"Teach Me How to Facebook!" Design-Based Research about Risk Prevention on Social Network Sites

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Abstract: Because of the increasing popularity of social network sites, the meaning of media literacy education has evolved. Indeed, in the 21st century, one of the important aspects of media literacy became to know how to behave safe online. However, most educational packages on the topic of e-safety have been developed without much theoretical consideration, and they have not been evaluated. Design-based research has been put forth as a good methodology to considerately develop effective educational materials. Therefore, in this study, a design-based research approach was used to develop educational materials about the risks on social network sites. By developing solutions based on existing knowledge and improving these solutions in 5 iterative cycles of implementation, evaluation and revision, this research results not only in effective practical solutions, but also in context-specific design guidelines that can be used by future researchers, practitioners and educational developers.

Introduction

With the rise of web 2.0, the meaning of media literacy has evolved. While traditionally, it referred to the ability to analyze and appreciate literature, the focus has been enlarged a few decades ago, thereby also including skills with regard to computers (Brown, 1998). Recently, this covers not only interactive exploration of the internet, but also the critical use of social media and social network sites (SNS) such as Facebook and Twitter. Since social media gives an excellent opportunity to create online content, the development of new skills is necessary. Livingstone (2004a) therefore describes media literacy in terms of four skills, this is as the ability to access, analyse, evaluate and create messages across a variety of contexts. It has been found that while children are good at accessing and finding things on the internet, they are not as good in avoiding some of the risks posed to them by the internet (Livingstone, 2004b).

In this respect media literacy education in schools has been put forth to empower teenagers (Livingstone & Haddon, 2009; Marwick, Murgia-Diaz, & Palfrey, 2010; Patchin & Hinduja, 2010). To encounter the increasing concerns about children's safety when using SNS, caused by for example privacy risks, sexual solicitation and cyberbullying, several prevention campaigns and awareness raising interventions have been developed (e.g., Insafe, 2014). However, most packages are developed without any theoretical base and a systematic review demonstrated that only few packages have been empirically evaluated (Mishna, Cook, Saini, Wu, & MacFadden, 2010). These scarce evaluation studies give evidence that a raise in internet safety knowledge is often achieved, but that evolutions in actual behaviour are much more difficult to obtain (Mishna et al., 2010). This is in line with the results of intervention studies in the more general field of media literacy education, that demonstrate that these interventions increase the knowledge about the specific topic of the course but have no impact on attitudes nor behaviour (Cantor & Wilson, 2003; Duran, Yousman, Walsh, & Longshore, 2008; Steinke et al., 2007).

As a reaction to the lack of theoretical base in interventions, the lack of theoretical implications of this intervention research, and the lack of evaluation studies in authentic settings, the design-based research methodology has been described (Phillips, McNaught, & Kennedy, 2012; The Design-based Research Collective, 2003). This methodology connects theoretical research with educational practice, and has been defined by Wang and Hannafin (2005) as

> a systematic but flexible methodology aimed to improve educational practices through iterative analysis, design, development, and implementation, based on collaboration among researchers and practioners in real world settings, and leading to contextually-sensitive design principles and theories. (Wang & Hannafin, 2005, p. 6-7).

The output of design-based research contains both an increase of theoretical knowledge and a contribution to society, such as school programs (Reeves, 2006).

In the current research the design-based research approach lead us to develop effective educational materials to teach teenagers in secondary education how to use SNS safely (i.e., to increase awareness of risks and to change unsafe attitudes and behaviour) and to describe critical design guidelines for the development of

such materials. By developing solutions based on existing knowledge and improving these solutions in five iterative cycles of implementation, evaluation and revision, this research results not only in effective practical solutions, but also in a prototheory, describing context-specific design guidelines. The output of this research is therefore interesting for both researchers, developers and practioners (i.e., teachers).

The Initial Development of Solutions

As is typical for design-based research, design guidelines based on previous literature and theories were taken into account during the development of the initial materials. In this research, we took into account both general principles that are shown to be important in prevention campaigns (Nation et al., 2003) and more specific instructional design principles that follow out of the leading theory in education: constructivism (Duffy & Cunningham, 1996). This way, initial educational materials were developed for use in secondary education (Vanderhoven, Schellens, & Valcke, 2014a). The package consisted of a syllabus for the students and an instruction manual for the teacher. Every course could be carried out in one hour, thereby taking into account the request of teachers to minimize the duration of the lessons and the work load (Vanderhoven, Schellens, & Valcke, 2014b). The package aimed at both a raise in awareness about the contact risks on SNS, that is privacy risks, cyberbullying and sexual solicitation (DeMoor et al., 2008), and a decrease of unsafe behaviour on SNS after following the course. The different learning goals are described extensively in the teacher manual. All courses followed the same structure, as can be seen in table 1.

