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Nationwide Implementation of Media Literacy Trainings on Internet Safety

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Abstract

Although numerous media literacy trainings on Internet safety for children and adolescents have been conducted, their number contrasts sharply with the few systematic studies on their effectiveness. In this study, we describe the evaluation of nationwide-implemented trainings on Internet safety in Luxembourg, which included perceptions of learning outcomes and evaluations of implementation and effectiveness. Training data from 2011 to 2018 were analyzed, including 28,060 students and 5,031 teachers. Students reported pronounced learning effects, especially for younger students and for repeated training participation. Teachers greatly appreciated the implementation and effectiveness, which generally increased over the years. The perceived effectiveness of the training was significantly related to teachers' planning to cover Internet safety topics in future lessons. The present study shows that carefully planned and continuously evaluated trainings on Internet Safety successfully support children's understanding and teachers' willingness to implement Internet Safety in their curriculum.

Keywords: Internet safety, educational training, media literacy, evaluation, Luxembourg

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MEDIA LITERACY TRAININGS ON INTERNET SAFETY

Introduction

The ever-accelerating development of digital devices as well as their pervasiveness and ubiquity allow children and adolescents to connect to the Internet anywhere and anytime. However, being able to access an online world of information not only means an almost infinite number of benefits and opportunities, but also raises important questions as to how potential risks may be minimized (Lee & Chae, 2012; Livingstone et al, 2011). Parents, caregivers, stakeholders and politicians ask for well-evaluated educational programs for children and adolescents that address the safe and secure use of the Internet (Aspen Institute, 2010; European Commission, 2016; Cases, 2009, Christ & Potter, 1998).

Almost a decade ago, these questions led stakeholders in Luxembourg to establish *BEE SECURE for schools,* a training program on Internet safety for children and adolescents. Its goal was to provide the target group with the required skills to fully and safely participate in the digital world. In a joint effort of different ministries, a nationwide training was designed and implemented in the mandatory curricula of primary and secondary schools.

Designing and implementing an initiative without controlling its quality and success carries the danger of educating inadequate behavior. Therefore, continuously controlling effectiveness and efficiency of any training is necessary (e.g., Chou & Peng, 2011), including regular evaluations of both learning success and participants' responses. Together, the stakeholders and the authors of this study designed empirical instruments to test for the perceived quality of the training. Questionnaires were developed for students and teachers for annual training evaluations. Thus, controlling training quality and ensuring continuous improvements to keep the training as effective and efficient as possible. This study presents the results of these evaluations for teachers (2011-2018) and students (2015-2018). In the

data analysis, emphasis was put on how trainings were presented and organized, their usefulness as well as students' understanding of the content.

Internet use in children and adolescents

Internet usage usually starts below the age of 9, with now even toddlers and preschoolers beginning to use the web (Chang et al., 2018; Holloway et al., 2013). Ninety-eight percent of 6 to 13-year-old children in Germany have access to the Internet, and about 50% have their own smartphone (KIM-Studie, 2018). These numbers increase to 84% for 12 to 13-year-olds and 99% for 18 to 19-year-olds (JIM-Studie, 2019), thus matching the numbers in many other European countries (Livingstone et al., 2011; Mascheroni & Cuman, 2014).

Children and adolescents are more likely to surf the web in their bedrooms than in shared rooms (König & Steffgen, 2015; Mascheroni & Cuman, 2014). Without parental supervision, they may be exposed to greater risks, which they may or may not be aware of (Livingstone et al., 2011; Mascheroni & Ólafsson, 2014).

Risks and Opportunities

Being online comes with opportunities, but also potential risks. For example, online activities can enhance cognitive and social skills in children (Blais et al., 2007; Guan & Subrahmanyam, 2009; Holloway et al., 2013), but social networks, privacy and security, contact with strangers, erotic and pornography, grooming, sexting, sextortion, malware, phishing, fraud, cyberbullying, harassment and many more have been shown to be potentially harmful (e.g., Livingstone et al., 2011; Smith & Steffgen, 2013).

In Europe, over half of the 9 to 16-year-olds are confronted with online content that made them uneasy or is perceived as disturbing (Livingstone et al., 2011). According to

Livingstone and colleagues (2013), 22% of children rated pornographic content as an online-risk, 18% felt threatened by violent content, 19% by cyberbullying and 13% by fraud (e.g., someone pretending to be someone else). Other online risks include unwanted messages via e-mail or social communities and careless handling of personal data. Exposure to inappropriate content may cause aggression, fear, trauma-symptoms, or negative self-image in children and adolescents (Cho & Cheo, 2005).

To protect children from these dangers, the role of parents and educators has been highlighted regarding strategies of *parental mediation* (e.g., Nikken & Janszen, 2006; Schaan & Melzer, 2015). Numerous tools and controls have been suggested (e.g., Zaman & Nouwen, 2016). Early accounts proposed to filter online content from children and adolescents. However, this prevents them from increasing their knowledge on Internet safety, making it ineffective for Internet safety education and is useless in places where there are no filters (Yan, 2009). Children will always find a way to surf the web unfiltered, thus programs aimed at increasing Internet safety are crucial (Antona et al., 2010; Livingstone et al., 2011; Livingstone & Olafsson, 2017; Yan, 2009).

