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**Barriers in using digital scientific information at German universities and other
higher education institutions–**

How to develop potentials in academic education

(Translation: Christoph Kaletka)

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Abstract

The „Sozialforschungsstelle Dortmund Landesinstitut“, a federal state institute located in Dortmund and working in the field of labour research, has recently carried out a representative study on the use of digital scientific information in Germany. As a major result, the study shows that most German students' information literacy is insufficient. German students consider the supply of digital scientific information to be confusing. They feel unable to evaluate the results of their search for information.

However, the internet is the most frequently used medium in searching for scientific information. Although, the use of this medium rarely follows systematic rules. Many German students confine themselves to simply „browsing the net“. German universities have not taught them how to use the new media systematically. That is why students had to acquire this knowledge as autodidacts.

The institute's results lead to comprehensive advice on how to solve these problems at least gradually. The study concludingly suggests to

- upvalue information literacy in German universities' curricula,
- enforce discourse among German students by offering tutorials on digital scientific information,
- develop criteria in order to provide the German students with well-examined digital scientific information.

Introduction

Increasing dynamism in the field of information-, web- and media-technologies takes far-reaching influence on the system of academic education, for classical universities as well as for other higher education institutions.

Traditional forms of teaching are being supplemented multimedially by intensive use of the internet. The „Virtual University“ of the future shall integrate electronic media directly into the learning process. Networking computers become a writing and presenting implement, multimedial textbook, laboratory, library and communication centre, for students as well as for lecturers.

From the beginning of the Nineties on, the development of digital scientific information rapidly took up speed. Online-libraries and catalogues in the internet, subject-oriented databases, digital magazines and full-text search offer multiple accesses to information in every academical field – some of them for free. The development of full-text databases is accelerating. Undoubtedly, competences in searching for and in using digital information have already become a major factor in the competition of universities.

That is why in April 2000 the Bundesministerium für Bildung und Forschung (Federal Ministry of Education and Research) engaged the Sozialforschungsstelle Dortmund Landesinstitut¹ to find out about the status quo concerning the use of digital scientific information in academic education in Germany. In a first step, the Sozialforschungsstelle was to determine German students' information literacy. Consequently, further potentials were to be described. Finally, the institute was to develop useful measures in order to improve academic use of digital scientific information.

Surveys with the following groups were conducted in written form at German universities and other higher education institutions:

- Offices of the deans (n = 353),
- Students (n = 2956) and
- Lecturers (n = 777).

Instruments used in the surveys were drawn up on a basis of 22 interviews with experts in the field of subject-oriented information, validated by pretests with lecturers and students. The following courses of studies were surveyed: Chemistry, Informatics, Mathematics, Physics, Electrical Engineering, Civil Engineering, Mechanical Engineering, Psychology, Education and Social Sciences.

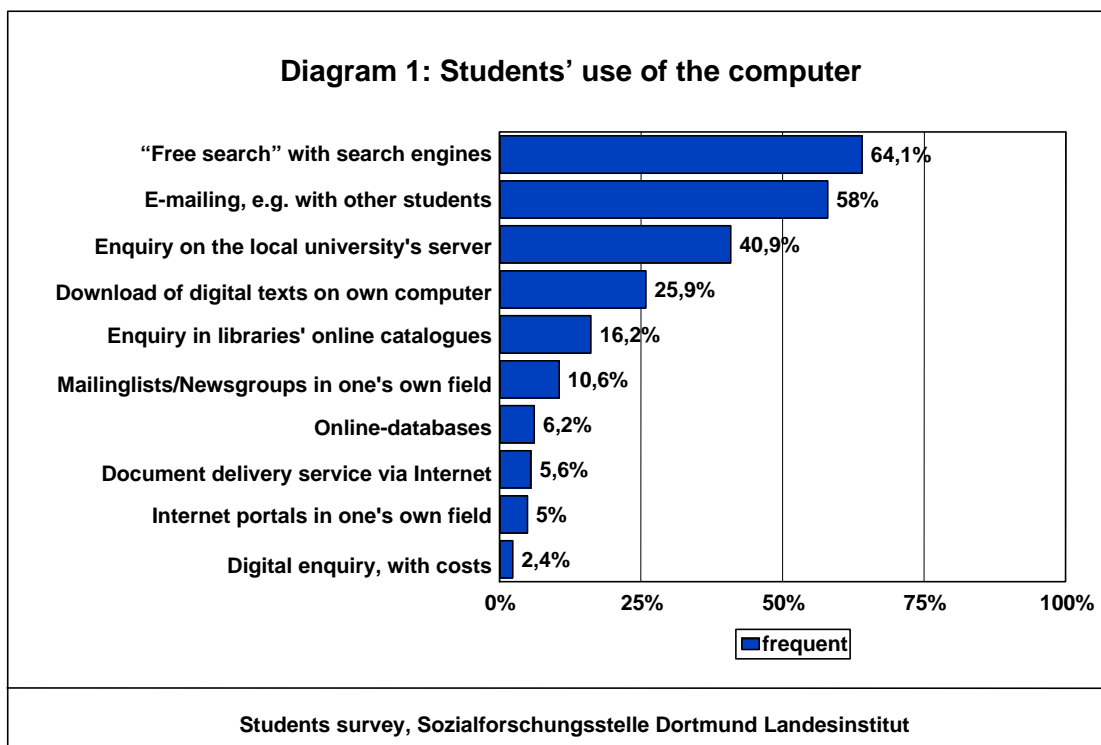
On the basis of these surveys, several measures were suggested. In the following, the most important results will be presented.²

