experts the answer on the research question is determined.

The outcome of determining the current situation is that there are already some teaching methods used for educating children to be aware of cyber risks. However, these do not cover all risks and are not structurally integrated in the curriculum. From the mapping of the stakeholders a large field of influence is described, whereby it is concluded that a large number of stakeholders, in more or lesser extent, are involved in the education of cyber safety awareness to children. We have identified 29 bottlenecks which are reduced to two root causes for schools and two for educational publishers. For school management board these are: Lack of vision with regard to cyber safety awareness education and the lack of educated teachers. For the educational publishers the lack of a proactive vision and the lack of fit with the current business model are root causes. Proposed solutions are to develop a proactive vision, start to educate teachers and adapt the current educational publishers' business model.

We have identified five critical success factors for vision development: the management boards knowledge belief and attitude, the involvement of relevant stakeholders, an appropriate scope, and the implementation methodology. To professionally educate teachers these are: connecting with the current knowledge, the teaching method flexibility, the method integration in the curriculum, the digital infrastructure environment, and involvement of relevant stakeholders. For the adaption of the current business model these are: the availability of an explicit business model, business model adaption method, the value proposition, the market and product strategy, and involvement of relevant stakeholders.

The conclusion is that there is not 'one size fits all' solution for the school and educational publishers management board, but it depends on the contextual fit which solutions are chosen. For further

research it would be interesting to implement the solutions proposed and measure their effectiveness compared to schools and publishers who stick to a wait-and-see attitude.

Table of contents

1. Introduction and background

There is increased media attention in the Netherlands for cases of cyber risks affecting young children. Examples of these are incidents whereby young children are approached online by child molesters to persuade them into having a sexual relationship (*grooming*) (NOS, 2016), but also risky behaviour of young children distributing sexual images to each other (*sexting*)(ECP, 2017). According to advice from the Dutch National Cyber Security Council (NCSC) there should be more attention with regard to cyber safety in elementary and secondary education whereby digital skills, learned at a young age, are very important (CSR, 2015b, p. 4). According to the NCSC there is a gap between skills needed to operate in our digital world versus digital education offered by educators (CSR, 2015b, p. 4).

Additionally, concerns of the Dutch government were aroused by a report on digital literacy from the Royal Dutch Academy of Sciences in 2012 (KNAW, 2012). The Dutch Ministry of Education, Culture and Science requested the Foundation for Curriculum Development (SLO) to develop a broad curriculum whereby 21st century skills were formulated for elementary and secondary education. Since 2014 there is now a curriculum with 21st century skills where attention is paid to cyber safety awareness through digital literacy. It seems a promising development. However, after researching the implementation there is still much to improve since the adoption of the curriculum is limited at elementary schools (Thijs & Diephuis, 2014).

There are a number of hurdles for educating cyber safety awareness via digital literacy. One is that schools are uncertain how to include these digital skills in their existing curriculum. Historically educational publishers produce the teaching methods for the curricula, which are subsequently adopted by elementary schools. Elementary schools rely on the availability of standard teaching methods provided by educational publishers: 86% predominantly uses standard methods being offered (Stichting Leerplan ontwikkeling, 2016, p. 6). Elementary schools keep a passive attitude as long as the publishers do not provide them with new developed teaching methods. Since the digital literacy requirements are currently not obliged by the Dutch government, there is no (economic) incentive for educational publishers to develop digital literacy methods, hence this results in limited action from both schools and publishers on cyber safety awareness education.

Focus

The focus of this research will be to improve cyber safety awareness of children at elementary schools in the Netherlands. Elementary school children, aged between four and twelve years old, are chosen since this is the age group in which young children generally have their first experience in cyberspace. It seems tenable to assume that creating awareness of cyber safety risks at a young age is important to protect children from harms related to cyberspace. With regard to the Netherlands we see from the EU Kids Online survey that, compared to other European countries, children between 9 to 16 years 80% have daily access to cyberspace versus 60% as an European average (Haddon & Livingstone, 2014, p. 45). Due to this high percentage of children using cyberspace the Netherlands is categorized as a 'high online risk country' by this research (Haan, 2010, p. 30). Actual percentages of exposure to risk seem limited: e.g. children from 9 to 12 year old 11,2% have seen pornographic images (Sonck & De Haan, 2011, p. 30). However the harm of being exposed to an online risk is relatively high for young children: 39,2% of the 9 to 10 year old children have had a negative experience in the last few months, compared to 20,7% of the 15 to 16 year old (Sonck & De Haan, 2011, p. 33). From more recent studies we see a substantial increase: Rutgers concludes that in 2017 66% of the children between 9 to 12 year have recently seen nude pictures online and 35% adults having sex (Rutgers, 2017a). There seems enough motivation to make Dutch children more aware of possible cyber risks by educating cyber safety awareness at elementary schools.

There are many stakeholders surrounding the elementary school children with regard to cyber safety risks. The Dutch Ministry of Education has requested PricewaterhouseCoopers (PwC) to conduct a measurement of the cyber safety and privacy risks of children within elementary and secondary education (Bruijn, 2014). PwC has identified a number of important stakeholders (Figure 1). This stakeholder model is confirmed by the literature studies regarding important stakeholders of schools for the implementation of the 21st century skills (Voogt & Roblin, 2010). Since there are many stakeholders involved with educating children an additional focus on the school management board and educational publishers as angle of incidence is chosen for this research. The school management board is chosen since they are the decision makers within a school and have the power to assign resources (time and budget) and decision power to select teaching methods to educate cyber safety awareness. Educational publishers are important since they traditionally provide the teaching methods educated at elementary schools. Within the literature study further elaboration of the stakeholders is described, and expanded with a more in depth research of these two primary actors and their relationship.

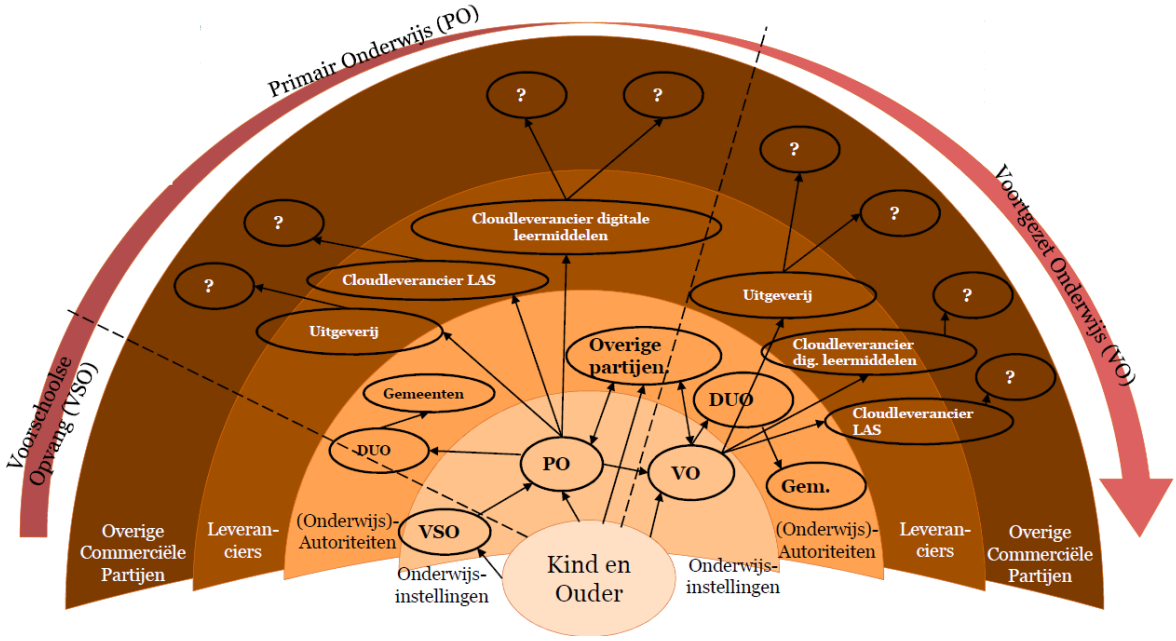

Figure 1: Stakeholders identified by the Ministry with regard to cyber safety and privacy (Bruijn, 2014, p. 16)

The target audience for this research are the decision makers within schools and educational publishers: based on this analysis they can use the proposed solutions to improve their decision making with regard to cyber safety awareness education. For the broader audience this research will provide a valuable insight in the relationship and problems between different stakeholders in educating cyber safety awareness.

Purpose and Research question

The purpose of this study is to investigate what improvements can be made to enhance the education of cyber safety awareness. This perceived from the perspective of elementary schools and educational publishers.

With the above purpose in mind the research question for this study is: '*What are important improvements for elementary school management boards and educational publishers to improve the cyber safety awareness education at Dutch elementary schools?*'

The research question can be divided into five sub-questions:

1. *What is the current status of cyber safety awareness education within Dutch elementary schools?*
   First, we will investigate what the primary risks for elementary school children are and how these can be categorized. This to understand what the primary focus topics are for educating cyber safety awareness. Second, an insight is created in the actual definition of cyber safety awareness education in this research. Finally, we will provide an insight in available models to educate cyber safety awareness and how these are currently being applied.
2. *What stakeholders are surrounding elementary school management boards and educational publishers management boards, with regard to educating cyber safety awareness, and what is their relationship?*
   In this second sub-question an insight in the stakeholders related to school management boards and educational publishers are described. This will assist in gaining an insight in the 'playing field' where these actors act in. We describe a stakeholder model showing what the importance and influences are between the stakeholders.
3. *What are, with regard to these two primary actors, the main bottlenecks and root causes for educating cyber safety awareness within elementary schools?*
   Within this sub-question an analysis is made of de bottlenecks (main problems) related to and between these two actors. Additionally, for these bottlenecks the root causes are determined and solutions are proposed.
4. *What are important critical success factors for improving cyber safety awareness education with regard to elementary schools?*
   Based on the proposed solution various sources are used to select a number of critical success factors. The critical success factors are used to ensure that the solution can effectively be implemented.
5. *Which improvements can effectively be made by school management boards and educational publishers to improve the education of cyber safety awareness within elementary schools?*
   Through combining the solution and critical success factors an overview of possible implementation options are described. An advice is formulated per solution for the short-term with the most potential (least effort and most result) implementation steps.

Methodology and research design

This research can be categorized as part of the social science as stated by the definition '*Social science, …, consists of the disciplined and systematic study of society and its institutions, and of how and why people behave as they do, both as individuals and in groups within society' (Halloran, 1999, p. 1)*. In this social research we will investigate two important actors who can enhance the education of cyber safety awareness, and thereby change the cyber safety awareness of children. This adds to our scientific understanding of how safety awareness education at Dutch elementary schools can be improved by both school management boards as well as educational publishers.

This research will be a qualitative descriptive study: the data collected will be from a limited set of the total population (limited set of schools and educational publishers) but the conclusions from the research will be validated with relevant educational cyber safety awareness experts. Second, design science will be applied for the solution phase of this research. '*Design science supports a pragmatic research paradigm that calls for the creation of innovative artefacts to solve real-world problems. Design science research must produce a viable artefact in the form of a construct, a model, a method, or an instantiation' (Hevner & Chatterjee, 2010, p. 9)*. Based on the available best-practices a solution to the identified root-causes may already be available, if this is not the case a new 'artefact' will be designed.

Different observational methods are used to collect the available data. The following data collection methods are used (Edgar & Manz, 2017):

- *Case studies:* For the literature research several available case studies related to cyber safety awareness education on elementary schools will be investigated to get an initial vision of the challenges they face.
- *Surveys:* Previously executed cyber risk and awareness surveys for children will be analysed to get an insight in the current status of cyber safety awareness education on elementary schools.
- *Semi-structured interviews*: Three important educational publishers and six elementary school headmasters will be interviewed to get a qualitative in-depth knowledge in what the current status is with regard to the education of cyber safety awareness. Also insight is gained what current bottlenecks in cyber safety awareness education are. Finally, three cyber safety awareness educational experts are interviewed to provide insight in the challenges and opportunities schools face in educating cyber safety awareness.

Based on a pre-study of this topic it is expected that the second sub-question, which provides a detailed composition of the stakeholder model and their mutual relationships, will take considerate amount of time to develop since the elementary school environment is a large field of influence as shown in Figure 1. There is an old African saying which summarizes this complexity very well: 'It takes a village to raise a child' (Payne, 2009).

This research consists of two parts: the first part is a literature research and an analysis of cyber safety awareness education in the Netherlands, and at Dutch elementary schools (chapter two). This will address the first two sub-questions of this research: the current situation of cyber safety awareness education and an initial stakeholder model. The second part of this research will sequentially answer the five sub-question based on the interviews with elementary school headmasters, educational publishers and digital literacy experts (chapter three). We will end with conclusions and recommendation for further research (chapter four).

One final remark before progressing to the literature research: the semi-structured interviews are audio-taped and available on request. Due to length limitations of this research we have not included full transcripts of the interviews, but for validity reasons they are available. Names of the interviewees are mentioned in this research and interviewees agreed to be called by name as long as they are not literally quoted.

2. Literature review and theoretical framework

This chapter is used to create an insight in cyber safety risks for children and an understanding of what cyber safety awareness education entails with regard to children. This is the initial step required to be able to analyse and answer the research sub-questions. In the second part of this chapter a stakeholder model is presented which will be used to analyse and answer the research sub-question two after the interviews (chapter three).

To structure this theoretical chapter, a straightforward model is used to describe the subdivision of the research question via three pillars (Figure 2). The first pillar provides an answer to the question what risks children are exposed to in cyberspace. A broad perspective is initially taken which first explores the broad definition of cyber risks, followed by a more specific definition of cyber safety risks affecting children. Finally, an overview of specific Dutch focused surveys concerning cyber safety risks for elementary school children are described.

The second pillar focusses on the theory with regard to cyber safety awareness: it starts with an exploration of the definition of cyber safety awareness. Based on this, a definition of cyber safety awareness for children is described. We will use this definition to evaluate the current cyber safety awareness status, which will be the last part of pillar two.

The third pillar starts with the definition of cyber safety awareness evaluation criteria which will be used during the interviews to determine the current status of cyber safety awareness education from practice. Finally, we will look at national and international cyber education models used to educate cyber safety awareness and the Dutch policy regarding cyber safety awareness.

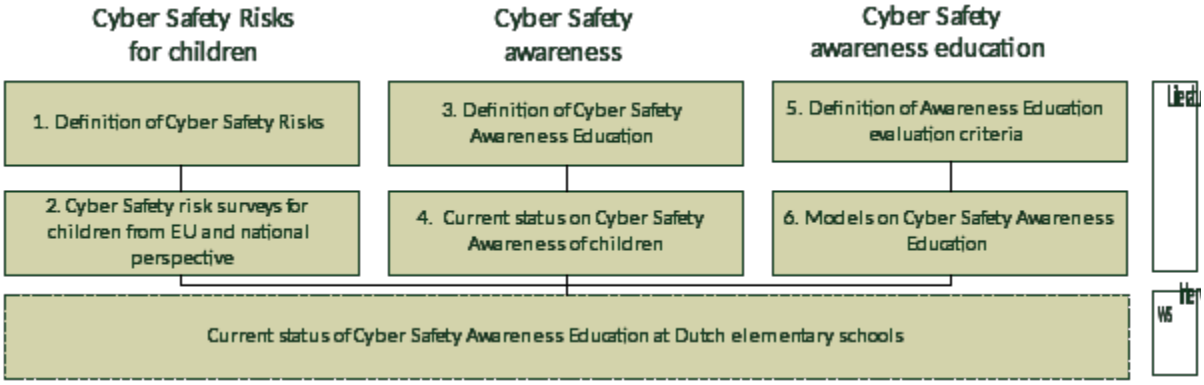

Figure 2: Subdivision of the literature study

Cyber safety risks for children

Definition of 'cyber safety risks'

An often used formulation of 'risk' is defined as the likelihood an incident will happen multiplied by the impact or consequences when an incident will happen, as shown in Figure 1 (ISO, 2014c). The likelihood calculation is additionally often subdivided in the threat multiplied by the vulnerability. There are several options to choose with regard to risk treatment according to ISO (ISO, 2014a, pp. 22–24):

- Retention: Accept the risk as it is, the costs and effort do not outweigh the gain in risk reduction and risk is below the risks acceptance level.
- Modification of the risk: Implement treatments to reduce the risks to an acceptable level.

- Sharing: Transfer the risk and shift the risk to another party e.g. insure the risk.
- Avoidance of the risk: Not executing the activity to eliminate the risk.

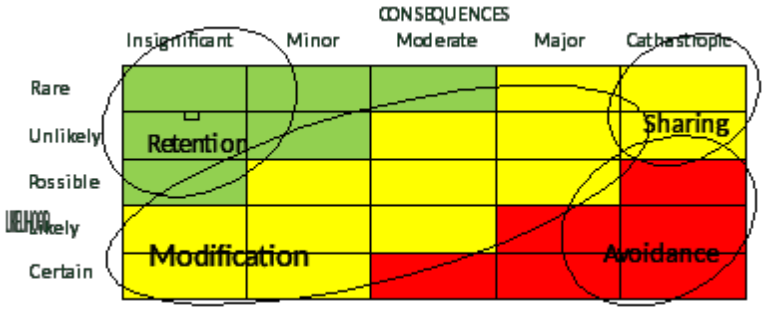

Figure 3: Risk Matrix (ISO, 2014b, p. 22)

The effects of raising awareness are covered by the risk modification treatment option. Whereby the likelihood calculation is based on the threats multiplied by the (in this research) human weaknesses. Both the likelihood an incident will happen and the impact of the consequences are reduced by educating awareness: prevent incidents and quickly solve incidents when they do occur (Barford et al., 2010).

There are two concepts (terms) mentioned with regard to the protection and prevention from cyber risks, these are: 'cyber security' and 'cyber safety'. ISO defines cyber security as: *'preservation of Confidentiality, Integrity and Availability (CIA) of information in Cyberspace' (ISO, 2014b, p. 4)*. The NIST defines cyber security as '*The ability to protect or defend the use of cyberspace from cyber attacks*' (NIST, 2013, p. 58). To illustrate the differences in cyber security definitions ENISA has made a comparison between six standardization organizations (Cadzow et al., 2015). What can be viewed in their report is that the technical protection mechanisms to preserve the CIA of data are the primary focus. The human factor and their behavior in cyberspace is underexposed.

The term cyber safety is summarized in the research 'Cyber safety in early childhood education' (Grey, 2011) as: *'Cyber safety is defined as the safe and responsible use of information and communication technologies, including protection against unsolicited marketing and advertising. Cyber safety teaches children about the positive and negative behavioral aspects of ICT, safeguarding against individuals who operate websites, attempt to contact children online, or to organize unsupervised meetings in person with children.' (Grey, 2011, p. 77)*.

The difference between the two concepts is well illustrated by the US based Internet Keep Safe Coalition: *'Cyber safety addresses the ability to act in a safe and responsible manner on the Internet and other connected environments. These behaviors protect personal information and reputation and include safe practices to minimize danger from behavioral-based, rather than hardware/software-based, problems. Whereas cyber-safety focuses on acting safely and responsibly, cyber security covers physical protection (both hardware and software) of personal information and technology resources from unauthorized access gained via technological means. In contrast, most of the issues covered in cyber-safety are steps that one can take to avoid revealing information by "social" means' (Pruitt-mentle, 2001, p. 2)*. Even though there are clear distinctions between the two terms they also supplement each other e.g. to preserve your data privacy you should not share your details to others (safety aspect) and additionally use a strong password policy (security aspect). Within this research we will follow the previous mentioned extensive definition of Grey: the focus of this research will be on preventing the 'social interaction risks' which exist (or worsen) through the use of cyber space.

Cyber safety risks for children

We continue with an analysis of the primary risks for children. Important surveys aimed at young children are analysed on risks in cyberspace. It is important to realize that there are internationally numerous institutions involved in the safety of children in cyberspace. An oversight of research conducting institutions for online child safety was created by Mrs. Alexandra Chernyavskaya and Professor Sonia Livingstone for the UK environment (Figure 4) (LSE Media Policy Project, 2015). The different institutes mentioned in this figure are also connected to the Netherlands: most of the international and EU institutes are equally applicable (e.g. The Netherlands actively participates in the EU Kids Online research). For the inner circle of this research, the UK national specific initiatives, have Dutch counterparts (e.g. UK ASA has as counterpart the Reclame Code Comissie[1], and Ofcom is identical to the Dutch Agentschap Telecom[2]). Since there are many surveys from these institutions (EU Kids Online, n.d.) we will focus on the European and Dutch surveys and will describe recent studies (less than five year old):

- EU Survey: Better Internet for Kids, Insafe network of helplines.
- EU: EU Kids Online survey & EU Kids Online Dutch perspective survey.
- Dutch: Rutger Foundation.
- Dutch: Dutch Youth Institute (NJi).

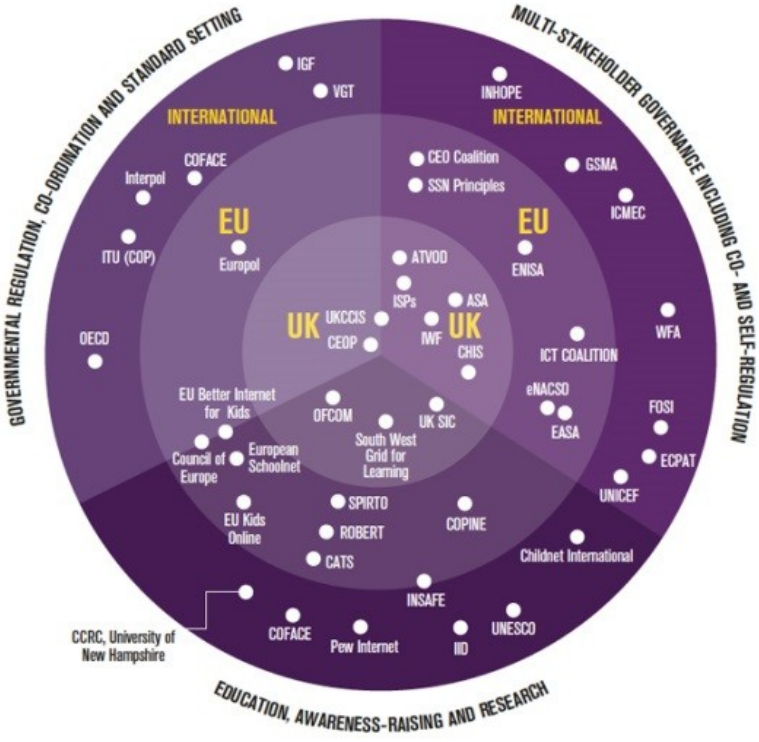

Figure 4: UK initiatives children and risks online (LSE Media Policy Project, 2015)

Better Internet for Kids

The Better Internet for Kids (BIK) organization is an initiative of the members of the European Union with a mission to provide better internet for children (SIC, 2017a). Insafe and Inhope are part of BIK and work together via Safer Internet Centres (SIC), both are located in EU countries. The SIC provide an awareness centre, helpline and hotline for children accessing cyberspace. For The Netherlands the

1 https://www.reclamecode.nl

2 https://www.agentschaptelecom.nl/

awareness centre is www.veiliginternetten.nl and helpline is www.meldknop.nl. The aggregated data from the helplines of the first quarter of 2017 provides an initial insight in risks where children are confronted with (SIC, 2017b) (Figure 5). It is composed of 11,561 contacts with hotlines all related to online issues from January to March 2017. The top three are cyberbullying, online sexuality/relationships and abuse of privacy. According to the report this top three is a suitable representation of previous reporting periods. Even though this is not specifically focussed on The Netherlands and depends on the fact that children must actively seek help to get registered, a cross check with other Dutch surveys (Nikken, Crijnsen, Vriezen, Pijpers, & Jacobsen, 2015; NJi, 2017) provides enough representativeness. It seems therefore tenable to assume that these three are important risks for children.

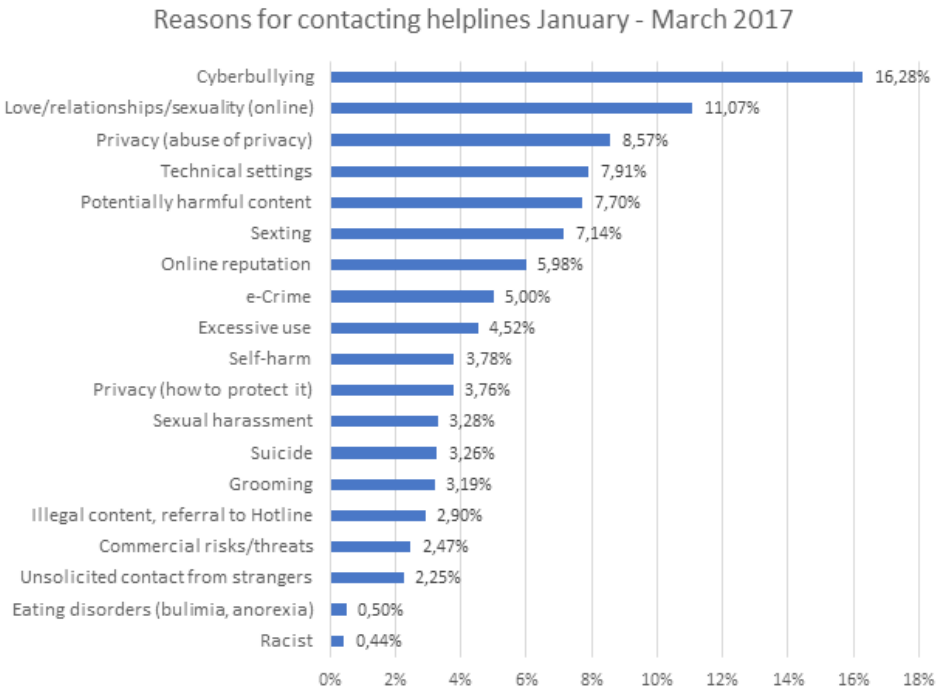

Figure 5: SIC helpline online risks children Q1 2017 (SIC, 2017b)

EU Kids online survey

Viewing from an European perspective towards cyber safety risks related to children one of the more important relevant studies is the online childhood studies of EU kids online (Livingstone, Sonia, Haddon, & Görzig, 2012). This broad study was conducted in 2010 and questioned 25.000 children (between 9-16 years old) on their behavior in cyberspace. The survey was updated in 2014 by adding questions on the use of mobile devices to access cyberspace. They questioned an additional 3500 children and a trend analysis can be performed for these years. This study provides an insight in the use of cyberspace by children and the negative effects (risks) they experience online. The survey uses a model (Barbovschi, 2013, p. 8) (Figure 6) which anticipates on the different influence factors a child acts in.

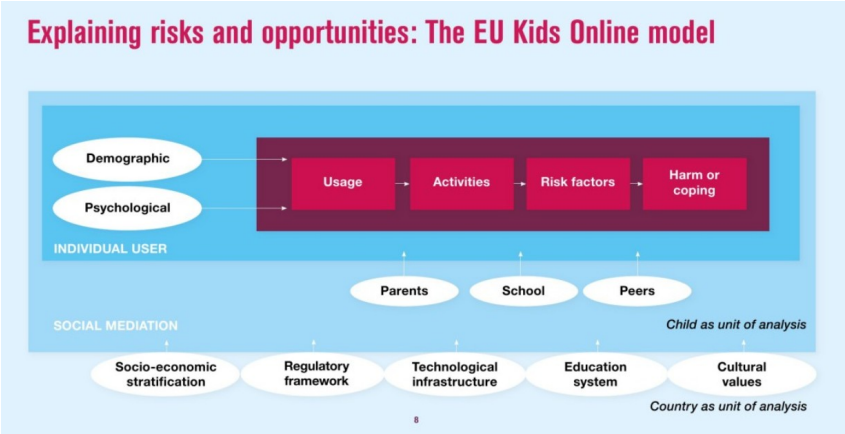

Figure 6: EU Kinds Online Research Model (Haddon & Livingstone, 2014, p. 8)

The research model divides the cyber risks ('risk factors') into three types of risk categories: content, contact and conduct (Table 1). According to the survey results the need for cyber safety awareness improvement gets clear: there is an increased trend of children being continuously more online, almost fifty percent accesses cyberspace (unattended) in their bedroom and for example risks regarding cyberbullying have increased during the years in the youngest age group (9-10 years old) (Livingstone, Mascheroni, & Ólafsson, 2014, p. 7).

Table 1: Risk categories of the EU kids online survey (Haddon & Livingstone, 2014, pp. 45–46)

Risk category	Definition	Examples
Content	Children receiving mass produced content.	Violent, hateful or pornographic content.
Contact	Children participating in (adult-initiated) online activity.	'Grooming', personal data misuse or other forms of sexual exploitation.
Conduct	Perpetrator or victim in peer-to-peer exchange.	Bullying, 'sexting' and potentially harmful user generated content.

When viewing the factual numbers of Dutch children (Haddon & Livingstone, 2014, pp. 45–46; Sonck & De Haan, 2011, pp. 22–27) being exposed to these risks we see that:

- Content: 22% of the Dutch children (between 9 to 16 year old) say they have seen pornographic images online (the European average is 14%). 5% of the children experience harm from that. 26% of Dutch children had encountered potentially harmful user generated content (e.g. hate messages, self-harm sites) versus the European average of 21%.
- Contact: 32% of the Dutch children (between 9 to 16 year old) engage in online contacts with strangers (EU average is 30%). 6% of these meet their online contact in real life (EU is 9%), 0,5% experience this as negative.
- Conduct: 15% of the Dutch children (between 11 and 16 year old) say they have received sexually explicit messages online. This is identical to the European average. 3% of these children experienced this as negative. 4% of the children (between 9 to 16 year) was victim of cyberbullying.

The results are not further specified for elementary school aged children, but give an indication of the degree to which children are exposed to online risks and experience these as negative. Boys and older teenagers are more exposed to risks, but girls and young children classify these experiences more often as negative. Especially nine and ten year old children report a negative experience online (in any of the previously mentioned risks): 40% has a negative experienced, which is twice as high compared to 15 to 16 year old children (22%). According to the research this is probably due to their lack of online risk experience.

Dutch: Dutch Youth Institute (NJi)

The NJi in their research report 'Media risks for children' (Nikken, 2013) combine different studies of children and media use, which include television and online media activities. Two types of distinctions are made between risks of media: time spent on media activities and the content of media offered. The first risk (Type 1) focusses mainly on the compulsive character (excessive use) of media. The second (Type 2) is about the risks of the content itself which is offered and can be (ab-) used by the child. Summarized the following risks are identified:

Type 1:

- Compulsive internet and game usage (approximately 1-4% of the young people show this behaviour).
- Diminished creativity and the less well developed social skills due to a lack of practice in real-life.

