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ABSTRACT

A study at Germany's FernUniversitat sent a questionnaire to 300 enrolled distance education students (mostly adult, mostly part-time) who labeled themselves as severely disabled or chronically ill (about 2 percent of students), asking them about the types of their disabilities and their attitudes toward computer-assisted learning and online classes. The study found that a higher (43 percent) than usual (37 percent) number of the students with disabilities were women, and their median age (43 years) was older than the students as a whole (32 years). About 45 percent of those questioned mentioned more than one type of disability or illness, with damage to the skeletal support system mentioned most frequently (38 percent of all answers), followed by central nervous system disorders and internal diseases (13 percent each), sight impairments (10 percent), hearing impairments (9 percent), and mental or psychological illnesses (9 percent). About 30 percent of the students did not use computers, usually because of cost and lack of opportunity to learn how to use them. Students cited advantages of computer use, including easier essay writing; Internet access, access to information and library research; potential for uses other than study; and easier communication with the university. Disadvantages cited included cost, physical problems caused by long work with computers (such as eye strain and wrist disorders), lack of training opportunities, and reinforcement of the isolation typical of distance learning. Students made the following suggestions for improving the use of computers in distance learning with disabled students: (1) better access to study centers for physically disabled students; (2) permission to use computers during written examinations; (3) more training on computers and information about assistive devices; (4) more modes of information transmission (multi-media); and (5) access to the Internet for all students without making it mandatory because of varying

needs of students with different types of disabilities. (Contains 59 references.) (KC)

Using Computers in Distance Study:

Results of a Survey amongst Disabled Distance Students

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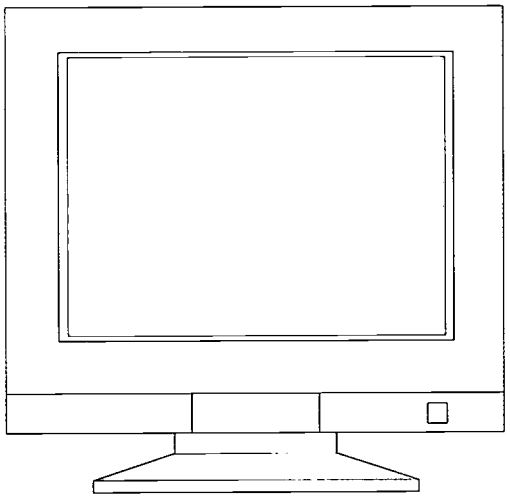

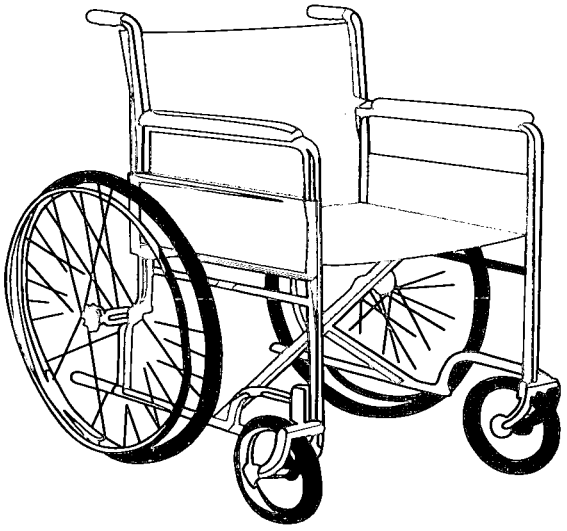

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Using computers in distance study: Results of a survey amongst disabled distance students.

Rainer Ommerborn & Rudolf Schuemer

In the widespread euphoria about the new technologies in distance education we run the danger of not sufficiently considering how the ever increasing "virtualisation" may exclude some student groups. We therefore undertook an explorative survey asking disabled students about their experiences with using computers and the internet.

To name the main result first: All in all, those questioned do indeed mention more advantages than disadvantages; they do, however, also mention dangers. The following article is addressed to those in a position of responsibility in educational institutions in the hope of sensitising them to the special needs of disabled students.

