Assessing Information Literacy: Creating Generic Indicators and Target Group-Specific Questionnaires

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Abstract. Information literacy is defined as the capacity to identify, locate, evaluate, use, create, store and index information. This article deals with the assessment of information literacy. Therefore a list of skills an information literate person should possess in the 21st century was developed. Based on these indicators, multiple-choice tests were developed which focus on the target groups of pupils, university students, teachers and researchers. With these tests it is possible to assess the knowledge in terms of information literacy.

Keywords: Information literacy, information literacy indicator, questionnaire, assessing information literacy.

1   Information Literacy

For some years Information Literacy is seen more and more as an essential competence for the 21st century. These skills are required not only for university students or library users but for each participant of the knowledge society.

In recent decades, numerous models and standards on information literacy have been developed. Probably the best known information literacy standards are the "Information Literacy Competency Standards for Higher Education" [1] created in 2000 by the Association of College and Research Libraries (ACRL) and the American Library Association (ALA). These standards are based on the definition of information literacy developed in 1989 [2] and describe specific skills that an information literate student should have. This includes the identification of the information need, the effective and efficient access of information, the evaluation and use of information and the understanding of economic, legal and social issues in connection to information. These skills are also mentioned in many other models, standards and projects like the Information for all Program (IFAP) by UNESCO.

But due to the strong developments in information and media technology, new additional skills are now in the focus of science. The proportion of internet publications increases more and more in comparison to traditional scientific publications [3]. For the past several years these internet publications also include user-generated content. In blog posts, wiki articles or on photo and video platforms, the so-called "prosumers" [4] have the opportunity to step out of the role as a passive recipient and to create their

own content. This kind of information creation and dissemination requires new skills from the users. According to Gust von Loh and Stock [5], this new set includes practical skills in the creation of knowledge and knowledge representation. Besides the creation of information, also indexing information (by then performed by information professionals) becomes an important skill. User-generated content can, for example, be tagged by keywords, which makes the information more accessible to other users [6].

However, with the new possibilities of Web 2.0, other traditional skills become increasingly important again. This includes, for example, knowledge about information law and ethics, like ensuring privacy or data security [5].

2   Assessing Information Literacy

Assessing information literacy serves several purposes. On the one hand, the results can be used to review the state of information literacy knowledge or the achievement of the learning objectives, whereby for example the strengths and weaknesses of information literacy instruction programs can be clarified. On the other hand, assessing information literacy helps institutions to create accountability reports, which may lead to further financial support [7]. When choosing a suitable method for assessing information literacy, the implementing institutions should be aware of the exact target, the subsequent use of the data and the target group of the survey. The following sections describe some methods that can be applied for assessment of information literacy. The methods can be divided into two areas: Subjective surveys and interviews as well as performance and knowledge tests. The first section mainly deals with the information and media usage, while the second part covers the actual knowledge and skills related to information literacy.

2.1   Interviews and Written Surveys

According to Bortz and Döring [8], surveys are the most common method used in the empirical social sciences. One can distinguish between interviews and written surveys. In interviews, the test administrator communicates with the subjects. An advantage of this method is that, depending on the degree of standardisation, the interviewer can respond to questions and issues that arise during the interview. A disadvantage of the oral interviews is the possible influence of the subject by the interviewer. This is especially true for low-standardized interviews.

In a written survey participants independently fill out standardized questionnaires. The intervention by an interviewer is not necessary here. The written survey has the advantage that within a short time significantly more subjects can be questioned than can be interviewed orally. In written surveys no issues arising during the survey can be addressed. Also, questions that may arise can only be answered if a test administrator is present during the survey. The method of subjective surveys has the disadvantage that the level of information literacy is assessed by the subjects themselves. With this method, however, subjective judgments as well as desires and fears of the subjects can be recorded which can contribute to the development or improvement of information literacy instructions. Förster and Orszullok [9] used the written survey method to assess

the state on information literacy among German students in grade six and eleven. To avoid problems with the questionnaires and to maximise the return rate the test administrators decided to be present during the whole survey.

2.2   Knowledge and Performance Tests

Knowledge and performance tests are often used in order to achieve an objective assessment of the state of information literacy. A commonly used method, which is also used in this work, is multiple-choice tests. Here constant answers are given, of which the subject has to select one or more answers. Advantage of this test method is the objectivity. Each respondent gets the same questions and answers. For each question there are clearly right and clearly wrong answers, regardless of the test administrators. Moreover, the results can be compared very well. Scharf et al. [10, p. 462] also write: "Such a limited-response test could provide the opportunity for cross institutional comparison, and such comparisons are important." But especially in the area of information usage or similar issues, the disadvantage of this method becomes clear: "Yet such tests may not well-suited to the task of evaluating higher-order skills, such as a student's ability to integrate new information" [10, p. 462]. In addition, there is always the risk of distortion through random checking by the subjects [11].

