

# Testing Learning Methods to Foster Information Literacy Skills

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## **Abstract**

Information literacy is seen as a key competency in working and everyday life. For library and information science (LIS) students information literacy is a core competency and taught in many LIS university programs. One challenge herewith is to mediate these skills in the best way. This paper tries to answer the question, how students cope with different learning methods and to which extent they foster the learning of information literacy skills. Four learning methods were applied in a retrieval course. The paper introduces the course design and the applied methods. For the evaluation the participants filled out online surveys, one of them measured the expectation and perception rates based on the idea of the Servqual concept. The results show that specific learning methods can be appropriate for teaching information literacy skills. Yet, the implementation of the learning methods could be improved because students were not satisfied in all matters. Implementing learning methods in future courses should come with changes in the process of introducing these methods to the students and with more information about the purpose of applying these methods.

**Keywords:** Information literacy, Information science education, Computer-supported collaborative learning, Inquiry-based learning, Team-based learning

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## 1 Introduction

Information literacy (IL) is seen as a key competence in working and everyday life. One important definition of the concept and its standards concerning the learning outcomes of an individual are published by the Association of College & Research Libraries (ACRL, 2000). Currently these “Information Literacy Competency Standards for Higher Education” are revised (ACRL, 2013). IL is a core competency for LIS students and taught in many LIS programs. Questions arise about the concrete teaching of IL skills: Which methods are most suitable to help students improving their information literacy skills?

This paper presents preliminary results of an evaluation on learning methods applied in a university course. These methods shall support students in improving their IL skills. The participants evaluated the new course design in which the following learning methods were applied: computer-supported collaborative learning, team-based learning, inquiry-based learning, and project-based learning (fig. 1). The research question of this paper is: *How do students cope with these learning methods and how satisfied are they?*

IL includes the skills of a person to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (ALA, 1989). The main aspects of IL are (ACRL, 2000, see also Gust von Loh & Stock, 2013: 4):

- to identify the information needed
- to search and find relevant information
- to evaluate the quality of information and its sources
- to use information efficiently
- to incorporate the selected information into one’s knowledge base
- to access and use information ethically and legally.

Researchers claim that additional competencies like information creation skills should be considered (Huvila, 2011). Stock and Stock (2013: 79) regard skills like “creation of information” and “representation and storage of information” as important for IL. In their revised standards ACRL considers aspects like “creation and dissemination of knowledge” and “the shift from IL to information fluency” to expand the definition of IL (ACRL, 2013). Besides ACRL standards, other IL standards have been developed (for an overview see e.g. Calzada Prado & Marzal, 2013 and Gust von Loh & Stock, 2013).

In addition to studies analyzing the effect of different instruction methods of IL, other approaches evaluate the effects of learning methods on the learning of IL skills. Educators apply learning methods to establish scenarios and environments, which should foster the learning of an individual or a group. For example Chu (2009) established inquiry project-based learning in a primary school with the result that the participating students got higher grades than the other students. The learning approach had several positive effects like, for example, the improvement of the students' research and problem-solving skills. A new method to teach IL skills is the concept of gamification (Knautz, 2013), i.e. fostering learning with the concept of playing. Note that this study does not have the aim to evaluate learning processes, but to evaluate a course design which includes several learning methods. The potential positive effects of these methods and their implementation are described in section 2. Section 3 describes the evaluation method and section 4 summarizes the results. This paper focuses on the survey results based on the Servqual concept, which measures the students perceptions of the methods. Section 5 gives a short conclusion and describes further steps.

## 2 Course design

We applied the learning methods in an information retrieval course. The course focused on searching in professional databases (Web of Science and databases from STN and Dialog) and applying search strategies (berry-picking model (Bates, 1989), building block strategy, citation pear growing (Efthimiadis, 1996)) using Boolean logic. The old course concept did not consider research on information seeking behavior and IL aspects (Webber & Johnston, 2000). It also supported the learning of fact-finding tasks, which tend to lead to "surface learning" rather than a deeper learning of IL skills (Limberg, 1999). Thus the new course design implements learning methods, which consider more aspects of IL skills, and support the mediation of retrieval skills mentioned above in a better way.