The Problem

The new media[1], particularly the internet, have over the last few years become increasingly important for university teaching and learning[2], especially in distance education. Distance-education institutions world wide harness the new technologies to their needs.[3] Another indication for this trend is the increasing number of articles on subjects like the "internet" or "multimedia" in distance-education journals such as *Distance Education* or *Open Learning.*

The German *FernUniversität* tries to concentrate its activities in this area under the programmatic title of *"virtual university"* [4] and in this context offers more and more multimedia products on CD-ROM or for downlowding from the internet.

For disabled students in particular the new media offer manifold possibilities[5]; at least for some groups of the disabled they do, however, also contain the danger of additional

1 New media are defined as computer-aided information and communication technologies (including the internet and multimedia).

2 cf. for instance the last volumes of the series *"Medien in der Wissenschaft"* - amongst others Hauff 1998; Krahn & Wedekind 2000; Scheuermann 2000; Simon 1997.

3 cf. e.g. the last conferences organised by the *International Council for Open and Distance Education*, ICDE, in 1997, 1999 and 2001, as well as Daniel 1996; Holmberg 1996; Fandl, Bartz & Nickolmann 1996.

exclusion. Many of the standard input devices and functions, such as mouse navigation or the use of key combinations (short cuts) prove difficult or painful to use for those with impaired motor functions of the arm. The graphic user surfaces prevalent today may present considerable obstacles to the visually impaired. On the other hand, the new media help many handicapped students compensate for their individual deficits and enable them to take an active part in academic life. Thus, persons with severely restricted mobility may use the internet to participate in discussions and other events (for instance virtual seminars).

This study intends to explore the ideas and views of those concerned on the chances and risks inherent in the new media.

Handicapped *FernUniversität* students as a group

People with a handicap as a FernUniversität target group

The *FernUniversität* remit[6] explicitly states as one aim opening up new educational and study opportunities for those who have no or only very slight chances of profiting from the courses offered by traditional face-to-face universities with their inherent restrictions of time and place. Those concerned are people in gainful employment (part-time studies), single parents with small children, people looking after family members needing special care, disabled persons and the chronically ill. Particularly those who, due to illness or a disability are restricted in their mobility may find that distance study presents a viable alternative to face-to-face study.[7] This is even more true when one considers that study conditions at face-to-face universities are far from ideally suited to disabled persons[8], even though some progress has been made at least in some areas.[9]

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4 cf. e.g. Schlageter, Buhrmann & Mittrach 1997; Hoyer (2000) and the *FernUniversität* web site: http://www.fernuni-hagen.de.

5 The increasing importance of the new media for the integration of the handicapped may be gathered from articles published in specialist journals (cf. Heiler 1997), in the internet (cf. e.g. Zondanella 1998; vom Bruch 1998a) as well as from statements published by associations representing the handicapped (cf. e.g. vom Bruch 1998b).

6 cf. Peters 1976; Rau 1976; cf. also Kramme 1996.

7 cf. amongst others Hofmann & Ommerborn 1985; Hofmann & Ommerborn 1997, pp. 33-35; Ommerborn 1995; cf. also Holmberg 1995, p. 13.

8 cf. amongst others Hofmann & Ommerborn 1997, p. 25; cf. also Meister 1998, pp. 2-3 and pp. 149-151.

9 Progress is here measured against the recommendations made by *the Standing Conference of the Ministers of Education and Cultural Affairs of the "Länder" in the Federal Republic of Germany*, and *the Association of Universities and Other Higher Education Institutions in Germany*. Cf. Deutsches Studentenwerk 1993.

