D7.1 Report on Critical design guidelines to consider when developing solutions

Ellen Vanderhoven        Tammy Schellens

Ghent University
Critical Design Guidelines to Develop Educational Solutions

Introduction

When developing educational solutions to raise the awareness of privacy- and security issues on social network sites (SNS), one cannot rashly start. It is important to take into account some guidelines. For this reason, educational scientists use Instructional Design models (ID-models). Instructional design is the complete process of analyzing the goal of instruction, how to attain this goal, how to test and revise the chosen approach and how to evaluate the learner (Gustafson, 1996). ID-models therefore “provide conceptual and communication tools that can be used to visualize, direct, and manage processes for generating episodes of guided learning” (Gustafson & Branch, 1997). Numerous ID-models have been developed, all with different accents and focuses. The most typical category of ID-models, are the ADDIE-models (Branch, 2009), dividing the development process in five different steps: Analyze, Design, Develop, Implement & Evaluate. More recently, system models were developed. These are even more comprehensive, taking the system, context,... into account and having more attention for implementation.

In what follows, we will describe the ID-model we use for our research and the implications this has for our future work. Based on this ID-model and a thorough literature study, critical guidelines could be formulated which we should keep in mind while developing materials. Finally, the results of a focus group with teachers and other educational stakeholders are described, to verify and finalize results found in the literature study.

The IDI-model

The IDI-model (Instructional Development Institute), which has a prominent place in the history of the field (Gustafson & Branch, 1997), was used as a guidance in our development
process. This system model, developed by the University Consortium for Instructional Development and Technology (UCIDT, 1973) can be seen in Figure 1. There are three clusters of activities: defining, developing and evaluating. Every stage has three steps, which can be divided further in two or three activities. The model claims that all steps need to be finished in a serial way, but in actual practice overlap is rather common. All steps will be discussed:

![Diagram of the IDI-model (UCIDT, 1973)](image)

**Defining**

The first stage of the IDI-model contains activities that can be categorized under ‘Defining’. With regard to the SPION-project, these steps have been finished in the first year and have been reported in the requirements- and state of the art- deliverable.

**Step 1. Define instructional problem.** This step contains three activities: determining the needs, determining priorities and formulating the problem. These activities have been done and reported in the requirement analysis-deliverable (Vanderhoven, Schellens & Valcke, 2011b).

**Step 2. Analyse context.** This step also contains three activities. Next to analyzing all stakeholders and analyzing prior conditions, which has been completed in the requirement
analysis-deliverable (Vanderhoven, Schellens & Valcke, 2011b), there also needs to be an analysis of the existing solutions, which has been described in the state of the art-deliverable (Vanderhoven, Schellens & Valcke, 2011a)

**Step 3: Organize development.** Again, we can distinguish three different activities: organizing tasks, organizing responsibilities, and organizing timing. A lot of different tasks need to be done to develop educational materials, and possibly more than one person is involved in the development. For this reason, a detailed planning is essential.

**Developing**

The second stage can be categorized as ‘Developing’. The actual development of the materials finds place in this stage. The critical guidelines that we need to take into account when developing materials (cfr. infra), need to be described in this part of the process, in preparation of the three steps in this stage:

**Step 4. Define learning goals.** Here we can distinguish two activities: defining end goals and defining subgoals that need to be attained during the process. These goals need to be concrete, and can be described in checklists, criteria or behavioral indicators.

**Step 5. Specify methods.** Different methods for learning, for instruction and for media need to be determined. We need to take into account different learning principles, eg. immediate feedback, learning-by-doing, reflection, cooperative learning,… .

**Step 6. Construct prototypes.** A test version of the materials has to be developed in this step, just as an evaluation-instrument to test this prototype.
Evaluation

The last stage can be categorized as ‘Evaluation’: once the materials are developed, they need to be evaluated. This will be done in further stages of the project and will be reported in upcoming deliverables.

**Step 7. Test prototypes.** The developed prototypes need to be tested with a representative sample of students, in an authentic setting. All data concerning the evaluation of the prototypes need to be collected.

**Step 8. Analyse results.** The results of the tests carried out in step 7, need to be analyzed with regard to the learning goals, the instruction methods used (step 5) and the method that was used to evaluate. Overall, it needs to be determined which aspects of the materials were good and which aspects need to be revised.

**Step 9. Revise and implement.** Depending on the conclusion of the evaluation, the materials need to be revised and previous steps need to be repeated. After a few iterations, the materials can be implemented.

