

DESIGN AND VALIDATION OF ONLINE INSTRUMENT FOR MEASURING INFORMATION SKILLS

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ABSTRACT

Most secondary education students use the WWW as their only information source for class assignments. The way they search and evaluate information is not ideal (MaKinster, et al., 2002; Walraven, et al., 2009). Teachers recognize the need for instruction in these skills, but instruction is still rare. Possible explanations are poor information skills of teachers themselves (van Deursen & van Dijk, 2010), and lack of insight in students' skills, since measuring information skills is often done outside educational context. A quick and easy measurement in educational practice could be a first start to 1) improve teachers' own skills and 2) integrate information skills in the curriculum. The design and validation of such an instrument was central in this study. Based on the model of Brand-Gruwel, et al. (2009), the instrument combines the advantages of off- and on-task measurements of information skills.

After content validity and usability tests, 106 secondary education students went through the instrument. Their actions in the instrument were compared to their answers to the validated information skills questionnaire by Timmers and Glas (2010). Data have been gathered and analyses are currently being performed.

KEYWORDS

Assessing information skills, Internet, secondary education

1. INTRODUCTION

A lot of research has been done on information problem solving (or the way people use the Internet for finding information) (see for instance literature reviews by Kuiper, et al., 2004). Several authors have also specified ways to measure the skills people need for finding information and the amount of which people of various age groups possess these skills (e.g., van Deursen & van Dijk, 2010)

A distinction can be made between off task measurements or on task measurements. Off task measurements are measurements of information problem solving skills that do not require the respondent to actually solve an information problem on the Internet. Examples of these kinds of measurements are surveys and self-reports. An advantage of these off task measurements is that a large group of respondents can be reached, and the data can be analyzed quickly. However, since respondents are asked for an estimation of their own skill level, the method has significant problems of validity (Hargittai, 2005).

On task measurements are measurements based on log files, eye tracking or observations. They always involve respondents performing a task on the Internet. Sometimes think aloud protocols are used (e.g., Walraven et al, 2009). These measurements give an accurate view on how respondents go about searching information on the Internet. However they are labor intensive and analyzing the data takes a lot of time. Furthermore on task measurements are often part of research and not education, since education lacks the time, instruments (expensive eye trackers) and expertise. This is unfortunate, since information skills are important in education, and most students lack the skills to successfully solve information problems.

What seems to be missing is an instrument to measure information skills, that combines the fast and large scale data collection of a survey with the accurate view on the skills of an observation, that can be used in educational settings by teachers. The development and validation of instrument with this combination is central in this paper.

2. DIGITAL INFORMATION SKILLS MEASUREMENT

2.1 Theoretical Background of DIM

The Digital Information Skills Measurement (DIM) was developed based on the IPS-I model, the off task paper and pencil test, and on task think aloud protocols used in Walraven et al. (2009), and the technology of the LEM-tool (Huisman & van Hout, 2008).

The model for information problem solving that forms the foundation for the developed instrument is the model by Brand-Gruwel, et al., (2009). This model, the IPS-I model is presented in Figure 1. The model describes the skills needed to solve an information problem when the internet is used to search information. The five constituent skills, 'Define information problem', 'Search information', 'Scan information', 'Process information', and 'Organize and present information' are linked blocks. Regulation happens during the execution of all skills and is visualized by the arrows. The five blocks rest upon three layers which represent the three most important conditional skills: (a) 'Reading skills', (b) 'Evaluating skills', and (c) 'Computer skills'.

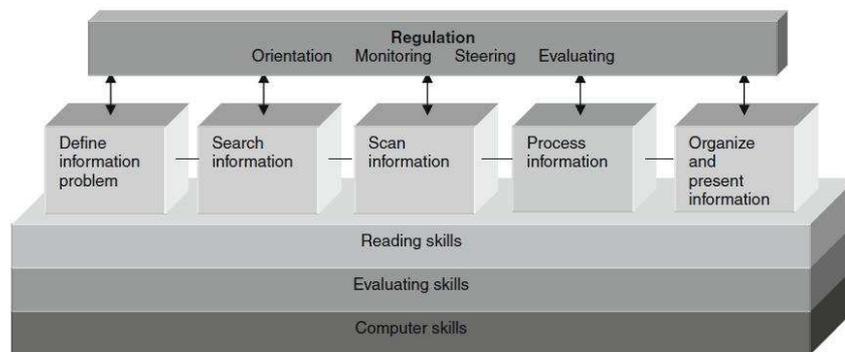


Figure 1. The information problem solving using internet model (IPS-I model).

Measuring information skills means participants should work on whole tasks, which are authentic and comprehensive. These tasks should require participants to perform all the constituent skills that make up the whole process. Research shows that especially the conditional evaluation skills are problematic for students of various ages (e.g., MaKinster, et al., 2002). Although the whole process of information problem solving is measured with DIM, the evaluation of information is central in DIM.

In an earlier study a paper and pencil test and think –aloud protocols were used to measure evaluation of websites and information. For the think-aloud protocols students received an information problem they had to solve while searching on the Internet and thinking aloud. To analyze which criteria students used to evaluate search results, information and source a coding scheme was used. However, thinking aloud is not always easy for students, and they discarded sites without explaining why. For the paper and pencil test participants received booklets with printed websites. To examine whether students could identify crucial features to base an evaluation on, students were asked which sites and what information they would or would not use. They could highlight parts of information or features of the website they based their decision on (Walraven et al, 2010). Although all students were capable of mentioning criteria for every site, the problem with the paper and pencil test is that it is done off line, and does not give an authentic measurement of what students focus on while performing an on line task. A combination of both measurements could be a solution to the problem of difficulty of thinking aloud and the absence of an authentic measurement.