The term "disability"

There does not seem to exist a generally accepted definition for "disability" (or for other related terms); mostly, a definition is given in relation to certain aims and/or under a specific perspective.[10] The three following definitions shall serve as example:

"If a person's ability to perform physically and/or mentally deviates negatively from the norm of a fully capable human being, he or she may be considered disabled."[11]

"Disability means the personally and socially harmful consequences of an impairment. Impairment is defined as an individual's deviation from the (ideal or average) functional or physical norms. Handicap means the difficulties caused to the disabled person by his or her environment. Contrary to illness, impairment defines an irreversible state (for instance defective development of the limbs as opposed to breakage of bones). These terms describe the ideal types."[12]

"*Disability:* A physical, mental or psychological impairment which is not only temporary and leads to a reduced fitness for work of at least 10 %. This is independent of whether the disability is congenital, whether it was acquired through exterior events (accidents, war) or caused by an illness. In accordance with the [German] Law Regulating Measures for the Protection and Support of the Seriously Disabled (SchwG) in the version of October 8, 1979 (BGB1. I S. 1649) , a *serious disability* may be said to be the case, when as a consequence of the disability a person's fitness for work is reduced not only temporarily by at least 50 % ...".[13]

What strikes you when reading definitions like the ones just quoted is the reference to a norm, whichever way this norm is defined.[14] Deviance from this norm - in the sense of a sub-optimal state or sub-optimal ability to function - seems to be the constitutive conceptual characteristic of "disability". The problematic nature of such definitions cannot be discussed in detail within the scope of this article.[15] Just some aspects shall be mentioned at this point:

- Reference to a norm raises the question of who defines this norm to which end and according to which aspects and criteria.
- The definition of disability as a deviance from a norm is linked to certain temporal and socio-cultural circumstances[16] - not the least, since setting norms (with a claim to super-

10 cf. amongst others Adam 1993, p. 24.
11 Kranig & Ramm 1990, p. 4.
12 Dorsch Psychologisches Wörterbuch, 11. revised edition: Dorsch, Häcker & Stapf 1987, p. 86.
13 Pschyrembel 1990: "Klinisches Wörterbuch" (Clinical Dictionary), p. 190.
14 Explicit reference or implicit one, like in Pschyrembel, which expresses the degree of disability in % of the full "fitness for work". This is a term from insurance law.
15 For more details see, among others, Adam 1993, p. 24-26, or Ommerborn 1994, pp. 43-35 and 139-141; cf. also Münch 1997, Ommerborn & Schuemer, in prep., or Sander 1994.
16 cf. amongst others Müller 1996.

individual importance) as rule results from a process of social and political negotiations in a concrete historical situation.

- Defining a group of people as "deviating from the norm" may produce the danger of a discriminating stigmatisation of this group - with all its possible negative consequences. This holds true even when - as in social welfare legislation - the term disability (and the disadvantages resulting from it for those concerned) is taken to found claims for compensating measures and obligations.
- Using categories like "disabled" or subcategories such as "physically disabled" must not close our eyes to the considerable inter-individual differences or to the fact that disability always is a very individual state. Disabled people differ no less from each other than able people. The groups of disabled and able people also have much more in common than separates them.[17]
- External and internal views of a disability do in no way have to concur: Not everybody who is regarded as "disabled" or "severely disabled" according to the definitions of social welfare legislation necessarily sees herself or himself as impeded or impaired in his or her life. Correspondingly not every student's disability or chronic illness means that their studies will be adversely affected (for more details see below).

While therefore the term "disability" appears to be questionable, it still seems legitimate to find out the views of those who regard themselves as disabled/chronically ill - provided one always keeps in mind the questions raised by those terms.

The number of disabled students

As a rule, estimates on the proportion of the disabled and the chronically ill amongst students are based on survey results. Students are generally asked whether they are disabled or chronically ill and possibly also to which degree this affects their studies. For the most part, researchers discard the idea of providing an explicit definition of "disabled" or "chronically ill" in their questionnaires in favour of defining the terms afterwards, based on the self-assessment of those concerned.

In accordance with the proceedings outlined above, the students questioned as part of the nation wide social surveys carried out by he *German Student Administration (Deutsches Studentenwerk, DSW)*[18] were asked: "Do you suffer from a disability or a long-term chronic

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17 cf. e.g. Dickopp 1983 p. 353.