As mentioned before, the main part of this deliverable will focus on the preparation of the second stage: developing. This stage consists of three steps: (1) define learning goals, (2) specify methods and (3) construct prototypes. In preparation of the first step, we can state that the main goal of our developed materials will be: raising the awareness about privacy- and security issues in SNS. Hereby we aim a greater knowledge about the existing risks, a critical attitude towards information-sharing on SNS and safe behaviour on SNS (without losing opportunities). In further processing, these goals will be elaborated into more concrete learning goals, behavioral indicators of the aimed results, checklists,... In preparation of the second step of the developing-
stage, the critical design guidelines to develop materials will be discussed. What are the criteria that should be kept in mind, to maximize the chance that the created educational materials are effective and satisfactory, with regard to changing knowledge, attitudes and behaviour? To find an answer to this question, a broad literature study was performed. In this study, we focused both on general principles that are shown to be important in prevention campaigns as on more specific instructional design principles that follow out of the leading theory in education: constructivism. For all mentioned criteria, we discuss the implications for the packages about safe use of SNS that will be developed, as a preparation of the third step of the developing-stage: constructing prototypes. Finally, our findings are extended with some remarks from people in the educational field, obtained during focus groups.

**Literature study**

**General principles of effective prevention campaigns**

A lot of educational materials to prevent different kinds of behaviour have already been researched (oa. Kumaraguru, Sheng, Acquisti, Cranor & Hong, 2010; Swearer, Espelage, Vaillancourt & Hymel, 2010). Results of some of these studies have been summarized in different reviews on different topics, eg. substance abuse, teen pregnancy, school dropout, juvenile delinquency,... (Dryfoos, 1990; Elias, Gager & Leon, 1997; Weissberg & Greenberg, 1998). Nation et al. (2003) reviewed 35 of these review-articles in four different topics (substance abuse, risky sexual behavior, school failure and juvenile delinquency and violence), trying to identify general principles of effective prevention campaigns that transcend specific content areas, this is characteristics of campaigns that show to be beneficial in helping youth to avoid numerous problems. Based on their review, they defined nine principles, ordered in three
categories. Most of these principles are also described by Finkelhor and Luna (1998), relying on different studies with even broader topics (also traffic safety, dental health, mental health, driver education, suicide). This confirms that these are consistent characteristics of effective prevention programs, which go beyond content. We might therefore conclude that these characteristics need to be part of any prevention program that tries to educate youngsters about privacy and security issues in SNS. Moreover Finkelhor and Luna also stated some factors that are typical for non-working preventions: the use of fear tactics, efforts to change attitudes alone and generalized approaches such as affective education. So, this characteristics should be avoided in any prevention programs on SNS.

In what follows, the nine different principles described by Nation et al. (2003) are explained. For every principle, we also give some suggestions of how we think it can be applied in the context of prevention of unsafe behavior on SNS.

**Principles related to program characteristics:**

- **Comprehensive**: Multiple interventions, in different settings (combined parent, peer and school interventions support positive outcomes). This can be obtained in the context of safe SNS-use by giving more than one lesson about the topic, by giving homework to involve parents, by giving specific tasks to work with peers,… Moreover, this characteristic also refers to the need to try to tackle all different risks that youngsters face when using SNS.

- **Varied teaching methods**: Active, skills-based component, interactive instruction, hands-on experience. We should therefore not rely too much on knowledge-transition and preaching information. Somehow, SNS need to be implemented in
in-class activities, possibly by (non-technical) simulations, to ensure skills-based exercise.

- **Sufficient Dosage**: Intense intervention, measured as the quantity and quality of the contact hours. Follow-up or booster session necessary to assure long term effects. Lessons about SNS should therefore be well-chosen and relevant, and need to be spread in time.

- **Theory driven**: Based on etiological theories (focus on cause of the problem) and intervention theories (focus on the best method to lower risks). Concerning the intervention theory, the IDI-model and guidelines described in this paper shape the theoretical framework we use to develop our materials. There is however a lack of etiological theories about the privacy- and security risks on SNS. We therefore focus on an empirical framework, described in our requirements deliverable (Vanderhoven et al., 2011b).

- **Positive relationships**: Parent-child, significant others (peers, teachers, community members). Educational activities should be focused on collaborative working and feelings of trust.

**Principles related to matching the program with the target population**

- ** Appropriately timed**: Trying to have a maximal impact: early enough (before onset unwanted behavior), but not too early (so that positive effects are not washed out before onset). Focus on changeable precursors of unwanted behavior. Tailored to the intellectual, cognitive and social development of the participants. In our requirement research (Vanderhoven et al., 2011b), we found that youngsters of different ages show different behaviour on SNS. Therefore, it might
be good to give different packages to different age groups, with a different focus each time.