Type 2:

- Bad language development and rough language usage.
- Aggression, asocial behaviour, and fear due to influence of violent and aggressive media content.
- On- and offline bullying (cyberbullying).
- Sexualisation and unwanted contacts, being more sexually active due to online sexual content and unwanted contact via social media.
- Commercialization, materialism and unhealthy lifestyle: due to focussed advertising children are enticed to buy (unhealthy) products, they by accidently purchase online or never receive a purchased item.

Additionally, the NJi provides advice via a toolbox with fact- and tip-sheets for parents and educational professionals concerning media use per child age group. They describe the impact from media use in relation to how to cope with online risks and young children. In their overall tip-sheets (NJi, 2015) the risks identified are: Grooming (online abuse), cyberbullying, sexting, scams, and financial pitfalls. These are in line with the type 2 risks mentioned in their research. A cross check with another source confirms these risks: the Centre for research on Children, Adolescents and the Media (CCAM) of the University of Amsterdam confirms the importance of these risks, they mention them in their Media Use and Effects in Childhood paper (Vossen, Piotrowski, & Valkenburg, 2014).

Dutch: Rutger Foundation

The Rutger Foundation has as primary goal to help youth in making sexual and reproductive choices, respecting the rights of others, in a society that supports them. Their mission is to develop effective, scientifically substantiated interventions, which approach sexuality in a positive way, within different cultural contexts, with human rights as a starting point (Rutgers, 2016, p. 4). In 2012 they conducted one of their safety studies which is called 'Youth and Cyber Safety' (Kerstens & Stol, 2012). The survey examines the risks children face between 8 and 21 years old and how they cope with these risks. The model they use (Table 2) is a combination of the content, contact, conduct identical to the EU Kids Online survey, the role young people play (receiver, participant or sender) and the applicable risk area.

Table 2: Mapping of online risks to the role of young people (Kerstens & Stol, 2012, p. 22)

	Role youth		
Risk area	Receiver - Content	Participant – Contact	Sender - Conduct
Online sexual activities	View sexual explicit material (pornography)	Sexual communication, grooming, meeting strangers offline	Producing and uploading of sexual (explicit) material (images of the uploader self or peer) and strip for the webcam

Cyberbullying	Not Applicable	Being bullied by peers	Bullying of peers
Financial-economic crime	Commercial deception	Auction theft by others, virtual theft by others	Auction fraud conducted by youth, virtual theft conducted by youth

The research reveals that the more access the children have the more risks opportunities they face. When focussed on the Dutch elementary school aged children (4 to 12 year old) we see that 36,1% has their own personal computer, 7,7% has mobile internet, 14,8% has a game computer (often connected to the internet). 71,7% of the children can access internet without parental supervision which poses additional opportunities and risks. Hours spent in cyberspace are also a factor to take into account: for children 8 to 10 year old this is on average approximately one hour online per day however, this doubles for children 10 to 12 year old and continues to rise as children get older (up to four hours a day or more). The role of victim or perpetrator is surveyed as well and motives to understand which causes explain their behaviour.

When we look closer into the results we see that the children in the victim category the children aged 8 to 10 year old 8,6% has bad experiences with cyberbullying in the last three months. This increases to 10,8% for children age 11 to 12 (group 7/8 of elementary school). For the perpetrators 9,7% of the 8 to 10 year, and 18,7% of the 11 to 12 year old have actively cyberbullied in the last three months (primarily digital gossip). This research however does not follow the standard criteria for bullying: intention, frequency and power criterion (Derriks, Vergeer, Roede, & Felix, 2011, p. 11), but use four own defined categories: gossip, threatening and cursing, exclusion, and online posting of annoying or hurtful images. This own definition makes it complicated to compare results to other cyberbullying surveys.

Next to cyberbullying, the risks with regard to online sexual activities and online financial-economic crime are further elaborated, we have extracted the specific results for elementary school children and stated these in Table 3.

Table 3: Results Rutgers risk model for elementary school children

			Role youth	
Risk area	Age	Receiver - Content	Participant - Contact	Sender - Conduct
Online sexual activities	8-10 year old	17,4%	16,9%*	1,0%
	10-12 year old	23,6%		1,7%
Cyberbullying	8-10 year old	NA	8,6%	9,7%
	10-12 year old	NA	10,8%	18,7%
Financial-economic crimes	8-10 year old	8,3%	**AF 3,9% ***VT 11,0%	AF 1,3% VT 3,3%
	10-12 year old	8,8%	AF 4,9% VT 15,4%	AF 2,2% VT 7,7%

*No age distinction available in survey

**AF = Auction Fraude

***VT = Virtual Theft

A recent (2017) study from the Rutgers foundation provides elaboration on the risks of children and the sexual content online. The paper 'How often are children between 9 to 12 years on the internet confronted with sexually explicit images?' provides insight in that 66% of this age group sees nude

pictures online (Rutgers, 2017a). The Rutger Foundation survey is an extensive, reliable and one of the few Dutch focused researches whereby (young) elementary aged children are included. The only downside is that it does not follow a standard definition with regard to cyberbullying, which makes it difficult to compare to other cyberbully surveys.

To summarize this first part of the chapter: the purpose was to create a general background and insight in cyber safety risks for children. This to be able to understand what risks cyber safety awareness education should address. The output will be used in chapter 2 (empirical research) during the interviews to determine what safety measures school management boards currently apply to mitigate these risks (e.g. using certain teaching methods). We have used the content, contact, conduct model of Livingstone (Haddon & Livingstone, 2014, pp. 45–46) to summarize the risks in Figure 7. One of the weaknesses of the Content, Contact, Conduct model is that risks sometimes can be categorized in more than one group e.g. a privacy risk can be categorized as Content when companies collect personal data, but when an adult or peer publishes privacy details online this can be categorized as Conduct or Contact. To emphasize this blurriness the categories in Figure 7 are drawn overlapping.

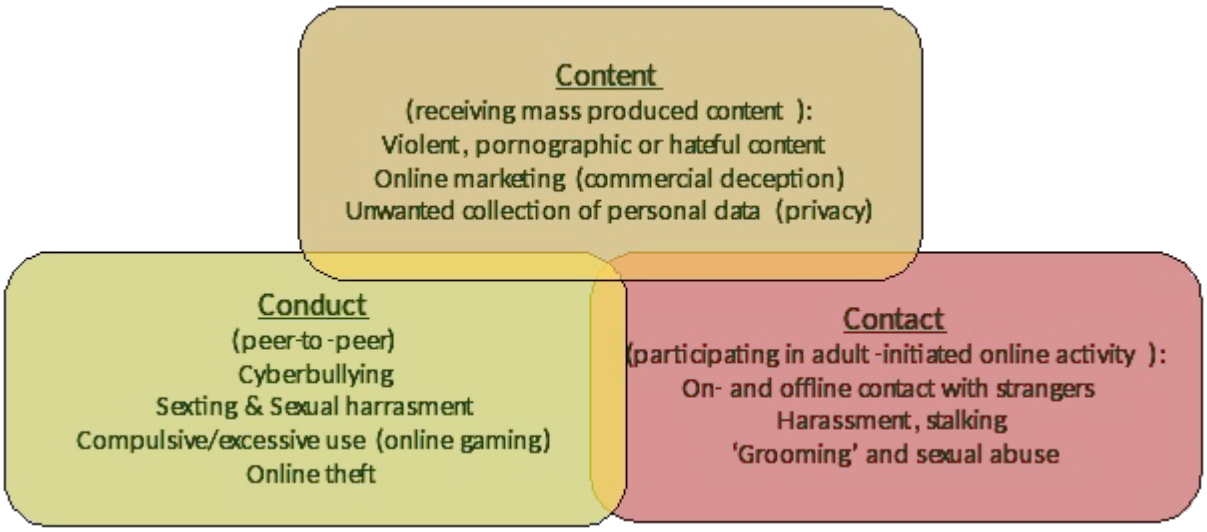

Figure 7: Summary of primary identified risks for elementary school children

Cyber safety awareness education

Definition of cyber safety awareness education

The term 'Education' originates from the Latin word 'educere' which is translated as raising and nurturing (Ensie, 2017). Education is also broader defined with terms like 'shaping', 'development of the individual' and the *'expansion of insights and knowledge of his life situation and citizenship' (Ensie, n.d.)*.

Since this research involves children at schools, a more obvious choice for an appropriate definition of 'education' is the pedagogy (the science of teaching). An early literature definition is of Dewey's 'Philosophy of Education' in the year 1916. He defines education as the process of continues growth through experience: *'that reconstruction or reorganization of experience which adds to the meaning of experience, and which increases ability to direct the course of subsequent experience' (Dewey, 1916, p. 76)*. He describes the education process in three conceptions:

1. Education as preparation: in this conception there is a clear distinction made between children and adults. Education in this respect solely prepares and trains candidates (children) to become fully educated for their role as adults.
2. Education as unfolding: in this conception the development of a person is the central topic. Development in the sense that it is an unfolding of latent powers towards a definite goal. The definite goal is utopian formulated as 'the realisation of perfection or completion'.
3. Education as training of faculties: Hereby the central idea is that a trained person can create their powers of accomplishment better that he would without training.

These broad conceptions can be recognized in the way education is defined in research on the quality of education: the definition from UNICEF is more holistic, the Dutch Youth Council has a goal oriented definition and the Dutch law on education provides a more rigid definition, we will briefly discuss these.

When we look at the education of children UNICEF provides insight in their holistic view of education stating *'education is a complex system embedded in a political, cultural and economic context' (UNICEF, 2000, p. 3)*. It is a holistic view in the sense that they view the child in the wholeness of society, not as a detached entity. With regard to the teaching or education of 'life skills' (these are development of attitudes, values and behavioural change, not only the development of a body of knowledge) two critical components are mentioned: the value of quality content and the importance of embedding this content in the context of quality processes. For the quality content the report mentions the education should emphasize in-depth rather than broad coverage of important knowledge areas. Focus on authentic and contextualized problems of study, and problem-solving that motivates skill development as well as knowledge acquisition. Education should also provide for individual differences, closely coordinate and selectively integrate subject matter, and focus on results or standards and targets for student learning. For ensuring the quality processes the importance of well trained and skilled teachers are mentioned, good school leadership (of management boards) with regard to managing the school, the support processes (both technological as well as administrative) and feedback mechanisms.

When reviewing the research report 'A rich education programme for every child' (Onderwijsraad, 2008) from the Dutch Education Counsel they provide a goal focused overview of the meaning of education. The counsel states that education evolves around two mutual interacting factors which influence each other: 'co-regulation' and 'adaptation'. Educators respond to the child in a particular way and the child responds again on educators. It is always a process of mutual influence and control which is called co-regulation. A second important characteristic of educating is that it is always about adaptation. Continuously adjustment processes takes place, including the wider environment

affecting both the child and the upbringing. Based on modern education orientations it is concluded that the main goals for educators to teach children nowadays are categorized into four goals:

- Autonomy: Development of self-esteem, bearing responsibility, being able to think critically and deal with emotions.
- Social feeling: To be tolerant, solidarity, taking others into account, helpfulness and respect for dissidents.
- Performance orientation: Stimulating attitude and behaviour around learning.
- Accommodating: Obedience, attachment to order, regularity and gentility.

In this report the importance of educational behaviour by educators in emphasized: For young children (0 to 6 years) initially the main sources for education are their family (parents, brothers and sisters). When children get older (6 to 12 years) their school (teachers) and peers become more important as well (Onderwijsraad, 2008, pp. 16–18). The behaviour of these educators towards the child is in their view very important. Finally they advise three strategies for continues education for children from 0 to 12 years old: First safety, stability and continuity should be provided. Second to stimulate broad child development but also to provide recreation and relaxation time. Finally to stimulate self-responsibility, give children the chance to actively participate and teach children to deal with (cultural) diversity and commonality (Onderwijsraad, 2008).

One of a bit rigid definitions (rigid in the sense that it states what is required, but does not assist in how it must be implemented) is of the Dutch law on elementary education (art. 8), which mentions three departure points (Onderwijsraad, 2008, p. 28). First children must be able to go through a continuous development process. Secondly, education must focus on their emotional and mental development, the development of creativity and the acquisition of necessary knowledge and of social, cultural and physical skills. Thirdly, education must take into account the fact that children grow up in a versatile society and aim to promote active citizenship and social integration, by paying attention to different backgrounds and cultures of peers.

We will summarize this chapter with the definition of cyber safety awareness education, this is based on deducting the essence of the above three descriptions in combination with the previous mentioned cyber safety definition (Grey, 2011, p. 77).

- From the UNICEF description the quality content and embedding this content in quality well trained and skilled teachers seem the most important aspects.
- From the Onderwijsraad the most important aspects are the co-regulation (guidance) and adaptation (tailoring) to the child.
- From the Dutch law the continuous development process and continuous emotional development are the most important.

This results in the aggregated definition: *'Cyber safety awareness education can be is defined as continuously teaching children safe and responsible online behavior, whereby skilled teachers provide guidance by using quality teaching methods, tailored to the social and emotional development of the child'*

Current status of cyber safety awareness of children

The challenge when we investigate the current status of cyber safety awareness is the fact that every research uses its own definition of awareness, as also found in previous research (Nikken, 2013). There are many different measurements (Kliksafe, 2017; Nikken, 2013; Pijpers, Boeke, Dondorp, & Heitink, 2017) which are hard to compare and therefore it provides often an ambiguous image. Sometimes measurements are based on skills or knowledge (or both), sometimes based on only risk perception, or it is based the results of an experiment e.g. sending a fake phishing e-mail (Dodge, Carver, & Ferguson, 2007). For children and cyber safety awareness the questions are sometimes asked to the children or their parents which produces different results (YoungWorks, 2014).

A survey which provides a recent insight in the current cyber safety awareness status in the Netherlands is a yearly recurring initiative called Alert Online[3]. Alert Online is a knowledge platform initiative that facilitates cooperation between government, business, education, science and consumers in the Netherlands. The Alert Online campaign aims to initiate and raise awareness of online and digital security and to enhance digital resilience. There are special campaign weeks dedicated to increase the awareness of Dutch community acting in cyberspace. Alert Online surveys a sample of the Dutch society yearly. In the 2017 survey of this campaign special attention was paid to young (10 to 12 year old) children being active online (Blanksma & Konings, 2017). The survey is conducted by independent experienced research organization Motivaction (Motivaction, 2018) which has over 30 years of experience in international market research. The independent respondents sample is representable for the Dutch society and correlated with the Golden Standard of the Dutch Central Bureau of Statistics.

Analysing the cyber safety awareness results of the Alert Online survey it first reports the results of the general Dutch community: Alert Online investigated the awareness of Dutch community aged between 13 and 80 years old. The result of their most recent 2017 study provide the following insights:

- 52% of the Dutch community does not worry about their online safety in their personal situation, 38% worries a little and 8% worries it a lot. Youth between 13 to 18 years and low skilled and low educated persons worry even less (exact number not reported).
- The expected risk perception of becoming a victim is low: 20% never worries about any online risk. Risk of becoming a victim of phishing mails is only 12% and any other risks of victimization mentioned like identity theft (5%), malware (7%), ransomware (6%) all score below 7%.
- Traditional attacks via hyperlinks in e-mail and e-mail attachments are perceived to be the largest risks to become victims of cybercriminals (64%), but newer threats like use of unprotected Wi-Fi networks, which can easily be used by criminals to eavesdrop on victims (Esther Aarts, 2014; Vanhoef & Piessens, n.d.), are by 20% perceived as a large risk.
- In practice 55% of the Dutch community has received phishing e-mails, 32% was requested to click on a link on social media. 14% actually clicked on a link which contained a virus, spam or phishing attempt and 8% was victim of ransomware.
- 63% of the community sometimes worries to become a victim of a cyber-attack however only 24% of these people are prepared to act on an attack (32% does not prepare at all and 44% does not know).
- From the 32% which does not prepare at all state they are unaware how to take measures (38%), their expectation is that the chance is very low that they encounter an attack (32%) or that they just have never thought of it (26%).

Summarized from this part of the survey: a large portion of the Dutch community is not aware how to act on cyberattacks due to low risk perception, lack of accurate and up-to-date knowledge and low estimation of chance on becoming a victim. A conclusion mentioned in this survey is that even though people state they are skilled to act appropriately on cyber risks in practice they only have a limited view of the actual risks and do not have the appropriate knowledge and do not consider it important.

There is a special section of the Alert Online report focused on cyber safety awareness of elementary school children (10 to 12 years old) the results state that:

- Nine out of ten children have a smartphone and seven out of ten children have their own account on one of the three major social media platforms: Facebook, Instagram and Snapchat.

3 https://www.alertonline.nl/

- 81% of the children indicate their parents are aware of what they are carrying out in cyberspace and social media, parents also know the passwords of their children's social media accounts.
- Children are often online without adult supervision, especially when smartphones are used (27% of the parents do not supervise at all, 67% sometimes).
- 70% of the children think they never do dangerous activities online.
- 26% of the questioned children state they use the same password for all their social media accounts.
- 59% has received a message or friendship request from a stranger (via WhatsApp or social media network) in the last three months. 28% has clicked on an unfamiliar link.
- 48% uses public unsecured Wi-Fi hotspots where no password is needed to log in, additionally 27% knows how to validate if they are using a secure connection. This is in line with a recent survey of the CBS regarding use of public unprotected Wi-Fi networks (Beuningen & Kloosterman, 2017, p. 9) (Figure 8).

The downside of this research is that it does not make clear distinction between exposure to risk and actual harm for the children therefore, we have to be cautious to draw harsh conclusions from these results. Nevertheless it provides us some insights: we can conclude that children spend a lot of their time in cyberspace which make them from that perspective experienced. However, when we compare these results to the previous mentioned definition of Cyber Safety (Grey, 2011) there are signals for improvement: when looked at the responsible use of ICT the lack of knowledge with regard to the risks of unprotected Wi-Fi hotspots seems an unawareness indicator. Also the usage of the same password for all their accounts seems worrying and clicking on an unfamiliar link is irresponsible behavior. Being approached by strangers online (part of the cyber safety definition) is relatively high but according to this research none of the participants has actually met a stranger offline (Motivaction, 2018, p. 53). The fact that children are unattended online for a large part of their time may be positive (parents trust them being cyber safe and children learn from own experience) but may also be factor to increase the chance of experiencing harm.

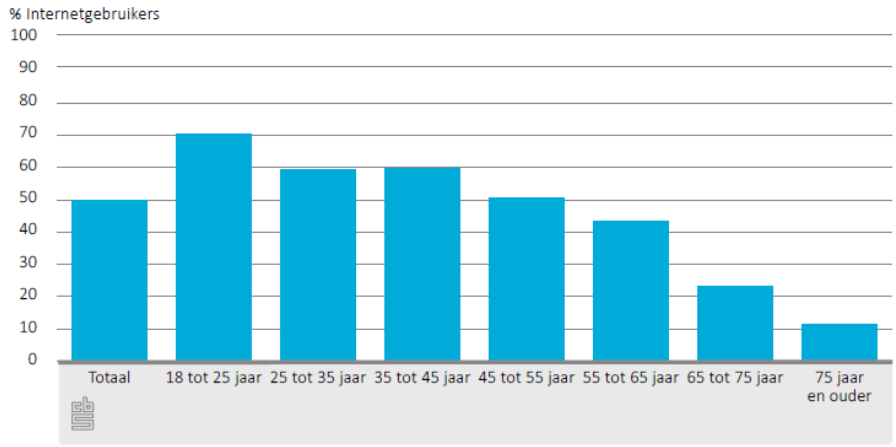

Figure 8: Percentage Internet users which use a public unprotected Wi-Fi network (Beuningen & Kloosterman, 2017, p. 9)

When reviewing the earlier EU Kids Online research performed in 2014 in which a specifically focus on country level exists (Haddon & Livingstone, 2014, pp. 45–46), the Dutch figures are compared to the average of other European countries. The diversity of online activities which children perform according to this research gives an indication of children's cyber experience which provides an indication for their awareness skills:

- For the Dutch youth social networking sites are most popular in the Netherlands: 80% of young internet users have their own profile compared to 59% for Europe as a whole. The

Dutch figures break down to 62% of those aged 9 to 10 year old, 77% of those aged 11 to 12 year, 86% of those aged 13-14 and 88% of those aged 15 to 16 year.

- Most Dutch children use the internet to watch video clips (89%, the EU average is 76%), play games (84%) or complete school work (78%). In addition, they relatively often use cyberspace to communicate with others, by sending e-mails (77%, above the European average of 61%) or by visiting a social networking profile (74% versus the EU average of 62%).

Awareness according to the model of EU kids Online (Figure 6) is gained by experience and getting assistance (active mediation) from people, especially parents, surrounding the children:

- Most Dutch children report that they have received active help by their parents in the past when something was troublesome to find (83%). Active mediation from peers (74%) and in lesser extend teachers (68%) was received.
- These figures drop when looking at harm: 27% received help from parents in the past when they were bothered or harmed by something online, 12% from peers and 9% from teachers.
- Almost all (98%) parents actively mediate their children's cyber use in one way or another, which is more than in most other European countries. This can be the monitoring of the child's social network profile and websites they visit (49%), share personal information to others online (89%). Rules are much less prevalent for uploading and downloading of content also the use of parental controls like software filters are rarely used (10%).

Finally, a recent (November 2017) published two yearly executed survey by Kennisnet surveyed the children's experience with digital literacy including cyber safety awareness. This is called the 'Monitor youth and media' (Pijpers et al., 2017). The questionnaire reveals that children are confident in their own digital capabilities. However, currently school hardly have a role in teaching digital (awareness) knowledge and skills. Young people learn their cyber competencies according to their own opinion in their spare time and are primarily helped by their parents. Due to the high reliance on the parents we see an emerging '*digital divide' (J. Van Dijk & Hacker, 2003, p. 315)*: Children with lower educated parents receive less cyber safety awareness education from home than children with higher educated parents. The researchers of this survey discovered a significant difference between the level at which students assess their own cyber (awareness) skills and their actual skills in practice. There is a case of self-overestimation: children think they are aware of the cyber risks and state they know how to act in risky cyber situations but in practice their actuals skills turn out to be less developed. Many of them have problems with searching the internet and valuing information. For example: less than half of all children are able to critically review and use online information. From the previous version of this survey (2015) we see there is a demand from children for more cyber safety awareness training from schools: in the survey the question *'What digital topics should get more attention at school? (Nikken et al., 2015, p. 73)* more than four out of ten children answers they would like to learn more about how they can enhance their privacy and security in cyberspace. This is confirmed by the survey on the digital rights of children by Mediawijzer.net: '*The use of media should be safe for children'*, *'Children should be protected online'* (YoungWorks, 2014, p. 14) are ranked as two of most important rights.

As a general conclusion for these surveys we see that with regard to the current status of cyber safety awareness of children an ambiguous picture, but a number of factors show:

- People state they are cyber security aware but often are not knowledgeable or interested to effectively handle a cyber risk. This could be caused due to the optimism bias whereby a person's tendency is to believe that a negative event is less likely to occur to them than other people (Weinstein, 1984).
- Under- and overestimation by children: children underestimate the chance of getting into a risky situation faced online and overestimate their own capabilities. They are from functional perspective skilled but do not oversee the (long-term) impact of online risks.

- As educators their parents are the primary sources for awareness educations and currently schools teachers still play a minor role. Due to rise of the smartphone usage it is more difficult to monitor their children's behaviour online and properly teach children cyber safety awareness.
- A growing digital inequality emerges due to dependence of children on their (socio-economic) home-situation. Educators can contribute to close this gap by teaching cyber safety awareness (Stichting Kennisnet, 2016a).

Defining awareness education evaluation criteria

In this research we will approach cyber safety awareness education both from literature as well as from practice by interviewing school management boards. To be able to evaluate their schools current status with regard to cyber safety awareness education we define five evaluation criteria that are analysed during the interviews. A number of criteria are selected based on proven effectiveness of (general) awareness campaigns. The criteria are used for determining the current status of cyber safety awareness education at six Dutch elementary schools.

Table 4: Cyber safety awareness education evaluation criteria

Evaluation criteria	Description
Vision on educating awareness	In general for education the Dutch education council recommends that elementary schools develop an integral vision of the development of children, in which both the cognitive-intellectual and the social-emotional domain are dealt with (Onderwijsraad, 2011). Both domains can reinforce each other, since the development of children on one domain often takes place simultaneously with the development on a different domain. Within the report of Kennisnet (Stichting Kennisnet, 2016b) a link between cyber safety awareness, media literacy and vision is made. According to Kennisnet a school is cyber aware if not only the pupils, but all those involved learn to deal with media wisely. So also teachers, other staff and parents. In a media aware school media are deployed on the basis of conscious choices made from the own vision on education. That means that there is not one blueprint for a media aware school but it's vision is tailored to the elementary school. Also the importance of vision as a guideline for the teacher is emphasized: teachers and learners (not technology) as the vital resources at the heart of the vision for how digital and media literacy competencies are best acquired (Hobbs, 2010).
Awareness method adapted to the child level	An important characteristic of a good awareness education method is that is can be adapted to the target audience characteristics (E. Kuiper, Volman, & Terwel, 2005, p. 294). It should be tailored to the social and emotional development of the child: children of different ages learn in different ways and different mental maturity states can be distinguished (Nath, 2009, p. 73). We see this also confirmed in the learning goals and reference frame requirements[4] set by the SLO regarding what exactly must be taught per age group in elementary schools. When adapted to the child level the possibility for peer-learning also increases: children teach each other how to become aware for risks of cyberspace, this is proven to be effective (Atkinson, Furnell, & Phippen, 2009). The UK government responsible for child safety online summarizes it clearly in their good practices for content providers of digital media and services with regard to education and awareness: *'Importantly, tailor the language, educational messages and approaches in a way a young user can follow' (Parola, 2015, p. 43).*
Integrated in curriculum: - Embedded in the curriculum - Relevant stakeholders involved	Integration of awareness education via embedding it in the curriculum was proven to be effective based on an international survey whereby an analysis was executed to enhance the sexuality awareness education of primary school children (Walker & Milton, 2006). It was concluded that multiple levels from the individual, organisational and policy perspective to tackle the awareness education issue was needed. Integration across the school curriculum and development of a cooperation strategy by the elementary school should assist in creating awareness. Also important is that integration can be regarded broader than the curriculum itself given within the school environment: a literature research of a sun protection awareness campaign (Thornton & Piacquadio, 1996) showed the importance of the integral involvement of multiple parties like teachers, parents and media to make children more aware, and helps to remember it even weeks after the training.
Appropriate skills and knowledge of teachers	Expert knowledge or educated and experienced teachers: to be able to effectively create awareness to elementary school children an educated knowledgeable teacher should educate the children (Chou & Peng, 2010). The importance of skills is also backed-up by the different competencies defined by

4 http://tule.slo.nl/

	Mediawijzer.net. They have defined competency levels for teachers to be able to verify if these have sufficient competency skills to teach children media literacy and media awareness (Mediawijzer.net, n.d.). Additionally, also from literature regarding the teaching of environmental awareness it is stated: *'the teaching must be one that makes the subject interesting and relevant to children. In order for this to happen the teacher must be enthusiastic, knowledgeable and be able to present the subject-matter in a way that accords with the perceived reality of the child's world' (Nath, 2009, p. 131).*
Learning theory endorsement	The importance of a learning theory or behaviour ideology for the development and supporting the awareness education is emphasized: '*Effective programs used social learning theories as a foundation for program development. In general, the effective programs were based upon theoretical approaches that have been demonstrated to be effective in influencing other health-risk behaviours; for example, social cognitive theory, social, influence theory social inoculation theory, and cognitive behavioural theory' (Kirby et al., 1994, p. 356)*. This is confirmed by an evaluation and analysis of 59 safety awareness approaches which have been proposed over years between 1985 and 2003: The approaches can be categorized in two social learning theories: cognitive and behaviour learning theory (Puhakainen & Mikko, 2006). The cognitive approach focusses on the ratio of the human and tries with persuasive communication (with arguments) to change behaviour. The theory relies on the ideas that people will not change if they do not understand why they need to change. They need to process the information to create an understanding in a meaningful way. The behaviour learning is based on the idea that changes in behaviour of people are the result of changes made to variables in the environment of the people with the regard to a reaction on the unwanted behaviour. This can imply the use of punishments (for bad behaviour) and rewards (for good behaviour). When we take a broader perspective at more recent elementary school theory trends, we see that many education developers see the importance of the constructivism theory (Shuell, 1988). Constructivism is based on the idea that the learning person does not directly absorbs the information provided but first interprets, processes and assimilates it. The main characteristics of constructivism are defined by T.J. Shuel in the sentence '*Learning is an active, constructive, cumulative and goal directed process….' (Shuell, 1988, p. 278)*. The social constructivism is on the basis of 'Het nieuwe leren' (the new learning) in the recent decade development in the Dutch elementary and secondary school systems which is a current rebelling of schools against the traditional teacher-student schooling system whereby the teacher is only transmitting information. Primary characteristics of 'Het nieuwe leren' current as stated in research for the Ministry of OC&W are: Attention for self-regulation and metacognition, space for self-learning, learning in an authentic learning environment, learning as a social activity, learning by usage of ICT and the use of new assessment methods. Even though the full transformation and adaptation of new teaching methods by schools is limited (Oostdam, Peetsma, & Blok, 2007) elements are often used to modernize the current teaching methods.

These criteria will be used in the following chapter (page 36) during the interviews with elementary school headmasters to evaluate the current status of cyber safety awareness education.

Models on cyber safety awareness education

From cyber safety model perspective an important document from the Dutch government perspective is the plan of approach to develop more cyber safety awareness education in the Netherlands. This important government policy document is the National Cyber Security Strategy -2 released in 2015 (NCSC, 2013). It states on the front page of their policy document: 'From awareness to capability' which is explained in the strategy. The focus of the 2011 strategy was to create awareness in contrary to ignorance, for the 2015 version they take it a step further and develop capabilities to protect Dutch society from cyber security risks. This is also the link to other awareness items mentioned in the strategy: the Dutch government expect that citizens should develop baseline knowledge and skills to be safe in cyberspace. They see their role in reaching this goal via awareness campaigns and supporting developing digital skills (NCSC, 2013, p. 22). When further investigating their strategy the importance of education is recognized: according to the strategy the education has been underexposed. Even though this remark is mainly focused on the lack of sufficient skilled security professionals it has opted the Netherlands for a broader focused skill development approach starting from elementary school up to university. Their implementation strategy is a Public Private Partnership that will be formed to focus on educational development of cyber safety in the current curriculum of the education system in the Netherlands. However, for the time being, connections are

sought with already existing initiatives (Technology Pact 2020[5] is mentioned). The current ambition for cyber safety awareness in education appears to be limited to already existing available initiatives.