Media Literacy and media literacy education

Internet safety education is inextricably linked to the idea of media literacy, which is most commonly described as a skill set aimed at promoting critical engagement with messages produced by the media (Bulger & Davison, 2018). More specifically, it comprises the ability to access the media, to understand and to critically evaluate different aspects of the media and media content and to create communications in a variety of contexts (European Commission, 2007). Therefore, the use of the term 'literacy' implies a broader form of education about media, which goes beyond mechanical skills or narrow forms of functional competence (Buckingham, 2015). In line with this reasoning, a media literate

person can decode, evaluate, analyze and produce both print and electronic media (Aufderheide, 1992).

Regarding media literacy education, the goal is to encourage critical thinking regarding media content and practices (Martens, 2010). However, increasing media knowledge requires the individual's information processing efforts to stimulate competencies such as the critical analysis of media (Potter, 2004), including critical viewing skills, heightened awareness of media influence, and decreased realism of media texts (Scharrer & Ramasubramanian, 2015).

Irrespective of the particular underlying concept, most trainings for children and adolescents therefore go beyond helping them to protect themselves against harmful content. Rather, skills need to be transported that are not confined to those of information retrieval but to enable children to evaluate and use information critically to transform it into knowledge (Buckingham, 2015). Ilomäki and colleagues (2016) suggest *digital competence* as a boundary concept to describe the core competences for a knowledge society. Although the authors believe their concept will certainly be subject to changes (e.g., in the technologies and society), digital competence comprises technical competence, the ability to use digital technologies in a meaningful and purposeful way, the ability to evaluate digital technologies critically, and the motivation to actively participate in the digital culture (Ilomäki et al., 2016). Passey et al. (2018) go one step further and suggest digital competence to be one of the three components of *digital agency* (the other two being digital confidence and digital accountability) that requires skills, disposition and mind-sets that people need to possess to act in their own interests within the increasing digitalization of society.

Media literacy programs on Internet safety

To protect children from different online risks, numerous programs and schoolings have been suggested for parents, children and adolescents. The EU initiative *clicksafe*[4] provides parents and teachers with an extensive collection of methods to inform and protect children and adolescents. Moreover, the *Insafe-Network*[5] consists of more than 32 Safer Internet Centres (SICs) and National Awareness Centers (NACs) in many European countries. The SICs are important in coordinating activities and initiatives of the EU program on protecting children using the Internet and other communication technologies (European Commission, 2016). Given the importance of such programs, the empirical base on their quality and effectiveness is surprisingly scarce (Finkelhor et al., 2020). In the following, an overview of existing program evaluations from around the world will be given.

The *ThinkUKnow Internet Safety Programme* (TUK) for 5 to 16-year-olds focuses on how to have fun, stay in control, and report a problem with the Internet. Though mainly focused on sexual abuse and exploitation, the program also covers aspects such as privacy, malware, phishing, and critical thinking. More than a third of participants indicated to be more careful online after program participation. However, it was found that the recall of safety messages tends to fade over time, showing the necessity for regular trainings (Davidson et al., 2009).

In Australia, the Alannah and Madeline Foundation (2015) evaluated the *e-smart schools*-program that had been implemented in a quarter of all schools in Australia. The online safety program was evaluated with more than 6,000 participants. Students felt safer

[4] http://www.klicksafe.de
[5] https://www.betterInternetforkids.eu/web/portal/ policy/insafe-inhope

and more aware of risks after the program while teachers felt more confident in technology and advising students.

The *ACMA Cybersmart Outreach Program* is an Australian initiative focusing on cyber-safety. Evaluation results showed high levels of support of the program by parents, teachers and students. Yet, the importance of continuing the dialogue about online-safety following the program was emphasized (Griffith Institute for Educational Research for the Australian Communications and Media Authority, 2012).

The *Cybersmart Detectives online education activity* is a game-based program for 11 to 12-year-olds in Australia since 2004. The evaluation with 28,000 students substantiated the intended changes in online behavior as well as positive actions for students in risk groups (Australian Communications and Media Authority, 2012; Dooley et al., 2011). Similarly, the motivating and challenging environment of the online role-playing game *Net-Detectives* teaches Internet safety in the UK (Wishart et al., 2007). Benefits were found regarding participation in the activity, including increases in knowledge and hands-on activities.

Chibnall et al. (2006) evaluated the *I-Safe* program implemented in the US with data of more than 2,000 children. Although knowledge in Internet safety increased, behavioral changes were not statistically significant. Similar outcomes were found in other studies (Australian Communications and Media Authority, 2012; Davidson et al., 2009; Dooley et al., 2011; Thompson et al., 2012).

In contrast to addressing students, evaluations over 10 years of the *Teacher Awareness of Internet Safety* (TAIS) program found that teachers who did not grow up with

the Internet feel more confident and able to teach their students about safety issues after participating in the program (Chou & Peng, 2011).

