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Information Gathering and Internet Learning

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Synonyms
Information literacy; Information seeking

Definition
To gathering information and learning from different internet sources, one must be able to solve information-based problems. An information-based problem is a problem that only can be solved by searching information because there is a gap between prior knowledge and the required knowledge to accomplish the (learning) task successfully. Brand-Gruwel et al. (2005) introduced the notion of Information Problem Solving (IPS; see, also, Eisenberg and Berkowitz 1990) and defined IPS as the ability to solve information-based problems; one must be able to identify information needs and define the problem, to locate corresponding information sources, to extract and organize relevant information from each source, and to synthesize information from a variety of sources into cogent, productive uses.

Theoretical Background
With the rising use of electronic information resources in everyday life and for educational purposes, researchers devoted more attention on unraveling the process of establishing meaning out of complex documents that learners will encounter when accessing the World Wide Web to learn out about a specific topic. Up to now, research on the IPS process has resulted in a large body of knowledge. Many researchers in library, information, and educational sciences have examined behaviors and skills associated with information use. Considering this research, one could conclude that different well-studied models are created. The model of Brand-Gruwel et al. (2005) contends that IPS can be decomposed into five constituent skills. These skills, which are meant to be executed in iterative cycles, are: (a) Define information problem; (b) Search information; (c) Scan information; (d) Elaborate information; and (e) Organize and present information. While executing these skills in an iterative way, regulation of the process is essential (for a comprehensive description of the model, see Brand-Gruwel et al. 2005). The IPS-model depicting the constituent skills and the subskills is visualized in Fig. 1.

The constituent skill Define information problem will always be performed at the beginning of the IPS process. This skill is important in order to get a clear insight into the problem. Without a good problem definition, the problem becomes hard to solve, and answers may not be adequate. While defining the problem, the main question and sub-questions are formulated, requirements are taken into account, and prior knowledge on the subject matter must be activated.

When performing the skill Search information, one has to select a search strategy, specify search terms, and judge the websites given in a hit list. There are several search strategies that can be used while searching information on the WWW. The three most common used strategies are: (a) using a search engine, (b) typing an address (URL) in the browser, and (c) browsing by following links. When using the first strategy, an important sub skill is specifying the search term(s). These terms are entered in a search engine, and the results (hit list) have to be judged on quality, relevance, and reliability.

The site that is opened after a search will be read globally (Scan information) to get an idea of the kind and the usefulness of the information. While scanning, one can elaborate on the content and combine the information with previous knowledge or other information found. When information is useful, it can be stored by for instance using bookmarks.

As opposed to scan information, the constituent skill Process information involves deep processing. The goal is to reach a deep understanding of the information or construct knowledge (learning), and to reach an integration of the different pieces of information found on the internet and relevant prior knowledge. Elaboration is an important aspect and can be expressed by analyzing,
selecting, and structuring information. Especially for selecting information, criteria for judging the usefulness and quality of information are important.

The first four skills are part of the analysis phase of the IPS process. Organize and present information is part of the process that can be described as the synthesis. All the information will be combined, and the information problem can be solved. Making the product as required in the (learning) task is the goal or outcome of this constituent skill.

As can be seen in Fig. 1, Regulation activities will be carried out during the entire IPS process. Especially, with the WWW as an extensive source of information, a strong appeal to peoples’ regulation ability is made. Regulatory aspects, such as orientation, monitoring, steering, and evaluation, play a key role in the execution of the skill. One needs to articulate a plan for how to solve the information problem. During the process, they have to monitor, steer, and check if the proposed plan is still the right one or decide if changes in the approach are needed. When a process is regulated well, it will have the characteristic of a “goal-directed approach.” In this approach, the interaction with the information will be guided through an overall plan, while in the “data-driven approach” based on information found a plan (mostly incoherent) develops.

Research shows that many students are not able to solve information-based problems successfully. In a research overview Walraven et al. (2008), it is concluded that young children, teenagers, and adults do especially have problems evaluating the trustworthiness of sources and information in terms of relevance and reliability. These evaluation processes receive particular relevance when searching information on the Internet, where traditional gatekeepers of credibility, such as editors, are missing. Especially when it comes to health information provision, it has frequently been reported that documents contain flawed or strongly biased information. In a special issue edited by Stadtler and Brand-Gruwel (in press), different studies on how students of different ages evaluated multiple (hypertext) document are addressed and, also, influencing factors as epistemological beliefs, prior knowledge, and also the ability to make use of textual cues in hypertext are described. Prior domain knowledge does have an impact on students’ evaluation behavior in a sense that students with low prior knowledge do trust less trustworthy sources and do not differentiate between relevant and irrelevant criteria when judging the trustworthiness of sources. Metatextual knowledge or knowledge about the functions of structural features of a text, such as headings, paragraphs, or hyperlinks is of importance. Students tend to rely on lexical and typographical cues when assigning relevance, with relatively less consideration for deeper semantic cues. Also, epistemic beliefs are related to how people evaluate information and sources. In this sense, the materials retrieved in Web search function as a mediator. If conflicting information is found, this has an impact on people’s confidence that they found an appropriate answer. It can be concluded that constructing meaning from multiple sources and especially when those sources are made up of hypertext and include conflicting information involves complex cognitive processes (see also Rouet 2006).

Taking these research results into account, it can be concluded that students must learn to solve information-based problems and must learn transferable strategies. Guidelines for designing instruction promoting the development of the complex cognitive skill of information problem solving are therefore needed. Different studies in different domain and with different kind of students are conducted to study effects of different methods and tools to support the process of IPS or certain constituent skills or the regulation of the process (see for different studies the special issue instructional support for IPS of Brand-Gruwel and Gerjets (2008)). Instructional and support methods can be grouped based on several features: the way the instruction is offered (either embedded in the curriculum or as a separate course); the way the instruction is followed by participants (individually or collaboratively), tools used during the instruction, and the skills addressed in the instruction. It shows (Walraven et al. 2008) most of the methods found were stand-alone courses for individual use. Tools used differed from a web-based portals or computer applications, to worked-out examples and visualizations, to worksheets, to paper material only. However, effectiveness of different methods has not been established without doubt. More research is needed to gain more insight in how IPS processes best can be fostered.

**Important Scientific Research and Open Questions**

In future research, fine-gained experiments should focus on unraveling the IPS processes involved in different circumstances and go into the interrelations of the influencing factors as epistemological beliefs, prior and metatexual knowledge, etc. More insight in how these processes and factors interact and are related can give input for design more adaptive instruction. Research on how the instruction and the learning environment can be
adapted to the learners need and support the process and not hampering it is of importance.

Moreover, research methods used to gain insight into cognitive processes have become more sophisticated, and methods such as eye tracking and cued retrospective reporting (using eye movements as cue) have proven to be successful besides the often used thinking aloud method and the use of log files analysis. The added value of the use of more sophisticated research methods must in the future be addressed.

Cross-References

▶ Information Literacy
▶ Information Processing Theory/Models
▶ Problem Solving
▶ Twenty-First-Century Skills

References


Information Gathering and Internet Learning. Fig. 1 Information problem-solving model
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