A well-known example of such a multiple-choice test is the "Information Literacy Test" (ILT) [12] based on the ACRL standards. But the chosen method of the test prevented the inclusion of the fourth ACRL standards ("The information literate student, individually or as a member of a group, uses information effectively to accomplish a specific purpose" [1, p. 13]). Thus, only the standards one, two, three and five were integrated into the test. Other examples for this method are the "Standardized Assessment of Information Literacy Skills" (SAILS), the "Tool for Real-time Assessment of Information Literacy" (TRAILS) or the "Research Readiness Self-Assessment" (RRSA). Also the Department of Information Science at the University Düsseldorf developed a questionnaire for the assessment of information literacy among students in Germany [13]. This questionnaire mixes both the task formats (free and bound) and the methods (survey and test). In addition to the multiple-choice questions, some free text questions are available. Thus, there are also questions that cannot be categorized as correct or incorrect (e.g. "Do you own a blog?").

Different institutions try to minimize the disadvantages mentioned by using Rubrics instead of multiple-choice tests (see e.g. [14]). Rubrics provide teachers or test users the ability to assess results based on specific criteria. Rubrics describe the performance of a specific task, a product or a service and evaluate them. Using Rubrics in the area of information literacy assessments brings some benefits for both teachers and test users. Since the evaluation is not only done by grades or scales, but through performance descriptions, learners can understand what they have learned and where they might have problems. The disadvantages of rubrics are also obvious. Thus, the results of the tasks are rated subjectively, in spite of predetermined evaluation criteria. The analysis is thus not completely objective, and the comparison between test results may suffer. This manual rating, however, brings another problem

with it. The analysis is very time consuming and cannot be processed by machine. Also, the construction of such a Rubric is very time-consuming and costly.

Another form of performance tests are the real-world scenarios. Here the subject is shown a scenario (for example a research task), which he needs to solve in a given time. In most cases, the test is automatically rated based on clicked links, keywords used or selected literature. A good example of this type of testing is the assessment ETS iSkills [15]. The advantage of this method is especially the realistic setting. Through the scenario-based tasks, areas such as critical thinking or the development of problem-solving strategies can be tested. Disadvantage of this type of performance is the high effort in creating the different tasks. Thus, the scenarios and algorithms for rating need to be implemented and the performance of the tests need to be ensured.

3   Information Literacy Indicators

While considering the different definitions, models and standards of information literacy many overlaps can be identified. During the development of the following indicators those overlaps were taken into account. But also less frequently discussed skills in the field of information literacy, such as the observance of privacy and the creation of information were included. The aim of the development of the indicators was to create a list of skills that an information literate person should have to succeed in the knowledge society. Depending on the target group the definition of the indicators need to be customized. For example the indicator „identification of suitable retrieval systems" for students or researcher means the selection of scientific information services (e.g., Web of Science or Scopus), for pupils the selection of suitable child search engines (e.g., in Germany, Binde Kuh or FragFINN). The indicators serve the development of the different questionnaires. Using these skills we were able to develop questions for the target groups. But those indicators can also be used for other purposes. Thus, it is conceivable to develop an instruction program based on the indicators.

The indicators are divides into seven areas:

1. Identifying information need
2. Searching and finding information
3. Evaluating information
4. Using information
5. Organizing Information
6. Communicating and publishing information
7. Responsible handling of information.

In the following, these areas and the associated indicators will be described.

3.1   Identifying Information Need

The ability to recognize a need for information is a prerequisite for a successful information retrieval. Information literate people must be aware of what they know and

also of their knowledge gaps. They are asked to find out what information they need and to what extent. The area of identification of information need is present in almost all models and standards of information literacy. Thus, the ALA writes in their standards: "The information literate student] determines the nature and extent of the information needed" [1, p. 8].

This area includes in addition to the identification of one's own knowledge gaps the identification of concepts, terms and research issues as well as the development of own research questions. Equally important is the articulation of information needs. Those needs should also be communicated to others. As the need for information in most cases cannot be satisfied by a single source of information, it is also necessary to revise the initial information need.

3.2   Searching and Finding Information

"The information literate student accesses needed information effectively and efficiently" [1, p. 9].