Taken together, online activities, movies and Internet safety programs can be effective and helpful for children, parents and teachers in general and particular individuals who already had negative experiences online (Australian Communications and Media Authority, 2012; Dooley et al., 2011; Griffith Institute for Educational Research for the Australian Communications and Media Authority, 2012; Thompson et al., 2012; Wishart et al., 2007). Due to the students' failure to remember having already participated, however, some programs only had short-term benefits (Davidson et al., 2009). Similarly, programs sometimes furthered Internet safety knowledge, but only changed the intended but not the actual online behavior (Chibnall et al., 2006; Davidson et al., 2009; Thompson et al., 2012). Jones et al. (2013) further propose that broader youth safety prevention programs should be more effective than stand-alone lessons.

In Luxembourg, the Internet-safety program *BEE SECURE for schools* was established in 2011 (for a more detailed description see CASES, 2009; Tiemann & Steffgen, 2017). The program is a joint initiative of the Ministries for Education, Family and Integration, and Economy and Foreign Trade. It was adopted as mandatory element in primary and secondary schools and training sessions are held once a year. The goal of educational program is the improvement of media literacy regarding Internet safety and media skills in students (CASES, 2009). *BEE SECURE* differentiates between media literacy and Internet safety to some extent. The trainings mainly address issues related to Internet safety, but also include selected aspects of media literacy, such as the topic of disinformation and the responsible handling of data. A central component of the program is

its quality assurance and improvement through continuous evaluation of the participating students and teachers.

Research Questions

The following research questions aim at evaluating the *BEE SECURE for schools* Internet safety program:

RQ 1: Do students perceive learning effects of the educational training as positive?

RQ 2: Does previous experience with content of the training have a positive effect on student ratings?

RQ 3: Do teachers perceive implementation and effectiveness of the educational training as positive?

Method

Training design

The main goal of *BEE SECURE for schools* is the acquisition of knowledge and understanding as well as the responsible use of the Internet and its functions (cf. CASES, 2009). This includes thinking before clicking and posting, using strong passwords, using antivirus programs, being vary of spam emails, and critical thinking. Three basic messages constitute the core of the training for students:

1. The Internet is based on a technical infrastructure, not a “magical thing”.
2. The Internet will not forget anything.
3. Protecting yourself and your data is in your hands.

Discussed topics include, among others, “what is the Internet”, “how does the Internet work”, cyberbullying, phishing, malware, privacy, settings, terms and conditions, copyright, rights of own pictures, technical protection, passwords, meeting with strangers, sexting, and sextortion. The training combines different educational methods and media, including videos, games, slide presentations, role-plays, debates, and real-life examples. Trainings focus on selected topics each year (e.g., “Clever Cloud user” in 2015/16, “Share respect – stop online hate speech” in 2016/17 and “Big Data” in 2017/18).

Age-appropriate versions of the trainings considering students’ prior knowledge exist. Trainings are held in German, French or English, take 90 minutes with a short break in between and comprise different modules that reflect the three core messages:

Module 1 (approx. 25 minutes): *The Internet is based on a technical infrastructure, not a “magical thing”.*

The training starts with discussing students’ favorite Internet activities, aiming at describing the use of the medium with its positive and negative experiences. Students learn that the Internet is a worldwide network of connected computers with server farms serving as nodes. Finally, the positive opportunities of the Internet, as well as the need to protect oneself against its risks and dangers raise students’ awareness. They also understand that technical protective measures and responsible behavior can be learned.

Module 2 (approx. 30 minutes): *The Internet will not forget anything*

A short explanation of the topic is followed by a group activity, in which students develop and present concepts for their own social networks. This exercise elaborates various Internet safety aspects, such as cyberbullying, privacy, settings, terms and conditions, the right regarding one’s own image, and copyright.

Module 3 (approx. 30 minutes): *Protecting yourself and your data is in your hands*

This part of the training summarizes the learnings and completes missing topics. In the group task "What do I already know?" students compare threats and corresponding protective measures related to technical protection, passwords, phishing, meeting strangers, sexting, and sextortion. Finally, to consolidate the information, students must solve a riddle consisting of the 3 core messages disguised by a jumble of letters.

Trainers are skilled professionals with various professional backgrounds, educated and specialized in providing *BEE SECURE* training sessions (Tiemann & Steffgen, 2017). They work for *BEE SECURE* as freelancers. Trainers are deployed to various schools across the country (elementary and secondary schools). After accepting the conditions described in the trainer label document, trainers are selected based on their communicational and pedagogical skills, their up-to-date knowledge and competences in information technologies and related security issues, and their social and organizational skills and ability to adapt to new situations. At least two trainings must be attended before candidates are allowed to conduct a training themselves. The first self-held training will be validated by a *BEE SECURE* trainer and the *BEE SECURE* program manager. The annually awarded trainer label requires attending at least eight hours of participation in further education each year. Further, trainers have to participate in at least three of the four annual trainer meetings. Therefore, trainers are under constant quality control.