18 The Deutsches Studentenwerk - DSW - is the voluntary national association of all Studentenwerk organisations in Germany (organisations for student affairs). These organisations perform public responsibilities related to the economic, social, health-care and cultural support and promotion of students at German higher education institutions.

illness?" Those mentioning a disability or illness were subsequently asked to define the type of impairment, with multiple responses possible.[19] According to Social Survey no. 14 carried out in the study year 1994, 2.3 % of those questioned classified themselves as disabled and 10.4 % as chronically ill.[20] By no means all of these altogether 12.7 % disabled and chronically ill, however, regarded themselves as restricted in their studies by their disability or illness (see table 1. Similar answers were given by disabled *FernUniversität* students[21]).

Table 1: Degree to which disability or chronic illness interfere with students' studies (according to the DSW Social Survey No. 14)

Degree of interference:	*%*
No interference	50
little interference	26
medium degree of interference	16
high degree of interference	8

As the table shows, only a quarter (24 %) of the disabled or chronically ill students feel that their disability or chronic illness interferes with their studies to a "medium " or "high" degree. With reference to all students a percentage of approximately 3 % of all students feel impeded in their studies by their disability or chronic illness. Earlier social surveys had produced similar results. On the basis of data from Social Survey No. 13 the DSW estimated "that more than 200.000 students are affected by chronical illness or disability. Of those more than 50.000 feel impeded to a medium or high degree." [22]

FernUniversität does not possess any up-to-date statistical data about the percentage of disabled people amongst its students. For reasons of the protection of personal data the relevant information, i.e. the characteristic "severely disabled: yes/no" has not been recorded since 1988.[23] Results of earlier surveys showed that about 2 % of all distance students considered themselves disabled.[24] Later surveys produced similar results; for the year 1994 a

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19 cf. Schnitzer, Isserstedt, Schreiber & Schröder 1996; cf. also the analogous type of questions in the DSW Social Survey No. 13 (Schnitzer, Isserstedt, Kahle, Leszczensky & Schreiber 1992).

20 cf. Schnitzer, Issersedt, Schreiber & Schröder 1996, figure 13.2, p. 29; similar figures were reported from the 15th DSW Social Survey (Schnitzer, Isserstedt, Müßig-Trapp & Schreiber 1998, 1999).

21 Hofmann 1989.

22 Deutsches Studentenwerk, DSW, 1993 p. 2.

23 Since 1988 the "Disabled Students Officer" asks disabled students to register with him on a voluntary basis. - It should be noted that the Officer's request is only addressed to "*disabled* students" (unlike the DSW survey which also include the "*chronically ill*").

24 Hofmann & Ommerborn 1986, p. 199. These estimates, however, probably lie below the actual figure, since a number of disabled students refuses to be registered, probably for fear of being stigmatised (cf. Ommerborn 1994, p.136).

percentage of 2 % corresponded to the absolute number of about 1.100 disabled students at *FernUniversität.*[25]

At first it seems paradox that estimates for the percentage of disabled students at *FernUniversität* appear to be lower than those at the face-to-face universities forming the base of the DSW surveys. Are disabled students not explicitly included amongst those target groups whose participation in higher education *FernUniversität* is supposed to make possible? In order to solve this puzzle the different survey methods need to be looked at: The DSW surveys explicitly mention disability and chronic illness, whereas up to 1988 *FernUniversität*, when enrolling students, (upon registration) merely registered the characteristic "severely disabled". In later surveys *FernUniversität* again only asked for mention of "disability", not of chronic illness.

Subgroups of the disabled and chronically ill / category systems

Forming subgroups or categories in order to classify types of disability usually takes place under pragmatic considerations: the aim is to render the almost endless variety of individual types of disability /chronic illness easily comprehensible by classifying them in a limited number of groups / categories; possibly forming categories is also intended to promote the development of group-specific forms of support: Those with a severe visual impairment for instance need another type of prothetic help than wheelchair users. Advantages and disadvantages of the different classification systems used for disabilities and chronic illnesses shall not be discussed here; it should be noted, however, that even if you limit your reflection to "study interference caused by disabilities and chronic illness", different systems of categories are conceivable. This becomes clear when one compares the different categories used in the different surveys.[26]

As a rule, these categories are not designed as mutually exclusive in the sense that those questioned are asked to place themselves into only one category. Since many of those concerned are disabled not only in one way, but suffer multiple disabilities, it is explicitly stated that they may give more than one answer. Additionally, the category systems in this area can, as a rule, not be considered comprehensive, since they cannot manage without a category under which other answers may be subsumed ("other type of disability").