In the following, we introduce our learning methods and their implementation (fig. 1) for a course offered in summer 2013. Most of the students attended this course in the first year of their studies. Participants were grouped in teams between five and eight students and had to perform a research task.

The results had to be described in a Wiki. We applied a blended teaching strategy with face-to-face meetings and a time where the students worked online. There were four meetings in April where the teachers introduced the project tasks. In July teams and teachers met again to discuss group results.

<p style="text-align: center;"><b>Computer-supported collaborative learning</b></p> <p>Wiki as supportive platform:</p> <ul style="list-style-type: none"> <li>▪ to foster group collaboration</li> <li>▪ as group project storage</li> <li>▪ as feedback tool for reviewer</li> <li>▪ as tracking tool for teacher</li> </ul>	<p style="text-align: center;"><b>Team-based learning</b></p> <p>Student groups as project teams:</p> <ul style="list-style-type: none"> <li>▪ foster collaborative learning</li> <li>▪ foster successful learning process of each student</li> <li>▪ support each other in finding best solution</li> </ul>
<p style="text-align: center;"><b>Inquiry-based learning</b></p> <p>Open retrieval task:</p> <ul style="list-style-type: none"> <li>▪ foster students to make own decisions</li> <li>▪ foster self-exploration and self-consistent learning</li> </ul>	<p style="text-align: center;"><b>Project-based learning</b></p> <p>Solve a problem-oriented task</p> <ul style="list-style-type: none"> <li>▪ foster autonomous work of students</li> <li>▪ support creative problem-solving</li> <li>▪ relation to real life tasks</li> </ul>

Figure 1. Advantages of the learning methods applied in the course design.

## 2.1 Inquiry- and project-based learning

Information retrieval is an open-ended process and best to be learned not only by exercising it, but also by applying it to real world problems. A good way to teach this knowledge is inquiry-based learning, as this method concentrates on the “pursuit of open questions” (Edelson, Gordin, & Pea, 1999: 393). Students are not given defined questions, but get a task and must be able to formulate research questions to make their own analysis for solving this task. Although inquiry-based learning focuses on self-exploration and self-consistent learning, it is important to lead students through their task (Kirschner, Sweller, & Clark, 2006). Related to inquiry-based learning, the project-based learning approach focuses on a problem-solving context and the autonomous work of students (Thomas, 2000). Inquiry- and project-based learning take into account the so-called “higher order” thinking skills (ACRL, 2000) like evaluating information critically, using information effectively for a specific purpose in a specific situation, organizing information (for oneself and for a group) and thinking critically and creating new information. In our course the student projects are retrieval tasks from BluePatent (bluepatent.com), a technology crowdsourcing website. The retrieval tasks

involve patent research and market analysis for a special product or technical idea. We took retrieval tasks from this website to create a realistic scenario of a retrieval project because these scenarios support the aspect of being able to transfer IL skills to different contexts (Lloyd, 2006). Additionally, taking the advantages of inquiry- and project-based learning into account, the retrieval tasks did not include a concrete unique question, but a problem-oriented task. The aim of the student project was to give a recommendation to a client about his prospect of success to place a product on the real market.

## **2.2 (Computer-supported) collaborative and team-based learning**

Collaborative learning in general involves two or more people, which act together and mostly try to solve a problem. It is one of the most popular approaches applied. However, researchers like Dillenbourg (1999) claim that learning in this approach might only be a kind of side-effect and not the aim of the process. Collaborative learning is neither a mechanism nor a method, but a situation where interaction among peers may or may not occur (Dillenbourg, 1999). Therefore, applied collaborative learning should guarantee that it fosters the interaction among persons. Only then it helps persons in their learning process and improvement of their efforts. The advantage of online collaboration tools in general is their asynchronous as well as time- and place-independent character. Various studies show that online tools and especially Wikis, implemented in the right way, support teamwork and learning (e.g. Beutelspacher & Stock, 2011; Laru, Näykki, & Järvelä, 2012). However there may be pitfalls when introducing Wikis in education. There is no guarantee that students will interact with each other in a better way (Larusson & Alterman, 2009).