- **Socio-culturally relevant:** Taking into account the community norms, cultural beliefs and practices. The program must also address the needs of the target group. For this, we take into account the needs analysis performed before (Vanderhoven et al., 2011). Moreover, it needs to be kept in mind that we are developing materials for Flemish youngsters, so that language, norms, values,... from this region should be considered.

**Principles related to implementation and evaluation of prevention programs:**

- **Outcome evaluation:** Testing the effectivity of the program. There seems to be a lack of empirical evaluation of educational materials about SNS. This is the focus of the research of the educational partner of the SPION-project, using design-based research: materials will be developed, implemented, evaluated, and reconsidered.

- **Well-trained staff:** The staff must be sensitive and competent. They must get sufficient training, support and supervision. This can be done by developing good guidelines, additional information for teachers, a privacy manual,… Additional support should be considered.

**Instructional principles out of constructivism**

Next to these general guidelines, some specific instructional guidelines drawn from the field of learning science must also be considered. In this field, constructivism is the dominant theory of the last decades. The main implication for education is that learning is seen as an active process, where the learner actively constructs its knowledge. This knowledge cannot be
transferred from one person to another just by lecturing (Duffy & Cunningham, 1996). That is why some basic principles for the development of educational materials are put forth to maximize the chances of successful learning (Karagiorgi & Symeou, 2005). Again, these principles are described, together with how they can be applied on our educational materials to raise awareness about privacy- and security issues on SNS.

- **Active learning.** As was mentioned already, learning is seen by constructivists as an active process. Learning-by-doing is emphasized: knowledge and skills are acquired better when they are actively exercised. Learners need to develop effective ways to resolve problematic situations. Technology and teachers can help to obtain this active learning, eg. by providing *scaffolding* opportunities. Scaffolds guide the learner from what he/she already knows to what needs to be known (Wood, Bruner & Ross, 1976), including opportunities for higher level thinking and metacognitive processes (Raes, Schellens, De Wever & Vanderhoven, 2011).

We can apply this information to our materials by ensuring active participation of the pupils (active problem solving, exploring, technical skill exercises,…), and offering some kind of scaffolding. Moreover, we can use the *personalization principle* (Clark and Mayer, 2002 ) which is described in literature about online security training as an important factor to consider (Kumaraguru et al., 2010). This principle states that by using a conversational style in materials and instructions (using first and second person language), people feel like they are more actively involved, rather than just receiving information.
o **Authentic learning.** Learning should take place in a socio-culturally relevant context. This is also called situated learning: learning is more likely to be meaningful if it is embedded in a realistic context (Duffy & Cunningham, 1996; Snowman, McCown & Biehler, 2003). Applied to our materials this means that somehow SNS should be part of the course (either in a computer course or by paper simulations), and realistic situations that youngsters encounter while using SNS should be simulated.

o **Multiple perspectives.** Learners should be confronted with multiple and alternative views. This plurality applies to content, strategies and perspectives. They can use multiple learning styles and multiple representations of knowledge (Kafai & Resnik, 1996). Procedural knowledge should be alternated with conceptual knowledge, since they influence each other in mutually supportive ways (Johnson & Koedinger, 2002). Moreover, the content should be represented in multiple ways, using schemes, pictures, text,... that are contiguous in time and space (Mayer & Anderson, 1992).

Applied to our materials, we should focus on different perspectives on the use of SNS. This is, not only the view of the youngsters themselves (which may already differ between peers), but also from teachers, parents, advertising companies, companies with which they might want to work in the future, … We should focus on opportunities and risks for all parties. Confronting youngsters with these different views is important to let them construct their own knowledge. Moreover, we need an alternation of practical exercises and theoretical concepts, and an alternation of different didactical strategies.
Critical Design Guidelines to Develop Educational Solutions

- **Collaborative learning.** For constructivists, learning is inherently a social-dialogical process. Working together helps in sharing and developing multiple viewpoints. As Duffy and Cunningham (1996) stated, collaborative learning provides variation in classroom activities, teaches students how to work together and how to cooperate, shares the workload and promotes peer tutoring. Peer tutoring is the process where students help each other to learn. It is proven that both parties (‘tutor’ and ‘tutee’) benefit from this process, in that they show higher learning motivation, higher cognitive awareness and a larger variety of self-regulated learning strategies (Vandevelde, Van Keer & De Wever, 2011). In our materials, we should therefore include tasks in which pupils have to work together with their peers. This can be a group task or a two-by-two exercise, like exchanging experiences, describing or observing each other’s SNS-profile,…