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25 thus Hofmann 1994, p. 2, for the summer semester 1994.

26 Those carried out by the DSW, for instance (cf. amongst others Schnitzler et al 1996), studies run at *FernUniversität* (Hofmann 1989), at the British *Open University* (Child 1993) or at the Dutch *Open Universiteit* (1992). - Furthermore, the OU-UK uses now another scheme for classification; cf. for example the brochure "Open to Your Needs"(The Open University, no year).

Two category systems shall be mentioned here. First, there are the categories from the DSW Social Survey No. 14:[27] (1) allergies or respiratory illnesses; (2) postural or motory disorders / damages to the skeletal support system (3) sight impairments; (4) diseases of the inner organs / chronic metabolic disorders; (5) mental / psychological illnesses; (6) skin diseases; (7) disorders of the ear, nose and throat area; (8) central nervous system disorders; (9) other impairments and disorders. The categories in a *FernUniversität* survey[28] were: (1) wheel chair users; (2) otherwise physically disabled; (3) damages to the inner organs; (4) blind; (5) severely visually disabled/impaired; (6) deaf; (7) severely hearing impairment; (8) mentally disabled; (9) others.

The category system used in this study (cf. table 2) mixes the two types of classification just described. Its results may thus easily be compared both with DSW-Surveys and with earlier *FernUniversität* surveys.

Method

In the autumn of 1999 a written survey was carried out on the basis of a standardised questionnaire. This questionnaire was developed on the basis of discussions with groups of disabled students and of a pilot study. The questionnaire was mailed to 300 students who had registered as disabled with the *FernUniversität* Officer for Disabled Students. 105 of those students returned their questionnaire, which is equal to a return rate of 35 %. Other surveys showed similar return rates - for instance a survey on the "provision of distance students with computers" in the study year 1995/1996.[29]

It is certainly doubtful, especially with reference to the selection of participants and the return rate (possible non-response bias), whether this survey may be considered representative. The survey, however, did not so much aim at getting representative results as at exploring for the first time the opinions of those concerned and thus isolating indications of problems and, if possible, proposals and ideas for solving these problems. We therefore did not consider it to be particularly harmful, if the survey was not representative. We do, however, wish to point out that due to the given small absolute number of questionnaires

27 Schnitzer et al 1996.
28 Hofmann 1989.
29 von Prümmer & Rossié 1996, p. 1.

returned, results concerning sub-groups may at best be interpreted as indications of a general tendency.[30]

Results

Characteristics of those questioned and information on their studies

Age, sex and place of residence: With an average age of about 43 years (median: 40 years), those questioned were older than *FernUniversität* students in the winter term 1998/1999 taken as a group (median: 32 years). At 43 %, the proportion of women was higher than amongst all *FernUniversität* students (37 %). About one third of those questioned lives in North-Rhine Westphalia, the land where the *FernUniversität* has its main seat.

Types of disabilities[31]: About 45 % of those questioned mentioned more than one type of disability or illness, i.e. multiple disability. Damages to the skeletal support system were mentioned most frequently (38 % of all answers; see table 2, column "%Ng2") followed by "central nervous system disorders" (12.7 %) and "diseases of the inner organs / chronic metabolic disorders" (12.7 %); 9.8 % referred to "sight impairments", 8.7 % to "hearing impairments" and 9.2 % to "mental / psychological illnesses". - Similar proportions appeared in an earlier survey of disabled *FernUniversität* students[32]; the proportions in the DSW Social Surveys are markedly different: whereas "allergies / respiratory illnesses" are mentioned frequently (by 51 % of those questioned; 36 % of all mentions), the corresponding category in this survey was only ticked by about 9 % of those questioned (ca. 5 % of all mentions).[33]

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30 For more on the methodology see Ommerborn & Schuemer 2000.

31 Many of those questioned did not only tick off one or several of the set categories, but also provided additional information on their disability; this information was subsumed under the set categories (as far as possible, amongst others according to a categorisation used by Budde & Leszczensky 1990).