¹ *In cooperation with the University of Dortmund and gaus mbH.*

1. On students' information literacy

Getting information about the students' views of their knowledge and use of digital scientific information³ was one of the main goals of the survey. 11,227 questionnaires were sent out to students. 26.3% were returned, 2,956 questionnaires were included in the evaluation.

Students more and more employ electronic media when searching for scientific information, which is a remarkable result. Here the internet becomes the most frequently used source of information – head to head with the local server at universities. Searching for scientific information, more than 50% of the students reported „frequent“ use of the internet.



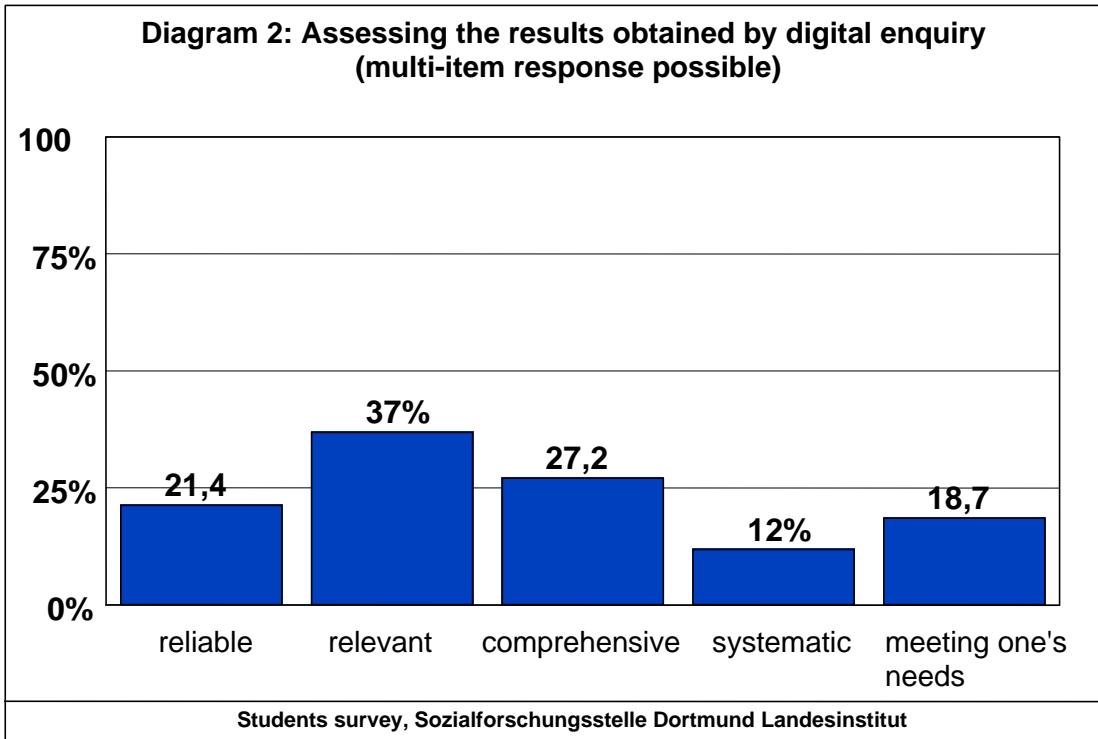
² Further results of the survey are documented on www.stefi.de. A publication in German will follow in 2001: „Nutzung elektronischer wissenschaftlicher Information in der Hochschulausbildung“ (Klatt et al.) („Use of electronical scientific information in academic education“).