Table 1: The structure and content of the initial intervention

Structure of the course	Content
1. Introduction	The teacher introduces the topic, using the summary of risks (De Moor et al., 2008).
2. Two-by-two exercise	Pupils answer questions about a simulated SNS-profile on paper, together with a peer. These questions scaffold them towards different risks (cyberbullying, sexual solicitation and privacy risks).
3. Class discussion	Based on the answers of the pupils to the scaffolding questions and the answers given in the teacher manual, the teacher leads the discussion in class.
4. Voting cards	Pupils raise green or red cards, to show whether they agree or disagree with five given statements. Answers are discussed guided by the teacher.
5. Examples and theory	Some real-life examples are discussed. All the necessary information is summarized.

Method

The materials that were developed were put into practice in authentic secondary classrooms, while the impact on awareness, attitudes and behaviour of the pupils were measured using a pretest-posttest design. Based on the results of these measurements, the materials were refined. The revised materials were then implemented again in other classrooms. In total, five iterations of development, evaluation and refinement were conducted. The methodology was similar in the five intervention studies. However, some small changes have occurred. This is a typical characteristic of design-based research, where integrative research with varying methods is necessary to meet new needs and issues that emerge during the process (Wang & Hannafin, 2005).

Participants

The materials have been implemented in classes in secondary schools. In the first intervention study 1035 pupils participated, with a mean age of 15,14 (SD=1.88). In the second intervention study, 1487 pupils were involved, with a mean age of 14.9 (SD=1.11). In the third intervention study, 156 pupils followed a course, with a mean age of 15.39 (SD=0.61). The mean age of the 146 pupils that were involved in the fourth intervention is 12.92 (SD=0.61), and of the 80 pupils in the fifth intervention 15.64 (SD=1.23). In all studies, pupils were randomly divided over conditions, and no pupil participated in more than one study.

Procedure and Design

A pretest-posttest design was used in all intervention studies. This means that in all conditions, in all studies, pupils had to fill in an online pretest survey before the intervention took place. Afterwards, they followed the intervention, which was different in all studies. Finally, they filled in a posttest survey. In all intervention studies, a specific experimental intervention was compared with a control group. In the first two studies, no intervention took place in this control group, and pupils only had to fill in the surveys. In the last three studies, the intervention out of a previous phase was given to the control group, so that comparisons with the experimental group indicated the added value of the revised materials. The procedure is depicted in figure 1.

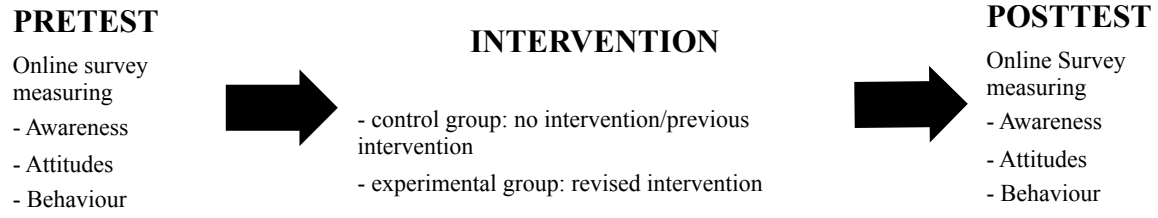

Figure 1. Procedure of the 5 evaluation studies.

Measures

Before and after the intervention, an online questionnaire was given to the pupils, measuring their awareness, attitudes and behaviour towards contact risks on SNS. This questionnaire was developed based on the contact risks as described by DeMoor et al. (2008). In the first two studies, three different scales were developed, one for awareness, one for attitudes and one for behaviour, all built on the base of the means of six or more items. They all had a satisfactory reliability as measured by Cronbach's alpha.

In the last three studies, the questionnaire was shortened, because pupils and teachers reported that it was too long and time consuming. Therefore, a new and shorter questionnaire was developed with less items on the awareness scale and with attitudes and behaviour measured based on the theory of planned behaviour following the manual of Fishbein & Ajzen (2009).