32 Hofmann 1989.

33 Possible reasons for these discrepancies are discussed in Ommerborn & Schuemer 2000, p. 28 f.

Table 2: Frequency of different types of disability *(several answers allowed)*

Data from the *FernUniversität* survey. N=104 (one person did not answer question 4 at all). f: frequency; %B: percentage, with reference to 104 answering interviewees; %Ng1: percentage with reference to the overall number of 226 mentions – with the sub-categories belonging to "damage of the skeletal support system" regarded seperately; %Ng2: percentage, with reference to the overall number of 173 mentions – with the sub-categories belonging to "damage to the skeletal support system" combined.

	F	*%B*	*% Ng1*	*% Ng2*
Postural or motory disorders / damage to the skeletal support system: mentions of one or more of the following four categories	66	63.5	--	38.2
-- damage to the skeletal support system as a whole	34	32.7	15.0	--
-- damage to the skeletal support system with motor activity of the upper body impaired, particularly arm-/hand motor activity	24	23.1	10.6	--
-- damage to the skeletal support system with impaired motor activity of the leg	36	34.6	15.9	--
-- wheel chair user	25	24.0	11.1	--
Central nervous system disorders	22	21.2	9.7	12.7
Diseases of the inner organs / chronic metabolic disorders	22	21.2	9.7	12.7
Chronic allergies / respiratory illnesses	9	8.7	4.0	5.2
Chronic skin diseases	5	4.8	2.2	2.9
Sight impairments	17	16.3	7.5	9.8
Hearing impairments	15	14.4	6.6	8.7
Mental / Psychological illnesses	16	15.4	7.1	9.2
Other disabilities / impairments (no further specification)	1	1.0	0.4	0.6

Student status: Around 2/3 of the interviewees were part-time and around 1/5 full-time students; 12 % of the interviewees were 'associate students' (enrolled for individual courses). This distribution according to the student status corresponds with the overall tendency of the student status distribution amongst *FernUniversität* students on the whole; greater deviancies in comparison with all distance students can be observed above all with the group of those who are enrolled at another university and are pursuing an additional course of studies at the *FernUniversität*; this group constituted only 1 % of the interviewees as compared to around 11 % of all students.

Department / subjects: Whereas more than half of the students in the group of all *FernUniversität* students register with "Economics" and around 1/4 with the department of "Education, Social Sciences and Arts", this relation presents itself the other way round amongst those questioned for our survey: 58 % mentioned "Education, Social Sciences and the Arts", 28 % mention "Economics". The subject mentioned most frequently is "Psychology" (17 % of all subjects mentioned). The DSW Social Survey also reports that languages and cultural sciences as well as the social sciences predominate amongst the disabled/ chronically ill students.

Number of semesters and period/stage of studies: About half of those questioned has studied 5 or more semesters, around 1/4 have studied 9 or more semesters in their particular subject. As far as the study stage is concerned, the interviewees most frequently (58 %) mention "basic studies"; around 23 % answer "second cycle studies" and about 13 % will "soon sit their exams/acquire their degree"; only very few have already successfully sat examinations at the *FernUniversität* and now study a second subject or are preparing a doctorate.

Use of study centres: FernUniversität has a net of study centres (distributed all over Germany but particularly close in North Rhine Westphalia). Over half of all interviewees (54 %) did not attend a study centre during the term preceding the survey; only a minority (11 %) attended a study centre once a week or more often. The proportion of those who did not attend a study centre is clearly higher among wheel chair users than amongst the other groups of disabled. (It has to be taken into account that at least in some study centre wheel-chair access is difficult.)

Use of PCs - advantages and disadvantages

Use of PC: At just about 30 %, the proportion of those who do not make use of a PC for their studies is markedly higher amongst the disabled interviewees than amongst *FernUniversität* students on the whole (around 14 % according to a survey[34] for the study year 1995/96). – If one regards the sub-groups according to the type of disability/illness, these on the whole differ only very little from the main group with regard to the use of PCs; the proportion of non-users is, however, noticeably higher amongst interviewees with impaired sight and those with mental disabilities (more than half non-users in each group).