After each *BEE SECURE* training session, students and teachers fill in questionnaires for the training evaluation. Questionnaires have been continuously improved in collaboration with the University of Luxembourg.

Since 2011, trainings were held at least once per year in a total of 338 different schools in Luxembourg (235 primary and 103 secondary schools). Table 1 shows the number of schools that participated in the *BEE SECURE* online safety training since 2011.

- Insert Table 1 about here -

Participants

Up to now, a total of 6,332 trainings were held on-site in primary or secondary schools, one school class or group at a time, with 2 to 90 participants per training session (M = 18.01, SD = 5.56). From 2015 to 2018, a total of 28,060 students participated in the survey. Student age distribution can be found in table 2. Gender was almost balanced (females: 50.80%; males: 49.20%). A total of N = 5,031 teachers were present during the trainings (2011-2018).

- Insert Table 2 -

Research Methodology

Short self-report questionnaires were used as a main evaluation instrument for this study. Self-report measures offer the advantage of being a low-cost, low-effort method of recording personal attitudes and opinions.

Measures

Self-report questionnaires were newly designed for the training. Due to the multilingualism of people living in Luxembourg, student questionnaires were available in German, French and English, whereas teacher questionnaires are in German and French.

Student questionnaire

Students provide information about their age and gender. Five items (*1."I understood well", 2."The trainer responded to our questions", 3."The presentation was interesting", 4."I learned something new about the Internet",5. "I will be able to apply/use what I learned"*) use emoticons (4-point scale ranging from "fully disagree" to "fully agree") to measure students' nonverbal feedback about the training.

Exploratory factor analyses revealed a 2-factor solution (varimax rotation) that comprises *insights* (Items 3, 4 and 5; α = .70) and *understanding* (Items 1 and 2; α = .41). The two factors explain 64.01% of the total variance (*insights* = 37.30%; *understanding* = 26.71%).

In addition, two additional items focused on organizational aspects such as *repetition* ("*I already assisted at a BEE SECURE training*") and *being informed* about the content ("*My teacher told me in advance what we will do with BEE SECURE").*

Teacher questionnaire

Teachers indicated their appreciation of the training on 11 items (5-point scale ranging from "fully disagree" to "fully agree"). Exploratory factor analyses (varimax rotation) indicated a two-factors solution, namely *implementation of the training (*6 items; α = .82) and *effectiveness of the training* 5 items; α = .87). Together, both factors explain 59.54% of the total variance (*implementation* = 28.58%; *effectiveness* = 30.96%; see appendix).

Two additional items (4-point scale ranging from "never" to "often") asked "*Have you covered the subject of training before in your own course?*" and "*Do you plan to cover the subject of training in your own course in the future?*".

Results

Statistical analysis

Questionnaires were entered into an encrypted database by *BEE SECURE*. Statistical analyses were carried out using IBM SPSS V.26. The level of significance was set to $p = .05$.

Do students perceive the learning effects of the educational training as positive?

Student answers on *insights* ($M = 3.54$, $SD = .54$) and *understanding* ($M = 3.74$, $SD = .38$) were far above the scale means. Both learning aspects were significantly positively correlated ($r = .31$, $p < .001$).

Age groups (<12, 12-15, 16-18, >18) significantly differed on *insights,* $F(3, 2{,}6647) = 402.87$, $p < .001$, $\eta_p^2 = .00$, and *understanding,* $F(3, 2{,}6679) = 4.06$, $p = .007$, $\eta_p^2 = .04$. Post hoc analyses (Tukey's HSD) indicated that for *insights*, students younger than 12 years ($M = 3.67$, $SD = .44$) found the training significantly more instructive ($p < .001$) than the other age groups (12-15: $M = 3.45$, $SD = .56$; 16-18: $M = 3.40$, $SD = .65$; >18: $M = 3.33$, $SD = .53$). Students in the oldest age group (> 18) showed a significantly lower score than students aged between 16-18 years ($p < .001$). Regarding *understanding*, 16 to 18-year-old students ($M = 3.70$, $SD = .43$) reported a significantly lower understanding than students younger than 12 years ($M = 3.75$, $SD = .38$; $p = .03$) and those aged between 12 and 15 ($M = 3.75$, $SD = .38$, $p = .01$).

Significant gender differences were found. Female students had higher scores on average for both *insights* (M = 3.58, SD = .50; t(25,682.26) = 12.53, p < .001, d = .15) and *understanding* (M = 3.76, SD = .36; t(25,849.92) = 7.37, p < .001, d = .11) compared to male students ($M_{insights}$ = 3.50, SD = .56; $M_{understanding}$ = 3.73, SD = .40).

Does students' previous experience with the content of the training have a positive effect on student ratings?