From international perspective the EU and other international organizations e.g. initiatives of the OESO and UNESCO but also the US based EnGauge and P21 Partnership for 21st century learning (Voogt & Roblin Pareja, 2010) we see a number of initiatives with regard to education for growing up in the 21st century. They all envision the fast changing technological environment children are growing up in and therefore focus on the need to educate digital skills to be well adapted to function in the 21st century. These organizations foresee the continues change from to an industrial to a knowledge based international society. When we take a closer look at the safety awareness aspects mentioned by these initiatives the terms 'Digital literacy', 'Media literacy' and 'Information skills' in relation with the term '21st century skill learning' are mentioned. All models refer to three domains: A technical domain (related to the basic skills that necessary to use ICT), a knowledge domain (that refers to the use of ICT knowledge acquisition as a goal) and an information domain (focused on the capacity to find, evaluate and use information). However, the emphasis in the different models is different per domain. These terms and domains seem to be primary components to be able to function effective in the 21st century and also provides the connection to the Dutch policy on cyber safety awareness.

The Dutch Council for Culture introduced media literacy 2005 as *'the whole of knowledge, skills and mentality that makes citizens aware, critical and active being able to move in a complex, changeable and fundamental medialized world'* (Hulshof et al., 2005, p. 2). According to Kennisnet this description is seen by many as the basis and accurate, but also difficult to work in practice (Borgdorff, Desain, Steffens, & Slegtenhorst, 2013, p. 23). Due to this difficulty there are a number of translations made by centers of expertise. Often mentioned initiatives are from Mediawijzer.net, Mijn Ouders Online ('My Parents Online') and the Nationaal Media Paspoort ('National Media Passport').

The authors of Mijn Ouders Online, a centre of expertise, developed in 2010 for teachers a more applicable and usable operationalization of the Council for Culture definition. They use as a starting point a vision focused on fun and creativity of the child to effectively educate media literacy. From their handbook they re-define media literacy as '*Media literacy for children is the knowledge, attitude and skills required to cope with media on a technically competent, creative, analytical and reflective way, for his or her own welfare and the personal development which is necessary to function as a democratic citizen of the 21st century*' (Pardoen & Zwanenberg, 2010, p. 32). On the basis of this definition, they distinguish four essentials media wisdom aspects, which together cover the entire field of media wisdom in education:

- *Technique:* Mastery of technical (computer) skills that are necessary for children to make media productions and to participate in social networks.
- *Creativity:* The use of media for artistic expression and creative interaction with media participation and innovation.
- *Analysis:* Knowledge about the functioning and influence of media in general, and being able to interpret media messages.
- *Reflection:* Being aware of own attitude and behaviour towards others through media, but also from the value of civil rights as privacy and freedom of expression, and moral issues like online respect and tolerance.

Additionally they provided a media literacy measurement tool for educators to measure the current status of media literacy (Figure 9).

5 https://www.techniekpact.nl/

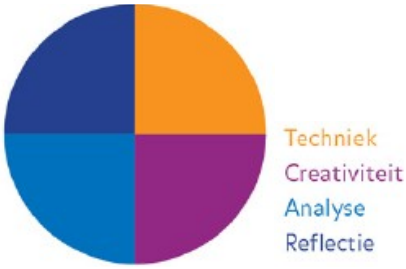

Figure 9: Media Literacy measurement circle

Mediawijzer.net has developed the Media Literacy Competence Model in 2012 on the basis of ten competencies (Mediawijzer.net, 2013). The model consists of four main groups (Understanding, Use, Communication, and Strategy), divided into ten competencies. For every competence there is a division into five levels. The classification and description of the ten competencies were developed on the basis of expert insights. There is a specific version with competencies for elementary school children. Due to the fast changing developments of digital media the model is dynamic and future adjustments can be made.

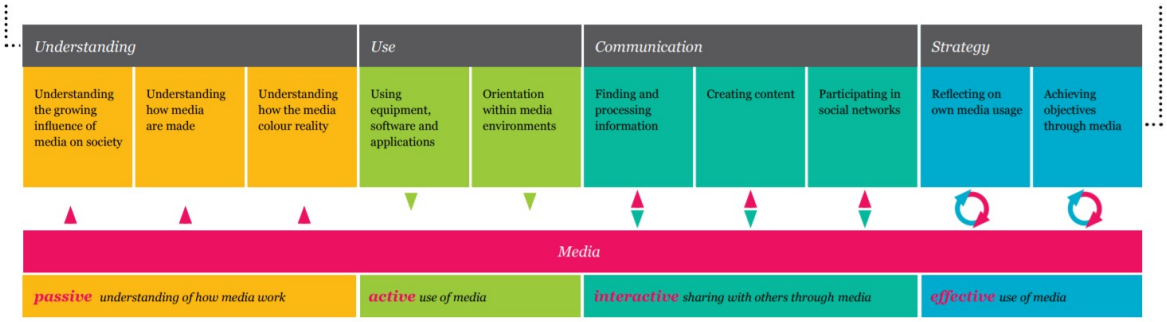

Figure 10: Mediawijzer.net Media Literacy Competence Model (Mediawijzer.net, 2013)

The Nationaal Media Paspoort[6] which is an initiative of the National Academy for Media and Society has developed together with the University of Amsterdam and social sciences department of the Radboud University of Nijmegen a teaching method based on scientific research which builds upon the competence model of Mediawijzer.net. This continuous curriculum is supported by the Scientific Council, consisting of scientists from six different universities in the Netherlands and Belgium. It is from cyber safety awareness supported by the advice of the Cyber Security Council which states in their 2015 advice that *'children in primary education should obtain a digital proficiency certificate. This skill card enables children to safely act in the digital domain'* (CSR, 2015a, p. 6). The goal of the Media Passport is that by applying an original, interactive teaching method, aimed at learning by doing, children will experience how they can acquire the right knowledge, intuition, motivation and skills to handle digital media well. The reward for the child is the National Media Passport, which is felt by a child as an important certificate. The importance for cyber safety awareness education is the risk preventive and easily applicable themes which form a continuous curriculum from group one till eight of the elementary school. There are seven themes which can be followed (Nationale Academie voor Media en Maatschappij, 2014):

- Know what you see online (e.g. what is true and what is false in the media?).
- Monitor your identity (e.g. who you are online?).
- What you give you get back (e.g. respectfully dealing with each other, online bullying).
- Keep an eye on the clock (e.g. the time you spend on online and offline games).
- Make good choices (e.g. how do you divide your online life?).

6 https://www.nationaalmediapaspoort.nl/

- Protect your privacy (e.g. what is private and what may others know about you?).
- Take care of your own safety (e.g. who can you contact if you need help and advice?).

This initiative seems a success since according to their website already 25.000 schools use their method. However, it is on a voluntary basis and from their website it is unclear how many elementary schools are using the method.

After investigating media literacy models of expert centers which cover cyber safety awareness at elementary schools in the Netherlands there are two government initiatives relevant, whereby one is directly related to the other. The first is called Curriculum.nu (previously Platform Education 2032) an initiative started by the Dutch Ministry of OC&W in 2014 to define the curriculum of the 21st century whereby the active role of many stakeholders is requested. This leads to new initiatives for the curriculum of the future (mentioned as the 21st century skills and digital literacy) aligned with educators (Onderwijs2032, 2017). In this initiative however, the term cyber safety awareness is not mentioned, only the digital literacy as part of the 21st century skills is specifically mentioned. The second initiative gives more insight in digital literacy linked with cyber safety awareness: the Ministry of Education, Culture and Science (Ministry OC&W) has requested the SLO (Foundation for Curriculum Development) to investigate and develop a curriculum with the 21st skills for elementary and secondary education. Special attention was requested for developing digital literacy skills (Thijs, Fisser, & Hoeven, 2014). This resulted in the development of a 21st century skills frame of reference that contains eleven necessary skills to be educated to children in elementary and secondary education. Four of these skills are made explicit for digital literacy (figure 2). The four are: Computational thinking, Basic ICT skills, Media literacy and Information skills (Thijs et al., 2014, pp. 27–30).

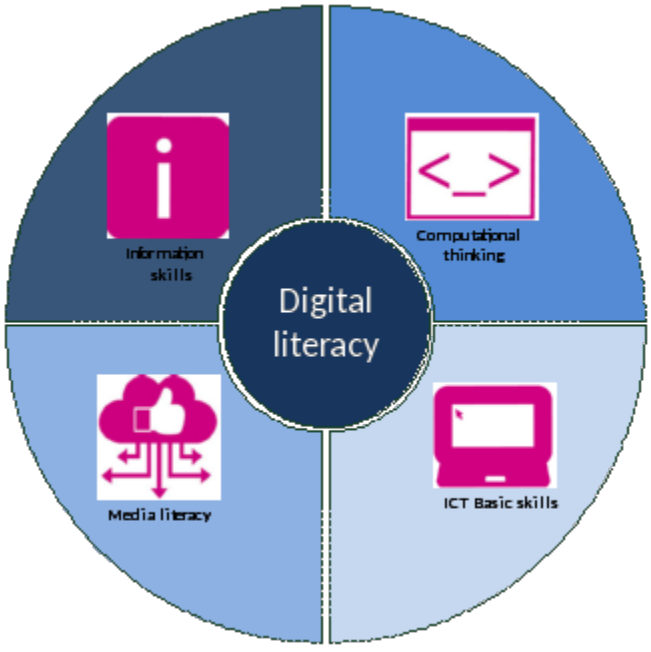

Figure 11: Digital literacy defined by the SLO (Thijs et al., 2014, p. 33)

The SLO has written a curriculum reference frame with skills to be learned per age group (Strijker, 2017a, 2017b, 2018). We have analyzed from these reference frames the cyber safety awareness risks of Figure 3 being addressed, together with a definition of the skills, in Table 5. We see that the cyber safety risks are covered in the media literacy part of digital literacy model. The risks of cyberbullying are not specifically addressed in the reference frames, which could be due to school already being obliged to have a generic bully protocol (SSV, 2017). Sexting and sexual harassment are

probable seen as items more for adolescents at secondary school. It is unclear why 'Grooming' and sexual abuse risks are not addressed, but this may be part of acting safe in social networks.

The conclusion can be drawn that there is attention for cyber safety awareness from the government via the developed digital literacy curriculum of the SLO. From these four digital literacy skills we can see that cyber safety awareness and digital literacy are connected to each other in Dutch elementary curriculum development. This model is the basis for developing the new obliged core objectives for digital literacy skills by Curriculum.nu and will therefore be an integral part of the new to be developed elementary school curriculum. As this model is recognizable for elementary schools (Pijpers, 2017b) and a large part of the risks are covered (by digital literacy) we will use this model as additional input for the interviews with elementary schools.

Table 5: Digital literacy skills in relation to cyber safety awareness (Strijker, 2017c)

Digital literacy skill	Description	Cyber safety awareness risk addressed (Figure 7)
Computational thinking	Processual formulation of problems in such a way that it becomes possible to solve the problem via computer technology (computer programming).	
Basic ICT skills	The knowledge and skills needed to understand the functioning of computers and networks, in order to be able to cope with different types of technologies and to understand the operation, capabilities and limitations of technology.	
Media literacy	The whole of knowledge, skills and mentality in which citizens can consciously, critically and actively move in a complex, changeable and fundamentally socialized (media) world.	Violent, pornographic or hateful content Online marketing (commercial deception) Unwanted collection of personal data (privacy) Compulsive/excessive use (online gaming) On- and offline contact with strangers Harassment, stalking Online theft
Information skills	The ability to formulate and analyze information from sources critically, to systematically search, select, process, use and refer to relevant information and evaluate and evaluate them for usability and reliability.	

Stakeholders surrounding elementary school and educational publishers management boards and their relationships

In this section we will explore the stakeholders surrounding elementary school management boards and educational publishers with regard to cyber safety awareness education. The structure of this chapter (Figure 12) is based on two sub-divisions: The background of both elementary education as well as educational publishers are described, to elaborate on the choice for these primary actors and their relationship. In following step we will describe an initial stakeholder model (similarly to Figure 1) to provide insight in the primary stakeholders related to school management boards and educational publishers. In the next chapter we will update the model with new relevant stakeholders based on the output of the interviews.

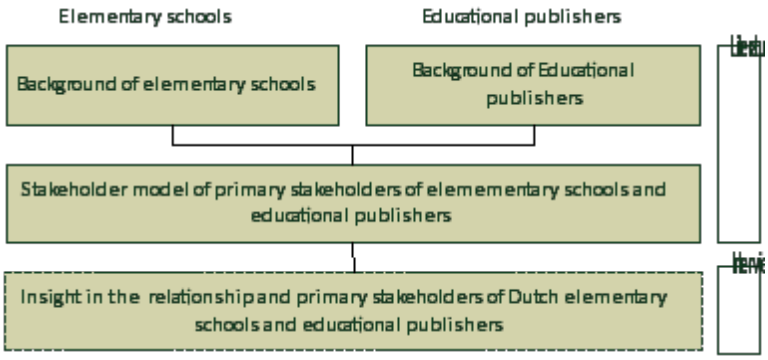

Figure 12: Subdivision of the literature study for the second sub-question

Background of Dutch elementary schools

To provide an initial insight in the playing field and challenges of elementary schools (e.g. aging personnel population) we describe some key figures and developments of elementary school primarily provided by the PO Council (PO Raad, 2017b) and CBS (CBS, 2017).

Current status of elementary schools:
After a continues growth of the number of children since the 90's we see since 2010 that there is a continuous decrease in the number of children on elementary schools: on average every year 15.000 less children (from 1.497.832 to 1.427.453 children). Prognosis until 2023/24 is that this decrease will continue with approximately 9.000 children a year. The number of children per school is on average 223 children and has remained steady in since 2012. The average class size has remained steady on average 23,3 children per class however, this number is distorted due to large dispersions in rural areas versus cities: 6% have more than 30 children (Wouda, 2017).

Financially elementary schools are relatively healthy with a positive solvency (ability to meet long-term debts) according to the Education Inspection for the financial year 2015 (Vogelzang, 2015). 80% of the costs of elementary schools are labor costs, together with housing costs these have caused an increases in overall costs in the last three years. Schools receive from the government a lump sum compensation which is based on the number of attending children per school therefore, 93,9% of the total school compensation is depending on government support (Vogelzang, 2015, p. 12).

The size of the total education staff (teachers, headmasters and supporting staff) in the elementary education has declined since 2011 fairly sharp. Compared to October 2011, it decreased by approximately 10,500 FTE's (-8.0%). With regards to the workforce aging: 35,8% of the total number of elementary school teachers was above 50 years old in 2016, for educational support staff this was even higher: 47,8%. It is estimated that due to this aging there will be a shortage of over 4000 teachers and headmasters in 2020. The shortages are highest in the larger cities. In the upcoming years, the differences between regions will increase (Rijksoverheid, 2017).

Due to a full curriculum and additional tasks for teachers there is within elementary education, a structural growing dissatisfaction with regard to the continuous work pressure and salary difference with teachers of secondary education. In 2017 teachers have been on strike on three different occasions (PO Front, 2018). Causes for the work pressure differ depending on which stakeholders (e.g. Ministry, PO Council, school teacher or management board) are questioned but in general the administrative regulatory pressure is seen as a general cause (PO Raad, 2014b).

Subjects and teaching methods:

The compulsory subjects from government at elementary schools are: Dutch, English, Mathematics, Self-orientation and World orientation (Geography, History, Biology, Traffic training and Civics education), Artistic orientation (Music, Drawing and Craftsmanship), Physical education: (Gym classes), Sexuality, Science and Technology. The expert center SLO describes the content of core objectives for primary education per age group. This describes what a child needs to know and do at the end of every school year. Subjects for which core objectives apply are a legal obligation, it means that all Dutch elementary schools need to teach these subjects. The school decides how they give substance to these subjects and by which teaching methods.

The intention of the law on freedom of education states that schools should be free to choose (or develop) their own teaching methods. However, due to the regulatory pressure, teachers heavily lean on the teaching methods provided by the educational publishers: 86% mainly use standard teaching methods (Blockhuis, Fisser, Grievink, & Voorde, 2016, p. 9). One of the other primary reasons for the use of standard methods is the expectation teachers will comply to the core objectives. Expectation of teachers is however, that the use of standard teaching methods will decline to 61% in the upcoming five years (Blockhuis et al., 2016, p. 11). We see an offering of methods by educational publishers on paper, fully digital and digital blended methods (Spanjers, Könings, Leppink, & Merriënboer, 2015). Standard teaching methods are expensive as a learning mean (W. van Dijk, Griffioen, & Kuipers, 2006) and schools use multiple methods, which are educated and amortized on average in eight years (Reinders, 2013). Long usage periods are mainly caused by contracts with educational material suppliers and these periods sometimes double depending on the elementary school (Both, 2008).

Within elementary schools the digitalization and use of cyberspace has entered the classroom (Brummelhuis & Binda, 2017, p. 5): Use of Digi board (79%), use of digital learning materials during class (62%) usage of a digital teaching method (57%) are becoming more common. Even though the use of digital teaching methods is becoming common, hurdles like a lack of a good quality IT infrastructure, availability of enough computers and ICT problems limit teachers to use them more often (Blockhuis et al., 2016, p. 26). When we look further we see that even though teachers are using these digital methods, the answer on the question if they also educate children how to safely act in cyberspace only 10% confirms this (Brummelhuis & Binda, 2017, p. 5).

Background of Dutch Educational publishers

To provide insight in the playing field of educational publishers and there challenges (e.g. market competition) we describe some key figures and developments primarily provided by research of PricewaterhouseCoopers (PwC).

Current status with regard to educational publishers:
Based on the Entertainment & Media Outlook report of PwC the Dutch market for educational publishers consists approximately 40 educational publishers, whereby the three largest are: Noordhoff, Malmberg and ThiemeMeulenhoff and possess 90% of the market (PwC, 2014, p. 87). Annual revenue was 391 million euros in 2015 and is expected to grow to 406 million euros in 2020. The printed books are expected to stay the primary income source until 2020 but are declining (-0,5% per year). The electronic education materials are expected to grow 15,2% during these four years. According to the PwC report the slow decline in printed books is mainly caused by the fact that teaching methods are generally bought by schools to be used for a number of years, and '*the educational sector tends to be slightly conservative and favours traditional teaching methods*' (PwC, 2014, p. 87) according to this report. This development is confirmed by Dutch teaching method research: five methods were used by 90% of the 467 schools, the five methods were offered by only three educational publishers (Hinloopen, 2012).

Teaching methods:

With the arrival of 'basic education' ('basisvorming') in 1993 (Rijksoverheid, 1993) and the associated establishment of core objectives and reference frames by SLO, the standard educational teaching methods became increasingly prevalent. Schools encountered problems with the translation of core objectives to teaching practice and publishers responded to this. They ensured full coverage of the core objectives and grew into experts in the development of standard teaching methods. They offer schools and teachers a lot of guidance and assurance. However, the commercial interests of publishers and the dominance of only a small number of parties in the market resulted into rising method costs (Carstens, 2017). The standard teaching methods of the well-known educational publishers are familiar and give guidance to both teachers as well as school management boards. They provide a clear continuous overview of the curriculum over several years, it saves development time and teachers do not have to develop the necessary expertise in a certain topic.

According to the innovative educational trends the developments of adaptive digital teaching methods are seen as essential (Peeters, 2017): Education becomes more personalized to the individual child, therefore the teaching materials also need to be adapted. Educational publishers recognize this trend and offer fully digital and blended methods, but it also opens the market for new competitors. In the recent years there are new entrants which focus on exclusively offering teaching methods digitally via their own platform or in combination with a digital device (tablet). Examples are Snappet[7] and Gynzy[8] they offer flexible alternatives (license fee based) for the standard teaching methods. However, these competitors are accused of fake competition and prosecuted by the large educational publishers since their teaching methods contain remarkable similarities with the existing methods of the large publishers. Through this way they try to circumvent copyright fees (Voorwinden, 2017).

Stakeholder model of elementary schools and educational publishers

In this last section we present a stakeholder model which provides insight in the important actors for educating cyber safety awareness. Together with the social-ecological model of Bronfenbrenner (Bronfenbrenner, 1994; Mooren, 2006) a model is presented as a starting point for the stakeholder overview (Figure 13).

7 https://nl.snappet.org/

8 https://www.gynzy.com/

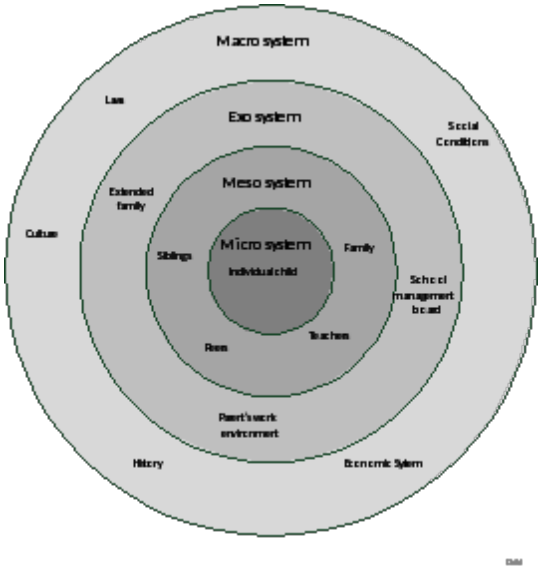

Figure 13: Bronfenbrenner's Ecological Model (Mooren, 2006, p. 18)

The underlying assumption of Bronfenbrenner's Ecological theory is that to understand the child's development we should understand the context and complexity of the relationship systems which comprise the child's environment. The model contains three different viewpoints: First the perceived spatial or material aspect (the psychical dimension). Second the persons (or group of persons) with their different relationships (the social dimension). Thirdly the actions which these persons perform alone or together, including the meaning of the actions (the action dimension). In addition to these three points of view Bronfenbrenner distinguishes a multiple concentric system influencing each other in his model. These systems are the micro system, the meso system, the exo system and the macro system and are summarized in (Bronfenbrenner, 1994, pp. 39–41).

Table 6: Definition of Bronfenbrenner's micro, meso, exo, and macro system (Bronfenbrenner, 1994, pp. 39–41)

Type of system	Definition from theory	Interpretation used in this research
Micro	The direct experiences of a child itself in a certain (social) setting. Children usually come into contact with various micro systems, such as the family micro system and the school micro system (teacher).	The stakeholders directly educating and influencing a child: parents, peers and teachers.
Meso	A meso system compromises the interrelations among two or more micro settings in which the developing person actively participates.	These are mutual relationships between the stakeholders directly educating and influencing a child, e.g. relation between teacher and parent and between peers and parents.
Exo	The exo system consists of factors where the child is not directly part of, but indirectly does influence him. Examples are the parent's work environment and the management board and policies of the school.	The indirect stakeholders for the child but contain the primary actors for this study: the school management board, educational publishers, and related suppliers.
Macro	This refers to consistencies, in the form and content of lower-order systems (micro, meso, and exo) that exist, or could exist, at the level of the culture as a whole, along with any belief systems or ideology underlying such consistencies (Bronfenbrenner, 1994, p. 26). For example, religion, politics and the organization of the education system.	These stakeholders are directly linked to the exo system stakeholders and influence the whole eco-system. In this research the government policy makers and expert knowledge centers with regard to creating cyber safety awareness education via digital literacy.

For this research the micro system is seen as a 'grey box': we do not focus on stakeholders and their relation with the children. We will focus on the other three system types and their mutual relationships. The current stakeholder model based on the literature including a description of the stakeholders are presented in Figure 14 and Table 7. During the expert interviews digital literacy experts are asked how (relative) important the stakeholder is and their mutual relationship with other stakeholders. The result will be a more a more extensive version of the stakeholder model (Figure 14). Additionally, bottlenecks will be added to the model to provide insight in the mutual relationships.

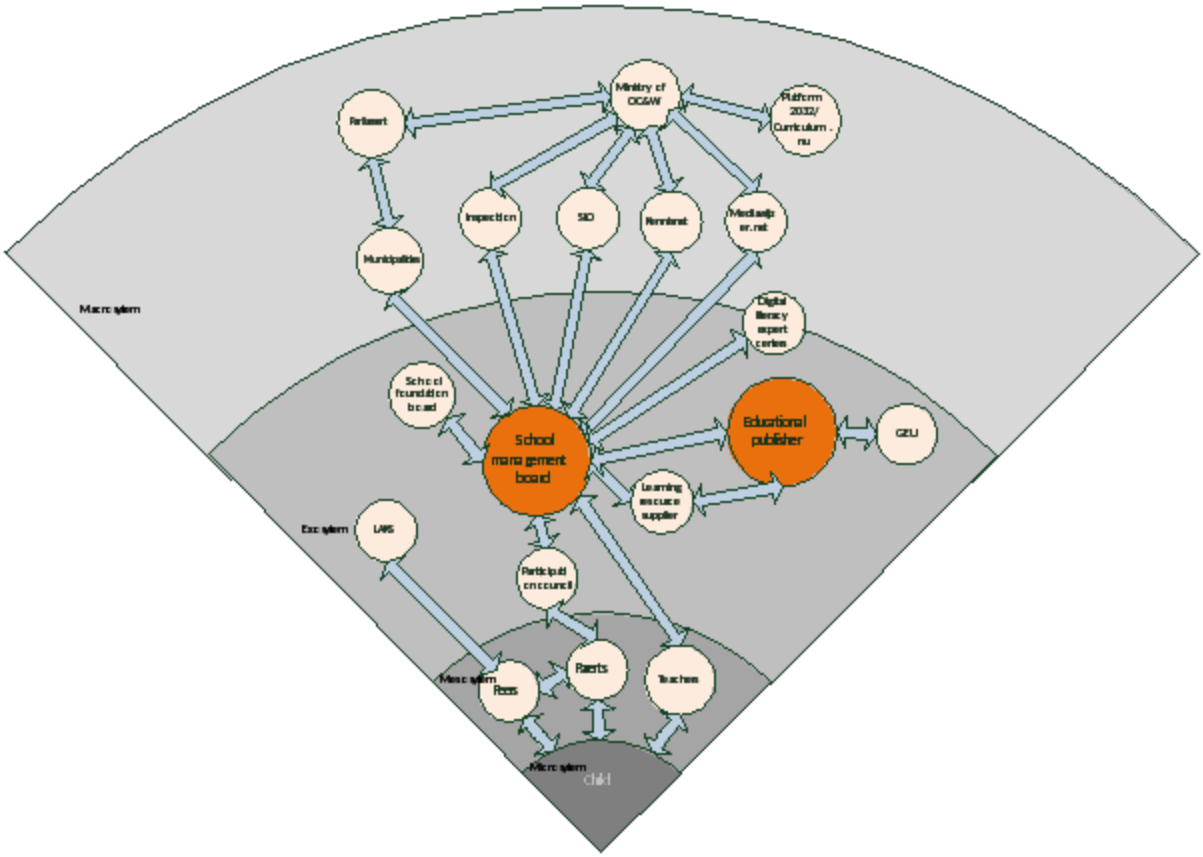

Figure 14: Primary stakeholders elementary school management boards and educational publishers with regard to cyber safety awareness education via digital literacy

Table 7: Primary stakeholders of elementary school management boards and educational publishers with regard to cyber safety awareness

Stakeholder	Description
Macro system	
Ministry OC&W, Inspection Parliament	From government perspective the Ministry of OC&W is responsible for the execution of the political agenda with regard to education. This includes also the education inspection that checks if the obligated subjects are adequately covered at schools. Part of the Ministry is also DUO, the executive organization responsible for financing and informing educational institutions (Ministerie van OC&W, 2017a). Finally, also the Dutch parliament (the First and Second Chamber) are important stakeholders since they jointly decide which education direction is chosen during their four year ruling period.
Platform Education 2032, Curriculum.nu	This broad community of educational stakeholders (SLO, PO & VO council, teachers, LAKS, parents etc.) was founded by the Ministry of OC&W for the development of the curriculum of the future ('21st century skills') which includes safety awareness via digital literacy (Onderwijs2032, 2017). Via dialog with many stakeholders they formulate an implementation advice to the Ministry. Since they represent

	a large part of the digital literacy educators and are appointed by the government they have a large stake in the development of a new digital literacy curriculum.
Kennisnet & Mediawijzer.net	There are a number of government funded education centers of expertise (foundations) like Mediawijzer.net and Kennisnet. Mediawijzer.net is a network organization of ECP, Kennisnet, public broadcasters and the Royal Library. They are an important provider of media literacy information and organize yearly the MediaMasters Game[9] as part of the week of the media literacy for groups 7 and 8 of elementary schools. Kennisnet provides a national ICT infrastructure (e.g. possibility to exchange digital data between suppliers of schools), strategic advice on digital teaching resources and providing expertise on educating digital literacy (Stichting Kennisnet, 2016b). Kennisnet develops also digital literacy teaching materials like Diploma Veilig Internet (certificate for safe internet use)[10].
Municipalities	Municipalities have a role in providing a platform for cooperation and partnerships between different schools and healthcare providers to accommodate children in their mental en physical development (Rijnbeek & Kooij, 2017). With regard to digital literacy they can assist in bringing stakeholder together and stimulate and assist schools via subsidies.
SLO	The SLO as education expert center provides the content and (obligated) core guidelines of the curricula which are taught in elementary schools. Digital literacy curriculum content is separately defined by SLO but is currently not obliged. SLO is an important contributor with regard to guidelines and objectives for digital literacy (Strijker, 2016).
Exo system	
School management board School foundation board	With elementary school management board we intend the headmasters, teachers and supporting staff which constitutes the management team of a school. Together these provide the teaching infrastructure at basic school level (Invasions, 2015). They are the team to provide education to young children on safety awareness via digital literacy in practice. Since schools are funded based on 'lump sum' per student they are entitled to decide which subject or theme to assign funds to. The schools are often united (based on a shared vision) in a foundation board to benefit from economies of scale (e.g. procurement benefits).
Digital literacy expert centers	This stakeholder includes a collection of digital literacy centers of expertise (organizations focused on digital literacy) that provide digital literacy training and teaching materials (often for free). They provide advice to educators (parents, schools etc.) and provide teaching methods and tools (e.g. apps). They are often foundations (non-profit organizations) which are sometimes funded by the government, supported by commercial companies or are private initiatives. In a number of cases there is cooperate with Universities to provide a scientific substantiation. Examples are Future NL[11]: Initiator of CodeUur (teaching children programming), Bureau Jeugd & Media[12] (providing advice, training and tools for educating children digital literacy) SkillsDojo[13] (digital literacy teaching materials and a digital platform). These are some examples, it goes beyond the scope of this research to provide an exhaustive list.
Educational Publishers & GEU	Private organizations that are in direct contact with the schools and have (traditionally) an influence on teaching methods employed by schools are publishers. Publishers provide the teaching methods and depending on the market demand of the schools in a certain area they develop new methods (Noordhoff, n.d.). The large publishers are united in a branch organization GEU which represent them as a group for mutual important topics[14].
Learning resource suppliers	There are primarily three large teaching material suppliers which provide teaching materials relevant for the schools. These are Heutink, Reinders and de Rolf group (Bisschop, Imandt, van der Vegt, & Bomhof, 2016). Materials can be from (note-)books, pencils, furniture but also reselling teaching methods (books, software licenses) from the educational publishers.