For our course we established a Wiki on the platform Wikispaces (wikispaces.com). The Wiki allows easy WYSIWYG editing, has discussion pages for each page, a mailing function and each member has its own account. A helpful feature is the project page function, i.e. members of a Wiki can be grouped in projects and project teams.

Motivating students to interact in collaborative learning situations often involves the action of grouping people together, which leads to the scenario of team-based learning: students are grouped in teams to solve tasks. Positive aspects of team-based learning are the support of small group learning, the support of feedback process among students and the help of developing

a student's professional competencies like communication and problem-solving skills and critical thinking (Sibley & Parmelee, 2008). Michaelsen and Sweet (2008) name four elements to be considered for a successful team-based learning scenario: accountability of students work, teacher's feedback, assignment of the task and forming of the group. To improve accountability in our course, we motivate the students to discuss their work, not only with their own group members but also with peers from other groups. In the Wiki we set up discussion pages for all attendees. Additionally, students act as reviewers for other teams, which further improves accountability. The peer review process should lead to a deeper understanding of retrieval strategies. Furthermore, the students could exchange their retrieval experience, got to know the other students' work and could learn from each other. The frequent feedback helps students to assess their learning efforts and supports the group to further merge to an interacting and cohesive team (Jacobson, 2011; Michaelsen & Sweet, 2008). Teacher feedback was given during the whole course time. Here the Wiki's tracking feature facilitates the feedback because the teacher can inform about the students work at all times.

We assume the assignment of the task to be is covered with the inquiry-based and project-based learning method. The last element (Michaelsen & Sweet, 2008) of team-based learning, group formation, is quite critical. A team must be formed properly to assure that members actively engage and interact: if the group members are diverse, i.e. if they have diverse personalities and skills, they may complement each other. But diversity may also constrain group efforts. Thus, it has to be decided if either students form their own groups (self-selected) or if the teacher forms the groups (instructor-selected groups). We decided to apply both methods to be able to compare them according to the students' learning outcomes. As this paper focuses on the students' perspectives on the learning methods, we will not explain our grouping method further (for details on this issue see Heck, 2013).

### 3 Evaluation

The main evaluation is based on a survey, in which we adapted the Servqual method (Parasuraman, Zeithaml, & Berry, 1988) to evaluate the students' perception of the learning methods. The Servqual method was originally deve-

veloped to measure the quality of a business service and consists of two parts. The first part is done before a client uses a service and requests the expectations a client has for a service. The second part is done after the client used the service and asks for his perceptions. Participants state their opinion on a rating scale from 1 (1 = I strongly disagree with the statement) to 7 (7 = I strongly agree with the statement). To measure the service quality, the expectation rate is subtracted from the perception rate. Negative values show negative results, and positive values show positive results. Values range from -6 to +6. With the Servqual method we assume to find out which expectations our students had with regards to the applied learning methods, which aspects they think are important and how the learning methods achieved these expectations. Our survey differs from the original concept by Parasuraman et al. (1988) and consists of 11 dimensions including 3 to 7 statements (fig. 2). Beneath this survey we had a general survey (also including one part before and one after the course). Part one of the general survey requested the students learning group experience and previous knowledge about Wikis. Results of this survey are already published (Heck, 2013) and left out here.

## 4 Results

Figure 2 shows the mean difference scores of the Servqual survey. 121 students filled out both the first and the second part of this survey. Note that more students ( $n = 162$ ) filled out only the first part, but are left out for the measurements in figure 2.