About 51.1% of the students had previously taken part in the educational training (*repetition*), and 48.5% had already been pre-informed by their teacher about the contents of the training (*informed*). *Informed* was negatively associated with *repetition* (r = -.05, p < .001) and positively correlated with *understanding* (r = .02, p < .001) and *insights* (r = .09, p < .001). Additionally, *repetition* was negatively correlated with *insights* (r = -.17, p < .001), but positively associated with *understanding* (r = .05, p < .001). Students who *repeated* the training had lower *insights* (M = 3.45, SD = .57; t(26,017.34) = -28.15, p < .001, d = .34) and higher *understanding* (M = 3.76, SD = .37; t(26,359.88) = -6.84, p < .001, d = .08) compared to students who did not have a training before ($M_{insights}$ = 2.78, SD = .47; $M_{understanding}$ = 3.73, SD = .39). Students who had been *informed* about the training content had higher *insights* (M = 3.59, SD = .50; t(26,609.46) = -14.22, p < .001, d = .17) and more *understanding* (M = 3.76, SD = .37; t(26,694.86) = -4.11, p < .001, d = .05) compared to uninformed students ($M_{insights}$ = 3.50, SD = .60; $M_{understanding}$ = 3.74, SD = .39).

There was a significant effect between age and *informed*, X^2 (3) = 177.38, p < .001, Cramer's V = .08. The younger age group (<12) felt most informed, followed by the oldest (>18) and the 16-18-year-olds, with the 12-15-year-olds being least informed. There was also an effect for age and *repetition*, X^2 (3) = 2209.36, p < .001, Cramer's V = .29. Individuals aged between 16 and 18 were most likely to have already participated in a

training, followed by the 12-15-year-olds, the above 18-year-olds and the ones younger than 12. In contrast, there was no significant gender effect for *informed* (X^2 (1) = .21, p = .65, Cramer's V = .003), but for *repetition* (X^2 (1) = 10.43, p = <.001, V = .001). Female students (51.7%) had participated more often in a training before than male students (49.3%).

Do teachers perceive the implementation and the effectiveness of the educational training as positive?

Teachers' training responses regarding *implementation* (M = 4.79, SD = .33) and *effectiveness* (M = 4.70, SD = .37) were both far above the scale means and close to the scale maximum for all items and variables. There was a significant positive correlation between *implementation* and *effectiveness* (r = .54, p < .001).

Teacher reports on having previously covered the subject of the training in their own courses ranged between "rarely" and "sometimes" (M = 2.45, SD = .88). They claimed they will "sometimes" (M = 2.97, SD = .70) cover the subject of training in their courses in the future. *Covered before* and *will be covered in the future* were positively correlated with each other (r = .61, p < .001). *Effectiveness* was positively associated with *covered before* (r = .08, p < .001) and *will be covered in the future* (r = .06, p < .001).

- Insert Table 3 -

Implementation and the effectiveness of the training, as well as the coverage and the planned coverage, have increased over the years (see figures 1-4).

- Insert Figure 1 to Figure 4 -

Years of training significantly differed with regard to all variables (see Table 3). To identify the years concerned, post hoc analyses with the Tukey's HSD test were carried out. For *implementation*, 2012/13 (M = 4.76, SD = .37, p = .02) had a lower mean score than 2015/16 (M = 4.82, SD = .31; see figure 1). For *effectiveness*, the year 2012/13 (M = 4.52, SD = .54) was lower than both 2015/16 (M = 4.62, SD = .48, p = .02) and 2017/18 (M = 4.61, SD = .49; p = .02; see figure 2).

Covered before was significantly different for the year 2010/11 (M = 2.26, SD = .92) compared to 2013/14 (M = 2.46, SD = .85, p = .01), 2014/15 (M = 2.50, SD = .90, p = .001), 2015/16, (M = 2.55, SD = .83, p < .001), 2016/17 (M = 2.51, SD = .86, p < .001), and 2017/18 (M = 2.54, SD = .87, p < .001). The year 2011/12 (M = 2.19, SD = .90) differed from all years from 2012/13 (M = 2.38, SD = .88, p = .008) to 2017/18 (p < .001). Additionally, the year 2012/13 had a lower mean score than 2015/16 (p = .01) and 2017/18 (p = .04; see figure 3).

Finally, *will be covered in the future* was significantly lower in 2010/11 (M = 2.81, SD = .75) compared to 2013/14 (M = 2.97, SD = .68, p = .02), 2014/15 (M = 3.01, SD = .69, p < .001), 2015/16 (M = 3.01, SD = .67, p < .001), 2016/17 (M = 3.07, SD = .67, p < .001) and 2017/18 (M = 3.05, SD = .67, p < .001). The score of 2011/12 (M = 2.75, SD = .74) was lower than in the year 2012/13 (M = 2.91, SD = .72, p = .01) to 2017/18 (ps < .001). Lastly, the mean of 2012/13 was lower than in 2016/17 (p = .001) and 2017/18 (p = .01; see figure 4).