In all studies, an open question asked pupils about what they had learned during the intervention, to have a direct measure of increased awareness. Moreover, a direct binary measure of behavioural change was conducted by the question 'Did you change anything on your profile since the first questionnaire?'. If the latter was answered affirmatively, an open question about what they changed exactly gave us more qualitative insight in the type of behavioural change.

Analysis

Since our data clearly have a hierarchical structure, i.e. pupils in classes, the obtained data from pupils out of the same class might be dependent, and might so break the assumptions of simple regression analysis. In this respect Multilevel Modeling (MLM) is suggested as an alternative and adequate statistical approach. Consequently, since a significantly between-class variance could be observed indeed in the first two studies, a two-level structure is used: pupils (level 1) are nested within classes (level 2). The impact of the intervention on different posttest-scores -when controlling for the pretestscores- is evaluated by comparing the control-condition with the experimental conditions (i.e., adding the condition as a predictor in the model). Bonferroni corrections were used to control for multiple testing.

However, in the last three studies, no significant between-class variance could be observed, so there was no need to use MLM. Therefore, MANOVA's and multivariate repeated measures approaches have been used.

Results

Study 1: Implementation and Evaluation of the First Version of Materials

The initially developed materials were implemented and evaluated in authentic secondary classrooms. A positive impact of the given course on awareness could be observed, as pupils in the intervention group had an increased awareness about contact risks on SNS compared to the control group where pupils only filled in the pre- and post questionnaire. Yet, no impact of the courses on pupils' attitudes nor on their behaviour could be found analyzing the quantitative data. Still, if we analyze the qualitative data, some differences could be found. In the experimental group, significantly more pupils changed something on their profile than in the control group ($\chi^2(1)=15.60$, $p<.001$). As could be expected, pupils involved in the intervention about contact risks on SNS often changed their privacy-settings and their personal information such as their contact information. While these results indicate an impact of the course on the behaviour of a significant amount of teenagers, a lot of teenagers involved in the intervention reported not to have changed anything (i.e., 83%). Therefore, this first evaluation study demonstrated that the developed course had a significant impact on the awareness about the contact risks on SNS, but only limited impact on behaviour (Vanderhoven et al., 2014a).

First Revision of Materials

Following the results of the first study, several aspects of the intervention were inspected more closely. Based on observations made during the courses and comments of teachers about the intervention, possible holdbacks

were identified. For example, it was striking that during the class discussions and the voting game, well-liked pupils claimed that posting risky information "is not that bad at all". Following the theory of planned behaviour (Ajzen, 1991) -which states that behaviour is partly determined by the *social norm,* that is the social pressure people experience- and evidence that teenagers especially are sensitive to peer pressure (Sumter, Bokhorst, Steinberg, & Westenberg, 2009), it could be assumed that the well-liked peers described above had an important impact on other pupils' behaviour. Because of advantages of sharing information on SNS, such as communicating (Pruulmann-Vengerfeldt & Runnel, 2012) and creating an online identity (Hum et al., 2011; Madden & Smith, 2010), risky behaviour might be encouraged between peers and peer pressure might have prevented behavioural change.

Following this assumption, the educational materials have been modified. The possibilities for individual reflection were increased during the intervention by decreasing the 'peer time' that allowed pupils to be influenced by their classmates. This way, a larger impact on behaviour was aimed. Concretely, the two-by-two exercise was replaced by an individual task, forcing pupils to answer the questions about the simulated profile on their own. Subsequently, answers were discussed in class. The same revision was applied to the voting game. Pupils now had to reflect about the statements individually, instead of publicly raising green and red cards

Study 2: Implementation and Evaluation of the Revised Materials

Again, the materials were put into practice in an authentic classroom setting. In this study, there were two experimental conditions: in 43 classes the previous intervention was given (with collaborative learning), and in 25 classes the revised intervention was given (with individual reflection). Both groups were compared with the control condition where no intervention was given (43 classes). Both the original and the revised course had a positive impact on awareness as compared to the control condition ($\chi^2(1)=8.91$, $p<.02$ and $\chi^2(1)=7.24$, $p<.02$ respectively). However, only the revised course had an impact on attitudes and behaviour as compared to the control group ($\chi^2(1)=9.91$, $p<.02$ for attitudes, and $\chi^2(1)=5.67$, $p<.02$. for behaviour).