Reasons for not using a PC: The reasons mentioned most often refer to the cost of acquiring and using a PC. Some also mention "fear that using the computer will take up too much time and effort so that other activities may suffer", the high amount of time and effort required when learning how to use a PC and the lack of training opportunities. Only comparatively rarely do interviewees mention their "fear of being restricted in the use of PCs by their type of disability/illness"; it is only among the visually impaired students that this reason is given by a majority. The visually impaired also mention specific reasons relevant only to their type of disability: "fear of straining the eyes when using a PC" and "preference for a reading implement independent of a PC", since these implements are to be preferred to the presentation of a monitor (even with enlargement), when there is only residual sight left.

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34 von Prümmer & Rossié 1996.

Use of additional assistive software/hardware for the disabled: Only very few of the interviewees use assistive computer technology (software or hardware) for the disabled. Their reasons for this are, among other things, high cost and lack of information about what is available; in consequence, several interviewees express the wish for more relevant information being provided by *FernUniversität.*

Advantages and disadvantages of PC use: The PC users amongst the interviewees see considerably more advantages than disadvantages.

Advantages of PC-use: The advantages selected most frequently amongst the answers on offer are (cf. Table 3): essays are easier to write; internet access; easier access to information; great potential for uses other than study; easier library search and easier communication with *FernUniversität.* There is relatively little difference between the sub-groups representing types of disability.

The open question for advantages with regard to different types of disability generated the following answers: PC may help compensate for problems and deficits due to the disability; PC as visual aid; use of e-mail as a substitute for the telephone (students with hearing difficulties); PC and the Internet as a means of overcoming limited mobility (for instance for wheel chair users) amongst others for library search or communication with fellow students; making writing possible or easier: several interviewees with impaired motor action of the arm state that they cannot write by hand at all, or only with great effort.

Table 3: Advantages of PC-use – from the user's point of view

f: Frequency; %B: Percentage, referring to the 75 PC-users amongst the interviewees;
%Ng: Percentage, referring to the overall number of 413 answers.

	f	*%B*	*%Ng*
Easier to write essays and other written contributions	67	89.3	16.2
Easier access to information	54	72.0	13.1
Internet access	58	77.3	14.0
Rendering communication with FernUni possible / easier	45	60.0	10.9
Rendering it possible / easier to participate in newsgroups, chats, virtual seminars	27	36.0	6.5
Rendering communication with fellow students possible / easier	27	36.0	6.5
Rendering it possible / easier to research for literature	47	62.7	11.4
Easier ordering of library books	31	41.3	7.5
Rendering study of course material possible / easier even for the visually impaired (e.g. by enlarged presentation of texts on screen)	7	9.3	1.7
Diverse possibilities for use other than study purposes	50	66.7	12.1

Disadvantages of PC-use: The disadvantages chosen most often by the PC-users amongst interviewees from a list with several options refer to (see table 4) the cost (especially

of data transfer, but also of the necessary hardware), problems caused by long work with the PC, strain to the eyes and wrists. Other answers, such as a lack of training opportunities, the presentation of www-sites or of multimedia-offers with little consideration for the needs of the disabled, were chosen less frequently. The answers given by the different sub-groups tally in many instances, but differ clearly regarding some aspects: the answer "problems caused by long sessions in front of the PC" is given relatively more frequently by the sub-group "damages to the skeletal support system as a whole" than by the other sub-groups; the visually impaired mention relatively frequently "overtired / strained eyes" and "the presentation of web sites without due consideration of the concerns of the disabled".

The open question for further disadvantages resulted in the following answers: reinforcement of the anonymity and isolation typical for a learning situation at a distance; elevated cost (amongst others because of long transmission times). With reference to the use of the internet, interviewees criticise amongst other things the limited opportunities of participating in newsgroups, chats and virtual seminars. Parallel to these general disadvantages some very specific disadvantages are mentioned in connection with specific types of disability – amongst others elevated cost for special additional hardware suited to the needs of the disabled; the need to phone in order to get answers to queries (for instance when installing net access to *FernUniversität*; these phone calls are not only considered expensive but also a considerable problem for those with severely impaired hearing); the posture of head and body enforced by computer use (may lead to severe pains when taken for long); for those with impaired senses, for instance with severely impaired hearing or sight, problems arise when multimedia information sometimes is presented only acoustically or only visually (danger of marginalization).