Discussion

To date, many trainings on Internet safety for children and adolescents have been reported. However, systematic research on training effectiveness is still sparse. This study analyzed evaluation data from nationwide-implemented trainings on Internet safety in Luxembourg from 2011 to 2018 with over 28,000 students and more than 5,000 teachers. Overall, students greatly appreciated and acknowledged the trainings. However, further analyses revealed a more complex picture. Younger students found trainings more instructive and showed greater levels of understanding, and female students reported having benefited more regarding both *insights* and *understanding*. As expected, students profited from previous participation and information on the training: they had lower insights but higher understanding, thereby revealing positive learning effects. At the same time, providing students with information about the upcoming training led to more insights and greater understanding compared to uninformed students. Teachers shared their students' positive appreciation of trainings. However, having already covered the topic of Internet safety before training was related to teachers' greater perceived effectiveness of the training and their intention to continue to cover the topic in the future.

Students and learning effects

Overall, students appreciated the learning effects of the training. They developed a good understanding of the matter and reported gaining new insights. The better they understood the aspects of Internet safety, the more they found the information useful and vice-versa, thereby illustrating the well-known effect that perceived usefulness is associated with greater knowledge on the subject (Holden & Rada, 2011).

However, there were significant differences between age groups. Ratings dropped with age with older students rating trainings less instructive. It is likely that older students already knew more about training contents or at least assume so. Younger students reporting

better understanding of the matter than older ones might reflect general differences in learning motivation for school content, known to drop during puberty (Eccles & Midgley, 1989). However, this does not mean that *BEE SECURE* trainings are generally better suited for younger groups. Rather, with additional age-appropriate aspects, trainings may lead to more positive results for older students.

That girls rated both *insights* and *understanding* significantly higher than boys corresponds with motivational gender differences still existing concerning academic achievement (Wentzel & Miele, 2016; Wigfield et al., 1996).

Students' previous experience with the training

About half of the students reported previous participation in the training, and knowing in advance what the training was about. Not surprisingly, being *informed* about the training was positively associated with both *insights* and *understanding,* suggesting that informing beforehand about the training topics is indeed beneficial (Perels et al., 2005). *Repetition*, that is, having already participated in the past, was negatively associated with *insights* but positively with *understanding*. This suggests that students showed an improved understanding of the matter when they had more than one training. Additionally, they seem to remember information from previous trainings, leaving them with less new information to learn. These are good news, as it suggests that multiple trainings along the years are beneficial (English & Visser, 2014).

The observed age effect that the younger age group was most likely to be informed about the content of the training (with the 12 to 15-year-olds claiming to be least informed) might again reflect differences in motivation during puberty (Eccles & Midgley, 1989). Alternatively, since trainings are mandatory for 7th-graders (i.e., around the age of 12),

teachers might tend to forget to inform about the training, as it is part of the curriculum not requiring explicit request. Therefore, all age groups should be equally well informed about the contents of the training to increase positive effects on insights and understanding.

Teacher appreciation of the implementation and effectiveness of the training

Teacher's answers were all far above the scale means, indicating their strong appreciation of the training. Quality of implementation and perceived effectiveness were positively related, suggesting that putting effort into carefully implementing trainings will pay off in terms of teachers' appreciation and their increased intention to cover topics of Internet safety in future lessons. Additionally, the positive correlation between having previously covered the topic in class and teachers' intention to cover the topics in the future is in line with well-known findings that past behavior is a strong predictor for a broad range of future behaviors (e.g., Ajzen, 1991).

Teachers who found the trainings to be effective were also more likely to have already covered the topics in their classes and intend to cover them more in the future. This illustrates how overall attitude toward the issue of Internet safety affects teachers' general motivation to discuss this topic in class. Despite slight variations, an overall increase in their appreciation of trainings was evident over the evaluation years. This might indicate that the annual evaluations and adaptations led to a constant training improvement. Multiple trainings may have positively influenced teacher attitudes towards the trainings as well as their willingness to communicate and cover topics of Internet safety in their future classes.

Comparison with other trainings/programs

BEE SECURE for schools differs positively from most programs for multiple reasons. Trainings cover a broader age range (age 6-18, younger and older age groups

possible) than many other programs. Thus, its flexibility allows adaptation to students' knowledge level. Trainings comprise a broad range of topics that includes the main messages and focal topics that change between years, depending on their actuality. Compared to other trainings, this ensures memorization of basic safety messages without repeating the same training. Trainings are held by carefully selected and qualified trainers, not volunteers, ensuring interactive and flexible high-quality sessions, aspects which were reported to be missing in other trainings.

Our analysis found that more than half of students who participated in *BEE SECURE for schools* had already taken part in it before and, thus, had the opportunity to consolidate their Internet safety knowledge, as recommended also by other programs.

Another aspect is the training's high level of general instructiveness. In contrast to initiatives seeming to appeal only to students previously affected by a particular aspect of Internet safety which the program deals with (e.g., showing a movie on cyberbullying), the majority of students participating in the *BEE SECURE* training found it instructive and helpful.

Another strength of the training is its nationwide implementation and the fact that it is mandatory for 7th-graders. This ensures that all students participate, whereas other non-compulsory programs and initiatives struggle to reach a broad audience.