³ Here we used a pragmatic definition of digital information that preceded the questionnaire: „As you already know, under the term ‚digital scientific information‘ we subsume all kinds of digital scientific information and publication (online and offline) such as libraries' online catalogues, e.g. in the internet, bibliographical online-databases of any kind, electronic professional journals, scientific document research and order services, CD-ROMs etc.“

The internet, which in the view of most of the students is a global, however unstructured archive for information of any kind, meanwhile provides many specific information channels useful in enquiries and an opportunity for the use of digital scientific information. Regarding the specific channels used with the help of networking computers, a dominating use of „free search“ with search engines such as Lycos or Web.de can be assessed. E-mailing between students also plays a significant part. So do enquiries on the local server of the library. Rather elaborated ways of searching for digital scientific information are mostly neglected.⁴

Instead of employing the whole range of electronic scientific information, students obviously concentrate on conventional, well-known paths to scientific information. Obviously, the fact that specific, complex databases and other electronic devices – which are not always free – offer a high quality regarding students' needs for information has not come to many people's minds yet.

⁴ *Online-catalogues such as the KVK and the Deutscher Verbundkatalog, online-databases (e.g. Medline, ERIC, Solis) provided by centers for subject-oriented information (e.g. FIZ Karlsruhe, FIZ Technik, FIZ Chemie) are not known to a broad public, although many of them have high usage growth rates.*



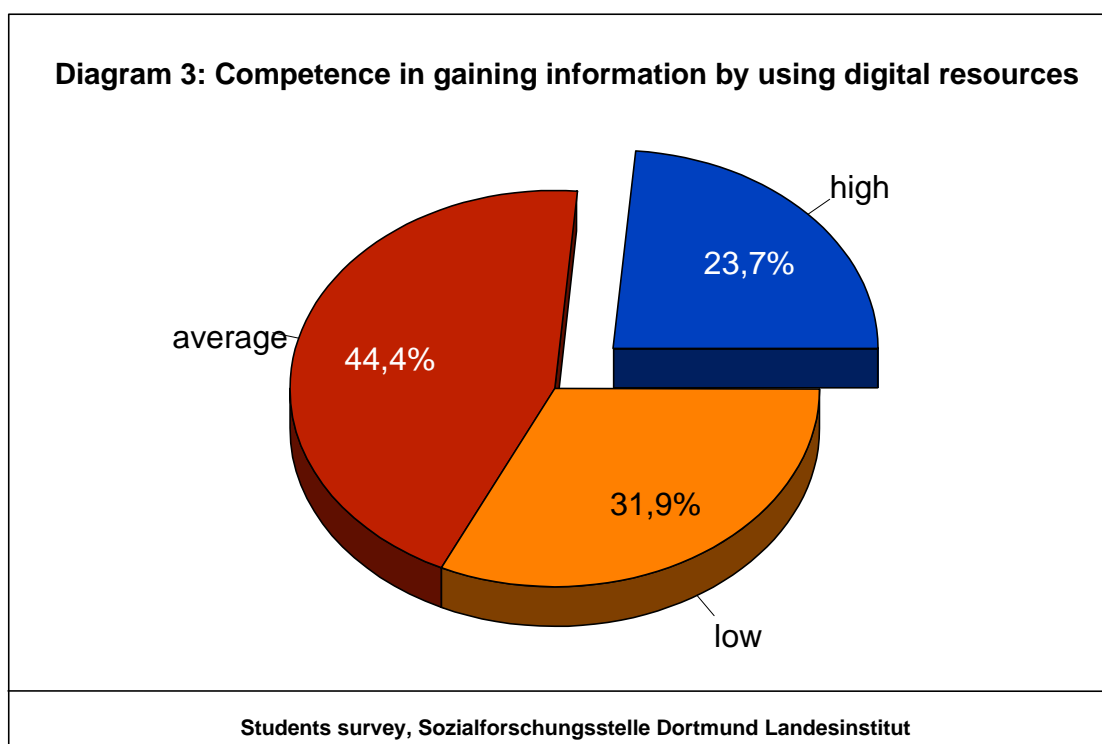
Results of digital enquiries obtained by students are usually not assessed positively. Frequently used and mostly simple digital enquiries do not lead to satisfying results.⁵ Especially "free search" with the help of digital engines is often conducted unprofessionally, without any competence for information retrieval⁶. That is why students often consider their results to be confusing.