9 https://www.mediamasters.nl

10 https://www.diplomaveiliginternet.nl

11 http://www.futurenl.org/

12 https://www.bureaujeugdenmedia.nl/

13 https://www.skillsdojo.nl/

14 https://www.geu.nuv.nl/

Meso system	
Children Peers LAKS	The children are the primary stakeholders on the receiving end and are as a stakeholder important since they want to be educated properly how to act safely in cyberspace. The children as a group are generally represented by Landelijk Aktie Komitee Scholieren (LAKS)[15]. LAKS represents itself as the interest group which has as primary focus that politicians and media not only talk about children, but with children, they represent the unified voice of school children.
Parents Participation council	Parents have a direct influence towards educating their children but their influence on the schools management board is indirect, they are generally represented via the schools participation council (MedezeggenschapsRaad, MR). The MR has the right of consent on the educational objectives of a school. This implies that these objectives can only be drawn up or amended with the consent of the MR (PO Raad, n.d.).
Teachers	The teachers (and parents) have a direct relation to the children and to the management boards of schools and are therefore the most important link for both development and implementing the digital literacy into the curriculum of an individual school.

3. Interviews & analysis

After completing the literature study we continue with the interview and analysis phase in which qualitative semi-structured interviews are conducted. There are three groups of interviewees selected:

- Six elementary school headmasters were interviewed. Their school sizes are comparable to the Dutch elementary schools in general: they have on average 234 children (Table 8) which is close to the nationwide average of 225. Five out of six elementary schools have a Christian religious conviction and one (De Bogen) is a general public elementary school. According to the headmasters of Het Kompas, De Baken and De Brug their schools have a relative mixed cultural composition (native Dutch, Turkish, Moroccan and Syrian) comparable to Dutch elementary schools in urban areas. This is primarily caused due to their position in the vicinity of social diverse neighborhoods. School headmasters are interviewed since they are the representatives of the management board of a school. They take often the final decision, including the acquisition of teaching methods and materials. They also know what is going on at the school, in the classes and have a close connection to the teachers. Often they have a teacher background and therefore understand the challenges teachers face while educating children.
- Three experts specialized in digital media education for young children and media literacy were interviewed: First, scientist prof. dr. Peter Nikken, specialist in youth, media, and media education and working for the Dutch Youth Institute (NJi) as well as lector Youth and Media at Windesheim University of Applied Sciences. Second, Mrs. Justine Pardoen, expert on education, media use and media literacy for youth. Also founder of several important websites on youth, education, parenting and media use. Finally, Mr. Remco Pijpers, strategic advisor digital literacy of Kennisnet with over 20 years of experience in investigating and publishing on youth and digital media. He has expert knowledge on the stakeholder field of influence of children and elementary schools. These experts are questioned since they have a long background in research on educating children and digital literacy. They know the relevant stakeholder and challenges in educating children in digital literacy. Experts have been selected based on how often they publish on relevant cyber risks affecting children, digital literacy and literature with regard to children. This is determined based on how often their names were mentioned during the literature study.
- The educational method developers of three educational publishers are interviewed: two of the largest educational publishers for elementary school (Noordhoff and ThiemeMeulenhof) and one smaller publisher (Cubiss). Cubiss is interviewed since they focus on development of new digital literacy teaching methods. This gives both insight in the field of influence within the area of the large established educational publishers as well as a smaller (and new) publisher.

15 http://www.laks.nl/

Based on the results of the interviews the stakeholder model was updated and additional important stakeholders like representatives of SLO, Curriculum.nu, learning material suppliers (de Rolf group) and municipalities were questioned either by phone or e-mail.

Table 8: Average size elementary schools interviewed

Elementary school name	# Children
CBS De Bron	360
CBS De Parel	170
CBS Het Kompas	231
OBS De Bogen	220
CBS Het Baken	193
CBS De Brug	230
Average size	234

The questions were focused on answering the central questions of this research, three different question lists were used which can be found in . For the schools and educational publishers the emphasis was on understanding their current situation, their bottlenecks and understanding what relevant teaching methods are used for teaching cyber safety awareness. The experts emphasis was focused on the relations between relevant stakeholders, their perceived solutions for the root causes and critical success factors for the solutions. During the interviews the interviewees were asked to verify the results of the research and who additionally should be interviewed, this was used to clarify and supplement the stakeholder overview. For practical reasons the interviews with the elementary schools took place in the same city. Additionally, the responses are verified with literature research. The interviews with school headmasters, digital literacy experts and educational publishers were conducted face-to-face, and additional interviews via phone. In all cases interviews are audio taped for verification purposes.

Sub-question 1: What is the current status of cyber safety awareness education within Dutch elementary schools?

Before presenting the results on the current status of cyber safety awareness education of the six elementary schools, an analysis is conducted to provide insight in the digital development and cyber risk (preventive) measures of school management boards. This is an indicator for how active they already are with digitalization (e.g. use of digital tools in classroom) which is an indicator for the maturity of their digital literacy education (Eyre, 2017). An analysis of the schools websites and their online school guides result in an overview of how digital and cyber secure they are (according to these sources). This initial analysis gave additional input for conducting the interviews as well. The results are presented in Table 9.

Table 9: Present status of digital development and cyber safety measures of six elementary schools

Digital topic and measures:	CBS De Bron	CBS De Parel	CBS Het Kompas	OBS De Bogen	CBS Het Baken	CBS De Brug
Present digital development						
Use of a Digi board	X	X	X	X	X	X
Basic computer use throughout the curriculum (group 1-8)	X	X	X	X	X	X
Access to student tracking system (ParnasSys &	X	X	X	X	X	X

Momento)						
Present cyber safety measures						
Content filter at school PC's	X	X	X	-	X	X
Internet & social media protocol (sexting & privacy risks)	X	X	X	X	X	X
Anti -bully protocol	X	X	X	X	X	X
Privacy protocol	X	X	-	X	X	-
Secure website connection (HTTPS)	X	X	X	-	X	X
Children's photo's shielded on Facebook / Website	X	-	-	-	-	-

Summarized from Table 9 we see that based on these online sources basic digital infrastructure at schools is available. For OBS De Bogen there is no content filter being used, but this is a deliberate choice of the school board since this fits within their liberal vision of educating children. With regard to the available policies there are Internet, social media and anti-bully protocols available which are in accordance with the government regulation on social security (SSV, 2017). The availability of a (separate) privacy protocol is not common for every school, two schools do not specifically mention them. Additionally, a check on the different online school (web and social media) sites provides insight that they generally use safe connections towards their school website: all except for OBS de Bogen use a secure HTTPS connection. However, they are negligent with the privacy of school children's photographs: only one has a shielded environment to limit the risk of abuse. This even though authorities warn for these risks (Autoriteit Persoonsgegevens, 2017). Finally, it needs to be noted that the content of these protocols are communicated to parents and children in the beginning of the school year, but no additional activities are undertaken to emphasize these rules during the school year.

For determining the current status of cyber safety awareness education the evaluation criteria mentioned on page 19 are used. The summary of these five evaluation criteria translated into interview questions can be found in Figure 15, the results of these questions are found in Table 9.

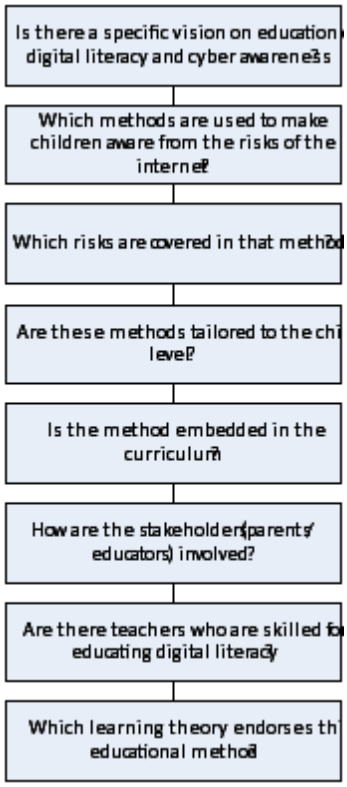

Figure 15: Question criteria for determining current status cyber safety awareness education

Table 10: Current status of educating cyber safety awareness on six elementary schools

Question:	*CBS De Bron*	*CBS De Parel*	*CBS Het Kompas*	*OBS De Bogen*	*CBS Het Baken*	*CBS De Brug*
Is there a specific vision on education of digital literacy and cyber safety awareness?	No	No	No	No	No	No
Which methods are used to make children aware from the risks of the internet?	Kwink (social- and emotional development)	Kanjertraining 'Library at school'	The Peaceful school Guest lectures of GGD/CJG	Participation in Codeweek Guest lectures of GGD/CJG	Kanjertraining 'Week of spring fever' (GGD)	Kanjertraining Guest lectures of Bureau Halt and GGD
Which risks are covered in that method?	Conduct: Cyber Bullying, harmful user generated content Contact: Sexual related (sexting)	Conduct: Cyber Bullying Contact: ' Grooming', Privacy risks Content: Wrong information	Conduct: Cyber Bullying Contact: ' Grooming', Privacy risks	Conduct: Cyber Bullying Contact: ' Grooming', Privacy risks	Conduct: Cyber Bullying Contact: ' Grooming', Privacy risks	Conduct: Cyber Bullying Contact: ' Grooming', Privacy risks
Are these methods tailored to the child level?	Yes	Yes	Yes	Yes	Yes	Yes
Integrated in curriculum (embedded): Is the method embedded in the curriculum?[16]	Continuous	Continuous & Theme based	Continuous Theme based	Theme based	Continuous Theme based	Continuous Theme based
Integrated in curriculum (stakeholder cooperation): How are the parents/educators involved?	Via newsletters	Via newsletters	Via newsletters	Via newsletters and information evenings	Via newsletters	Via newsletters and information evenings
Are there teachers which are skilled for educating digital literacy?	Some	Some	Some	Some	Some	Some
Which learning theories endorses the mentioned educational method?	Result oriented working (Wij-leren, 2014) Building on an adaptive school (Kooiman, 2005)	Development-oriented education (Wij-leren, 2014) Action-oriented working (Faber & Visscher, 2015)	Building on an adaptive school Development-oriented education	New Pedagogies for Deep Learning (Fullan, 2013)	Action-oriented working	Action-oriented working Focus on language development

16 *Continuous:* It is a subject frequently paid attention to (e.g. weekly) and a fixed part of the curriculum for multiple years. *Theme based*: Periodically (e.g. every year) attention is paid to a subject for one or multiple weeks. Theme based may rotate periodically (e.g. after a few years).

The headmasters were asked if they had negative experiences with the risks of cyberspace at their school: two schools mentioned cases of sexting (children exchanged semi-nude pictures of themselves) and one school mentioned a case whereby cyberbullying took place via WhatsApp. Even though these incidents took place outside schools it had effects inside schools and therefore the headmasters felt the need to discuss the incident with the involved children and their parents. These cases give a rough idea how these schools are acting in regard to cyber risks: they apply a reactive strategy, only when incidents occur they act upon them. This is additionally confirmed by the results of the six interviews with the headmasters: they do not (yet) have a clear vision on how to embed digital literacy and media literacy in their curriculum. Therefore, they rely on the experience of a few teachers with an above average interest in digital media. Based on the evaluation criteria relevant for determining the current situation of cyber safety awareness education (results in Table 10) the following findings can be summarized:

- All schools are using one or more educational methods which educates awareness to some extent of cyberspace risk, not the full spectrum of risks as mentioned in Figure 7. None of these methods is of one of the large educational publishers (Noordhoff, Malmberg or ThiemeMeulenhoff).
- Methods Kwink (Kwink, n.d.), Kanjertraining (Stichting Kanjertraining, n.d.), The peaceful school (CED Groep, 2013) focus on the social and emotional development of children. The 'Week of spring fever' (Rutgers, 2017b) of the Rutgers foundation and the General Health Services (GGD) is focused on the sexual development of children, additionally a local initiative of the GGD and the center for youth and family (CJG) provide guest lectures which pay attention to cyber safety awareness and media literacy (Smit, 2016).
- For Kanjertraining, Kwink and the 'Week of spring fever' the cyber safety awareness raising is limited in the method: only a very small part of the method pays attention to it. The methods primarily focus on the knowledge, social and emotional aspects: how children behave mutually and in society. There is less attention for the strategy application, willingness and self-esteem of children to safely act in cyberspace.
- The educational methods can roughly be divided into two types: theme based, these are yearly recurring events that usually take place in one or a few weeks, examples are 'The week of spring fever' of the GGD and Codeweek[17] organized by the ECP. The other are methods are continuously taught across the curriculum, for example 'Kwink' has every two weeks of the curriculum a separate focus topic.
- The risks covered by the more continuously methods are mainly cyber bullying, sexual related (sexting) and to lesser extent safe behavior in social networks.
- All methods are specifically developed and adapted to different age groups, they acknowledge the emotional and social development differences between children. The theme based initiatives like Codeweek and visits of the CJG are only for the groups 7 and 8, this is mainly due to the growing social media use at these ages.
- On average only some (one to three) teachers within a school have (some) affinity with educating awareness of the cyber risks mentioned in the methods. These have generally also the 'ICT coordinator' role within the elementary school.

Compared to the previous literature research we conclude that these results are largely in line with each other: There is not a continuous digital literacy curriculum and schools are only paying limited attention to cyber safety awareness education. However, there is some attention to cyber safety awareness: From the available educational methods which contain cyber safety awareness topics there is attention for the conduct and contact risks, but no attention for the content cyber risks (Figure 7). The educational methods which address the risks a bit more thoroughly are yearly one-off thematic without any structural embedding in the school's curriculum. There is no vision from the six

17 https://codeweek.nl/

schools how to embed cyber safety awareness education into the current curriculum and only limit widely supported knowledge available from teacher perspective.

Sub-question 2: What stakeholders are surrounding elementary school management boards and educational publishers management boards, with regard to educating cyber safety awareness, and what is their relationship?

To provide a detailed insight in the stakeholders, their size, their mutual relationship and the primary direction of their influence based on the interviews and additional literature research we have made updated the stakeholder overview including these relationships. In Figure 16 there is a sub-division in: major, medior and minor important stakeholders. Also the direction of influence: one-way or mutual-way and amount of influence (high, medium, low) is made visual to illustrate the complexity of the playing field for both the elementary schools as well as the educational publishers. The criteria used to determine the stakeholder importance and influence direction are based on the estimation by the three experts and validated by literature research. Table 11 describes role of the stakeholders and the relationships within their surroundings in more detail, they are sub-divided in the three Bronfenbrenner layers (colors match with the figure).

Table 11: Description of relevant stakeholders for educating awareness via digital literacy

Stakeholder	Description
Macro system	
Provinces & Municipalities	Initially the role of the municipality seemed minimal when we asked the school headmasters during the interviews. They mentioned that the municipality assisted in consultation between elementary schools and secondary education for seamless transition of children between their schools. However, generally the municipalities have an important cooperation and supporting role, which is in line with the vision of the Foundation for Dutch Municipalities (VNG, 2014) and Dutch government (Rijksoverheid, n.d.). With regard to digital literacy we have interviewed the Chairman of the Executive Board of O2G2 (one of the largest school communities in the Netherlands and digital literacy precursor), he acknowledges that a general integral vision on digital literacy from the municipality of Groningen assisted in their development of digital literacy curriculum (Oudsten & Teesink, 2017). The municipality fulfill a medior important stakeholder role for developing cyber safety awareness education: they provide a local platform whereby they are the uniting factor between the public and private parties in a municipality.
GGD/CJG	The influence of provinces and municipalities with regard to funding and focus on digital literacy via the libraries and GGD/CJG (local health services) is important. An example of a local initiative of the CJG[18] in Harderwijk is that there are voluntarily media literacy guest lectures for groups 5-8 (Smit, 2016) for elementary schools.
Libraries	Libraries often already have a connection with elementary schools and provide information and support with regard to media literacy (Bibliotheek, 2017).
POI's	Provincial support institution's like Rijnbrink (Duinkerken & Deckers, 2017) assist libraries in fulfilling the digital literacy role.
Bureau Halt	Municipalities can request Bureau Halt (Bureau Halt is responsible for the prevention, combating and punishment of juvenile crime) for support in providing guest lectures on risks of social media and online safety (Halt, n.d.).
Parliament and ministries (Internal affairs & Economic affairs)	The parliament have the primary responsibility and decision making power for the direction of elementary education from political perspective. With regard to digital literacy they rely on the proposals of the Ministry of OC&W, has assigned the platform Curriculum.nu[19] as their primary source for changing the current elementary schools curriculum via new core objectives and learning goals.
Ministry of OC&W	From government perspective the Ministry of OC&W is responsible for the execution of the political agenda with regard to education. For digital literacy they are overall responsible for the development

18 https://www.opvoeden.nl/cjg/

19 https://curriculum.nu/

	of new core objectives for elementary education via Curriculum.nu and are primary client of the SLO.
ECP	The ECP is the platform (funded by the Ministry of Economic Affairs) for the Information Society. It is an independent platform where public and private organizations work together to exchange knowledge about the impact and responsible application of new technologies in Dutch society. Various activities help to connect parties and to shape social and economic significance of ICT for government politics and business (ECP, n.d.). With regard to digital literacy they are a strong partner for both Mediawijzer.net and CodePact. With regard to creating cyber safety awareness they facilitate events like the Safer Internet Day (ECP, 2018).
CodePact	CodePact [20] is a public-private partnership between the organizations Mediawijzer.net, Kennisnet, ECP and a large number of private companies (e.g. Google, IBM, Microsoft). They cooperate with one goal to get as much children as possible acquainted to computer programming[21]. They have launched the initiative 'Samen Digiwijzer' (Together digital literate)[22] which focusses on assisting schools in educating children cyber safety awareness skills via digital literacy.
Cito	Cito is the organization which designs the central final test for elementary education every year on behalf of the Board of Examinations of the Ministry of OC&W (Cito, n.d.). They are one of the primary sources for elementary school with regards to providing tests and exam materials for teaching methods. Currently their influence is low, since they are awaiting for the new core objectives for digital literacy of the Ministry of OC&W or for educational publishers to request to design new exams.
Inspection	The inspection for education is assigned by the Ministry of OC&W to check and monitor the quality of the education of elementary schools. Based on a number of criteria they evaluate an elementary school and rate them. This rating is for parents and indication of the quality of the school and therefore seen as important by school management boards. With regard to cyber safety awareness education via digital literacy their role currently is still limited however, it can help to become an 'Excellent' school when used as a distinctive quality of the school (Onderwijsinspectie, 2017).
Kennisnet	Kennisnet is a so called center of expertise: it provides a national ICT infrastructure (e.g. possibility to exchange digital data between suppliers of schools), strategic advice on digital teaching resources and providing expertise on educating digital literacy (Stichting Kennisnet, n.d.-c). Their influence for elementary school management boards and educational publishers is mainly providing information, direction and assistance in educating cyber safety awareness. They are also contributor of a large number of ICT and digital literacy related initiatives (e.g. SamenDigiwijzer, CodePact) and provide teaching materials (dimplomaveiliginternet.nl[23])
NJi	The Dutch Youth institute (NJi) is a knowledge center which collects, enriches, indicates and shares current scientific (digital media) knowledge about youth to professionals, educators and policy makers (NJi, n.d.). With regard to digital media they provide guidelines and advice for parents and professionals adapted to different ages of a child.
Curriculum.nu	Curriculum.nu[24] the successor of Platform Onderwijs2032[25] was formed after the advice of Platform Onderwijs2032 was discussed in parliament. The parliament accepted the advice, but had a number of motions whereby the advice was adjusted (Meijer, 2017; Tweede Kamer, 2017b). Goals of Curriculum.nu is to develop together with teachers and school leaders so called 'building blocks' whereby digital literacy is one of the focus areas. These building blocks will be translated into core and final objectives which are brought for decision into parliament in 2019. After acceptance of the core and final objectives schools are obliged to follow them. The key stakeholders at this stage are the teachers whereby education development experts (like SLO) are consulted. Other stakeholders like PO-council, educational publishers, and Ouders & Onderwijs are part of the teams providing feedback

20 https://codepact.org/

21 https://codepact.org/

22 https://www.samendigiwijzer.nl/

23 https://www.diplomaveiliginternet.nl/

24 https://curriculum.nu/

25 http://onsonderwijs2032.nl/

	during this development period. All relevant stakeholders and experts recognize that Curriculum.nu is the driver for changing the current curriculum for schools. The fact that it will be obliged forces schools to adapt their curriculum. The SLO will adopt the new core and final objectives and these are eventually the primary source for both schools as well as teaching method developers of educational publishers to develop their standard teaching methods.
SLO	SLO is a national expertise center (funded by Ministry of OC&W) with an unique focus: the development of the curriculum in primary, special and secondary education. SLO forms the link between developments in educational practice, policy, society and science (SLO, 2016). They are the primary point of contact for both schools as well as government and teaching method developers. With regard to digital literacy they have formulated learning plans and goals for a continues curriculum, these are currently not obliged (SLO, 2015). SLO has participated in Platform2032 and are providing expertise for Curriculum.nu. The results of Curriculum.nu will be translated into core and final goals, these are adopted by the SLO and distributed to the relevant stakeholders.

Exo system

PO Council	The PO Council represent the elementary school management boards towards policy makers and media. The affiliated school boards in elementary education and special elementary education and form a representative reflection of elementary education. As a result, the sector can express a united voice and exert maximum influence on politics and the media (PO Raad, 2014a). With regard to cyber safety awareness education they have actively participated in Onderwijs2032 and are active in a policy lobby for more ICT and digital literacy in education.
Private companies	ISP's (Ziggo, Vodafone, KPN) but also large American software companies like Facebook and Google are willing to invest in knowledge development and teaching materials on elementary schools. This can be from a social responsibility perspective, but also from a commercial view: to sell own products (e.g. Google's Chromebooks (Stichting Kennisnet, 2015) and from (long term) vision to interest children from IT and develop (and select) the workforce of the future. An interview with the CISO of KPN gave an interesting stakeholder perspective: in her view schools could benefit from the help from private companies but the initiative should come from the school itself, in her perspective in general there should be more attention for STEM (Science, Technology, Engineering and Mathematics) in schools including programming. She beliefs in public private partnerships but the initiative initially should come from the Ministry of OC&W. An example of cyber safety awareness education, which is facilitated by ECP is the Safer Internet Day in which KPN assisted by providing guest on cyber safety lectures at schools. Another is the Alert Online week in which KPN facilitates a workshop 'Hack in the Class' in which elementary school children learn about programming and online safety (KPN, 2016).
Digital literacy expert centers	This stakeholder includes a collection of digital literacy centers of expertise (organizations focused on digital literacy) that provide digital literacy training and teaching materials (often for free). They provide advice to educators (parents, schools etc.) and provide teaching methods and tools (e.g. apps). They are often foundations (non-profit organizations) which are sometimes funded by the government, sometimes supported by commercial companies or are private initiatives. In a number of cases there is cooperate with universities to provide a scientific substantiation. Examples are Future NL[26]: initiator of CodeUur (teaching children programming), Bureau Jeugd & Media[27] (providing advice, training and tools for educating children digital literacy) and SkillsDojo[28] (digital literacy teaching materials and a digital platform). These are some examples, it goes beyond the scope of this research to provide an exhaustive list.
School Management Boards	As can be seen from the stakeholder model the elementary school management board is generally a first point of contact for the different stakeholders and often a 'gatekeeper' for additional activities which focus on educating children. The board composition is generally the headmaster, teachers and a member of the participation council. These are the final decision makers for selecting new teaching methods and are generally first contact for advisors from learning resource suppliers and educational publishers. With regard to cyber safety awareness education through digital literacy we see from the initial interviews with the school headmasters there are already some of the cyber risks addressed in the current teaching methods but it is not structurally embedded in the curriculum and is highly depend on the enthusiasm and interest of some teachers.

26 http://www.futurenl.org/

27 https://www.bureaujeugdenmedia.nl/

28 https://www.skillsdojo.nl/

Teaching material supplier	There are primarily three large teaching material suppliers which provide teaching materials relevant for the schools. These are Heutink, Reinders and de Rolf group. Teaching materials can vary from notebooks, pencils to furniture and also reselling teaching methods (books, software licenses) from the educational publishers. Additionally, they offer digital education platforms supporting digital teaching methods from all large educational publishers. Heutink has started a digital platform Momento (Heutink, 2017) which provides an integrated solution for usage of standard online teaching methods. These teaching material suppliers have a large number of advisors available to visit, advise and assist schools in selecting the right teaching methods and materials. The advisors are paid on commission for selling certain methods of the educational publishers which can influence their teaching method advice. However, according to de Rolf group[29] the aim of these suppliers is to provide a broad portfolio of teaching methods to be able to serve the whole market of elementary schools. Based on the interviews with the educational publishers we conclude that the teaching material suppliers have an important role in reselling their teaching methods due to the fact that they lack the capacity to visit all elementary schools yearly, the number of advisors of teaching materials is much higher and their contact rate is higher.
School foundation board	The headmasters of the elementary schools are often united in local foundations ('het bovenschoolse') which share for example the same mutual (often religious) basis. They have the benefit of joint purchasing of methods and benefit from each other's knowledge, even though they retain their own unique identity. In selecting teaching methods the individual schools are free to choose the method they seem appropriate however, since there are overall contracts with teaching material suppliers they can benefit from procurement advantages. The school foundation board can additionally assist in creating opportunities by removing restrictions to experiment with for example new teaching methods (e.g. free up resources). By uniting in a foundation there is more negotiating power towards stakeholders like municipalities to claim for subsidies and educational publishers to develop new teaching methods. Finally it is a central platform for sharing and documenting relevant teacher knowledge and experience.
Educational publishers	Educational publishers offer currently analog, digital and blended standard teaching methods but have no specific portfolio for cyber safety awareness via digital literacy. They are traditionally reserved (risk averse) with large investments in which the market is still uncertain. They have method advisors which visit schools for advice, receive feedback on current methods, receive requests for new methods and test in practice (pilot) new developed methods. They follow the reference frames, intermediate goals and core objectives of the SLO when developing a standard teaching method. For developing teaching methods they have in-house expertise for developing teaching methods and contract authors ('content providers') to provide the content of a method.
GEU	The GEU is the branch organization for educational publishers and educational services in the Netherlands. The GEU has currently 43 members including all the large educational publishers, their members covers 95% of the teaching method market (GEU, 2017). They facilitate in creating a mutual vision in the development and application of digital teaching methods between schools and publishers. Their focus is to create long-term partnerships. With regard to cyber safety awareness education they assist educational publishers in creating partnerships and to provide a united voice towards policy makers.
Content providers	Educational publishers do not have all the knowledge within their organization for developing standard teaching methods. Educational publishers hire specific content providers (e.g. authors and illustrators) to develop their teaching methods. These are often freelance authors and illustrators who are hired and receive a royalty compensation (e.g. based the amount of method copies sold) ("Waarom auteursrecht? | Onderwijs en auteursrecht," 2018). These content providers are important for the development of digital literacy methods. However, content is already available, but not adopted by the large educational publishers. Examples of current methods are from Cubiss (Cubiss, 2017a) and the previous mentioned National Media Passport whereby the method is issued in-house.
Advice & Consultancy firms	School board can contract an advice bureau which assist them in developing a vision, conducting research, provide education materials and train teachers in applying the content and didactic of digital literacy methods. These are contracted for solving a specific problem or topic. Examples of advice and consultancy firms with specific focus areas on digital literacy and digital developments schools are O21[30] and Sardes[31]. They use the learning objectives of the SLO and use their own models/materials to implement digital literacy. Since these are paid by schools their influence can be substantial but the risk exist that their advices only focus on a certain digital literacy issue and lack the cohesion within the curriculum. Additionally they may receive limited teacher commitment and lack in continuity.

29 https://www.derolfgroep.nl/

30 https://o21.nu/

Meso system	
Ouders & Onderwijs	Ouders & Onderwijs (Parents & Education) is the educational information contact for parents, they represent 'parents' towards the government and the education sector. With regard to digital literacy they were active in Onderwijs2032 and currently are in the feedback teams for Curriculum.nu with regard to developing the new curriculum core objectives.
Parents	The parents are the primary responsible for educating cyber safety awareness to their children. However, to what extent this is done depends on their own background (e.g. education, economic situation, previous experience). Parents expect schools (teachers) to educate children to act safe in cyberspace. Parents influence the teachers directly and school management board indirectly via the Participation Council.
Participation Council	Parents are represented in the schools participation council. The participation council consults with the school management board on subjects like budget spending and has the right of consent to the educational objectives of the school. This means that objectives can only be drawn up or amended with the consent of the participation council. Finally they have the right of consent in establishing or adapting the school regulations. With regard to cyber safety awareness their role is currently limited to in providing feedback on the vision on digital literacy of the school management board (when available) (Pijpers, 2016; PO Raad, n.d.).
Teachers	The teachers are the direct connection to the children and school management board, therefore they are the most important link for both development and implementing digital literacy into the curriculum of an individual school. They are often part of the management team and have a large stake in the selection of new teaching methods. With regard to cyber safety awareness education there is a wide variety of skills and knowledge levels. Generally within the elementary schools there are teachers with an additional role as IT coordinator, these are often also the most active in implementing ideas for digital literacy activities. Overall, according to a survey of SLO in 2014 (Thijs et al., 2014) whereby 33.000 teachers were questioned through a digital survey, the result was that digital literacy skills are underappreciated by educators in current school practice.
Subject Union I&I	Teachers are assisted in their professional development, they receive expert support of the subject union for computer science and digital literacy Subject Union I&I (i&i vakvereniging, 2017) which have expertise in developing materials for digital literacy.
PABO	The new accreditation of talented teachers from the university's department of education (PABO) has an influence (Kramer, Albers, & Coenders, 2017). The PABO's are however still in its infancy with regard to developing their teacher education curriculums towards digital literacy (Loohuizen, 2015).
Education Cooperative	The Education Cooperative is the professional organization for teachers. It is a knowledge and experience sharing community which also provides funding for professional development of teachers. With regard to cyber safety awareness education they focus on advising the teacher, which is basically advice and a reaction on the results final report of Platform2032.
Peers	Peers (e.g. a child's classmates, friends, brothers and sisters) have an important role in influencing the child and their parents. They often attend the same school and receive the same education. With regard to cyber safety awareness education towards the schools management board they have an indirect influence via the teacher or their parents.
Laks	Children as an educational group are represented by National Action Committee School Children (Landelijk Aktie Komitee Scholieren, LAKS). LAKS represents itself as the interest group which has as primary focus to force policy makers to involve children within decision making (LAKS, 2018). They were part of the discussion with regard to cyber safety awareness education via digital literacy via Platform Education 2032 and are now part of the feedback team of Curriculum.nu (LAKS, 2016).