After *BEE SECURE* trainings, teachers indicated to plan on covering the topics more in the future, which is in line with suggestions emphasizing the importance to continue the dialogue after the program finishes (e.g., *ACMA Cybersmart Outreach Program*, 2011).

Strengths and Limitations

The present study shows the strengths of the *BEE SECURE for schools* training, including its nationwide implementation and continuous application since 2011, the annual evaluation and continued improvement, the skilled and annually certified trainers, the adaptation to different age groups as well as its diversified and dynamic implementation. For the statistical analyses, the large sample sizes are a clear advantage as well as the collection of data from both students and teachers.

With regard to limitations, the reliability of the student questionnaire factor *understanding* was low, possibly influencing the results due to the scale consisting of only two items. Future research should use a more complex and, thus, more reliable measure for *understanding*. Also, some questions were left unanswered, such as why older students perceived the training to be less valuable. This may be due to the sole use of quantitative data with questionnaires not allowing an in-depth and nuanced understanding. Future research on *BEE SECURE* or international adaptations could employ a mixed methods approach, adding qualitative date such as interviews or journals, thus contributing to a deeper understanding of the effects and shortcomings of the trainings. Mixed methods studies have been proven successful in the context of media literacy education (e.g., Schilder et al., 2016).

Both data from students and teachers are based on self-reports. Self-reports are prone to common issues, such as social desirability, interpretation of questions or lack of motivation. Through self-report, there is no indication of actual competences regarding Internet safety. However, defining measurable competencies may pose an important issue. Ilomäki et al. (2016) even question the usefulness and feasibility of measuring competences, especially if competences are defined as performance in novel situations in contrast to concrete tasks. Trainings may only change intended, but not actual online behavior

(Chibnall et al., 2006; Davidson et al., 2009; Thompson et al., 2012). Measuring only student perceptions of media literacy tells little about actual practice and reduces the significance of the efficacy of a program. Future research would benefit from pre and post-measurements of students' Internet safety knowledge and competencies. Such measurements should examine how to best operationalize actual learning outcomes, enabling to explore knowledge transfer to actual behavior as well as the persistence of training effects. Evidence of long-term effects would also counter the accusation that such programs often have only short-term effects (Davidson et al., 2009).

Lastly, it is important to stress that the current training neither represents nor replaces a more holistic approach to media literacy, which would imply a much broader form of education about media (e.g., Aufderheide, 1992). Rather, it is the goal of this Internet safety training to teach and support critical thinking regarding Internet-related content and practices, thereby addressing a selective aspect of a more general approach (Martens, 2010).

Concluding remarks

This study described the evaluation of *BEE SECURE for schools*, a nationwide-implemented training on Internet safety. Based on data from three consecutive years including over 28,000 students, we found pronounced learning effects in participants. Students emphasized the importance of having already participated in the training before regarding knowledge gain. Teacher reports mirror the overall positive ratings from students, by greatly appreciating the implementation and effectiveness, with both variables generally increasing over the years. Participating teachers also planned to cover topics of Internet safety in future lessons. *BEE SECURE for schools* represents a training program in media

literacy that successfully supports children's understanding of Internet safety and teachers' willingness to implement this topic in their curriculum.

Future developments of the training could pursue a more holistic approach (i.e., by involving parents, the community etc.), as does the *e-smart schools* program (Alannah and Madeline Foundation, 2015). The use of mixed multi-methods and an increased reliability of the student questionnaire scales will warrant students' competencies regarding Internet safety issues. It would be important to look at behavioral changes in students over time through a longitudinal measurement approach, addressing previous findings that programs often fail to show significant outcomes in this regard (Australian Communications and Media Authority, 2012; Davidson et al., 2009; Dooley et al., 2011; Thompson et al., 2012).

Given that the training has been successfully applied to the multilingual population in Luxembourg, it should be easy to transfer the program to other countries. The training is scalable to other learning contexts, which may help addressing the issue of media literacy education in a more complex way.

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Table 1

Number of schools where BEE SECURE trainings were held over the years

Year	2011	2012	2013	2014	2015	2016	2017	2018
Number of schools	91	92	103	102	110	135	138	104

Table 2

Number of Students per age-group

	< 12	12-15	16-18	>18	Total	Missing	Total
N	10,791	14,994	750	294	26,829	1231	28060
%	38.5%	53.4%	2.7%	1%	95.6%	4.4%	100%

Table 3

ANOVAS with year of training as factor

		SS	*df*	*MS*	*F*	*p*	η_p^2
Implementation	Between Groups	1.608	7	.230	2.06	<.05	.003
	Within Groups	558.703	5,001	.112			
	Total	560.311	5,008				
Effectiveness	Between Groups	6.713	7	.959	3.90	< .001	.007
	Within Groups	1,219.298	4,960	.246			
	Total	1,226.011	4,967				

Covered before	Between Groups	57.051	7	8.150	10.70	< .001	.015
	Within Groups	3,691.944	4,847	.762			
	Total	3,748.996	4,854				
Will be covered in the future	Between Groups	41.766	7	5.967	12.37	< .001	.018
	Within Groups	2,296.242	4,762	.482			
	Total	2,338.008	4,769				