For each survey statement, we first measured the difference score per student and then calculated the mean difference score for all students. In general negative tendencies predominate, but the difference scores are quite low. This means that some student expectations were not achieved appropriately. However no perception greatly deviates from the expectations. Nevertheless there are differences concerning the dimensions.

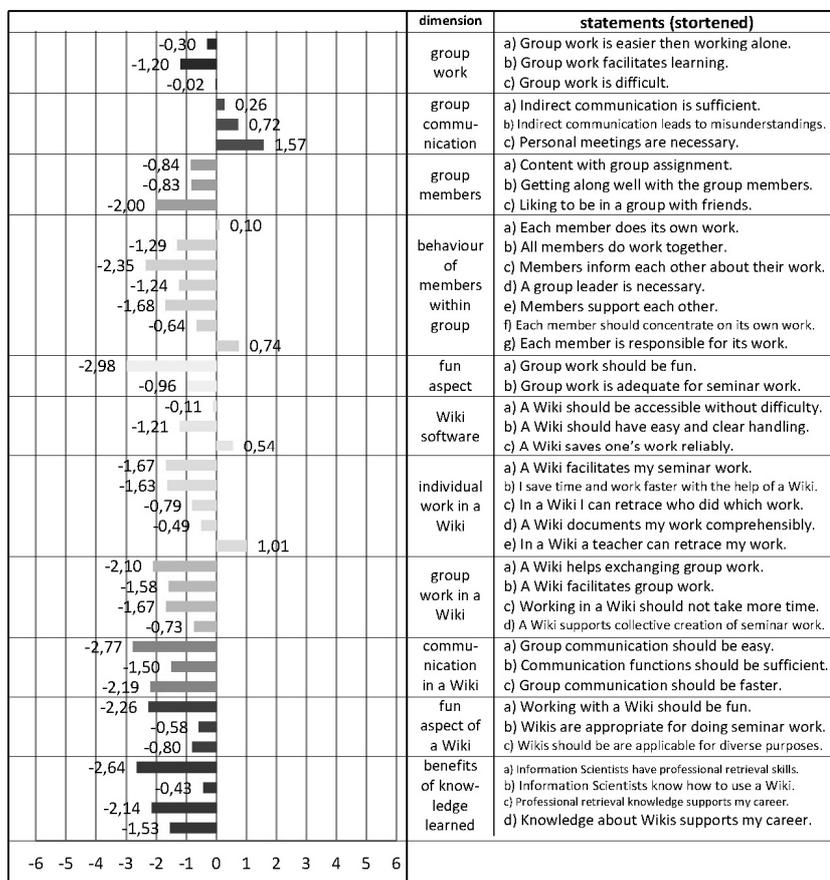


Figure 2. Mean difference scores of the Servqual survey. n = 121.

An overall positive tendency can be seen in the dimension “group communication”: The average expectation rating (n = 162: all students from first survey part) of its statement a) is 3.2, b) 4 and c) 5.2. Hence students think that indirect communication might not be as sufficient and can lead to misunderstandings and that personal meetings are necessary. Their perception in the course (n = 121) was that indirect communication was not quite sufficient (average rating = 3.4) and tended to lead to misunderstandings (3.3). However, the students thought that personal meetings are not as important as they expected (3.6). Indirect Wiki communication might thus seem to be sufficient for group communication. In the general survey we asked the groups

how often they met face-to-face. The average number of 1.9 meetings is unexpectedly low, the maximum numbers of meetings was 10.

Only 18.4% of the students met four or more times. Thus, indirect communication might work quite well and face-to-face meetings are not inevitable. But looking at the negative difference scores of the dimension “communication in a Wiki”, communication through a Wiki seems not to be satisfactory. The explanation for this opposition is that almost all groups communicated via a Facebook group, which they established for the team project. 110 (n = 120) students stated they established a Facebook group. 96 students said such a group was satisfying for their teamwork. Students claimed communication via Facebook is easier because they use the social platform regularly and recognize messages from their group members immediately via the Facebook smartphone application. The students complained that they did not recognize Wiki messages and posts of a team member immediately. This would make communication more difficult, especially if students tried to organize their teamwork. These aspects influence the rating in the dimension “communication in a Wiki”, which reach from -1.5 to -2.8. We suppose that the students could handle the Wiki communication options quite easily, but the aspects discussed above influenced the ratings negatively.