There are a large number of stakeholders available to assist schools in educating cyber safety awareness. Therefore, it is incomprehensible why school management board do not make use of this stakeholder network to start educating cyber safety awareness. The school and connected stakeholders probably encounter problems (bottlenecks) to able to educate of cyber safety awareness. In the next section we will map the bottlenecks and determine what the root causes are limiting the education of cyber safety awareness. Even though the educational publishers are influenced by less stakeholders (in absolute numbers) a problem with one of them can have a more severe impact on the educational publisher.

31 http://www.sardes.nl/

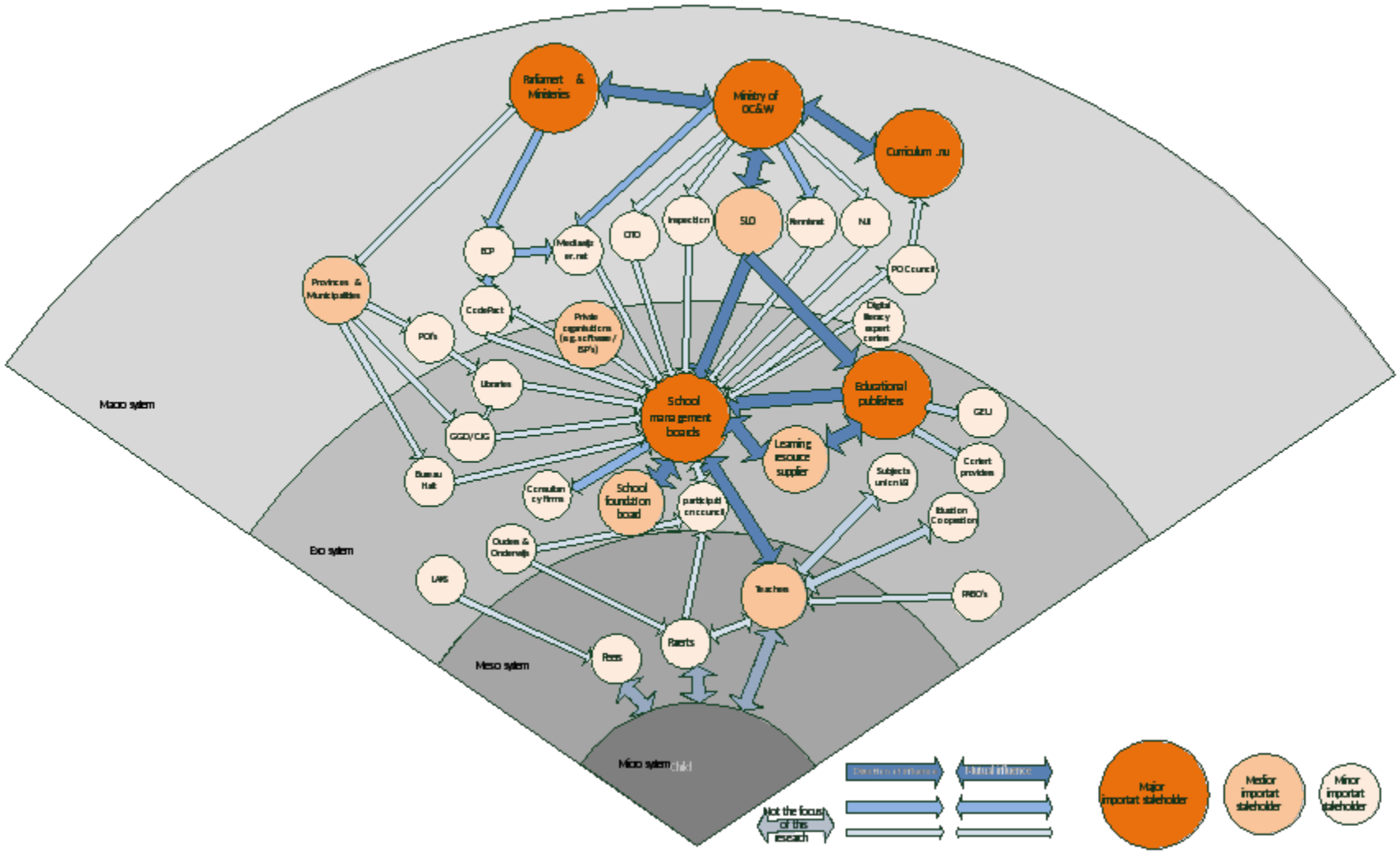
Parliament & Ministeries
Ministry of OC&W
Curriculum .nu
Inspection
SLO
Kennisnet
NJI
CITO
ECP
Mediawijs er.net
POCouncil
Provincies & Municipalities
CodePact
Private capitalization (e.g. software / ISPs)
Digital literacy expert centres
POFs
Libraries
School management boards
Educational publishers
GZU
GGD/GIG
Learning resource supplier
Content providers
Bureau Halt
Consultancy firms
School foundation board
participation council
Subjects unions
Education Cooperation
Ouders & Onderwijs
LMS
Teachers
PABO's
Parents
Fees
Macro sytem
Exo sytem
Meso sytem
Micro sytem child
Not the focus of this research
Mutual influence
Major important stakeholder
Medior important stakeholder
Minor important stakeholder

Figure 16: Field of influence of stakeholders with regard to educating cyber safety awareness through digital literacy

Sub-question 3: What are, with regard to these two primary actors, the main bottlenecks and root causes for educating cyber safety awareness within elementary schools?

Based on the interviews with the school headmasters and experts a number of bottlenecks with regard to the lack of cyber safety awareness education are identified. We have added these in the stakeholder model (Figure 17) to show where their effect is noticed and additionally provided the description of the bottlenecks in Table 12. We will finalize this sub-question by determining the root causes of the lack of cyber safety awareness education via digital literacy.

Table 12: Bottleneck description which limit cyber safety awareness education via digital literacy

Primary stakeholders and related bottleneck	Description
Macro System	
Parliament & Ministries: Lump sum compensation leaves too much freedom to schools	Elementary schools are funded by the Ministry via lump sum compensation, which means in practice that they receive a fee based on the amount of children on the school. The compensation is divided into one part for the employee wages, one part for compensation for material costs (learning materials, furniture, cleaning costs) and a 'performance box' with additional funds for special activities like additional attention for talent development (PO Raad, 2017a, 2017c). The first bottleneck with this lump sum construction is that it gives limited direction (and much freedom) on how to spend the lump sum which limits uniformity in investing in cyber safety awareness education: some schools invest, most focus on other subjects.
Limited requirements how to spent compensation	Additionally there are limited requirements defined by the government how to spent compensation. The Education Inspection checks the financial health of the school but does not steer in how the compensation is spent.
School culture: freedom of education	This lack of political direction and resulting freedom is mainly caused due to the liberal Dutch education culture for freedom of education as it also is laid down in article 23 of the Dutch Constitution: '*The teaching of education is free, subject to the supervision of the government and, with regard to the forms of education that are designated by law, the examination of the competence and morality of those who provide education, to be regulated by law*' (PDC, n.d.). The government should watch, monitor the quality of education, and fulfill the preconditions for good education but must not intervene in how it is taught.
Lack of funds	Another bottleneck which adds to the above, is that schools feel their budgets are insufficient to cover for example IT infrastructure investments deemed necessary for teaching digital literacy, additional compensation of the low teacher wages and investment in new or replacing expensive educational methods. Therefore, schools focus on utilizing existing knowledge and pay less attention to the long term education of (new) cyber safety awareness skills via digital literacy.
Unclear political direction due to change of parliament every four years	There are from regulatory perspective inconsistencies in political direction due to the four yearly elections. To illustrate this: After the recent (2017) elections we see that from the 21st century skills the topic of 'Citizenship' gets more attention due to the parties that participate in the new parliament (NOS, 2017). We see direction changes due to individual political parties agenda's to win votes and the political game resulting in a lack of continuity. SLO defined non-obligatory curriculum goals, but due to divergent opinions of political parties these were not converted to obligated core objectives. The multi stakeholder platform Education 2032 did not solve the political disagreement: On the 20th of April 2017 the parliament amended the advice of Platform Education 2032. More elaboration on the 'building blocks' that would provide support to schools to implement digital literacy were requested. Current planning is to make the final decision on the core objectives in 2019.
Provinces & Municipalities: Absence of long term vision	From the municipalities, in this case the municipality of Harderwijk, mentioned they did not have a vision with regard to digital literacy and schools, even though they were working on a vision document for the elementary schools this was currently not part of it. Even though this municipality is not active with regard to digital literacy there are municipalities like Groningen which do have a specific vision that enhances the cooperation between schools and provide funds which stimulate digital literacy education (Gemeente Groningen, 2017).
Parliament & Ministries Ministry of OC&W	From parliament point of view there is an absence of a shared vision on education of digital literacy. Parties in parliament are expecting the Ministry of OC&W to come forward with a supported proposal. The Ministry expects Curriculum.nu to provide the long term vision on the development of the digital literacy curriculums. As mentioned prior this will take (at least) until 2019 before new core

Absence of shared vision	objectives are defined. Due to parliamentary change every four years elementary education becomes a political negotiating instrument whereby he vision is adjusted when deemed necessary.
Parliament & Curriculum.nu	Curriculum.nu has been made responsible by the Dutch government for developing the curriculum of the future. Their focus is to develop obligated core learning goals which will be implemented by the SLO. However the development of these goals take longer than initially planned. New core objectives should have been created within one parliamentary period of four years (2013-2017). However, due to disagreement within the parliament (not all relevant stakeholders were involved in the development phase) final decision was postponed. More stakeholders (expertise) was requested to develop building blocks which will be defined in the year 2018 and 2019. Further decisions are postponed until 2019.
Development of new 21st century skills (standards) take too long	
Complex stakeholder playing field	The cause of the current delay was according to MPs mainly due to the lack of input of relevant stakeholders (lack of consultation of specific subject expertise) (Tweede Kamer, 2017a). The complex and large stakeholder field of influence school operate in, causes the possibility to overlook a stakeholder. Additionally, the complex stakeholder field results in a delay in decision making: there are always additional stakeholders who wants to be part of the discussion and want to interfere with decision making, which resulted in further delay.
SLO: Digital literacy no obligation for schools	The digital literacy learning objectives are defined by the SLO (SLO, 2017b) however these are not obligated, but they are guidelines. Since there is still no consensus within parliament what the new core objectives will exactly look like these guidelines will continue to be voluntary for elementary schools.
Unclear guidelines & definition of digital literacy	The non-obligatory learning objectives do not provide sufficient support for schools and educational publishers to develop teaching methods, there is an absence of detailed reference frames. Overall school curriculum consists of 58 core objectives (SLO, 2017a) which define what children must learn during their time on elementary school. SLO has defined in their system TULE[32] the intermediate goals and learning objectives, finally frames of reference (Meijerink, Letschert, Rijlaarsdam, van den Bergh, & van Streun, 2009) are described to give schools and educational publishers more grip on the detailed interpretation of the learning objectives.
Exo system	
School Management Board: Difficulty in finding suitable information	There are already a lot of stakeholders with digital literacy and cyber safety awareness information sources available as we have seen from the stakeholder diagram, and there are probably many more (international) information sources which are less often mentioned. For schools it is difficult and time consuming to determine and select the right quality from these sources to use in their curriculum. For school management there is no turnkey solution which can be directly integrated in the existing educational methods. Every party offers some of the information but all in their own format based on their own research models. The result of this is that schools, which must invest a lot of time and effort in selecting and transforming the materials to fit their curriculum, wait and see until there are clear detailed requirements from the government and wait until the method developers of the educational publishers come up with an integrated solution.
Lack of vision	One of the primary bottlenecks is from school management board perspective the fact that they currently have not adapted a clear vision how to embed cyber safety awareness education via digital literacy in their curriculum. This is mainly caused by school management board focusing on the current problems and unclear direction of the SLO guidelines. By not developing a vision it is difficult to prioritize what topics are relent and to make explicit choices.
Excessive focus on programming	Different private companies invest in educating the youth in digital literacy aspects. This is often with the focus to interest children in developing programming skills to develop the software engineers of the future. They foresee a shortage of skilled personnel and are willing to invest in educating the youth and having the opportunity to pre-select new talent. There is an excessive focus on development of programming skills of children (De Correspondent, 2017), which is covered in the computational thinking part of digital literacy. However, the problem is that schools only focus on this part and pay less attention to other digital literacy aspects including cyber safety awareness education. Schools do not have a clear view on what digital literacy means and therefore give no direction or requirements to private companies.
No capacity to develop own curriculum	According to the school headmasters there is currently an enormous work pressure on teachers (Adriaens, Grinsven van, Woud van der, & Westerink, 2016) and therefore they do not have the capacity (resources, time, funds) to start the development of a curriculum for cyber safety awareness via digital literacy.
Overcrowded curriculum	A problem is that there are increased expectations from different stakeholders (government, parents, media) to widen their school curricula with many additional activities (e.g. even growing vegetables (Winterman, 2017)), which causes an overcrowded curriculum.
Administrative	Also the registration and (quantified) monitoring progress of children via for example pupil tracking

32 http://tule.slo.nl/

burden	systems create an administrative burden. From government perspective the statement is that elementary schools administer probably more than actually needed, due to schools lack of knowledge what registrations are obliged (Ministerie van OC&W, 2017b). However, the school headmasters point to the government and state that they ask too much from them and that the cohesion within the curriculum is lost.
Difficulty in determining priorities	Due to the overcrowded curriculum and administrative burden, schools expect everything is important and finding it difficult to determine the right order of priorities and to know exactly what is required and what the optional activities are.
Absence of demands of schools	The educational publishers account management and method specialists visit schools on a frequent basis, but according to them there is not an uniform request of elementary schools for delivering digital literacy methods. Therefore, there seems to be no market demand.
Educational Publisher:	According to the educational publishers it is difficult to prepare a financially viable business case to make the development of a new cyber safety awareness education teaching method profitable for them. Since the market for digital literacy methods and the return-on-investment period is still highly uncertain.
No viable business case	
High investments	Developing a fully new teaching method requires high investments and not knowing if enough schools buy the method. It takes sometimes over €100K to develop a new method and a two to four year development period.
Current settlement contracts (Copyright-royalties) with content providers does not fit	Current trend is for publishers to offer their teaching method more digitally on one or more compatible digital learning platforms. When a digital platform is deemed necessary an adaption of the revenue model is needed since the copyright remittance is different. Currently, the number of books sold determines how much an author or content provider earns in royalties. However, when digitally offered the number of clicks or views of a content item may be used as payment which makes the remittance uncertain.
Decrease in market size: Less children & Less schools	The Dutch elementary education market is relatively small compared to the investments that must be made for developing a teaching method. The market is decreasing due to decline in the number of children and merging elementary schools, therefore it becomes less attractive to invest. Additionally, the number of school classes are in decline due to larger class sizes. The requests for traditional standard teaching methods will therefore probably decline.
Competition from new entrants	There is increased competition from new entrants like the previous mentioned Snappet, which according to the educational publishers, more or less copies their (expensive to develop) teaching methods and offer them digitally (with a small adaption) whereby they can offer them without the costs of copyright royalties.
Lack of proactive vision of publishers with regard to digital literacy	In general the vision for developing educational teaching methods from the educational publishers is to be a follower: wait until there are clear guidelines (core goals, reference frames) available and then start to develop a teaching method. They currently apply a 'wait and see attitude' with regard to developing digital literacy teaching methods and there is a lack of proactive vision. Due to the large size of the companies, their long experience in developing and publishing printed books (which still covers most of their revenue) they are risk averse.
Current business model does not fit	When viewed from a product/market perspective the multiple internal and external (market) challenges are part of a larger bottleneck: for developing a teaching method on cyber safety awareness education the current business model does not fully fit. This is mainly due to a shorter development time for (cyber safety) digital teaching methods, the changing market size and current large investments needed.
Meso system	
Teachers:	According to the experts, the school headmasters and research data (Van De Hoef & Van Aarsen, 2016) most teachers do not, or have only limited, knowledge and experience with the topic of cyber safety awareness education via digital literacy. Often the school children are more digital experienced than teachers in cyberspace, however they still need guidance in teaching them to use their skills in a safe manner since they often do not oversee the potential risks of their behavior.
Lack of knowledge & experience of teachers	
No affinity with the topic	Teachers feel insecure in educating these skills; there is a lack of affinity with the (risky) activities children perform in cyberspace. Often the applications (e.g. social media platforms) children use are not used by the teachers. This makes it difficult to understand what risks the children come up against. According to one of the experts teachers often do not have a clue what children do in the cyberspace outside school and the risks they are facing. According to one of the headmasters there is a generation gap: children nowadays are brought up with cyber connected devices and tools but boundaries between on- and offline are blurred. Teachers which are brought up and educated in the 'analog' area are often not aware of the digital experience world of children.
No or limited education	Teachers are not, or limited, educated in digital literacy: teachers did not receive specific training during their university education (e.g. PABO's do not pay attention to digital literacy (Stichting Kennisnet, 2014)) and during their school career. To become more knowledgeable in cyber safety

	awareness and digital literacy teachers must invest time which is often not available during their working hours due to the work pressure. According to a survey 'gender' (men are more skilled), 'age' (younger teachers are more skilled) and if they have full- or part-time contract (fulltime are more willing to invest their time and therefore more skilled) also plays a significant role. In this study the role of the PABO's is also mentioned: currently there is limited attention during the education of new teachers caused also due to a lack of vision on ICT and cyber safety.

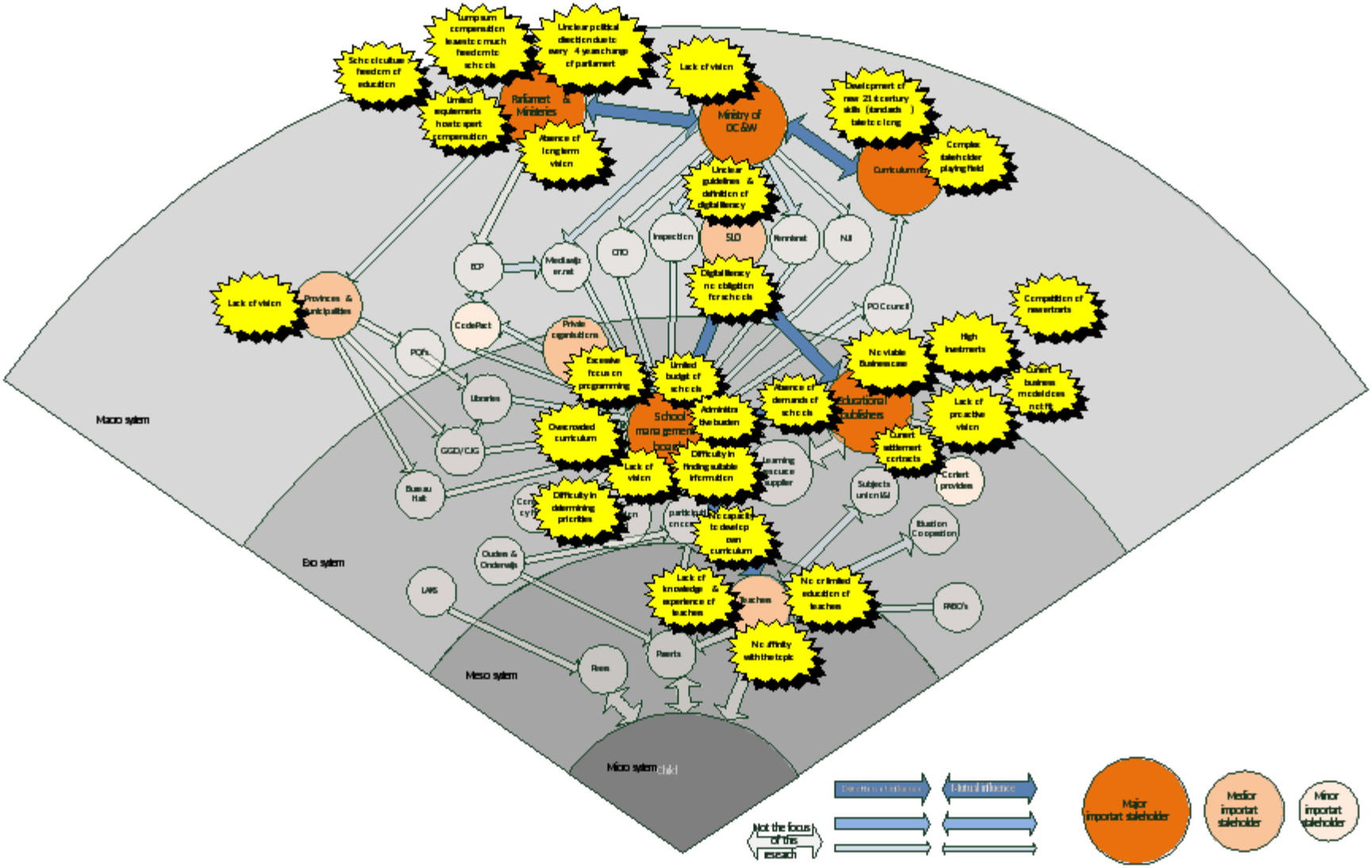
Lumpsum compensation leaves too much freedom to schools
Unclear political direction due to every 4 years change of parliament
Lack of vision
Development of new 21st century skills (standards) taken to long
Complex stakeholder playing field
Schools (curriculum) freedom of education
Limited requirements how to spent compensation
Parliament & Ministeries
Absence of long term vision
Ministry of OC &W
Curriculum.nu
Unclear guidelines & definition of digitalliteracy
Inspection
SLO
Kennisnet
NJI
Mediawijs er.net
CITO
ECP
Digitalliteracy no obligation for schools
POCouncil
Competition of newentrants
Lack of vision
Provinces & municipalities
CodePact
Private organisations
POFs
Excessive focus on programming
Limited budget of schools
No viable Business case
High investments
Current business models does not fit
Libraries
Administrative burden
Absence of demands of schools
Educational publishers
Lack of proactive vision
School management boards
Overcrouded curriculum
GGD/GHG
Lack of vision
Difficulty in finding suitable information
Learning resource supplier
Current settlement contracts
Content providers
Bureau Halt
Difficulty in determining priorities
Subjects unions I&I
Illustion Corporation
No capacity to develop own curriculum
Guides & Onderwijs
LWS
Lack of knowledge & experience of teachers
Teachers
No or limited education of teachers
RMO's
No affinity with the topic
Peers
Rees
Macro system
Exo system
Meso system
Micro system child
Not the focus of this research
Major important stakeholder
Medior important stakeholder
Minor important stakeholder

Figure 17: Identified bottlenecks plotted on stakeholder field of influence

Root causes

After adding bottlenecks to the stakeholder model we see a complex stakeholder overview, relationships and bottlenecks influencing each other. We see there are bottlenecks more visible (tangible) and what bottlenecks are less tangible. During the interviews the effects were often mentioned first and by asking questions other bottlenecks (causes) became visible. The visible bottlenecks are often 'symptoms' or 'effects' which have other more complex causes. There can be multiple layers of causes which lead to a limited amount of root causes. A root cause is defined as '*A root cause, at the most basic level, is a fundamental reason for the occurrence of a problem or event. The appellation "root" is meant to differentiate a root cause from a more immediate or proximate cause; in other words, it can be considered an ultimate cause.' (Wilson, 2014)*. Root causes have several characteristics (Rooney & Heuvel, 2004):

- They are often deeper hidden causes: the goal should be to identify specific underlying causes. The more specifically defined the better.
- Root causes are those that can reasonably be identified: they should be able to be identified with reasonable cost and effort.
- Management has control over the causes: the definition of the causes should be as specific as possible for management to be able to put effective improvement actions on it.
- Effective recommendations can be generated for root causes. Recommendations needs to (directly) address the root causes identified during the investigation.

An effective technique to determine root causes is the Lean (Six Sigma, 2016) method asking 'Five Times Why? (Bulsuk, 2009). This method starts with a bottleneck, after which the initial question 'why?' is asked. The answer on this question is a cause (or multiple causes) of the initial bottleneck. After this first cause (or causes) the question is repeated for these initial cause and tries to answer the second question. It is repeated again until the answer does not lead to new causes. This simple to apply method generally leads within (often less than) five repetitions to a small number of root causes. The results of the 'Five Times Why' for determining root causes for the lack of cyber safety awareness education is presented in . This method was used together with the experts to determine the root causes.

For the elaboration of we have sorted the bottlenecks and causes in three main stakeholder groups: the government, the educational publisher and the elementary school, this is a primary stakeholder grouping. The colours refer to the stakeholder who has caused the effect to arise. We start on the left and analyse the column from top to bottom:

Macro system: Government

- For schools (pushed by private companies) there is a primary focus on only one element of digital literacy namely computer programming (as part of 'Computational Thinking' of the SLO circle model). Additionally, there is no regulatory obligation for schools to teach digital literacy and they encounter problems finding and selecting the most suitable information in the amount of digital literacy information available. Cause of these effects is due to the current unclear (and lack of) guidelines and the definition of digital literacy of the SLO and Curriculum.nu: it is not clear what is meant by digital literacy and therefore this leads to preferences by private companies (for programming), difficulty for policy makers to make it obliged, and for schools to know exactly what information to use in their curriculum. When we look at the cause of these unclear guidelines it is due to the slow development of 21st century standards by the Ministry of OC&W which has appointed Curriculum.nu (previous Onderwijs2032) to develop these. However, due to the complex stakeholder field surrounding elementary schools. Not all relevant stakeholders were involved causing an delay in decision making for the new elementary school curriculum. Additionally, the lack of

a clear long-term shared political vision has an impact in the delay in developing appropriate standards. The complex stakeholder playing field has the root cause in the 'freedom of education' culture whereby schools have a lot of freedom to determine their own interpretation and priorities in the school curriculum.

- Lack of funds: the lack of sufficient funding for educating digital literacy is caused by the current structure of lump sum compensation from the government whereby no direction is given where this funds should be spent on. There is no specific funding for digital literacy and therefore also their budget for buying teaching methods is limited (or capacity to develop own methods). The limited requirements how to spent the compensation are caused by the absence of a long term shared vision of the parliament how the Dutch education should look like in the near future (there is a lack of direction and cohesion). The Ministry of OC&W recognizes this absence and has formed Curriculum.nu. However, due to the four yearly parliamentary elections a political reformation takes place whereby a new Minister changes the educational focus due to their public political promises.

Exo system: Educational publishers

- From the educational publisher we see that they do not start to develop digital literacy methods due to the fact that they see currently not a viable business case for investing in a new cyber safety awareness method or adjusting their current methods. This is caused due to several factors: they expect to need to develop a digital platform and digital teaching methods, however their current contracts with content providers (authors) do not foresee in a change in settlement contracts. Additionally, there is competition of digital entrants which are agile organised and do not have long-term contacts with writers but develop their own content. Also the educational publishers state there is no clear demand from elementary schools for a digital literacy method and due to a decreasing market (mergers of schools), high investments (needed for a digital method) and a limited budget of schools makes it according to publishers not a viable business case. These effects are (root) caused by the current business model of publishers which is not flexible to anticipate on these contract and market changes. Next to this a root cause is a lack of proactive vision of publishers with regard to digital literacy: the standard approach is to keep a wait and see attitude by not starting until there are clear guidelines, core objectives and reference frames provided by the government.

Exo system: School Management Board

- According to the school management boards there is no capacity available to develop and shape their schools own curriculum, which was originally one of the primary intentions of the law on freedom of education. This is caused by the administrative burden on the teachers to administer the school children their social, emotional and rational developments. This is caused by an overcrowded curriculum in which schools have to pay attention to many other activities next to the core subjects of the curriculum. Both government, parents and other interest groups require school management boards and teachers that they integrate additional activities into the curriculum (e.g. English is in recent years added by the government). The primary cause for this overcrowded curriculum is the difficulty of schools management boards having to choose between many (equally important) subjects and therefore experience a difficulty in determining the right priorities (what will be part of the curriculum and what is left out). The root cause of this prioritization dilemma is the lack of vision of school management boards with regard to digital literacy education. Due to the lack of vision it is hard to assign the right resources to digital literacy education and to help the teachers to prioritize their activities. A vision also provides direction towards external stakeholders: Parents, suppliers, interest groups all understand what the school stands for and what they choose not to integrate in the curriculum.
- The lack of knowledge and experience of the teachers is seen as an important factor why the digital literacy development has not been implemented yet. This is caused by a lack of time

of teachers due to an overcrowded curriculum and a lack of affinity with the topics of digital literacy: teachers expect it is complex (technology driven) and do not feel comfortable to use these new digital media. They therefore do not see a direct connection to their subject. This lack of affinity with digital literacy is (root) caused by limited education within the context of digital literacy: for the development of new teachers within the PABO university education historically none, and currently limited, attention is paid to digital literacy education. Within schools often training depends on the personal preference and wishes of the teachers and since they feel no affinity with the topic this is currently disregarded. The limited education has also a connection with the lack of vision of the school management board: since there is no clear pathway developed which gives directions for the school teachers there is no attention and resources for professional development of teachers.

Figure 18: Determination of root causes why cyber safety awareness is limited educated

Summarized from this chapter we have identified six root causes:

- *Government:* The school culture: freedom of education and the unclear political direction with regard to education due to every four year of parliament change.
- *Educational publishers:* The current business model does not fit and there is a lack of vision on cyber safety education.
- *School management board:* there is a lack of vision and teachers are limited educated to teach cyber safety awareness.

This figure () and these root causes are validated by the digital literacy experts and one publisher.

The first part of the root cause analysis which covers the effects and causes related to the government are not taken into the improvements determination, since they are not one of the focus actors for this research. Nevertheless, for the root causes related to the government it would be the easiest solution to state that the government need to make digital literacy an obligated subject. It is also expected that this will eventually happen. However, current expectation by the digital literacy experts is that this may take until 2021 for it become obliged core objectives. According to important

stakeholders the current role of government is already to dominant: schools should not be top-down forced to change their curriculum (Onderwijscooperatie, 2017; PO Raad, 2015). According to Michael Fullan for bottom-up educational innovation the sense of 'moral purpose' is the way to create a supported change in the school curriculum (Fullan, 2006; Hemels, 2015). Policy makers should support this by giving substance to preconditions and capacity building (Fullan, 2006, p. 8). One of the headmaster illustrated this as well: school want to educate the world citizens of the future and therefore educating cyber safety awareness through digital literacy should be part of that. One of these preconditions is the financial compensation to reduce work pressure: Currently additional financial resources are made available by government (Rijksoverheid, 2018) to improve the budgets (and teachers salary). Even though these seem not enough (R. Kuiper, 2017) it will help to create new cyber safety opportunities.