This ALA standard describes the area of „searching and finding information" very well. Firstly, an appropriate search strategy must be chosen. In order to use these strategies one must identify suitable retrieval systems.

3.3   Evaluating Information

The evaluation and assessment of information need to happen for various reasons. First, the relevance of information needs to be determined. Information is only relevant if it is constructive for the research questions. The quality of a source is crucial for the quality of the result of the information process [16].

Through the evaluating with the help of meta-information a source can be assessed without even looking at the text. Since this is often insufficient, information should also be evaluated with the help of the actual content.

3.4   Using Information

Without effective use of information, the information process cannot be completed. Information literate persons must identify contradictory statements or find connections between different publications. This area also includes the independent development of theories and ideas as well as the selection of appropriate information and quotes to support arguments.

3.5   Organizing Information

The area of information organization includes literature administration and information management. A particular focus is on the use of reference managing systems like EndNote. In addition, this area contains the graphical representation as well as the thematic mapping of information.

3.6   Communicating and Publishing Information

Communicating and publishing information experienced a real upswing in the past few years. Especially in the Web 2.0 publishing is not only reserved for professional writers and publishers. Each user can make his information accessible to the public through a variety of channels. The ability to create information is a prerequisite for communicating and publishing. In addition, this area of competence includes the correct use of citations and the selection of a suitable communication medium. Another important point related to publishing information is adding tags and keywords to the created information.

3.7   Responsible Handling of Information

Information literacy includes not only traditional skills but also new ones that can be found mainly (but not exclusively) in the digital world. Thus, this area of expertise includes information ethics, which focuses primarily on the fair interaction with other users and the avoidance of unethical behaviour. Closely related to information ethics is the topic of information law. This is about the knowledge and use of different publishing licenses and the protection of intellectual property.

4   Questionnaires

In the following, the development of the different questionnaires will be explained. Therefore the structure of the tests and the differences between the target groups will be highlighted.

Based on the indicators explained above, test items were developed to determine whether an indicator is met by the person tested. With these 68 test items we generated five different questionnaires for the following target groups:

- Students in seventh grade (33 questions)
- Students in tenth grade (38 questions)
- High-school graduates and university students (41 questions)
- Teachers (41 questions)
- Scientists (41 questions)

The different areas of competence contain between two and 24 questions. This difference results from the different importance of the areas and indicators. Also, the information literacy test by the ALA mentioned above established that some standards should be weighted higher than others [12]. However, the different number of test items in the area of competence also results from the choice of the test format. It is not (or only partially) possible to assess specific areas with such a multiple-choice test. For these purposes, the so-called performance tests, such as real-world or rubrics assessments are necessary. The difficulty to measure certain standards and indicators is also recognized by the ALA. The test items were realized with a bound response format, subjects can therefore choose between given answers. The test on the one hand includes questions with only one correct answer. Depending on the complexity

of the question a subject can reach between 0.5 and 2 points per task. In addition, test items were inserted, in which the respondent can tick more than one answer. The points are awarded to the respondent even if he has not selected all correct answers. This type of question involves the risk that a test person ticks every answer. Because of this we decided to give minus points for the ticking of incorrect answers.

Since different target groups should have different skills, five questionnaires were developed to test these different skills. Pupils need to search for information for school as well as for their private lives. For students in the seventh and tenth grades, a focus is placed on the responsible use of information. For high-school graduates, university students and scientists the focus is on exploring, using and generating information. Knowledge of different retrieval systems and search options are as important as the use of systems for organizing knowledge and information. Teachers must be able to deal with information in order to search for materials for teaching or for their own education. They also face the difficulty that they need to prepare this information for their students. In addition they need to copy and distribute information, which requires a deep understanding of copyright issues.

5   Pre-tests

After completion of the questionnaires in September 2013, a pretest was conducted to make sure that the questionnaires meet all requirements. For this purpose, the questionnaires were given to five participants from each group. The pretest groups of students of the 7th and 10th class consisted of participants of a summer camp. In the group of high school graduates and students two school graduates and three students were interviewed. The pretest group of teachers consisted of one secondary school teacher and four primary school teachers. The five members of the group of scientists consisted of staff from the Heinrich-Heine University in Düsseldorf. Those were split into two employees of the Department of Information Science, an employee of Linguistics and two employees of Computer Science. While answering the questionnaires a few problems in understanding some questions could be identified. These problems have been fixed by adjusting the individual questions.Although at the time of this work no extensive representative study has been carried out with the help of these questionnaires, a few results of the pretests are presented here. The following examples are intended as a suggestion for possible evaluations.