- **Assessment.** With constructivism, there has also been a shift in evaluation. The notion of assessment, which stresses the learning process and not only the result, became more important. According to Birenbaum (2003) we are experiencing a shift from a test culture to an assessment culture and as Gardner (2006) said we evolved from assessment of learning to assessment for learning. Assessment for learning requires students to be actively involved in the assessment process, e.g. through negotiation of the criteria, the design of the assessment and/or the interpretation and value of the assessment for performance improvement (van Zundert et al., 2010). This evolution in evaluation entails different kinds of innovating forms of assessment like self-assessment, peer-assessment and co-assessment. These forms of assessment have shown to have many advantages.
An important characteristic of these forms of assessment, is the reflection principle: students need to stop and think about what they are learning (Lagerwerf & Korthagen, 2006). Another important aspect is the timing of the feedback: the sooner, the better (Anseel, 2010).

In our materials, we therefore need to take into account a continuous evaluation. Especially since we aim a grow in skills, behaviour and attitudes, we should not end the course with a test and a score. Building in a moment of reflection on their own behaviour and attitudes, seems much more appropriate. Possibly the view of others can be integrated. In addition, with the given exercises it is important to provide a moment for immediate feedback.

**Focus group**

In addition to the literature study described above, a focus group was organized where teachers from secondary education, someone from schools advisory service and a developer of educational materials were gathered to discuss some topics with regard to the criteria that educational packages about SNS should meet, to maximize the chance of dissemination and effectivity. The goal of the focus group was therefore to get an answer to the following questions:

- What criteria of educational packages are experienced as important?
- How should an educational package best be implemented?

**Method**

To answer the first question, the attendees of the focus group were given small cards in two different colours: red and green. They were asked to write down positive characteristics of educational materials on the green cards and negative characteristics on the red cards.
Afterwards, all cards were pinned on a notice board in front of the room, and all suggestions were discussed. Afterwards, the criteria that were derived from our literature study (cfr. supra) were summed up, and attendees were asked to give feedback on these criteria: to what extent did they agree, to what extent did they think the criteria were achievable,…?

To answer the second question, attendees were given two dilemmas. First, would they prefer that lessons about safe use of SNS were given in one course, several courses, or rather a theme day or week? Second, would they prefer that a regular teacher gave these lessons, or that an expert would provide this information?

**Results**

**What criteria of educational packages are experienced as important?**

Educational packages should not have too much text, since teachers reported that youngsters do not like to read. It should not be colourless, boring or only theoretical. Positive characteristics of packages are:

- Age appropriate, appropriate difficulty, close to youngsters all-day experiences
- Attractive, funny, with humour
- Short and powerful, not time consuming → selective information
- Interactive, varied teaching methods (movies, games, pictures,..), practice-based, using real-life examples
- Results of their actions should be clear to the pupils: they should experience a *wow-effect*
- Manual for teachers (solutions + extra information)
Regarding the criteria out of our literature study, teachers agree with most of the principles. However, they raised some practical problems on how to combine a comprehensive and sufficiently dosed package with their concern of time-consuming packages. They emphasize the fact that the package should be short and to the point. Information should be selected in accordance with youngsters’ interests and their environment. The possibility of different short lessons for different age groups with a shift in focus has been raised, just as the possibility of a ‘standard’ package that can be extended with extra exercises.

**How should an educational package best be implemented?**

Teachers prefer to give a package in one hour, in one course. They do not like the idea of a theme week or day, since there are already a lot of these projects. Moreover, this format brings a lot of work and most of the time a few teachers need to motivate all the others.

Although the input of an expert is seen as valuable, teachers prefer to get a training themselves, so that they become ‘experts’ themselves. This way they can answer their students questions even after the class is over. Moreover, the teacher knows his/her pupils best, and can become a trust person for those in need.

**Conclusion**

Following the IDI-model of Instructional Design, we needed to describe some guidelines and criteria to develop educational materials on the subject of safe SNS-use. For this, we did a literature study that led us to nine general principles that are proven to be important in prevention materials and five instructional principles out of the leading theory in education, namely constructivism. While developing educational materials, we need to keep all this principles in mind as much as possible, while not passing over the remarks of stakeholders in the educational field. Their concerns might somewhat compromise the way we can take all the mentioned
principles into account, but they help to ensure that materials will be disseminated. Therefore, a
good balance needs to be found, so that the given criteria and guidelines are met as much as
possible.

References