⁵ In his study (n=566) Charney describes similar results: 71% of the studies participants using search engines were frustrated while searching (Charney 2000).

⁶ This result has been proved by a number of studies during recent years. In a logfile-analysis of Alta Vista Silverstein found out that 79.6% of all inquiries did not contain an operator (Silverstein 1998). A logfile-analysis of Fireball showed that the average length of words used for the inquiry was 1.66, operators were rarely used (Hölscher/Strube 1999, 4). In his study on search engine usability Schulz concludes that web users choose the research way with the least cognitive effort (Schulz 2000, 80). These results bringing many euphoricists down to earth contrast with an enormous capacity and performance that free search engines offer (see Günther, Armin/Hahn, Andre: „Suchmaschinen, Robots und Agenten: Informationssuche im World Wide Web, in: Batinic, Bernad (2000)).

We conclude that most students do not search for scientific information systematically, but that they are simply „browsing“.⁷

Students' self-ratings concerning their knowledge about digital resources for scientific and technical information must be considered in the light of the former hypotheses:



In spite of „subjective distortion“, the majority of students rates their own knowledge „average“ or „low“. What is even more, as these self-ratings refer to the students' competence in „browsing“, their overall information competence is rather low.

In view of students' knowledge in using digital scientific information, we summarise that

⁷ „We use „browsing“ in the sense of undirected and unsystematical rummaging which goes along with an

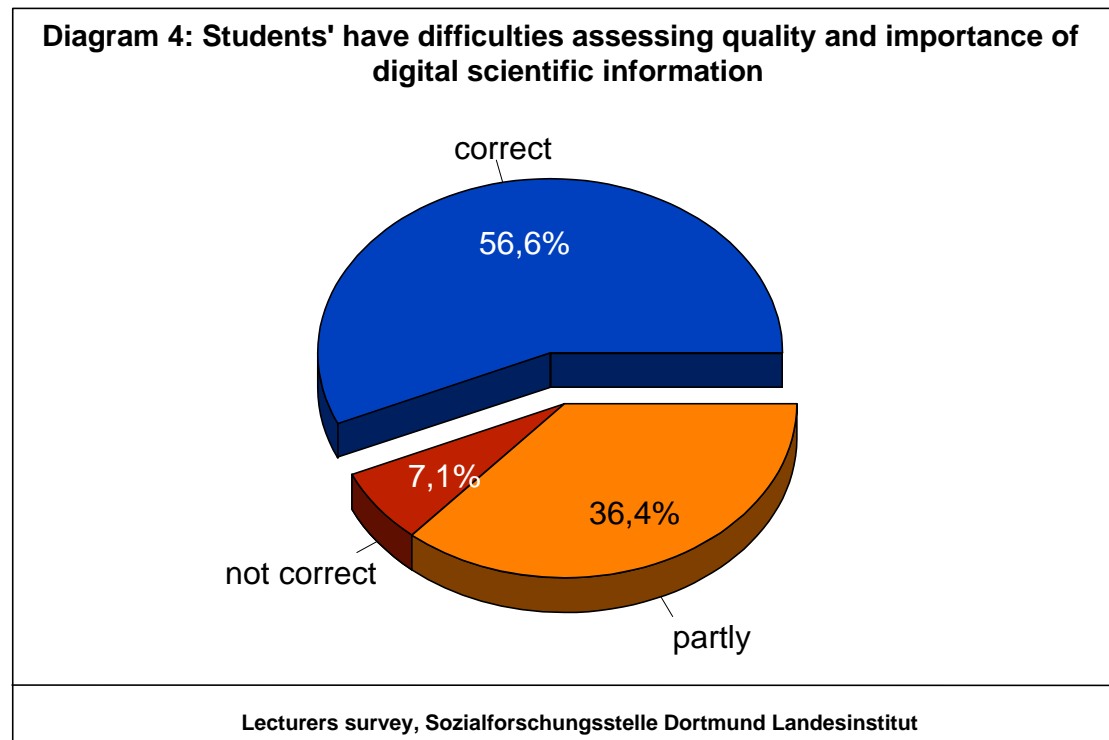
1. for students the internet is becoming the primary source for information;
2. competences in systematic use of all kinds of digital sources (use of subject-oriented databases, information retrieval) leave a great deal to be desired; electronic search for information is too often limited to „browsing“;
3. more than fifty percent of the students think that they just have a limited, mediocre or no knowledge at all of using digital sources.