Concerning group work the students expectations and perceptions are similar, thus their expectations are achieved. However the expectation is not very high and ratings lie between 3.5 and 4.6 (n = 162). Participants did not state that group work is definitely easier than individual working. The mean difference scores in the dimensions “group members”, “behavior of members within group” and “fun aspect” are even more negative. Several students complained about their group members concerning their work and participation within the group. The motivated students seemed to be disappointed because they had the feeling of doing all the group work alone. Another concern influencing group work is the unsteadiness of group sizes. At the beginning over 160 students participated, but over 30 of them skipped the course. In most cases they did neither inform their group members nor the teachers. This leads to misunderstandings within the groups. Thus, the “fun aspect” of group work is rated most negatively (-2.98).

With the work in a Wiki, students had slightly negative experiences. The reason might be that the students’ expectations were not very high: The expectation statements in the dimensions “individual work in a Wiki” and “group work in a Wiki” got average ratings from 4.5 to 5.5. The perception rates range between 3 and 5.4. Furthermore, only 24 people had ever used a

Wiki before the course and many students had difficulties using it for their work. Thus, for those students using an unknown service means additional learning, which takes more time. Nevertheless, students might have had serious problems in using a Wiki. Thus, if using a Wiki in education, it is advisable to give a longer and more regular instruction on its usage.

To come to the last dimension, “benefits of knowledge learned”, the mean difference scores concerning the benefits of a Wiki are slightly more positive than those concerning the benefits of retrieval skills. But all results are quite negative. That means the students do not have the feeling that they had learnt enough about the topics and that this might help them in their career. One reason might be that they are not able to estimate their skills in an appropriate way because they do not know what good retrieval skills are. Here the Wiki content analysis will give a deeper insight into this issue.

Finally, we want to answer the research questions asked at the beginning: The applied learning methods embedded in the course design did not foster the learning of information literacy skills in an appropriate way. The students perceived the learning methods more negatively than positively. However, there are no distinct negative results and a change in the course structure might lead to more positive results concerning conceptions like teamwork and the usage of collaboration software. A weekly course meeting might have helped the students with the new course structure in a better way. According to their current experience the students were not satisfied with the overall course design and the applied learning methods.

Nevertheless, in the second part of the general survey 57.6% of the students ( $n = 120$ ) stated that they would like to do group work again. 36.7% of them said that they will use a Wiki application for their future work independently from any course. Exactly half of the 120 students liked the project work and the style of the retrieval tasks. Thus it can be said that the students experiences with the learning methods are not purely negative. But further investigations and improvements of the learning conceptions might be rewarding and lead to improved IL learning outcomes of LIS students.

## 5 Conclusion and future work

We have implemented four learning methods into a retrieval course to foster the learning of IL skills. The survey results show that the students experienced some aspects of the learning methods rather negatively. However, the expectation and perception rates don't differ to a great extent. Thus, we assume that learning methods have the potential to help fostering the learning of IL skills. Nevertheless, the embedding of these methods in a university course has to be done appropriately. Group work is seen as rather positive, but in practice there are difficulties which influence its positive perception. Computer-supported collaborative learning can be helpful and support the work in a course, but its success strongly depends on its mediation. The inquiry-based and project based concept was rated positively.

Regarding the helpfulness of the introduced learning methods related to the improvement of information literacy skills, future work is needed concerning the analyses of the Wiki. We will be able to track the history of the pages the groups created. These analyses will help us to make statements about the appropriateness of team-based learning and to conclude on the students development of their IL skills.

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