After determining these root causes, we can start to develop opportunities to improve the bottlenecks. A straightforward answer on how to solve the root causes for school management boards is to develop a sustainable vision with regard to cyber safety awareness education via digital literacy. Together with this vision the management board should focus to invest in the professional development of teachers. For the educational publisher next to the development of a proactive vision with regard to cyber safety awareness education also the adaption of the current business model is required. These solutions are however complicated to implement and does not give enough guidance to the management boards. There are a number of critical success factors for these solutions to be effective, these were mentioned in the literature study and during the interviews. These critical success factors provide implementation choices for schools and educational publishers which in combination with the four proposed solutions will aid in developing the for the organization most suitable implementation.

Sub-question 4: What are important critical success factors for improving cyber safety awareness education with regard to elementary schools?

According to literature research, the interviews with the digital literacy experts, the headmasters and representatives of the educational publishers there are a number of Critical Success Factors (CSF) for the solutions to be able to effectively develop cyber safety awareness education via digital literacy. CSF are by Boynton and Zmud defined as '*those few things that must go well to ensure success for a manager or organization' (Boynton, A.C. and Zmud, 1984, p. 20)*. Translated to this research paper they are the variables which the proposed solutions must at least meet to be successful. We have interviewed two additional stakeholders (the digital literacy expert of Cubiss and the director of O2G2, a large school community which has successfully implemented digital literacy education in their curriculum. They both have a lot of experience with developing digital literacy education within schools and asked what according to them CSF are to contribute to the successful education of cyber safety awareness. The overall results are presented and elaborated in Table 13, for the vision solution the same CSF are applied for schools as well as educational publishers. These CSF's are validated with the digital literacy experts and their feedback has been incorporated.

Table 13: Critical success factors for determining and implementing suitable solutions

Critical Success Factor	Description
School & educational publisher management board: Develop a proactive cyber safety awareness vision	
MT's current experience	To grasp the importance of developing a vision on cyber safety, basic cyber safety awareness education knowledge is critical to be able to decide and understand what it involves and implies for the organization. SLO defines education vision development with the 4S-model (SLO, n.d.): vision on Student, School (policy), Subject and Society. Additionally the basic cyber knowledge will assist in creating a sense of urgency within the organization and provide a common baseline within the management team.

Belief & attitude	According to Kotter (Kotter & Cohen, 2017) the start of change requires the increase of urgency: The belief (sense of urgency) that change is needed for the future of the organization and the attitude to act on that. For the vision development this would mean feeling pressure to start right away with developing a cyber safety awareness education vision. Sense of urgency can be triggered both internally as well as externally (Tanner, 2018) e.g. this can be triggered by external events like policy changes or internal incidents.
Relevant stakeholders involved	Cooperation and involving relevant stakeholders to develop cyber safety awareness education vision is critical to get overall organizational commitment (Borgdorff et al., 2013). There is also the benefit from sharing knowledge and skills which enhances the quality of the vision and support in the organization (Jong de & Albers, 2017, p. 12).
Appropriate Scope	With regard to scoping of the vision there are roughly two options: does the organization wants to focus the vision on specific topics within cyber safety awareness education (one part of the SLO digital literacy circle) versus a broad focus which includes more subjects. The choice of a narrow scope (e.g. only media literacy) will have less impact on resources versus a broad scope between the subjects on digital literacy (Jong de & Albers, 2017) which provides more cohesion (NAP, 2012, p. 245).
Choice of Implementation methodology	The (innovative) strategy used to implement the vision. This is the method how the vision will be implemented into the organization, the (project management) methodology. Following the standard practices within the organization to make it familiar for the people involved. Methodologies like Lean (Stroo, 2016) and Scrum are proven to be effective (Scrum at Schools, n.d.).

School management board: Invest in the professional development of teachers	
Connect with Current knowledge of teachers	To be able to newly develop knowledge and skills regarding cyber safety awareness education the training plan should connect to the already available knowledge and experience of the individual teacher (Mediawijsheid.nl, 2017). This will enhance the motivation of teachers to develop new cyber safety awareness education knowledge. The current knowledge and experience should therefore be made transparent (measured) (Pardoen & Zwanenberg, 2010) to get an overview of the current experience status and potential training impact.
Teaching method flexibility	The decision to what extent the teaching method can be tailored to the school, the child, and the teacher preferences. It determines what is expected from teachers with regards to implementing a cyber safety awareness education teaching method. It provides the flexibility to adapt preferences of the teacher. This ranges from using already available standard teaching methods, which includes a manual and is often provided with a training course, until fully own developed teaching methods which require method development skills.
Method integration in the curriculum	The choice how cyber safety awareness via digital literacy is integrated into the curriculum determines what the impact of the knowledge development will look like. If the method is integrated into the current curriculum subjects (some experts advocate this integration (Net, 2013)) and used throughout multiple school years (group 1-8) this will have an impact on all teachers compared to providing it as a separate subject which can be taught by a few well educated expert teachers (KNAW advocates a separate subject (KNAW, 2012)).
Digital infrastructure environment	The development of cyber safety awareness through digital literacy teaching methods is expected to be partially or fully digital, therefore a prerequisite for teachers to educate cyber safety awareness teaching method is a good working connection to cyberspace and availability of digital devices. Depending on how this is completed by the school this will reinforce or limit the professional development of the teachers: when these facilities are limited this will additionally limit the opportunities of the teachers to develop themselves with digital media in the classroom and vice versa.
Relevant stakeholders involved	Cooperation within the teachers, method developers, cyber safety awareness experts and parents via for example 'Communities in professional learning' (Choi & Song, 2017) will greatly enhance the teacher motivation to learn and adopt the cyber safety awareness education. Close cooperating with parents can aid to professional development of teachers (Cijvat, Voskens, Boer de, & Vries de, 2009). This can also be used as a communication forum for educational publishers methods developer and teachers with regard to development of both the teacher as well as the cyber safety awareness methods. As management board the facilitation of these 'knowledge community' is essential for the professional development of teachers.

Educational publishers: Change the current business model	
Availability of a business model: definition of	The business model indicates how organizations can realize their mission, vision and strategy, internally and externally. To be able to understand how it must be adapted to include digital cyber safety awareness education methods there should be a consensus in what the current model for the educational publishers looks like e.g. via the business model canvas of Ostenwalder

current situation	(Osterwalder, Pigneur, Clark, & Smith, 2010a).
Business model adaption	The adaption of the business model focusses on the rigorousness with which the changes to the business model are implemented. This can be an incremental evolutionary iterate product innovation (e.g. adjusting the current product) or more drastic revolutionary pivot strategy (Amarsy, 2015; Norman, Verganti, Group, & Bio, 2012) (e.g. developing a fully new product proposition). It is highly depending on the organization and market developments.
Value Proposition	The value proposition is focused on how the educational publisher will deliver value (what problem does the cyber safety awareness method solve?) to the customer (teacher/child) and what the driver behind this proposition is. Putting the customer centrally is one way to create value but also other options like creating shareholder value can be the driver.
Market & product strategy	With the market and product strategy the Matrix of Ansoff ("Ansoffmatrix - Managementmodellensite," 2017) is applied to determine the market which the educational publishers would like to serve. This can be to serve the current market of elementary schools but also by exploring new markets. Next to this the product choices like adapting the current products (teaching methods) or start with a new separate (flexible) cyber safety awareness teaching method.
Relevant stakeholders involved	Close cooperation with stakeholders like the authors, method developers (SLO), the learning material suppliers and school management boards are required to be able to develop the most suitable cyber safety awareness product for the elementary schools and develop a supporting revenue model which fits with the vision of the educational publishers, their customers and suppliers. Involving relevant stakeholders also provides the opportunity to validate the value proposition and adapt when deemed necessary.

To summarize this part: We have identified five CSF for development of a proactive vision for the educational as well as the school management board. Also five CSF are defined for the professional development of teachers and five for the adaption of the educational publishers business model. What these CSF groups have in common is that in all situations the continuous interactions with their environment (stakeholders) is important to adapt to changing circumstances and requirements.

Sub-question 5: Which improvements can effectively be made by school management boards and educational publishers to improve the current implementation of cyber safety awareness education within elementary schools?

Within this last sub-question we will propose the school and educational publishers management board implementation choices based on the CSF linked to the four solutions. We propose alternatives based on the expert interviews and literature research. This is done via a 'menu' (table) for the management board to select which options fits best with the current organisation. This will finally result in a preferred implementation solution. The explanation of these combinations are presented in Table 14 (vision development for schools and educational publishers), Table 15 (teacher development) and Error: Reference source not found (business model development).

Summarized from these tables we see there are many possible combinations, which are dependent om the context of the organization. For example the external environment, culture, type of leadership and core qualities of the organization are important (existing and hard to change) factors that impact the choice of the implementation strategy. Although many have tried to model these factors (Verbiest, 2014) they are a unique combination to the individual school and educational publisher. We can therefore not propose one best overall solution but advice to choose the options which seem to fit best with the context of the current organization. We can however, select from these options a number of implementation activities which are low in implementation cost, low in effort to execute and have the highest benefit for the organization. These are the so called *'the low hanging fruit' (Solem, 2007)*. We can define a number of low hanging fruits per solution/CSF combination.

With regard to the proactive vision development:

- Start to gather information and get basic knowledge on the vision development for cyber safety awareness education: visit the provided websites and read-in on cyber safety

awareness education. Answer the questions on vision development stated by Kennisnet and share these within the management board.

- Start the dialog on the idea of defining a new vision with regard to cyber safety awareness education and share the idea with other stakeholders.
- For school management board: Sign up for support on both vision development as well as the professional development of teachers on Samendigiwijzer.
- For school management board: Start with an inventory what currently is already being done in the curriculum on cyber safety awareness education and which knowledge and experience is already available in the organization.

With regard to professional development of teachers:

- Determine by using the competency model of Mediawijzer.net what the current knowledge and skill level is of the teachers within the school.
- Start with capacity building: start the dialog on the cyber safety awareness professional development with the teachers and provide them with accurate information.
- Determine (together with the teachers) an initial baseline knowledge level for the teachers.

With regard to the adaption of the current business model:

- Make on the basis of the business canvas of Ostenwalder (Osterwalder et al., 2010a) the current business model explicit and start with a market research (with schools) to understand what wishes they have for cyber safety awareness education. This can be used to arouse the feeling of urgency within the management board.

- **Table 14: Proposed solutions and implementation steps for the root causes with regard to proactive vision development**

•	*School & educational publisher management board: Develop a proactive cyber safety awareness vision*			
•	Critical Success Factor	• Options and advice **what** to do: • *Schools & Educational publishers*	• Advice **how** to implement it: • *Schools*	• Advice **how** to implement it: • *Educational publishers*
•	*MT's current experience*	• *Minor (prior) knowledge:* There is yet no knowledge within the management team of 21st century skills and cyber safety awareness education vision development. In this case it will be wise to start with orientating on easy accessible knowledge and searching for inspiration on these subjects.	• Read into surveys and research and visit seminars or for example knowledge sharing session e.g. of Cubiss (Cubiss, 2017b) to get a first impression of cyber safety awareness education via digital literacy and read the step-by-step approach for media literacy vision generation of Kennisnet (Borgdorff et al., 2013). Once this basic knowledge is gained next implementation step is described in section *Some knowledge*.	• *Advice identical to the schools & additionally:* • Investigate current market initiatives (e.g. like Cubiss but also local school initiatives (SLO, 2015) and other available materials ("OntdekMedia," 2016)) with regard to digital literacy and cyber safety awareness education to get a sense of current product availability and competition. •
		• *Some knowledge:* There is already a good idea of the 21st century skills but on the part of cyber safety education via digital literacy there are still knowledge gaps. Not all MT members may be on the same knowledge level which help to develop the mutual vision.	• The initial step is to make an inventory what knowledge is already available within the MT and to get everybody on the same level. First step is to invite a digital literacy expert (e.g. MediaCoach[33]) who can provide information on what cyber safety awareness education exactly is and the implications for the school vision.	• *Advice identical to the schools & deviation:* • Invite a digital literacy expert (e.g. experts consulted for this research) who can provide information on what cyber safety awareness education development implies with regard to developing new teaching methods.
		• *Knowledgeable:* in this case the knowledge from cyber safety awareness education via digital literacy is already known within the management team. The only additional step is to stay up-to-date with latest news and current ongoing initiatives	• To stay up-to-date with the latest developments within the digital literacy domain it will help to subscribe to participate in feedback sessions of Curriculum.nu (Curriculum.nu, 2017) and visit schools which have already developed a digital literacy vision. Examples can be found on the site of Kennisnet (Stichting Kennisnet, n.d.-b).	• *Advice identical to the schools & additionally:* • Search in the current existing contacts for schools which are already cyber safety awareness active, and ask their experience with teaching methods being used. Additionally, investigate current available cyber safety awareness method development knowledge within the company.
•	*Belief &*	• *Cyber ignorant:* There is no sense of urgency within the MT, a possible latent	• According to the experts and literature cyber safety awareness education urgency	• The sense of urgency can be triggered by providing insight in the current policy

33 https://www.mediacoachinbeeld.nl/

	attitude		presence is ignored and focus is on other subjects . The urgency will probably increase by (for example) cyber incidents within the school (including pressure from important stakeholders) or eventually legal (policy) obligation.		can be triggered in the MT by creating transparency of cyber safety incidents of the school itself or nearby other schools or in the media. Creating an own (simulated) crisis e.g. phishing e-mail (Dodge et al., 2007) can help to open the eyes of MT members not to wait until regulators make the decision for them.		developments with regard to Curriculum.nu, the potential new market opportunities in the near future and the lack of (proven) good quality continuous teaching methods offered. Bring this in connection with the mission of the organization (e.g. 'Learning to innovate together' of ThiemeMeulenhoff[34]) to open the eyes of MT members and not to wait until regulators make it obliged for schools (and new entrants will compete).
		•	*Smart follower:* the conscious decision of the MT to wait for large changes until there is certainty on digital literacy policy, but does want to do start with cyber safety awareness education in some way. Starting with small theme based initiatives will aid to create a developing environment without too much impact.	•	In this case some MT member feel te urge to do something right now and others would like to wait. Storytelling might help to inspire MT to get a mutual sense of urgency. Additionally experiments with theme based initiatives like MediaMasters[35] may trigger more urgency within the MT for digital literacy development.	•	In this case some MT member feel te urge to do something right now and others would like to wait. Pilots with elementary schools to prove the importance or exploratory research may trigger more urgency within the MT for cyber safety awareness method development.
		•	*Precursor:* Within the MT there is a clear sense of urgency to develop a vision on cyber safety awareness education via digital literacy. This sense of urgency should be used to start generating ideas for the vision as soon as possible.	•	The most important implementation is in this case to make use of this existing energy for change: start right away with investing time in development of a digital literacy vision: Use the vision question list of Kennisnet as an aid to develop a cyber safety awareness via digital literacy vision (Stichting Kennisnet, n.d.-a) or play a vision design game with the management team (Slim met Media, 2018).	•	In this case the most important implementation is to make use of this existing energy for change: start right away with development of a proactive cyber safety awareness vision and linked business model: Use the vision question list of Kennisnet (Stichting Kennisnet, n.d.-a) as a reference to develop a vision.
•	*Relevant stakeholders*	•	*Reactive stakeholder management:* There is an internal MT focus, only involve 'outsiders' when there is an special need for (e.g. requirement from relevant stakeholder	•	With this strategy MT can start developing a vision quickly but are dependent on the use of reliable information sources and internal MT knowledge. Kennisnet has provided a	•	*Advice identical to the schools & additionally:*

34 https://www.thiememeulenhoff.nl/

35 https://www.mediamasters.nl/

involved	like inspection). This makes the development of the vision faster compared to the proactive strategy since there is no need to take into account other requirements.	handbook which provides reliable resources to start with (Pijpers, 2017a). When stakeholder involvement is needed good communication from an influential spokespersons is very important (Eskerod & Jepsen, 2013), a formal agreement on this will assist in leading external stakeholder in the right direction.	• Core questions should be transformed to suit the publishing internal organization. Additionally this has strong connections with the internal identity of the company: do we want to deliver method with have a certain and short return-on-investment or do we educate children to act (safely) in the world? These MT choices determine how the rest of the organization is shaped to develop a cyber safety awareness method.
	• *Proactive stakeholder management*: relevant stakeholder are actively involved in the development of the vision and external help is used for developing the vision. It helps to not only focus on the internal stakeholders but request active support and input from external parties which for example can provide expert knowledge and support.	• The challenge to involve the internal and external surroundings of the school to create support but do no slow down the vision development. Capacity building can assist in this (Fullan, 2006): not only the MT members but also other important stakeholders must be convinced of the need to develop a cyber safety awareness via digital literacy education vision (e.g. teachers, parents) e.g. use newsletters and information sessions can help but also use of change agents (The George W. Bush Institue, 2013, pp. 6–7). Seek active support in creating a vision and developing digital literacy cooperation from digital literacy expert centres and knowledge platforms like Kennisnet and Samendigiwijzer[36].	• The importance for publishers is to get an outward focus: what do customers (children) need? What (latent) problem is being solved? To understand this active participation in foundation for teacher knowledge sharing (e.g. LeerKRACHT), cooperation with schools is important. Active cooperation with the teaching material suppliers is needed to understand the potential market for cyber safety awareness education methods. The active support and the strengths and facilities of the GEU can assist in this. Additionally, cooperation with Kennisnet and SLO can help, to use their experience with the new core objectives. Finally participate in the feedback teams of Curriculum.nu to have a head-start regarding to the future obliged objectives. •
• *Scope*	• *Focus:* When the MT is used to start small with changes in their vision the advice is to start with one part of the digital literacy circle. For cyber safety awareness education the media literacy part is in that case a preferred focus in the schools vision.	• When one component is (media literacy) is included in the vision more specific resources can be used to implement this. For example the continuous curriculum of National Media Passport (Nationale Academie voor Media en Maatschappij, 2014) or Cubiss (Cubiss, 2017a) can be used	• *Advice identical to the schools & additionally:* • Make a weighted decision in the vision: focus exclusively on cyber safety awareness education, which limits investments but does not cover all the core objectives.

36 https://www.samendigiwijzer.nl/

			as a basis.	
		• *Cohesion:* The primary aim of the MT is to develop a vision which enhances the total cohesion between the subjects in the curriculum and cyber safety awareness education via digital literacy. All four components of digital literacy should be included in the vision.	• Use the (concept) continuous curriculum requirements of the SLO (SLO, 2017b) to enhance cohesion with the components and make a connection between the current subjects. •	• *Advice identical to the schools & additionally:* • Focus in the vision on the cohesion between the current available teaching methods offered and the four subjects of digital literacy. •
•	*Implementation methodology*	• Traditional (project based) method (waterfall) implementation methodology: detailed step-by-step development in long term planning cycles. Implement the vision once the whole planning cycle is complete and detailed action plans are available.	• Assign a project leader and use the previous mentioned handbook of Kennisnet (Pijpers, 2017a) to make a project plan to develop the vision and implement it once it is agreed upon.	• *Advice identical to the schools & additionally:* • Follow the standard development practices for a new / adapted teaching method and include this in the vision.
		• Innovative agile methodology: Lean/Scrum methodology: Part of the vision is the strategy to implement the vision, be able to adjust to changing circumstances (agility) and think of trying new methods to receive daily feedback from teachers e.g. Agile or Scrum methodologies (Scrum at Schools, n.d.).	• Based on the vision start a (small) initiative as soon as possible to create support: celebrate the successes and learn from the failures. Create a 'experiment and learn' atmosphere e.g. start with parts of the National Media Passport as a basic safety awareness initiative.	• Mention in the vision the strategy to build a minimum viable product and quickly release this to the market. Receive feedback and continue to adapted it to the wishes of the teachers and children.

•

• **Table 15: Proposed solutions and implementation steps for the root causes regarding investing in the professional development of teachers**

•	*School management board: Invest in the professional development of teachers*			
•	Critical Success Factor	• Options and advice **what** to do: •	• Advice **how** to implement it	•
•	*Current knowledge of teachers*	• *Minor (prior) knowledge:* There is currently no knowledge within the teachers team of 21st century skills and cyber safety awareness education via digital literacy. In this case it will be wise to start with orientating on easy accessible knowledge and searching for inspiration on the topic.	• Determine a certain minimum digital base level (knowledge & skills) every teacher should have for educating cyber safety awareness. For example the competency model of Mediawijzer.net can be used as a reference. Teacherschannel provides an online assessment (Teachers in Media, 2018). Start with capacity building to enthusiasm teachers.	
		• *Some knowledge:* There is already a good idea of the 21st century skills but on the cyber safety education through digital literacy part there are	• Determine a certain minimum digital base level (knowledge & skills) every teacher should have for educating cyber safety awareness. For	

	still knowledge gaps. Not all MT member may be on the same knowledge level which help to develop the mutual vision.		example the competency model of Mediawijzer.net can be used as a reference. Share current available knowledge within the team and give laggards extra training for example hire digital literacy experts to educate digital literacy[37]. Provide recurring feedback on learning progress.
	• *Knowledgeable:* in this case the knowledge from cyber safety awareness education via digital literacy is already known by the teachers. The only additional step is to stay up-to-date with latest news and current ongoing initiatives.	•	Determine a certain minimum digital base level (knowledge & skills) every teacher should have for educating. For example the competency model of Mediawijzer.net can be used as a reference. In this case the active usage of own cyber safety awareness knowledge can be put in practice and improved by training on the job (e.g. receiving feedback from an expert).
• *Method development knowledge*	• Use standard teaching methods: in this case the standard teaching method provided by the publisher is leading for educating cyber safety awareness education via digital literacy. An overview of current existing methods is made by Kennisnet. •	•	Standard currently available methods are provided with training instructions which should be followed.
	• Customize standard teaching method: Teachers should actively enrich the standard methods with their own cyber safety awareness additions. Most important here is that it fits with the children being educated. •	•	This can be very diverse, depending on the background of the teacher and preferences of the children. What is most important is to search for add-ons which appeal to the children and whereby a teacher feel comfortable to use them.
	• Own developed method (e.g. open source): When there is enough knowledge and experience an own curriculum can be designed specific tailored to the school.	•	Important is to start small and follow the guidelines of the SLO and Mediawijzer.net concerning the requirements for cyber safety awareness education. These together with sites like Wikiwijs[38] provide teach materials to be used in class.
• *Cyber safety awareness method integrated in the curriculum*	• Given as separate subject: provides visibility within and outside school and can limit the training effort to only a limited set of teachers. They will be the experts and cyber safety awareness change agents within the school.	•	Select change agents who are motivated to teach cyber safety awareness education. The teacher need to be educated up to semi-expert level to be able to transfer knowledge. External education to become a MediaCoach provides a solid basis.
	• Given as integral part of all other subjects: this will impact all teachers but only to a limited extent, and has the advantage that it can be connected to other topics where the teacher already has an affinity with.	•	Train all the teachers with the baseline knowledge and let them come up with proposals to enrich their subjects with cyber safety awareness via digital literacy aspects.

37 https://www.bureaujeugdenmedia.nl/

38 https://www.wikiwijs.nl/

• *Digital infrastructure knowledge*	• Basic (WiFi/DigiBoard available): When the cyber safety awareness education uses existing infrastructure minimum additional knowledge is required to teach.	• Make sure the basics work properly for the teachers and actively ask teachers regarding issues with those basics. Teachers should be tested regularly to check their basic ICT skills and be trained accordingly (e.g. via training on the job).	
	• High-level (every child a digital device): The opportunity for children to practice their cyber skills is optimal when used in combination with a solid infrastructure but this requires more ICT knowledge from teachers. •	• Create an ICT knowledge and skills training plan based on an ICT vision supporting the use of digital infrastructure PO council provides support in creating the ICT ambitions and practical guidelines (PO Raad, 2016). •	
• *Relevant stakeholders involved*	• *Reactive stakeholder management:* There is an internal school focus, only involve 'outsiders' when there is a special need for (e.g. requirement from relevant stakeholders). This makes the knowledge development more straightforward but depending on only some key-players.	• Verify the correctness of the background knowledge available. Since there is heavy reliance on own internal skills and knowledge usage of the right sources can make a difference. Kennisnet provides modules how to develop knowledge (Schouwenburg, 2017). Make sure the right resources are followed including the guidelines from SLO.	
	• *Proactive stakeholder management*: relevant stakeholder are actively involved in the knowledge development of the vision and external help is used for developing the vision. It helps to not only focus on the internal school stakeholder but request active support and input from external help.	• Create so called 'Communities of interest' whereby knowledge is shared between experts, teacher and other interested people. Example of a knowledge sharing platform is foundation LeerKRACHT (Heemskerk & Schenke, 2016). Involve children and parents in de knowledge and skills development process to create an integral approach.	

•

• **Table 16: Proposed solutions and implementation steps for the root causes with regard to change of the current business model**

• *Educational publishers: Change the current business model*			
• Critical Success Factor	• Options and advice **what** to do: •	• Advice **how** to implement it (first steps):	
• *Availability of a business model: definition of current situation*	• Explicit defined model: there is a formal business model defined within the company. This will act as the starting point for the business model adaption.	• Verify and if needed update the existing business model to the current organization. Check if it is in line with the current vision.	
	• Implicit model: The model is informal and not specifically written down. People within the company generally know elements of the model, but only few see the whole picture.	• Define the current model and make a direct link with the current vision e.g. use the business model canvas of Ostenwalder & Pigeur (Osterwalder, Pigneur, Clark, & Smith, 2010b).	
• *Busine*	• Incremental adaption: When the standard development procedure	• Determine the current strengths of the educational publisher business	

ss model adaption method	within the publisher is to incremental adapt current business model (evolution) the business model should be adapted/adjusted to provide a new cyber safety awareness digital literacy method.	model and evolve from that: adapt the existing business model to address current issues with content providers and adapt the proposition to offer teaching methods digitally (e.g. transaction or license fee).
	• Re-design the model: This involves the revolution method whereby the educational publishers start from scratch to re-define what their business will look like. Innovative trends are that educational publisher digitally transform their businesses.	• Investigate the possibility to re-define the publishing business via offering digital adaptive learning platforms (Moll van, 2014) (e.g. like Reed Elsevier). Investigate using flexible revenue models (Wille, 2010) which will provide opportunities to adjust current issues with content providers.
• *Value proposition*	• Focus on shareholder value: The focus of the educational publishers is to receive a quick return-on-investment with calculated risk. In this case cyber safety awareness method investments must limited or be guaranteed profitable.	• Focus on the upgrade of the current teaching methods to limit risk and return-on-investment time. Focus on enhance the revenue growth of current existing methods by making explicit what is already included on cyber safety awareness.
	• Focus on customer value: The focus of attention is in this case understanding how cyber safety awareness education is adding value according to the customer (school management board).	• Perform additional market research at schools specifically focused on cyber safety awareness education. This to grasp what latent wishes elementary school management board have with regard to cyber safety awareness education via digital literacy.
• *Market & product strategy*	• Focus is on the existing markets & new product of the Ansoff Matrix: this segment is called product development. The cyber safety awareness teaching method will be a new product (or add-on) in the current existing market of elementary schools. This requires adaptions on the product side of the business model.	• The assessment of customer needs, via market research and product research and development are key for this strategy: the business model should be flexible to adapt to the wishes of schools e.g. product should the theme based and modular, the business model should support this. Develop an add-on for current teaching methods and make explicit how these contribute to cyber safety awareness.
	• Focus on new market & new product of the Ansoff Matrix: this segment is called Diversification. This means searching with a new cyber safety awareness method actively for new markets. Since the investments for developing a new method are relatively high new markets will provide more revenue. This will additionally help to improve the business case to serve the current market for elementary schools as well.	• Look beyond the current market of elementary schools and think of developing teaching methods which can be used internationally or focuses on a broader market e.g. via gamification (Kapp, 2012, p. 9). Adjust the business model to these new market opportunities.
• *Relevant stakeholders involved*	• Reactive stakeholder management: There is an internal focus with regard who is involved in adapting the business model, only 'outsiders' are involved when there is an special need for. For example when ambiguity is over the latent market demand external market researchers can be consulted. For the business model development of internally focused organizations the updating of the existing model is most suitable and requires less effort and is faster to implement.	• With this strategy MT can start update quickly but are dependent on the use of reliable information sources and internal MT knowledge. Kennisnet has provided a handbook which provides reliable resources to start with. When stakeholder involvement is needed good communication from an influential spokespersons is very important, a formal agreement on this will assist in leading external stakeholder in the right direction.
	• Proactive stakeholder management: relevant stakeholder are actively involved in the development or redefinition of the business model. Since there are a lot of stakeholders involved, proactively cooperation will assist in defining the customer value and assists in settling current copyright difference with content providers.	• From customer perspective: Actively search for school management boards willing to cooperate in developing a cyber safety awareness education method to provide insight in the customer value proposition. • • From method resellers: Start exploratory talks for a partnership with one

		of the teaching method suppliers to cooperate in developing a suitable pricing and distribution structure for cyber safety awareness teaching method. • • From suppliers: Work together with the method developers and content providers to define an adapted or new type of royalty agreement based on offering the method digitally. Also contact SLO to understand what can be expected with regard to digital literacy core objectives in 2019.

4. Conclusion & recommendations for further research

- In this research we have created an insight into the complex stakeholder field of influence surrounding elementary schools and educational publishers with regard to educating cyber safety awareness. Further we have provided an overview of bottlenecks, defined root causes for the lack of current cyber safety awareness education and proposed improvements to enhance these.
- The central question we started this research with was: '*What are important improvements for elementary school management boards and educational publishers to enhance the cyber safety awareness education at Dutch elementary schools?'* The research question was divided into five sub-questions, we will summarize the answers shortly.
- *Sub-question 1. What is the current status of cyber safety awareness education within Dutch elementary schools?*
  - The interviews conducted with the school headmasters resulted in the conclusion that there is limited attention for cyber safety awareness education in the current elementary school curriculum. This corresponds to the literature research: teachers currently play a minor role in teaching cyber safety awareness. The six elementary schools use teaching methods which address some cyber safety risks (primarily cyberbullying, sexting, grooming and privacy risks) however, within these methods only little attention is paid to raise safety awareness.
- *Sub-question 2. What stakeholders are surrounding elementary school management boards and educational publishers management boards, with regard to educating cyber safety awareness, and what is their relationship?*
  - The construction of a layered stakeholder model provided the insight that there are many stakeholders active in cyber safety education. These are mainly focused on the school management boards and in lesser extend on the educational publishers. The main influential stakeholders for school management boards are: SLO, educational publishers, learning resource suppliers, the school foundation board and their teachers. For educational publishers these are: SLO, school management boards and the learning resource suppliers.
- *Sub-question 3. What are, with regard to these two primary actors, the main bottlenecks and root causes for educating cyber safety awareness within elementary schools?*
  - The results of the interviews with headmasters, educational publishers and digital literacy experts was the identification of 29 bottlenecks that could be traced back to four root causes. Two root causes are the same for schools as well as educational publishers: the absence of a proactive vision with regard to cyber safety awareness education. Additionally, for schools the limited education of teachers is a root cause and for educational publishers the current business model does not fit. The solutions are to develop a proactive vision with regard to cyber safety awareness education, educate teachers (school management boards) and adapt the current business model (educational publishers).
- *Sub-question 4. What are important critical success factors for improving cyber safety awareness education within regard to elementary schools?*
  - For every solution five critical success factors were defined. For the solution to develop a proactive vision these are: Management boards current experience, the belief and attitude, involving the relevant stakeholders, the appropriate scope and choice of implementation methodology. For the solution to invest in the professional development of teachers these are: connection with the current knowledge of teachers, teaching method flexibility, method integration in the curriculum, digital infrastructure environment, and

involving the relevant stakeholders. For the solution to adapt the current business model these are: availability of a business model, the business model adaption, the value proposition, the market and product strategy, and involving relevant stakeholders.