Figure 1

Implementation and year of training

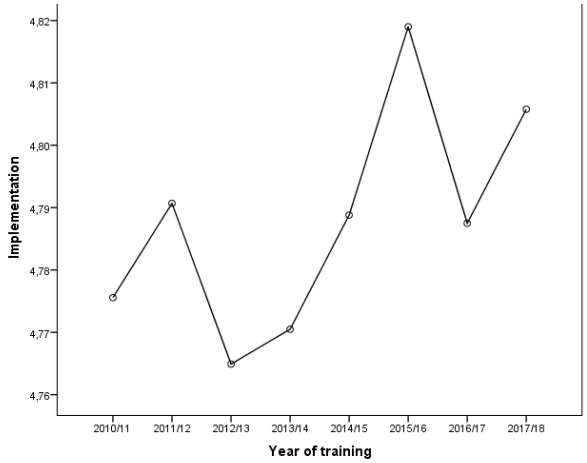


Figure 2

Effectiveness and year of training

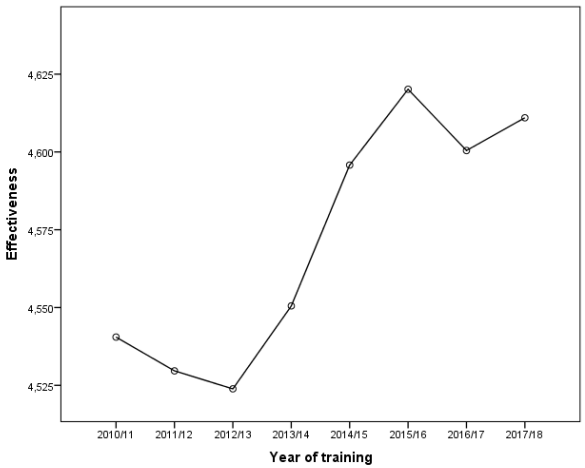


Figure 3

Covered before and year of training

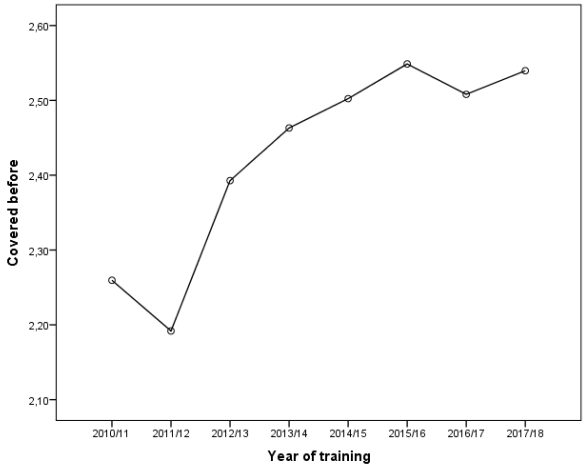
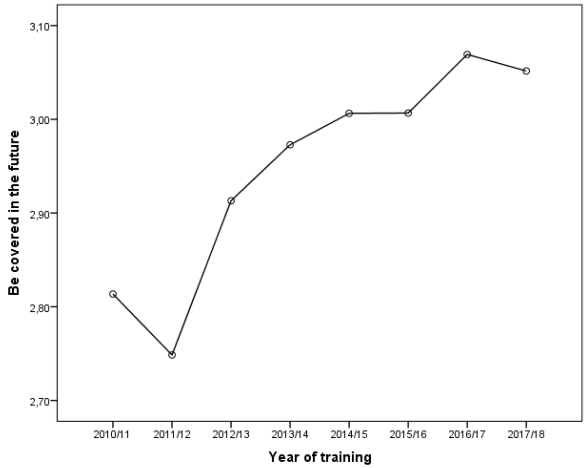


Figure 4

Be covered in the future and year of training



Appendix

Table 4

Factor loadings of the teacher questionnaire items on the factors implementation and effectiveness

	Factor loadings		
Item	Implementation	Effectiveness	h^2
1. The training follows a clear structure.	**.66**		.51
2. The training seems appropriately prepared.	**.72**		.57
3. The trainer expressed himself clearly and comprehensibly.	**.81**		.68
4. The trainer deals with the topics in an understandable way.	**.77**		.63
7. The trainer creates a pleasant working climate.	**.61**		.46
9. I think the training is useful.	**.52**		.43
10. The training sensitizes the students with regard to...			
a. ...an understanding of how the Internet works and its peculiarities.		**.69**	.54
b. ...respecting the safety rules and their social behavior.		**.79**	.68
c. ...a critical and careful use of the Internet.		**.79**	.67
d. …the recognition of concrete risks and dangers and adequate reactions.		**.80**	.71
e. ...the knowledge of the basic principles of data protection and their application.		**.79**	.68
Eigenvalues	3.14	3.41	
% of explained variance	28.58	30.96	