A way of combining the two measurements would be having participants write comments on the sites they visit while searching the Internet, in stead of verbalizing those comments. The technique of the LEMtool can be used for this. The LEMtool is a non-verbal measurement tool for the evaluation of websites (Huisman & van Hout, 2008). One can choose the expression that best describes ones feeling towards (parts of) a website. See Figure 2 for a screenshot of the LEMtool.



Figure 2. Choosing the emotion a (part of a) website evokes.

After choosing an emotion, one can move the LEMtool to a different part of the site, select it, and choose another emotion. For the DIM, the emotions could be replaced by text fields.

2.2 The DIM

The DIM was designed based on earlier research and available techniques as described above. In this section the DIM will be described.

The search engine Google is the starting point of the DIM. Participants can use Google, or surf to another search engine or website to start their search. However, a layer is added to the DIM, logging all the actions of the participant. The keywords entered, which search results are visited, how long the participant stays on a website, and so on. On top of the page is a task bar, showing the task to be performed by the participant, and four buttons. By using these buttons, participants can get 1)an explanation of the instrument, 2)open a notepad and paste or type information there that is useful to solve the task, 3)view the comments they made on the sites and 4)decide to solve the task. After pressing this 'answer' button, the participant ends the search. After this, participants can not return to the search. The taskbar is always visible and on top of the page. The task the participant has to solve is: Young people used msn and sms a lot. Does this affect their Dutch? (Explain your answer in about 15 lines in your own words.) The maximum search time is 30 minutes. This time is counted down in the task bar. Participants are prompted 10 and 5 minutes before the search time expires.

By using the evaluation button, participants can post comments on the search results and sites. By right clicking on the evaluation button, and then clicking on the part of the site the participant wants to comment on, an input field is created. After the comment is saved, it is no longer visible on the screen. This allows the participant to make as many comments as he wants, without getting a screen filled with comments. To see which comments he has made, the participant can use the 'view comments' button in the task bar.

When the participant has gathered enough information on the notepad, he uses the 'answer' button to go to the answer screen. On this screen the participant sees the task, an entry field, and all the information from his notepad. After answering the task, the participant is given a model answer. After comparing his own answer to this model answer, the participant grades himself.

This first part of the DIM allows participants to perform the constituent skills search, scan, process and organize and the conditional evaluation skill from the IPS-I model. The regulation that happens during the execution of all skills is the focus of the second part of the DIM.

After answering the task, the participant is asked a number of questions about the search process. Amongst others questions about which site was most useful, and what the participant would do differently next time. After answering the questions, the participant grades his information problem solving process.

In the third part of the DIM, participants are presented with 5 websites. For each website they have to decide whether they would use this site in answering the task they just solved: Young people used msn and sms a lot, does this affect their Dutch? The questions they have to answer for each site is: Would you use this site or not? And why? What do you notice? They can use the evaluation button to make comments on this site, and can make as many comments as they want.

After the five sites are evaluated, the participant must rank them according to usefulness and provide a reason for his choice with each site. After the participant is done, again a model answer is shown. The correct order is shown, and the features of the sites that could be commented on are provided. Again, the participant grades himself.

The DIM was evaluated with 4 experts in information skills and research on information problem solving. The researchers walked through the DIM together with the experts. Focus of the evaluation was whether the DIM measured the concept of information problem solving. After the expert evaluation, a target group evaluation with 6 secondary students was performed. In two groups of 3, the students went through the instrument. They were asked to think aloud, and discuss the instrument together. Focus was on usability and comprehension of the task, questions and evaluation button. After these evaluations slight changes were made, resulting in the DIM as presented in 2.2.

To further validate the DIM the actions of secondary education students in the DIM are compared with their answers to the validated information skills questionnaire by Timmers and Glas (2010).

3. METHOD

3.1 Participants

106 students of pre-university secondary education (mean age 14.3 years) participated in this study. 54 of them were male, 52 female.

3.2 Instruments

3.2.1 The Dim

The Dim as presented in 2.2 was used.

3.2.2 Information Skills Questionnaire

The questionnaire by Timmers and Glas (2010) was used to compare with the actions of the participants in DIM. This validated and reliable questionnaire consists of four scales within a 46-item survey on information-seeking behavior. Three scales were used for validating the DIM: a scale for applying search strategies, a scale for evaluating information and a scale for regulation activities when seeking information. This resulted in a questionnaire with 25 items. All items are answered with a 4 point scale, going from always to seldom or never. Example items are: When I search information for study assignments:

I determine the best places to search for this information.

I select information that corresponds with my own opinion

I scan through the information found

3.3 Procedure

Students individually completed both the digital measurement (DIM) and the IPS questionnaire. The tasks were counterbalanced. A random assigned group started with the DIM and finished with the questionnaire, and the other group started with the questionnaire and finished with the DIM. Prior to the DIM or questionnaire some demographics were collected.

3.4 Data Analysis

Data analysis is currently being conducted. Actions of participants in DIM will be coded using a coding scheme based on the think aloud coding scheme used in previous research. This scheme will focus on the search process (the constituent skills) and used evaluation criteria (as entered in the comments with the evaluation button). Furthermore scores on the questionnaire will be calculated for search strategies, evaluation and regulation. Questionnaires scores will be compared with the DIM scores. Analyses will be completed and presented at the conference.

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