- *Sub-question 5. Which improvements can effectively be made by school management boards and educational publishers to improve the education of cyber safety awareness within elementary schools?*
  - The critical success factors in combination with the solutions were used to define implementation options. These are depending on the individual situation (e.g. culture) of the school or educational publisher. Based on the choices of the schools and educational publishers initial implementation steps are proposed. Finally we have provided a description of the relatively easy to implement steps. With regard to the proactive vision development these are to start gathering information and get basic knowledge on the vision development and start the dialog on the idea of defining a new vision. With regard to professional development of teachers it is important to determine what the current knowledge and skill level is of the teachers within the school. For adaption of the current business model the easy to implement step is to make (by using the business canvas of Ostenwalder) the current business model explicit and start with a market research (with schools) to understand what wishes they have for cyber safety awareness education.
-
- The research question may be called a 'wicked problem' (Borko, Whitcomb, & Liston, 2009): which implies it includes a large number of complex dynamic variables, that are interdependent and contextually bound. The facilitation of an educated teacher and a standard teaching method resulting in good cyber safety awareness education holds no ground when looked at the complex (stakeholder) field of influence the management boards are acting in. By starting soon with the implementation of solutions to enhance cyber safety awareness education schools and educational publishers are prepared for now and the near future.
-
- For further research there are a number of recommendations: For the school management board and educational publishers there is the opportunity to start to implement the solutions provided in this report. Kennisnet in cooperation with the SLO can investigate the effectiveness of the solutions in practice. E.g. a pilot with one or multiple schools and publishers for comparison: which have, and do not have a cyber safety awareness educational vision and how does it support the children in acquiring cyber safety awareness skills? Additionally, the influence of educating teachers how to develop and apply cyber safety awareness education methods can provide insight in the importance of the knowledge development component of the proposed solution. Kennisnet and SLO can use this knowledge to update their advices to schools and their knowledge materials. With regard to the educational publishers an experiment with different types of adjusted business models would provide insight on what works best in practice. The GEU trade association can accompany this experiment, whereby their members can benefit from the knowledge gained.
-
- Another option regarding to cyber safety awareness education is for the Ministry of OC&W to investigate in more depth the possible solutions for the government root causes mentioned in sub-question 3. What important improvements can be made by policy makers and would help to enhance the education of cyber safety awareness? By answering this question schools and publishers will benefit and the overall cyber safety awareness education solution will be strengthened.
-

- When looking at the near future it can be expected that in upcoming years the core objectives for digital literacy will be determined. It is useful to monitor by Kennisnet and SLO to which extend the pilot schools and publishers benefit from a head-start compared to other schools and publishers that wait and stay behind. As stated by one of the digital literacy experts: the new digital literacy core objectives will eventually be defined, it is up to the schools and educational publishers to (proactively) act on these.
-

Attachment A: Questionnaire

- *Interviews are conducted in Dutch therefore interview questions are in Dutch*
- **<u>Vragen voor directieleden basisschool:</u>**
- *Inleiding:*

- Kunt u wat achtergrond informatie geven over het [naam school]? Welke rol vervuld u hierin?
- In hoeverre wordt er al met digitale leermiddelen gewerkt binnen uw school (denk aan Digibord, tablets, PC, maak ook bv sociale media)?
- *Kern:*
- [Laten zien model van risico's die kinderen lopen & definitie cyber safety awareness]
- Herkent u deze risico's?
- In welke mate worden uw basisschool kinderen bewust gemaakt van deze risico's van het internet?
    - Op welke manier gebeurt dit? Bv privacy protocol, pest protocol, thema lessen etc.
    - Heeft u hiervoor een visie ontwikkeld?
    - Welke leermethoden worden hiervoor gebruikt?
        i. Zijn deze methoden afgestemd op het leerniveau van het kind?
        ii. Zijn de methoden geïntegreerd in het curriculum?
        iii. Hoe worden de ouders hierin betrokken?
        iv. Welke leertheorie ligt hier aan ten grondslag?
- Bent u bekend met de 21ste -eeuwse vaardigheden vanuit SLO?
    - Bent u bekend met de digitale geletterdheid?
    - In hoeverre geeft u al invulling aan digitale geletterdheid? Op welke wijze?
    - Welke bronnen gebruikt u daarvoor?
    - In welke mate hebben uw docenten hier kennis van?
- Wat zijn volgens u de belangrijkste knelpunten om kinderen bewust te maken van de risico's van het internet?
- Wat zijn voor u belangrijke stakeholders (belanghebbenden)
    - Welke rol spelen de educatieve uitgevers hier in?
    - Welke rol spelen de directies van basisscholen hier in?
- Van welke educatieve uitgevers maakt u gebruik? En welke leermethoden?
- Hoe makkelijk/moeilijk is het voor om van uitgever te veranderen?
    - Zijn er contracten met uitgevers?
    - Heeft u al een langdurige relatie met deze uitgever?
- Hoeveel tijd/effort kost het u om een nieuwe leermethode te introduceren? (of te wisselen van methode
    - Hoe gaat het selecteren van een leermethode?
    - Wordt daar gekeken naar nieuwe uitgevers?
    - Welke invloed heeft u in het ontwikkelen van nieuwe methodes?
- Wat zijn volgens u belangrijke succes factoren om kinderen bewust te maken van de risico's van het internet?

    - Welke rol heeft u als directie daar in?
    - Welke rol hebben educatieve uitgevers hier in?
-
- Welke verbeteringen zouden er nodig zijn om kinderen meer bewust te maken van de risico's van het internet?
    - Welke verbeteringen richting educatieve uitgevers?
-
- *Afsluiting:*
- Welke andere personen zou ik volgens u nog moeten interviewen?
- Zou ik u mogen benaderen voor aanvullende vragen?
- Zou u een check willen doen op de inhoud van het rapport?
- Zou u een kopie van het rapport willen ontvangen?
-
- **<u>Interviewvragen voor Uitgevers</u>**
-
- *Inleiding:*
- Kunt u wat achtergrond over [naam uitgever]als uitgever geven?
- Kunt u uitleggen wat educatieve uitgeverijen voor diensten leveren aan het primaire onderwijs?
    - Welke ICT diensten worden geleverd?
    - Wat is uw rol hierin?
- In hoeverre worden er al digitale leermiddelen ontwikkeld binnen uw uitgeverij?
-
- *Kern:*
- [Laten zien model van risico's die kinderen lopen + definitie cyber safety awareness]
- Herkent u deze risico's?
- In welke mate worden door uw bestaande lesmethodes basisschool kinderen bewust gemaakt van deze risico's van het internet?
-
- Bent u bekend met de 21ste -eeuwse vaardigheden vanuit het SLO?
    - Bent u bekend met de digitale geletterdheid?
    - In hoeverre geeft u al invulling hier aan door ontwikkeling van les methodes voor digitale geletterdheid?
    - Op welke wijze wordt dit gedaan?
    - Welke bronnen gebruikt u daarvoor?
- Wat zijn volgens u de belangrijkste knelpunten om kinderen bewust te maken van de risico's van het internet? (door invulling te geven aan digitale geletterdheid)
- Wie zijn volgens u hierin belangrijke stakeholders (belanghebbenden)?
    - Welke rol spelen de directies van basisscholen hier in?
    - Welke rol spelen educatieve uitgevers hier in?
-
- Hoe makkelijk/moeilijk is het voor scholen om van uitgever te veranderen?
    - Zijn er contracten met scholen?
    - Heeft u al een langdurige relatie met scholen?
- Hoe gaat het proces van het ontwikkelen van een nieuwe lesmethode in zijn werk?
- Wie heeft hierop invloed?
-
- Wat zijn volgens u belangrijke succes factoren om kinderen bewust te maken van de risico's van het internet?
    - Welke rol heeft u als educatieve uitgever daar in?

    - Welke rol hebben directies van scholen volgens u hier in?
    -
- Welke verbeteringen zouden er nodig zijn om kinderen meer bewust te maken van de risico's van het internet?
    - Welke verbeteringen richting directies van basisscholen?
    - Welke verbeteringen richting directies van educatieve uitgevers?
    -
    - *Afsluiting:*
- Welke andere personen zou ik volgens u nog moeten interviewen?
- Zou ik u mogen benaderen voor aanvullende vragen?
- Zou u een check willen doen op de inhoud van het rapport?
- Zou u een kopie van het rapport willen ontvangen?
    -
    - **<u>Interview vragen voor Experts</u>**
    -
    - *Inleiding:*
- Kunt u wat achtergrond over uw rol als expert digitale geletterdheid geven?
    - Wat is uw ervaring met kinderen in het primaire onderwijs en risico's die de kinderen lopen op het internet?
- Weet u in hoeverre er digitale leermiddelen ontwikkeld worden binnen uitgeverijen en hoe worden deze toegepast binnen scholen?
    -
    - *Kern:*
- Wat zijn volgens u de belangrijkste risico's van het internet voor basisschoolkinderen?
    - *[Laten zien model van risico's die kinderen lopen & definitie cyber safety awareness]*
- Herkent u deze risico's?
- Ontbreken er belangrijke risico voor basisschool kinderen?
- Op welke manier worden kinderen volgens u bewust gemaakt van deze risico's van het internet?
    - Welke rol hebben basisscholen hier in?
    - Welke rol hebben educatieve uitgeverijen hierin?
    -
- Bent u bekend met de 21ste -eeuwse vaardigheden (en het model vanuit de Stichting Leerplan Ontwikkeling)?
    - Bent u bekend met digitale geletterdheid?
        - Informatie vaardigheden
        - ICT basis vaardigheden
        - Mediawijsheid
        - Computational Thinking
- Wat zijn volgens u de belangrijkste knelpunten om kinderen bewust te maken van de risico's van het internet?
    -
- Wie zijn volgens u hierin belangrijke stakeholders (belanghebbenden)?
    - Welke rol spelen de directies van basisscholen hier in?
    - Welke rol spelen directies van educatieve uitgevers hier in?
- Kunt u omschrijven hoe de relatie tussen basisscholen en educatieve uitgeverijen gevormd is?
    - Welke invloed heeft de basisschool op de uitgever? En visa versa?
    -
- Wat zijn volgens u kritieke succes factoren om kinderen bewust te maken van de risico's van het internet?

    - Welke rol heeft een educatieve uitgever daar in?
    - Welke rol hebben scholen volgens u hier in?
    -
- Welke verbeteringen zouden er nodig zijn om kinderen meer bewust te maken van de risico's van het internet?
    - Welke verbeteringen omtrent directies van basisscholen?
    - Welke verbeteringen omtrent educatieve uitgevers?
    -
    - *Afsluiting:*
- Welke andere personen die met dit onderwerp bezig zijn zou ik volgens u nog moeten interviewen?
- Zou ik u mogen benaderen voor aanvullende vragen?
- Zou u een check willen doen op de inhoud van het rapport?
- Zou u een kopie van het rapport willen ontvangen?
    -

References

- Adriaens, S., Grinsven van, V., Woud van der, L., & Westerink, H. (2016). *Werkdruk leerkrachten in het basisonderwijs*. Retrieved from http://www.duo-onderwijsonderzoek.nl/wp-content/uploads/2016/01/Rapportage-Werkdruk-Leerkrachten-PO-8-januari-2016-1.pdf
- Amarsy, N. (2015). The Pivot: 6 Situations When It's Time to Change Your Business Model and Value Proposition. Retrieved February 7, 2018, from http://blog.strategyzer.com/posts/2015/7/23/the-pivot-6-situations-when-its-time-to-change-your-business-model-or-value-proposition
- Ansoffmatrix - Managementmodellensite. (2017). Retrieved February 8, 2018, from https://managementmodellensite.nl/ansoffmatrix/#.WnuFv-jOXIV
- Atkinson, S., Furnell, S., & Phippen, A. (2009). Securing the next generation: enhancing e-safety awareness among young people. http://doi.org/10.1016/S1361-3723(09)70088-0
- Autoriteit Persoonsgegevens. Publicatie van beeldmateriaal van leerlingen door scholen, Pub. L. No. z2016-11232 (2017). Autoriteit Persoonsgegevens. Retrieved from https://autoriteitpersoonsgegevens.nl/sites/default/files/atoms/files/20170830_vereniging_vo-raad_02.pdf
- Barbovschi, M. (2013). *Innovative approaches for investigating how children understand risk in new media dealing with methodological and ethical challenges*. EU Kids Online. Retrieved from https://lsedesignunit.com/EUKidsOnline/html5/index.html?page=1&#
- Barford, P., Dacier, M., Dietterich, T. G., Fredrikson, M., Giffin, J., Jajodia, S., … Yen, J. (2010). Cyber SA: Situational Awareness for Cyber Defense (pp. 3–13). Springer, Boston, MA. http://doi.org/10.1007/978-1-4419-0140-8_1
- Beuningen, J., & Kloosterman, R. (2017). *Hoe ervaren internetgebruikers hun digitale veiligheid*. Retrieved from https://www.cbs.nl/nl-nl/achtergrond/2017/24/hoe-ervaren-internetgebruikers-hun-digitale-veiligheid-
- Bibliotheek. (2017). Wat is de Bibliotheek op school? Retrieved February 5, 2018, from http://www.debibliotheekopschool.nl/wat.html
- Bisschop, P., Imandt, M., van der Vegt, A. L., & Bomhof, M. (2016). *Kwaliteit, betrouwbaarheid of innovatie?* Amsterdam. Retrieved from http://www.seo.nl/uploads/media/2016-69_Kwaliteit_betrouwbaarheid_of_innovatie.pdf
- Blanksma, A., & Konings, Ç. F. (2017). *Nationaal Cybersecurity Bewustzijnsonderzoek Rapportage 2017*. Amsterdam. Retrieved from https://www.alertonline.nl/media/Nationaal-Cybersecurity-Bewustzijnsonderzoek-2017-DEF.pdf
- Blockhuis, C., Fisser, P., Grievink, B., & Voorde, M. ten. (2016). *Leermiddelenmonitor 15/16*. Enschede. Retrieved from http://downloads.slo.nl/Repository/leermiddelenmonitor-15-16.pdf
- Borgdorff, M., Desain, C., Steffens, W., & Slegtenhorst, G. (2013). *Mediawijsheid voor schoolbestuurders*. Zoetermeer. Retrieved from https://www.kennisnet.nl/fileadmin/kennisnet/publicatie/Mediawijsheid_voor_schoolbestuurders.pdf
- Borko, H., Whitcomb, J., & Liston, D. (2009). Wicked Problems and Other Thoughts on Issues of Technology and Teacher Learning. *Journal of Teacher Education*, *3-7*, 5. http://doi.org/10.1177/0022487108328488
- Both, D. D. (2008). Onderwijsmethode belangrijk, maar niet allesbepalend. *dRS Magazine*, (10). Retrieved from http://www.drs-online.nl/artikel.php?ID=629
- Boynton, A.C. and Zmud, R. W. (1984). An Assessment of Critical Success Factors. *Sloan*

Management Review, *25*(4), 17–27.
- Bronfenbrenner, U. (1994). *Ecological Models of Human Development* (2nd ed.). Oxford: Elsevier. Retrieved from http://www.psy.cmu.edu/~siegler/35bronfebrenner94.pdf
- Bruijn, A. de. (2014). *Ministerie van Onderwijs, Cultuur en Wetenschap: Nulmeting Privacy & Beveiliging Primair en Voortgezet Onderwijs*. Den Haag.
- Brummelhuis, A. ten, & Binda, A. (2017). *Vier in balans-monitor 2017*. Zoetermeer. Retrieved from https://www.kennisnet.nl/fileadmin/kennisnet/publicatie/vierinbalans/Vier-in-balans-monitor-2017-Kennisnet.pdf
- Bulsuk, K. (2009). An Introduction to 5-why. Retrieved February 7, 2018, from http://www.bulsuk.com/2009/03/5-why-finding-root-causes.html
- Cadzow, S., Eckmaier, R., Eschweiler, J., Gerber, B., Guarino, A., & Uni, –. (2015). *Definition of Cybersecurity | Gaps and overlaps in standardisation*. *European Union Agency For Network And Information Security* (Vol. v1.0). Retrieved from http://afyonluoglu.org/PublicWebFiles/ENISA/2016 July ENISA - Cybersecurity_Definition_Gaps_v1_0.pdf
- Carstens, N. (2017). #Onderwijsvraag 18: Waarom standaard lesmethodes? Retrieved February 5, 2018, from https://operation.education/onderwijsvraag-18-waarom-standaard-lesmethodes/
- CBS. (2017). Prognose aantal leerlingen po | Kengetallen | Onderwijs in cijfers. Retrieved February 5, 2018, from https://www.onderwijsincijfers.nl/kengetallen/primair-onderwijs/deelnemerspo/prognose-aantal-deelnemers
- CED Groep. (2013). De Vreedzame School. Retrieved February 5, 2018, from http://www.devreedzameschool.nl/basisonderwijs-1/lessenserie-2/30-praktijk/kosten/79-lessenserie0103inhoud
- Choi, J., & Song, K.-O. (2017). Structural analysis of factors that influence professional learning communities in Korean elementary schools. *Lnternational Electronic Journal of Elementary Education*, *10*(1), 1–9. http://doi.org/10.26822/iejee.2017131882
- Chou, C., & Peng, H. (2010). Promoting awareness of Internet safety in Taiwan in-service teacher education: A ten-year experience. http://doi.org/10.1016/j.iheduc.2010.03.006
- Cijvat, I., Voskens, C., Boer de, H., & Vries de, P. (2009). *Een onderzoek naar de rol van ouders in het primair onderwijs*. Amersfoort. Retrieved from https://www.leraar24.nl/app/uploads/2._Publicaties-De-rol-van-ouders-in-het-primair-onderwijs.pdf
- Cito. (n.d.). Cito: Zo werken wij. Retrieved February 5, 2018, from http://www.cito.nl/over cito/over-ons/verantwoording
- CSR. (2015a). *Advies inzake cybersecurity in het onderwijs en het bedrijfsleven*. Den Haag. Retrieved from https://www.thehaguesecuritydelta.com/images/CSR_advies_inzake_cybersecurity_in_het_onderwijs_en_het_bedrijfsleven.pdf
- CSR. (2015b). *Veiligheid en Justitie en Onderwijs , Cultuur en Wetenschap inzake cybersecurity in het onderwijs en het bedrijfsleven* . Retrieved from http://vkplusmobilebackend.persgroep.net/rest/content/assets/2a2fc09b-5bbc-4e69-92d9-e0d79239684e
- Cubiss. (2017a). De doorgaande lijn is klaar! Retrieved February 8, 2018, from https://www.cubiss.nl/actueel/de-doorgaande-lijn-klaar
- Cubiss. (2017b). Parallelsessies Cubiss Kennisdag 2017. Retrieved February 8, 2018, from https://www.cubiss.nl/parallelsessies-cubiss-kennisdag-2017
- Curriculum.nu. (2017). Curriculum.nu Meedoen. Retrieved February 8, 2018, from https://curriculum.nu/meedoen/

- De Correspondent. (2017). Hoe bedrijven kinderen aan het programmeren krijgen. Retrieved February 7, 2018, from https://decorrespondent.nl/7542/hoe-bedrijven-kinderen-aan-het-programmeren-krijgen/215937060966-c944f813
- Derriks, M., Vergeer, M., Roede, E., & Felix, C. (2011). *Preventie van pesten*. Amsterdam. Retrieved from http://www.kortlopendonderzoek.nl/onderwijs_pdf/OS88_Preventie van pesten.pdf
- Dewey, J. (1916). *Democracy and Education*. The Macmillan Company. Retrieved from https://archive.org/details/democracyeducati1916dewe
- Dijk, W. van, Griffioen, A., & Kuipers, L. (2006). *Leermiddelen in het basisonderwijs, een onderzoek naar de kosten*. Utrecht. Retrieved from https://www.vosabb.nl/wp-content/uploads/2013/06/Rappoprt_leermiddelen.pdf
- Dodge, R. C., Carver, C., & Ferguson, A. J. (2007). Phishing for user security awareness. *Computers and Security*, *26*(1), 73–80. http://doi.org/10.1016/j.cose.2006.10.009
- Duinkerken, A., & Deckers, M. (2017). *Rijnbrink partner in cultureel en sociaal domein*. Arnhem. Retrieved from https://www.rijnbrink.nl/images/PDC/RB_PDC_2017_web_met_bladwijzer.pdf
- ECP. (n.d.). Wat doet ECP - ECP. Retrieved February 5, 2018, from https://ecp.nl/over-ecp/wat-doet-ecp/
- ECP. (2017). Meer dan driekwart seksueel getinte foto's en berichten verstuurd via Snapchat - ECP. Retrieved May 24, 2017, from https://ecp.nl/actueel/meer-dan-driekwart-seksueel-getinte-fotos-en-berichten-verstuurd-snapchat/
- ECP. (2018). Safer Internet Day 2018 | Saferinternetcenter.nl. Retrieved February 5, 2018, from https://saferinternetcenter.nl/saferinternetday/
- Edgar, T., & Manz, D. (2017). Research Methods for Cyber Security, 12–13.
- Ensie. (n.d.). Permanente educatie | wat is de betekenis en definitie. Retrieved February 4, 2018, from https://www.ensie.nl/management-begrippenlijst/permanente-educatie
- Ensie. (2017). Wat is de betekenis van Educatie. Retrieved February 14, 2018, from https://www.ensie.nl/betekenis/educatie?q=Educatie
- Eskerod, P., & Jepsen, A. L. (2013). *Project stakeholder management*. Gower. Retrieved from http://www.gpmfirst.com/books/project-stakeholder-management/planning-project-stakeholder-management
- Esther Aarts. (2014). Dit geef je allemaal prijs als je inlogt op een openbaar wifinetwerk. Retrieved February 11, 2018, from https://decorrespondent.nl/845/dit-geef-je-allemaal-prijs-als-je-inlogt-op-een-openbaar-wifinetwerk/25988820-b2a600e1
- EU Kids Online. (n.d.). European evidence database - European evidence database - EU Kids Online - Research - Department of Media and Communications - Home. Retrieved January 28, 2018, from http://www.lse.ac.uk/media@lse/research/EUKidsOnline/DB/home.aspx?query=netherlands
- Eyre, M. (2017). Digital literacy in the classroom. How important is it? Retrieved February 5, 2018, from https://resourced.prometheanworld.com/digital-literacy-classroom-important/
- Faber, J. M., & Visscher, A. J. (2015). Opbrengstgericht werken in het primaire onderwijs, 36. Retrieved from https://www.nro.nl/wp-content/uploads/2014/10/Opbrengstgericht-werken-in-het-primair-onderwijs.pdf
- Fullan, M. (2006). Change theory - a force for school improvement, *1*(35), 15. Retrieved from http://michaelfullan.ca/wp-content/uploads/2016/06/13396072630.pdf
- Fullan, M. (2013). *Towards a New End: New Pedagogies for Deep Learning*. Retrieved from www.newpedagogies.org

- Gemeente Groningen. (2017). *Digi-deal Groningen Digitaal Geletterd*. Groningen. Retrieved from https://gemeente.groningen.nl/sites/default/files/10a. Stand van zaken intensiveringsmiddelen %27leren%27 2015-2017 Digideal Groningen br raad.pdf
- GEU. (2017). Samen werken voor onderwijs | GEU. Retrieved February 5, 2018, from https://www.geu.nuv.nl/samenwerken/
- Grey, A. (2011). Cybersafety in early childhood education. *Australasian Journal of Early Childhood*, *36*(2), 77–82. Retrieved from http://search.informit.com.au/documentSummary;dn=052931566768432;res=IELHSS
- Haan, J. de. (2010). *NL Kids online: Nieuwe mogelijkheden en risico's van internetgebruik door jongeren*. http://doi.org/978 90 377 0430 3
- Haddon, L., & Livingstone, S. (2014). Leslie Haddon , Sonia Livingstone and the EU Kids Online EU Kids Online : national perspectives EU Kids Online : National perspectives, 3. Retrieved from http://eprints.lse.ac.uk/46878/
- Halloran, J. D. (1999). A Critical, Social Scientific Approach to the Study of Communication Structures and Processes: Problems and Possibilities. *Jurnal Kommunikasi*, *15*. Retrieved from http://www.ukm.my/jkom/journal/pdf_files/1999/V15_1.pdf
- Halt. (n.d.). Halt. Sociale media en online veiligheid. Retrieved February 5, 2018, from https://www.halt.nl/veilige-school/sociale-media-en-online-veiligheid/
- Heemskerk, I., & Schenke, W. (2016). *Kennisontwikkeling en kennisdeling met leerKRACHT*. Kohnstamm Instituut. Retrieved from http://www.kohnstamminstituut.uva.nl/assets/ki956.pdf
- Hemels, I. (2015). Artikel #BOORiMagazine | Frans Schouwenburg pleit voor onderwijsinnovatie van onderop | BOOR iMagazine. Retrieved February 14, 2018, from http://www.boorimagazine.nl/edities/13/Nr-11-oktober-2017/18/Frans-Schouwenburg-pleit-voor-onderwijsinnovatie-van-onderop
- Heutink. (2017). Alles over Didactiek | Heutink.nl. Retrieved February 6, 2018, from https://www.heutink.nl/info/kennismaking_met_momento
- Hevner, A., & Chatterjee, S. (2010). *Design Research in Information Systems*. Springer US.
- Hinloopen, J. (2012). De markt voor lesmethoden, 42–44.
- Hobbs, R. (2010). *Digital and Media Literacy: A Plan of Action*. Retrieved from www.knightcomm.org
- Hulshof, G., Schwarz, M., Rijken, D., Aalst, W. van, Wielders, F., Huberts, W., … Kranenburg, R. van. (2005). *Mediawijsheid. De ontwikkeling van nieuw burgerschap*. Den Haag. Retrieved from https://www.cultuur.nl/upload/documents/adviezen/Mediawijsheid.pdf
- i&i vakvereniging. (2017). Digitale geletterdheid visie november 2017. Retrieved February 6, 2018, from http://ieni.org/digitale-geletterdheid/
- Invasions, A. (2015). Goed bestuur in het primair onderwijs : resultaten van de nulmeting monitor Goed Bestuur PO 2010 Goed Bestuur in het primair onderwijs Resultaten van de nulmeting monitor Goed Bestuur PO 2010, (January 2011).
- ISO. (2014a). *Nen-iso/iec 27005* (Vol. 2011).
- ISO. (2014b). *Nen-iso/iec 27032* (Vol. 040).
- ISO. (2014c). *Nen-iso/iec 31010*.
- Jong de, I., & Albers, M. (2017). *Samenwerken aan digitale geletterdheid*. Provincie Noord-Brabant. Retrieved from https://www.cubiss.nl/sites/default/files/afbeeldingen/producten/samenwerken aan digitale geletterdheid.pdf.pdf
- Kapp, K. M. (2012). *The gamification of learning and instruction : game-based methods and strategies for training and education*. Pfeiffer. Retrieved from https://www.wiley.com/en-us/The+Gamification+of+Learning+and+Instruction%3A+Game+based+Methods+and+Strategies+for+Training+and+Education-p-9781118096345
- Kerstens, J., & Stol, W. (2012). *Jeugd en Cybersafety. Online slachtoffer-en daderschap onder*

Nederlandse jongeren. Den Haag: Boom Lemma Uitgevers. Retrieved from http://www.rutgers.nl/sites/rutgersnl/files/PDF-Onderzoek/Jeugd_en_Cybersafety_2012.pdf