2. Complementary results on low information literacy – lecturers' views

Two aspects which became apparent in the course of the „lecturers survey“ shall be mentioned here as well.

1. Our representative study shows that lecturers are not satisfied with students' use of digital information sources. Especially the quality of gathered information (which is commonly obtained by employing free search engines) leaves a great deal to be desired. This becomes obvious when lecturers emphasise students' inability to assess whether obtained information is useful and relevant. Logically, lecturers are not satisfied with the quality of digital scientific information students use in their papers.

enormous waste of time on single websites, intuitive assessments of random results and a high probability of being distracted from the subject.



2. Additionally, two results of the lecturers survey hint at appropriate steps to be taken because of students' low information literacy. Most of the lecturers (57%) want the development of students' information literacy for using digital sources to become a subject in introductory and higher courses. One half of the lecturers (49.9%) thinks that further education in using digital scientific information should be installed for the lecturers themselves as well.

A benevolent interpretation of these results brings up the following conclusions: Lecturers want students' information literacy to be developed systematically. Many of them also want their own information literacy in using digital scientific information to be further educated.

3. Reasons for students' insufficient information literacy

After having found out about insufficient use of digital devices, the Sozialforschungsstelle drew far-reaching conclusions.

Obviously, information literacy in using digital scientific information is **not** obtained at universities. Three facts lead to this conclusion:

- a) A majority of students (79.6%) obtained their knowledge by „trial-and-error“ or with the help of fellow students (51.4%).
- b) A minority (15.7%) stated to have learned to use digital scientific information systematically and with the help of universities' library staff.
- c) Additionally, only every tenth student declared to have obtained information literacy in regular courses at the university.

This shows that students currently can hardly be called "information literates", since they have obtained their knowledge by themselves. That is why the Sozialforschungsstelle assumes that students cannot know how to conduct a professional enquiry.

As another conclusion, the libraries' and faculties' supply in developing the students information literacy is either insufficient or not useful in students' views.

4. Trying an outlook: the future of information literacy at German universities and other higher education institutions

The Sozialforschungsstelle describes two different scenarios for possible future developments in using digital libraries.

The „worst case scenario“:

Isolated students virtually „get lost“ while browsing the net. They just accidentally find helpful scientific information. They cannot differentiate between relevant and irrelevant information. The development of information literacy happens – if it happens – by coincidence. If students do have information literacy, it has been developed autodidactically.

Lecturers and librarians are not able to improve students' information literacy in the course of their studies. The status quo is improving rather slowly.

In contrast to this, the „best case scenario“:

Lecturers cope with students' information literacy by constantly working on it, applying methods and knowledge in their own courses. Students exchange their knowledge about relevant digital sources. Departments provide students with an assessed range of research tools which are for free. Libraries and departments commonly develop courses of training and online tools in order to foster information literacy. Basic training and further education on information literacy have become an integral and certified component of study. Companies also approve information literacy as a major qualification of job applicants.

5. Conclusion: Measures to take

The Sozialforschungsstelle emphasises several steps which must be taken in order to prevent the „worst case scenario“ from being realised.

All relevant authorities – the federal government, federal states, the „Fachgesellschaften“, information brokers, libraries, universities, departments and professors must be held responsible – have to take the following measures to improve students' information literacy:

1. Imparting of information literacy and of use of digital subject-based information has to become an integral component of studies at university and other higher education institutions.
2. Knowledge exchange among students concerning the use of digital subject-based information has to be encouraged and institutionalised in tutorials.
3. Students and lecturers have to be provided with assessed digital scientific information by departments and faculties. This can be realised on the departments' homepages.

4. Demands on students' information literacy have to be developed by both universities and companies.
5. Courses and learning modules for professional use of digital scientific information must be conceived, developed, applied and assessed. Therefore, intra- and inter-university co-operation of lecturers, libraries and information brokers is absolutely necessary.

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