If we analyze the qualitative data, it could be found that while 7% of the control group changed something on their profile after the intervention, more pupils changed something in both the condition of individual reflection (13%, $\chi^2(1)=6.70$, $p<.01$) as in the condition of collaborative learning (17%, $\chi^2(1)=15.60$, $p<.001$). Pupils who changed something, often modified their privacy-settings, or adapted the personal information on their profile page.

The second evaluation study therefore showed that more time for individual reflection is valuable as a decrease of unsafe attitudes and behaviour could be observed compared to the control condition (Vanderhoven, Schellens, & Valcke, 2012).

Second Revision of Materials

After this second iteration, there was still room for improvement. Again, we took a closer look at the intervention and the remarks of teachers, pupils and observers. It was noted that the simulated profile in the course (the profile of "Sexy_Julie") contained so many risks that it was not experienced as realistic. Pupils might therefore feel like the risks are not relevant with regard to their own profiles. Therefore the materials have been revised. Where previously, students needed to complete an exercise with the simulated profile, now they had to make the same exercise with their own profile on a computer. This way, the authentic setting, that is described as an important instructional guideline out of constructivism (Snowman, McCown, & Biehler, 2008), was emphasized. Because computers were not always available at school, and because teachers reported that the course was already narrowly timed, the exercise was given as a homework task.

Study 3: Implementation and Evaluation of the Revised Materials

In this third study, there were two conditions. The control group (40 pupils) was involved in the intervention where the homework task was completed with the simulated SNS-profile of Sexy_Julie, while the experimental group (40 pupils) followed the course where the homework task was completed with the own profile. It was verified whether there was an added value of the revised materials concerning their impact on the awareness, attitudes, and behaviour with regard to contact risks on SNS. Three ANCOVA's have been performed with the posttest scores of respectively awareness, attitudes and behavior as dependent variables. There was no difference in impact between the two conditions when controlled for pretestscores, neither for awareness ($F(1,77)=.12$, $p=.73$), nor for attitudes ($F(1,72)=.001$, $p=.97$) or behavior ($F(1,72)=.38$, $p=.54$). On the contrary, qualitative data showed that the awareness of more different risks increased in the control condition where the profile of Sexy_Julie was used. Since there was no added value of using the own profile it was opted to keep the profile of Sexy_Julie in the package (Vanderhoven, Schellens, & Valcke, 2013).

Third Revision of Materials

For further improvement of the materials, we leaned back on the Theory of planned behaviour (Ajzen, 1991), because in our second study it has proven to be an interesting source of information to increase the impact of the intervention. Indeed, the social norm seemed to have an important impact on pupils' behaviour, as demonstrated by the larger impact of the intervention when the potential of peer pressure was decreased. Taking into consideration these results, it is notable that not only peers, but also parents have an important impact on the life of teenagers. Parents are often considered to be primary responsible for the moral socialization of the child (Maccoby, 2007) and play an important role in the education about online risks (Marwick et al., 2010; Pasquier et al., 2012; Safer Internet Programme, 2009). Moreover, Nation et al. (2003) emphasized that encouraging positive relationships, such as the relationship between parents and children, is a typical characteristic of effective prevention campaigns. Therefore, although peer pressure showed to have a negative influence on the impact of the intervention, parental involvement in school interventions might have a positive influence.

For this reason, the materials have been adapted, so that parental involvement is increased. Berkowitz and Bier (2005) described several strategies for schools to engage parents. One of the possibilities is to involve parents as clients, by organizing trainings in the topics of interest. Because of the rapid growth of SNS, many parents lack the expertise to guide and support their children's internet use (Livingstone & Bober, 2004). Therefore, training in internet related skills is necessary for parents as well. Following this assumption, parents were involved in the revised materials as clients by extending it with a parental information evening.

Study 4: Implementation and Evaluation of the Revised Materials

The revised intervention was again put into practice (Vanderhoven, Schellens, & Valcke, 2014c). However, since only 15% of the invited parents attended these parental information evenings, and only 19 of their children filled in both pre-and posttest, it was difficult to interpret results. Still, the qualitative results of this study show that the parental information session was useful to increase skills and literacy with parents. Moreover, most of the attending parents informed their children after the session about the risks on SNS and how to behave more safely. Therefore, it can be concluded that involving parents is effective at least to some extent. However, since only a limited amount of parents showed up at the information evening, organizing information evenings might not be sufficient to involve all parents. Although the attending parents were pleased with the information, and indicated that they learned a lot, there is no knowledge about the awareness, the internet literacy and skills of the non-attending parents. Analyzing the characteristics of the attending parents points to one of the main challenges of increasing parental involvement, this is involving all the parents and not only those parents who are already involved (Reynolds, 2005).