It is possible to divide the scores in different levels of the information literacy. With the help of these levels, the results of the tests can be better specified, which facilitates evaluation. The level "beginner" is reached when the subject has received at least 50 % of the maximum number of points. With 75 % level "advanced" is reached. With less than 50% the respondent must be regarded as "not information literate". These degrees of information literacy are arbitrary and used for a clear classification of the participants in competence classes. This method was chosen because we have no statistical data to work with. After we will have finished the survey, there is the possibility of changing these degrees depending on the statistical data.

Figure 1 shows the result of the pretests. Two seventh grade students reached the beginner and the advanced level. Only one student had to be classified as not information literate. In the target groups of 10th Grade students, high-school

`graduates and university students no participant fell below the 50% mark, while teachers came off worse. In the group of Scientists a clear trend towards the stage "advanced" can be seen.
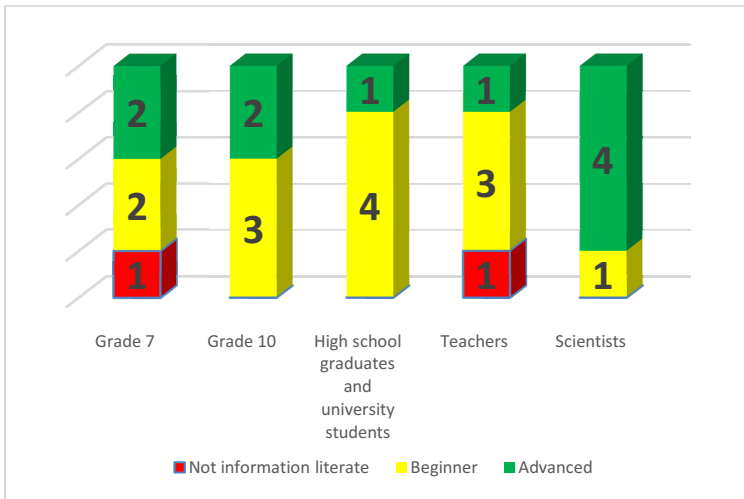

Fig. 1. Pre-test results: Levels of information literacy

Depending on the intended use of the results these should be evaluated and considered different. An important purpose of the tests is the evaluation of programs for teaching information literacy. Before the beginning of such a course, the knowledge of the participants can be tested with the help of questionnaires and so weak points can be identified. After completing the course, the test can be repeated to determine how the participants have improved in each area.

6   Limitations

Based on the available questionnaires, it is possible to detect the level of information literacy of target groups. The method of multiple-choice questionnaires has many advantages, such as the level of objectivity and thus good comparability of the test results or the opportunity to interview many subjects in a short time. However, some disadvantages and limitations can be identified. Some indicators could not be tested because of the multiple-choice format. Here especially those skills which can be detected only by certain actions, such as sharing or creating information, must be named. For this purpose additional methods should be used, Rubrics or Real World scenarios. Another problem that occurs especially in multiple-choice formats is the risk of random checking. Also, depending on how the questionnaire is distributed, the return rate can be very low. The highest response rate is achieved when the survey is conducted in a group association (e.g. in a school class) and under the supervision of a test administrator.

A common problem, which occurs in almost all test and survey methods, is the lack of motivation among the participants. Here, the importance of such acquisition must be made clear or additional motivation, such as participation in a lottery, must be taken into account. In schools and universities, depending on the intended use, participation could also be rewarded with credit points.

7 Conclusion and Further Work

The developed indicators provide a detailed list of skills an information literate person should possess in the 21st century. The seven areas of competence cover the identification of information need, the developing and implementation of search strategies, the effective use and evaluation of information as well as the organization, creation and publication of information. In addition the last area includes issues on information ethics, law and privacy.

The designed questionnaires provide an efficient tool for institutions or individuals to assess their own information literacy or the information literacy of their students, employees and users. The advantage of the chosen method of multiple-choice test lies in the objectivity of the results and in the possibility to test a huge amount of persons in a relatively short time. The limits of these tests are that some areas may not be sufficiently covered. These areas are, for example, the use of information or the identification of information needs.

Follow-up studies will focus on using the developed questionnaires in schools, universities, libraries and research institutions to get an accurate picture of the state of information literacy in Germany and – by translating our questionnaire – in other countries. Moreover, it is also conceivable to extend the multiple-choice test with a performance test. Thus, the areas not covered by the existing questionnaires could also be tested.

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