- Kirby, D., Short, L., Collins, J., Rugg, D., Kolbe, L., Howard, M., … Zabin, L. S. (1994). School-Based Programs to Reduce Sexual Risk Behaviors: A Review of Effectiveness. *Public Health Rep*, 339–360. Retrieved from https://s2443-www-ncbi-nlm-nih-gov.ezproxy.leidenuniv.nl:2443/pmc/articles/PMC1403498/pdf/pubhealthrep00060-0037.pdf
- Kliksafe. (2017). *Jongeren en online veiligheid*.
- KNAW. (2012). *Digitale geletterdheid in het voortgezet onderwijs*. Retrieved from http://www.knaw.nl/Content/Internet_KNAW/publicaties/pdf/20121027.pdf
- Kooiman, M. C. (2005). Adaptief onderwijs in scholen voor speciaal basisonderwijs. Retrieved from https://www.nro.nl/wp-content/uploads/2014/12/Adaptief-onderwijs-in-scholen-voor-SBO.pdf
- Kotter, J. P., & Cohen, S. (2017). The Heart of Change / Change through persuasion, (March 2005), 61–65.
- KPN. (2016). Basisschoolkinderen leren hacken bij KPN - KPN Corporate. Retrieved February 6, 2018, from https://overons.kpn/nl/nieuws/2016/basisschoolkinderen-leren-hacken-bij-kpn
- Kramer, B., Albers, M., & Coenders, F. (2017). *Mediawijs op de pabo*. Retrieved from https://www.cubiss.nl/sites/default/files/bestanden/kennisbank/Aandacht voor media %28Pabo%29.PDF
- Kuiper, E., Volman, M., & Terwel, J. (2005). The Web as an Information Resource in K–12 Education: Strategies for Supporting Students in Searching and Processing Information. *Review of Educational Research Fall Review of Educational Research Fabos & Young British Journal of Educational Technology*, *75*(3), 285–328. Retrieved from http://journals.sagepub.com.ezproxy.leidenuniv.nl:2048/doi/pdf/10.3102/00346543075003285
- Kuiper, R. (2017). Waarom zou die 770 miljoen nu wel bij basisschoolleraren terechtkomen? Retrieved February 7, 2018, from https://www.volkskrant.nl/binnenland/waarom-zou-die-770-miljoen-nu-wel-bij-basisschoollerarenterechtkomen~a4520172/
- Kwink. (n.d.). Pesten - Kwink. Retrieved February 5, 2018, from https://www.kwinkopschool.nl/home/pesten/
- LAKS. (2016). Reactie LAKS Onderwijs 2032. Retrieved February 6, 2018, from http://www.laks.nl/reactieonderwijs2032
- LAKS. (2018). LAKS. Voor scholieren. Door scholieren. -. Retrieved February 6, 2018, from http://www.laks.nl/LAKS/hoezo-laks
- Livingstone, Sonia, Haddon, L., & Görzig, A. (2012). *Children, risk and safety on the internet: research and policy challenges in comparative perspective*. Retrieved from http://eprints.lse.ac.uk/44761/
- Livingstone, S., Mascheroni, G., & Ólafsson, K. (2014). Children ' s online risks and opportunities: Comparative findings from EU Kids Online and Net Children Go Mobile Executive summary, (November), 49.
- Loohuizen, N. (2015). *21e eeuwse cultuureducatie op de lerarenopleiding*.
- LSE Media Policy Project. (2015). Children's safety on the internet: a guide to stakeholders | LSE Media Policy Project. Retrieved January 28, 2018, from http://blogs.lse.ac.uk/mediapolicyproject/2015/03/31/childrens-safety-on-the-internet-a-guide-to-stakeholders/#EUKO
- Mediawijsheid.nl. (2017). Zo word je als docent/leerkracht zelf mediawijzer. Retrieved February 7, 2018, from https://www.mediawijsheid.nl/zelfmediawijzerworden/
- Mediawijzer.net. (n.d.). Competentieniveaus mediawijsheidcompetenties voor PO Leraren en PABO. Retrieved from

https://www.mediawijzer.net/wp-content/uploads/sites/6/2013/09/competentiemodel-competentieniveaus-leraren-en-pabo-studenten.pdf
- Mediawijzer.net. (2013). *Media Literacy Competence Model*. Retrieved from https://cdn.mediawijzer.net/wp-content/uploads/sites/6/2013/09/ENG-competencemodel-explained.pdf
- Meijer, R. (2017). Kamer snijdt stevig in hervormingsplan “Ons Onderwijs 2032” - Binnenland - Voor nieuws, achtergronden en columns. Retrieved February 5, 2018, from https://www.volkskrant.nl/binnenland/kamer-snijdt-stevig-in-hervormingsplan-ons-onderwijs-2032~a4489119/
- Meijerink, H. P., Letschert, J. F., Rijlaarsdam, G. C. W., van den Bergh, H. H., & van Streun, A. (2009). *Referentiekader taal en rekenen*. Retrieved from http://www.steunpunttaalenrekenenvo.nl/sites/default/files/referentiekader-taal-en-rekenen-referentieniveaus.pdf%5Cnwww.taalenrekenen.nl
- Ministerie van OC&W. (2017a). Diensten en instellingen | Ministerie van Onderwijs, Cultuur en Wetenschap | Rijksoverheid.nl. Retrieved May 24, 2017, from https://www.rijksoverheid.nl/ministeries/ministerie-van-onderwijs-cultuur-en-wetenschap/inhoud/diensten-en-instellingen
- Ministerie van OC&W. (2017b). *Ruimte in regels*. Den Haag. Retrieved from https://www.leraar.nl/file/download/54516452
- Moll van, M. (2014, April 8). De toekomst van de educatieve uitgever: digitale adaptieve leerplatformen | Jungle Minds - Jungle Minds ontwikkelt digitale merken, platforms & teams. *Jungle Minds B.V.* Retrieved from https://jungleminds.nl/blog/de-toekomst-van-de-educatieve-uitgever-digitale-adaptieve-leerplatformen/
- Mooren, F. C. T. V. D. (2006). *Opvoeding op school en in het gezin. Onderzoek naar de samenhang tussen opvoeding en de houding van jongeren ten opzichte van sociale grenzen*. Groningen. Retrieved from https://www.rug.nl/research/portal/files/14498970/02_h2.pdf
- Motivaction. (2018). Over Motivaction | Motivaction Marktonderzoek | Motivaction International. Retrieved February 5, 2018, from https://www.motivaction.nl/over-motivaction
- NAP. (2012). *A Framework for K-12 Science Education*. Washington, D.C.: National Academies Press. http://doi.org/10.17226/13165
- Nath, B. (2009). *Environmental Education and Awareness - Volume I*. Singapore: Eolss Publishers Co. Ltd. Retrieved from https://books.google.nl/books?id=SROnCwAAQBAJ&printsec=frontcover&hl=nl&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
- Nationale Academie voor Media en Maatschappij. (2014). *Doorlopende leerlijn naar thema Nationaal Media Paspoort*. Nijmegen. Retrieved from https://www.nationaalmediapaspoort.nl/images/pdf/Doorlopende leerlijn Nationaal Media Paspoort.pdf
- NCSC. (2013). *National Cyber Security Strategy 2*. Retrieved from http://english.nctv.nl/Images/national-cyber-security-strategy-2_tcm92-520278.pdf
- Net, M. (2013). “Mediawijsheid integreren in bestaande vakken.” Retrieved February 7, 2018, from https://www.mediawijzer.net/mediawijsheid-integreren-bestaande-vakken/
- Nikken, P. (2013). *Media-risico’s voor kinderen Een verkenning*. Retrieved from https://www.nji.nl/nl/Download-NJi/Publicatie-NJi/Media-risicos-voor-kinderen.pdf
- Nikken, P., Crijnsen, H., Vriezen, M., Pijpers, R., & Jacobsen, S. (2015). *Monitor Jeugd en Media 2015*. Retrieved from http://mijnkindonline.nl/sites/default/files/uploads/Kennisnet_Monitor_Jeugd_en_media_2015.pdf
- NIST. (2013). *Glossary of key information security terms*. *Nist Ir* (Vol. 7298). Retrieved from http://nvlpubs.nist.gov/nistpubs/ir/2013/NIST.IR.7298r2.pdf

- NJi. (n.d.). Over het Nederlands Jeugdinstituut | NJi. Retrieved February 5, 2018, from https://www.nji.nl/nl/Over-het-Nederlands-Jeugdinstituut
- NJi. (2015). *Tipsheet Mediagebruik - adviezen voor ouders*. Retrieved from https://www.nji.nl/nl/Download-NJi/Publicatie-NJi/Tipsheet-risicos-mediagebruik.pdf
- NJi. (2017). Kindertelefoon - Cijfers | NJi. Retrieved January 28, 2018, from https://www.nji.nl/nl/Databank/Cijfers-over-Jeugd-en-Opvoeding/Overzicht-van-het-jeugdstelsel-Kindertelefoon
- Noordhoff. (n.d.). Wegwijs in onderwijs - Home. Retrieved May 24, 2017, from http://www.noordhoffuitgevers.nl/wps/portal/nuco/noordhoffuitgevers
- Norman, D. A., Verganti, R., Group, N. N., & Bio, –. (2012). *Incremental and radical innovation: design research versus technology and meaning change*. Retrieved from www.verganti.com
- NOS. (2016). Slachtoffers van digitale kinderlokkers steeds jonger | NOS. Retrieved May 24, 2017, from http://nos.nl/artikel/2138244-slachtoffers-van-digitale-kinderlokkers-steeds-jonger.html
- NOS. (2017). Kabinet wil meer “burgerschap” op scholen | NOS. Retrieved February 7, 2018, from https://nos.nl/artikel/2204910-kabinet-wil-meer-burgerschap-op-scholen.html
- Onderwijs2032. (2017). Onderwijs2032 in de praktijk - Rol van leerlingen en ouders - item:3. Retrieved May 24, 2017, from http://magazine.onderwijs2032.nl/onderwijs2032-in-de-praktijk#!/rol-van-leerlingen-en-ouders/item/3
- Onderwijscooperatie. (2017). Focusgroepen - Onderwijscoöperatie. Retrieved February 14, 2018, from https://onderwijscooperatie.nl/focusgroepen/
- Onderwijsinspectie. (2017). *ONDERZOEKSKADER 2017 voor het toezicht op de voorschoolse educatie en het primair onderwijs*. Den Haag. Retrieved from https://www.onderwijsinspectie.nl/documenten/publicaties/2016/10/17/onderzoekskader-2017-po-en-vve
- Onderwijsraad. (2008). *Een rijk programma voor ieder kind*. Den Haag: OBT bv. Retrieved from https://www.onderwijsraad.nl/upload/documents/publicaties/volledig/een_rijk_programma_voor_ieder_kind.pdf
- Onderwijsraad. (2011). Een stevige basis voor iedere leerling (volledig). Retrieved February 5, 2018, from https://www.onderwijsraad.nl/publicaties/2011/een-stevige-basis-voor-iedere-leerling/volledig/item257
- OntdekMedia. (2016). Retrieved February 8, 2018, from http://www.ontdekmedia.nl/methoden/
- Oostdam, R., Peetsma, T., & Blok, H. (2007). Het nieuwe leren in basisonderwijs en voortgezet onderwijs nader beschouwd: een verkenningsnotitie voor het Ministerie van Onderwijs, Cultuur en Wetenschap. Retrieved from https://www.bvekennis.nl/Bibliotheek/08-0174_SCO_studie_nieuwe_leren_def_150207.pdf
- Osterwalder, A., Pigneur, Y., Clark, T., & Smith, A. (2010a). *Business model generation : a handbook for visionaries, game changers, and challengers*. Retrieved from https://books.google.nl/books?hl=nl&lr=&id=UzuTAwAAQBAJ&oi=fnd&pg=PA7&dq=osterwalder+business+model+canvas&ots=yXCTybH91w&sig=xSK8Q2w4R8gvZG3KYAiW8bgLDI8#v=onepage&q=osterwalder business model canvas&f=false
- Osterwalder, A., Pigneur, Y., Clark, T., & Smith, A. (2010b). *Business model generation : a handbook for visionaries, game changers, and challengers*. Retrieved from https://www.wiley.com/en-us/Business+Model+Generation%3A+A+Handbook+for+Visionaries%2C+Game+Changers%2C+and+Challengers-p-9780470876411
- Oudsten, P. den, & Teesink, P. (2017). *Inzet intensiveringsmiddelen “leren” 2017*. Groningen. Retrieved from https://gemeente.groningen.nl/sites/default/files/3. onderwijsatelier

initiatieven 2017 raadsbrf.pdf
- Pardoen, J., & Zwanenberg, F. (2010). *Handboek Mediawijsheid op School*. Leidschendam. Retrieved from http://mijnkindonline.nl/sites/default/files/uploads/Handboek Mediawijsheid versie website.pdf
- Parola, A. (2015). *Child Safety Online A Practical Guide for Providers of Social Media and Interactive Services*. *Chartered Clinical Psychologist (University of Southampton)Consultant Child & Adolescent Psychiatrist*. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/487973/ukccis_guide-final__3_.pdf
- Payne, V. J. (2009). *It Takes a Village to Raise a Child: How Bronfenbrenner's microsystem promotes youth resilience in black communities*. Retrieved from http://victoriajpayne.pbworks.com/f/Research+-+It+Takes+a+Village.pdf
- PDC. (n.d.). Artikel 23 Grondwet - Nederlandse grondwet. Retrieved February 7, 2018, from https://www.denederlandsegrondwet.nl/9353000/1/j9vvihlf299q0sr/vh8lnhrouwy3
- Peeters, W. (2017). De onderwijstrends voor 2017 - 2018 - Vernieuwenderwijs. Retrieved February 5, 2018, from https://www.vernieuwenderwijs.nl/onderwijstrends-2017-2018/
- Pijpers, R. (2016). *Stappenplan digitale geletterdheid*. Zoetermeer. Retrieved from https://www.kennisnet.nl/fileadmin/kennisnet/digitale_vaardigheden/21e_eeuwse_vaardigheden/bijlagen/Stappenplan_Digitale_Geletterdheid_po.pdf
- Pijpers, R. (2017a). Handboek Digitale geletterdheid 2017/2018, 171. Retrieved from https://www.kennisnet.nl/fileadmin/kennisnet/digitale-geletterdheid/Kennisnet-Handboek-Digitale-Geletterdheid.pdf
- Pijpers, R. (2017b). Scholen maken werk van digitale geletterdheid. Retrieved February 11, 2018, from https://www.kennisnet.nl/artikel/scholen-maken-werk-van-digitale-geletterdheid/
- Pijpers, R., Boeke, H., Dondorp, L., & Heitink, M. (2017). *Monitor Jeugd en Media 2017*. Zoetermeer. Retrieved from https://www.kennisnet.nl/fileadmin/kennisnet/publicatie/jeugd_media/Kennisnet_Monitor_Jeugd_en_Media_2017.pdf
- PO Front. (2018). PO-Front gaat door met actievoeren! #POFRONT. Retrieved February 5, 2018, from https://www.pofront.nl/eerdere-acties/
- PO Raad. (n.d.). Medezeggenschapsraad (MR). Retrieved February 6, 2018, from https://www.poraad.nl/themas/medezeggenschap/rollen-en-verantwoordelijkheden/medezeggenschapsraad-mr
- PO Raad. (2014a). Over de PO-Raad | PO-Raad. Retrieved February 9, 2018, from https://www.poraad.nl/over-de-po-raad/over-de-po-raad
- PO Raad. (2014b). *Regeldrukagenda Onderwijs*. Retrieved from https://www.poraad.nl/files/werkgeverszaken/regeldrukagenda_2014-2017.pdf
- PO Raad. (2015). "Maak van programmeren geen verplicht vak" | PO-Raad. Retrieved February 14, 2018, from https://www.poraad.nl/nieuws-en-achtergronden/maak-van-programmeren-geen-verplicht-vak
- PO Raad. (2016). Ondersteuning bij ICT | PO-Raad. Retrieved February 8, 2018, from https://www.poraad.nl/themas/ict-in-het-onderwijs/ondersteuning-bij-ict
- PO Raad. (2017a). Bekostiging | PO-Raad. Retrieved February 6, 2018, from https://www.poraad.nl/themas/financien/bekostiging
- PO Raad. (2017b). Het primair onderwijs in cijfers | PO-Raad. Retrieved February 5, 2018, from https://www.poraad.nl/nieuws-achtergronden/het-primair-onderwijs-in-cijfers
- PO Raad. (2017c). Overheidsfinanciering onderwijs. Retrieved February 6, 2018, from https://www.rijksoverheid.nl/onderwerpen/financiering-onderwijs/overheidsfinanciering-onderwijs
- Pruitt-mentle, D. (2001). C3Matrix - A Companion to the Augmented Technology Literacy

Standards for Students.
- Puhakainen, & Mikko. (2006). A DESIGN THEORY FOR INFORMATION SECURITY AWARENESS. Retrieved from http://jultika.oulu.fi/files/isbn9514281144.pdf
- PwC. (2014). Entertainment & Media Outlook for the Netherlands 2014-2018.
- Reinders. (2013). Nieuwe methodes en omruilregelingen. Retrieved from https://webshop.reinders-oisterwijk.nl/content/files/images/Folders/Nieuwsbrief-def.pdf
- Rijksoverheid. (n.d.). Taken van een gemeente. Retrieved February 5, 2018, from https://www.rijksoverheid.nl/onderwerpen/gemeenten/taken-gemeente
- Rijksoverheid. Kerndoelen basisonderwijs (1993). The Netherlands. Retrieved from https://www.rijksoverheid.nl/binaries/rijksoverheid/documenten/rapporten/2006/05/15/kerndoelen-1993/kerndoelen1993deel1.pdf
- Rijksoverheid. (2017). Leeftijd van personeel in het primair onderwijs | Kengetallen | Onderwijs in cijfers. Retrieved February 5, 2018, from https://www.onderwijsincijfers.nl/kengetallen/primair-onderwijs/personeelpo/leeftijd-personeel
- Rijksoverheid. (2018). *Samenvatting Miljoenennota 2018*.
- Rijnbeek, S., & Kooij, J. (2017). Gemeente Harderwijk Onderwijs. Retrieved December 2, 2018, from https://www.harderwijk.nl/leven/onderwijs_3143/
- Rooney, J. J., & Heuvel, L. N. Van den. (2004). *Root Cause Analysis For Beginners*. Retrieved from https://servicelink.pinnacol.com/pinnacol_docs/lp/cdrom_web/safety/management/accident_investigation/Root_Cause.pdf
- Rutgers. (2016). *Jongeren versterken, om gezond en gelukkig te leven*. Utrecht. Retrieved from https://www.rutgers.nl/sites/rutgersnl/files/PDF/20170726_Rutgers-Strategieschema.pdf
- Rutgers. (2017a). *Hoe vaak worden kinderen van 9-12 jaar op internet geconfronteerd met seksueel getinte beelden?* Utrecht. Retrieved from https://www.rutgers.nl/sites/rutgersnl/files/PDF/Resultaten onderzoek Rutgers i.s.m. het NOS JeugdjournaalMaart2017.pdf
- Rutgers. (2017b). Wat is de Week van de Lentekriebels? | Seksuele vorming. Retrieved February 5, 2018, from https://www.seksuelevorming.nl/onderwijssoort/basisonderwijs/week-van-de-lentekriebels/wat-de-week-van-de-lentekriebels
- Schouwenburg, F. (2017, September 7). Ict-bekwaamheid van de leraar: hoe pak je dat aan? *Kennisnet*. Retrieved from https://www.kennisnet.nl/publicaties/ict-bekwaamheid-van-de-leraar-hoe-pak-je-dat-aan/
- Scrum at Schools. (n.d.). Scrum@School - For Professionals. Retrieved February 8, 2018, from https://www.scrumatschool.nl/for-professionals
- Shuell, T. J. (1988). The Role of the Student in Learning from Instruction. *CONTEMPORARY EDUCATIONAL PSYCHOLOGY*, *13*, 276–295. Retrieved from https://ac-els-cdn-com.ezproxy.leidenuniv.nl:2443/0361476X88900276/1-s2.0-0361476X88900276-main.pdf?_tid=cdb05fe8-0a72-11e8-8348-00000aacb362&acdnat=1517835063_3a86404ded16a4d8d6fa61a9f38f1854
- SIC. (2017a). Better Internet for Kids - About. Retrieved January 28, 2018, from https://www.betterinternetforkids.eu/web/portal/about
- SIC. (2017b). Better Internet for Kids - Latest helpline trends: Quarter 1, 2017. Retrieved January 28, 2018, from https://www.betterinternetforkids.eu/web/portal/practice/helplines/detail?articleId=1936708
- Six Sigma. (2016). Wat is Lean Management? - Six Sigma. Retrieved February 7, 2018, from https://www.sixsigma.nl/lean-management
- Slim met Media. (2018). Slim met Media. Retrieved February 8, 2018, from

https://slimmetmedia.nl/basisonderwijs/studiedag-socialemedia-mediawijsheid/
- SLO. (n.d.). *Vier S-model*. Retrieved from http://www.cursuscurriculumontwerp.slo.nl/kennisbank/Vier_S.docx/
- SLO. (2015). Mediawijsheid - curriculum van de toeomst. Retrieved February 8, 2018, from http://curriculumvandetoekomst.slo.nl/21e-eeuwse-vaardigheden/digitale-geletterdheid/mediawijsheid
- SLO. (2016). *Curriculum in beweging*. Enschede. Retrieved from http://downloads.slo.nl/Documenten/Curriculum-in-beweging-Strategische-Agenda-2017-2020.pdf
- SLO. (2017a). Kerndoelen - SLO, nationaal expertisecentrum leerplanontwikkeling. Retrieved February 7, 2018, from http://www.slo.nl/primair/kerndoelen/
- SLO. (2017b). Leerlijnen digitale geletterdheid. Retrieved February 7, 2018, from http://curriculumvandetoekomst.slo.nl/projecten/leerlijnen-digitale-geletterdheid
- Smit, R. (2016). Gastles mediawijsheid BO 7&8 by Rico Smit on Prezi. Harderwijk: CJG. Retrieved from https://prezi.com/fh3_yvn0uc9p/gastles-mediawijsheid-bo-78/
- Solem, M. O. (2007). Go For The Low Hanging Fruit! Retrieved February 8, 2018, from https://www.agileconnection.com/article/go-low-hanging-fruit
- Sonck, N., & De Haan, J. (2011). Kinderen en internetrisico's. EU Kids Online onderzoek onder 9-16 jarige internetgebruikers in Nederland, 82.
- Spanjers, I., Könings, K., Leppink, J., & Merriënboer, J. van. (2015). Blended learning effectiever met regelmatig online toetsen. Retrieved February 5, 2018, from https://wij-leren.nl/blended-learning-online-toetsen.php
- SSV. (2017). Wet Veiligheid op school - SSV | Primair Onderwijs. Retrieved February 5, 2018, from https://www.schoolenveiligheid.nl/po-vo/kennisbank/wet-op-sociale-veiligheid/
- Stichting Kanjertraining. (n.d.). Kanjerschool Primair Onderwijs. Retrieved February 5, 2018, from https://www.kanjertraining.nl/scholen/kanjertraining/kanjerschool/kanjerschoolprimair2
- Stichting Kennisnet. (n.d.-a). *Checklist "digitale geletterdheid in het onderwijs."* Retrieved from https://www.kennisnet.nl/fileadmin/kennisnet/publicatie/Checklist_digitale_geletterdheid.pdf
- Stichting Kennisnet. (n.d.-b). Digitale geletterdheid in het onderwijs. Retrieved February 8, 2018, from https://maken.wikiwijs.nl/73680/Digitale_geletterdheid_voor_bestuurders_en_schoolleiders
- Stichting Kennisnet. (n.d.-c). Kennisnet Wie wij zijn. Retrieved February 5, 2018, from https://www.kennisnet.nl/wie-wij-zijn/
- Stichting Kennisnet. (2014). Meer aandacht nodig voor digitale geletterdheid. Retrieved February 9, 2018, from https://www.kennisnet.nl/artikel/meer-aandacht-nodig-voor-digitale-geletterdheid/
- Stichting Kennisnet. (2015). Chromebooks in het onderwijs: de voor- en nadelen op een rij. Retrieved February 9, 2018, from https://www.kennisnet.nl/artikel/chromebooks-in-het-onderwijs-de-voor-en-nadelen-op-een-rij/
- Stichting Kennisnet. (2016a). Vier in balans-monitor 2015. *Kennisnet*. Retrieved from https://www.kennisnet.nl/fileadmin/kennisnet/leren_ict/visie_implementatie/bijlagen/Kennisnet_Vier_in_balans-monitor_2015_De_belangrijkste_resultaten_voor_het_primair_onderwijs.pdf
- Stichting Kennisnet. (2016b). Werken aan digitale geletterdheid? Zo doe je dat. Retrieved May 24, 2017, from https://www.kennisnet.nl/artikel/werken-aan-digitale-geletterdheid-zo-doe-je-dat/
- Stichting Leerplan ontwikkeling. (2016). *Leermiddelenmonitor 15-16*. Retrieved from http://downloads.slo.nl/Repository/leermiddelenmonitor-15-16.pdf
- Strijker, A. (2016). SLO Digitale geletterdheid. Retrieved February 5, 2018, from

http://curriculumvandetoekomst.slo.nl/21e-eeuwse-vaardigheden/digitale-geletterdheid
- Strijker, A. (2017a). Digitale geletterdheid Kenniskaart - fase 2. Retrieved February 5, 2018, from http://curriculumvandetoekomst.slo.nl/21e-eeuwse-vaardigheden/digitale-geletterdheid
- Strijker, A. (2017b). Digitale geletterdheid Kenniskaart fase 3.
- Strijker, A. (2017c). SLO - Leerplan in Beeld. Retrieved February 5, 2018, from http://leerplaninbeeld.slo.nl/primaironderwijs/vakoverstijgend/digitale-geletterdheid/digitale-geletterdheid-versie-januari-2017/
- Strijker, A. (2018). Digitale geletterdheid - jonge kind (fase 1). Retrieved from http://downloads.slo.nl/Documenten/InhoudskaartenPO-DigitaleGeletterdheidFase1%28januari2018%29.pdf
- Stroo, L. (2016). Lean en agile werken met je schoolteam. Retrieved February 7, 2018, from http://zienindeklas.nl/lean-en-agile-werken-schoolteam/
- Tanner, R. (2018). Leading Change: Creating a Sense of Urgency (Step 1). Retrieved February 7, 2018, from https://managementisajourney.com/leading-change-step-1-creating-a-sense-of-urgency/
- Teachers in Media. (2018). Mediawijsheidcompetenties van Leerkrachten Transparant Toetsen en Trainen (M@LT) | Teacherschannel Pro. Retrieved February 9, 2018, from https://pro.teacherschannel.nl/arrangements/412/
- The George W. Bush Institue. (2013). *Change Agents: How states can develop effective school leaders*. New York. Retrieved from http://newleaders.org/wp-content/uploads/2016/09/Change-Agents-Concept-Paper.pdf
- Thijs, A., & Diephuis, R. (2014). *Leerplan_voor_het_funderend_onderwijs_voor_de_toekomst*. Enschede: SLO. Retrieved from http://www.cps.nl/l/library/download/urn:uuid:2af90a8c-a357-4431-b9b9-b42ed1aa7c2d/leerplan_vor_het_funderend_onderwijs_voor_de_toekomst.docx?format=save_to_disk&ext=.docx?return_uri=/k/news/view/206716/207277/brief-toekomstgericht-funderend-o
- Thijs, A., Fisser, P., & Hoeven, M. van der. (2014). *21e Eeuwse Vaardigheden in het curriculum van het funderend onderwijs*. Enschede.
- Thornton, C. M., & Piacquadio, D. J. (1996). Promoting Sun Awareness: Evaluation of an Educational Children's Book. *Pediatrics*, *98*(52), 52–55. Retrieved from http://pediatrics.aappublications.org.ezproxy.leidenuniv.nl:2048/content/pediatrics/98/1/52.full.pdf
- Tweede Kamer. (2017a). Kamerbrief over vervolg curriculumherziening in het primair en voortgezet onderwijs | Rijksoverheid. Retrieved February 7, 2018, from https://www.rijksoverheid.nl/documenten/kamerstukken/2017/02/13/kamerbrief-over-vervolg-curriculumherziening-in-het-primair-en-voortgezet-onderwijs
- Tweede Kamer. (2017b). Primair Onderwijs | Tweede Kamer der Staten-Generaal. Retrieved February 5, 2018, from https://www.tweedekamer.nl/kamerstukken/brieven_regering/detail?id=2017Z10143&did=2017D21073
- UNICEF. (2000). *Defining Quality in Education*. Retrieved from https://www.unicef.org/education/files/QualityEducation.PDF
- Van De Hoef, H., & Van Aarsen, E. (2016). *Hoe ict-vaardig zijn leerkrachten in het basisonderwijs?* Retrieved from https://o21.nu/wp-content/uploads/2017/02/Hoe-ict-vaardig-zijn-leerkrachten-in-het-basisonderwijs.pdf
- Van Dijk, J., & Hacker, K. (2003). The Digital Divide as a Complex and Dynamic Phenomenon THE MULTIFACETED CONCEPT OF ACCESS. *The Information Society*, *19*, 315–326. http://doi.org/10.1080/01972240390227895
- Vanhoef, M., & Piessens, F. (n.d.). Key Reinstallation Attacks: Forcing Nonce Reuse in WPA2. http://doi.org/10.1145/3133956.3134027

- Verbiest, E. (2014). *Leren innoveren.: Een inleiding in de onderwijsinnovatie*. Maklu. Retrieved from https://books.google.nl/books?id=VsU5AwAAQBAJ&pg=PA246&lpg=PA246&dq=regelgerichte,+vakgerichte+en+leerlinggerichte&source=bl&ots=agCIDUU6ww&sig=UvuZaFdpjH6XMyJvwuhMQy2Nz1Y&hl=nl&sa=X&ved=0ahUKEwj1s8SdhozZAhVRbFAKHdP3AEMQ6AEIMzAD#v=onepage&q=regelgerichte%25
- VNG. (2014). *Gemeenten op weg naar 2020 Naar een verenigingsstrategie voor de VNG*. Retrieved from https://vng.nl/files/vng/05._gemeenten_op_weg_naar_2020_bijlage.pdf
- Vogelzang, M. (2015). *De financiële staat van het onderwijs 2015*. Retrieved from https://www.onderwijsinspectie.nl/binaries/onderwijsinspectie/documenten/rapporten/2016/12/14/financiele-staat-van-het-onderwijs-2015/Financiële+Staat+van+het+Onderwijs+2015+printversie.pdf
- Voogt, J., & Roblin Pareja, N. (2010). *21st Century Skills. Discussienota*. Enschede. Retrieved from http://www.21stcenturyskills.nl/download/21_st_century_skills__UT_discussie_paperNL.pdf
- Voogt, J., & Roblin, N. P. (2010). 21st Century Skills Discussienota, 66. Retrieved from http://onderzoek.kennisnet.nl/onderzoeken/overig/21stcenturyskillsdiscussienota
- Voorwinden, R. (2017). School neemt afscheid van werkboekjes. *Onderwijsblad*, *10*, 13–16. Retrieved from https://www.aob.nl/wp-content/uploads/2017/07/School-neemt-afscheid-van-werkboekjes.pdf
- Vossen, H. G. M., Piotrowski, J. T., & Valkenburg, P. M. (2014). *Media Use and Effects in Childhood*. Retrieved from https://www.ccam-ascor.nl/images/stories/publications/books_PDF_ENG/Vossen_Piotrowski__Valkenburg_2014_Media_use_and_effects_in_childhood_-_The_handbook_of_lifespan_communciation.pdf
- Waarom auteursrecht? | Onderwijs en auteursrecht. (2018). Retrieved February 6, 2018, from http://www.onderwijsenauteursrecht.nl/waarom-auteursrecht/
- Walker, J., & Milton, J. (2006). Teachers' and parents' roles in the sexuality education of primary school children: a comparison of experiences in Leeds, UK and in Sydney, Australia. *Sex Education*, *6*(4), 415–428. http://doi.org/10.1080/14681810600982267
- Weinstein, N. D. (1984). Why it won't happen to me: Perceptions of risk factors and susceptibility. *Health Psychology*, *3*(5), 431–457. http://doi.org/10.1037/0278-6133.3.5.431
- Wij-leren. (2014). HGW en OGW: twee kanten van een medaille. Retrieved February 12, 2018, from https://wij-leren.nl/HGW-en-OGW.php
- Wille, F. (2010). Verdienmodellen in de software industrie, 59.
- Wilson, B. (2014). Root Cause | The Rootisserie. Retrieved February 9, 2018, from http://www.bill-wilson.net/root-cause-analysis/rca-wiki/root-cause
- Winterman, P. (2017). Alle basisscholen in Nederland moeten een moestuin krijgen. Retrieved February 7, 2018, from https://www.destentor.nl/politiek/alle-basisscholen-in-nederland-moeten-een-moestuin-krijgen~a33e48bb/
- Wouda, J. (2017). Hoe groot mag een groep zijn op de basisschool? Retrieved February 5, 2018, from https://www.heutinkvoorthuis.nl/nl/hoe-groot-mag-een-groep-zijn-op-de-basisschool/news/178/
- YoungWorks. (2014). *Mediamasters Online onderzoek Ouder & Kind*. Retrieved from https://www.mediawijzer.net/wp-content/uploads/sites/6/2016/11/YoungWorks-en-Mediawijzer-rapport-Recht-op-Mediawijsheid.pdf