Fourth Revision of the Materials

Trying to encounter this challenge, new methods to involve parents were considered. Following Berkowitz & Bier (2005), the approach of actively involving parents as partners of the school was considered. This approach might be more appropriate to get in touch with all parents, and might so have a more positive influence on teenagers' behaviour. Therefore, the materials were revised, changing the homework task from an individual task into a task that needed to be completed in collaboration with the parents. Next to the questions that needed to be answered individually by both pupils and their parents, there were also a few questions that needed to be answered in communication, such as: on which questions did you have the same answer? Where did you/did you not agree? This way, all parents were actively involved in the intervention.

Study 5: Implementation and Evaluation of the Revised Materials

In this fifth study, an experimental group (9 classes) that followed the revised intervention was compared with a control group (7 classes) where the previous intervention was given. Both interventions had a significant impact on awareness about contact risks ($F(1,199) = 27.33$, $p < 0.001$), but especially boys benefited from the homework task with the parents when it came to a change in behaviour. While girls of both conditions posted less personal information and had less intentions to post personal or sexual information in the future, only the intervention with parental involvement showed this beneficial impact on boys.

Discussion and Conclusion

The last step of design-based research includes a reflection of the total research procedure and all findings, resulting in both practical solutions and improved theoretical understandings (Reeves, 2006). Therefore, we start this discussion with a conclusion and reflection on the findings. In a first phase of the research, educational materials have been developed based on different theoretical guidelines. Subsequently, important characteristics of effective educational materials were revealed in five iterative cycles of implementation, evaluation and revision. The final materials are therefore effective, as they increase awareness about risks on SNS, and decrease unsafe behaviour on SNS. Summarized it can be concluded that time for individual reflection and the involvement of parents in an intervention about risks on SNS is beneficial, especially for boys. However,

involving parents by organizing a parental information evening is not sufficient to engage all parents. Involving parents as partners, using a homework task, is put forward as a good alternative. Moreover, exercises with simulated profiles are just as good as real online profiles to obtain the objectives. Considering all these findings, a final effective and evidence-based practical solution was developed, that has an impact on both awareness and unsafe behaviour.

It is important that design-based research goes beyond designing and testing certain interventions. It must produce sharable *prototheories*, that help to communicate relevant implications to practitioners and educational developers (The Design-based Research Collective, 2003). Based on the results of this design-based research, context-sensitive design principles and theories are suggested. First of all, the initial design guidelines used to develop the materials need to be reconsidered. For example, in contradiction with the findings of Nation et al. (2003) that prevention campaigns need to be sufficiently dosed, it seems that an impact can be obtained already after a short-term intervention about risks on SNS. Second, collaborative learning, which was proposed as a central instructional strategy (Duffy & Cunningham, 1996), appears to be less successful in the case of reputation related behaviour like unsafe behaviour on SNS. Also, the value of an authentic learning context is put into perspective: while it seems to be valuable to include a SNS profile in the intervention, a simulated profile is sufficient to obtain results. There is no added value of making the context even more authentic, by including a real online SNS profile. Finally, the significance of positive relationships (Nation et al., 2003) is confirmed in the results of our studies: by including parents in the intervention, the impact on unsafe behaviour is enlarged. Combined with the finding that collaborative learning with peers is less effective because of the negative impact of well-liked peers, these results confirm the value of the impact of the social norm on behaviour, as stated by the theory of planned behaviour (Ajzen, 1991).

As a conclusion, it can be stated that this research resulted in both usable and evidence-based, educational materials about the risks on SNS and some contextually-sensitive design principles. The output of this research is therefore interesting for researchers, future developers and practioners. Moreover, this research is relevant to the theme of ICLS 2014 "Learning and becoming in practice" for several reasons. First of all, by focusing on changes in attitudes and behaviour, next to an increase in knowledge and awareness, we acknowledge that learning entails becoming a certain kind of person. We aim to influence pupils in a way that goes further than only increasing knowledge. By trying to make them critical citizens in this 21st digital century, and by teaching them to reflect about the different new risks that pop up with the rise of web 2.0, our materials aim to have a sustainable outcome. Second, by choosing for a design-based research approach, it was tried to gain insights by studying learning in real authentic settings, in this case the secondary classroom. By working in close collaboration with practitioners, materials have been developed that offer an opportunity for teenagers to learn, and become in practice.

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