Table 4: Disadvantages of PC-Use – from the point of view of PC-users

f: frequency; %B: Percentage, related to 75 PC-users amongst the interviewees; %Ng1: Percentage, related to the overall number of 153 answers – with the sub-categories for cost regarded separately; %Ng2: Percentage, related to the overall number of 135 answers – with the sub-categories for cost combined.

	f	*%B*	*%Ng1*	*%Ng2*
Too complicated use	1	1.3	0.7	0.7
Lack of training opportunities for learning the use of the PC	14	18.7	9.2	10.4
Elevated cost (mentioning one or more of the following sub-categories):	33	44.0	---	24.4
– for the basic equipment (hardware + programmes)	20	26.7	13.1	---
– for the necessary additional equipment (adapted to the needs of the disabled)	3	4.0	2.0	---
– for data transmission / communication (e.g. telephone cost during the use of the internet)	28	37.3	18.3	---
Problems when trying to get the authority bearing the costs to finance necessary additional equipment	4	5.3	2.6	3.0
Lack of advice when choosing / assembling computer equipment best suited to my special form of disability	2	2.7	1.3	1.5
Fatigue / exhaustion / damage to one's posture as a result of long sessions with PC	32	42.7	20.9	23.7
Fatigue of wrists after using PC for long stretches of time	18	24.0	11.8	13.3
fatigue / exhaustion / strain to the eyes	28	37.3	18.3	20.7
www-sites on the internet or multimedia offers are presented without considering the needs of the disabled (e.g. using graphical elements or spoken language without adding explanatory text)	3	4.0	2.0	2.2

Suggestions for improvement made by the interviewees

Two final open questions asked the interviewees for any suggestions for improvement they might wish to make. Though interviewees clearly see more advantages than disadvantages in using a PC for their studies at a distance, they do offer a number of suggestions for improvement. These do not only apply to using the PC and do not refer to the specific situation of disabled students either; many of the suggestions might have come from able-bodied students. In the following we shall, however, mainly concentrate on suggestions relating to the use of media and PC by disabled students. The suggestions are listed in the boxes below, followed by comments.

Suggestions on the study system (particularly with regard to disabilities)

a) Study centres allowing easy access to wheel chair users and equipped with facilities necessary to the disabled.
b) The chance to chose venues with access for wheel-chair users when attending written examinations and other events; at least information on which places are accessible to the physically and visually disabled.
c) The communication opportunities open to disabled students ought to be improved; lists of regional contacts in order to facilitate the organisation of self-help groups; special news groups for the disabled.
d) Reduction of registration fees for the disabled.

Ad a) + b): Currently not all study centres are accessible to the disabled (particularly wheel chair users), nor do all of them possess the necessary facilities for disabled students (for instance in the sense of DIN Norm 18024, part 2). Whether and when this situation may improve does not depend on *FernUniversität* alone – apart from the fact that this would require additional financial means – since study centres are as a rule established on the basis of agreements concluded with external partners (local authorities, other institutions etc.).

It would however not require much effort to point out the accessibility of study centres in the course programme and on the *FernUniversität* web-site. The course programme for the study year 1999/2000 does in fact contain the comment "especially suited to wheel chair users" next to some selected study centres. But this comment leaves students guessing as to which extent the other study centres may be accessible to wheel chair users and whether they are accessible at all.

Places / rooms chosen for *FernUniversität* events (face-to-face seminars, written examinations) are not always accessible to wheel chair users either. It would be commendable if in the future the university tried to consider access to disabled students to a greater degree than before when allocating places and rooms or if announcements of any such events at least automatically carried a note on the facility of access.

Ad c): Forming regional contact groups starting out from lists of disabled students could certainly in many ways be of considerable use to those concerned.

FernUniversität, however, cannot provide such lists of disabled students, since the characteristic "disabled / chronically ill" is no longer recorded upon registration, for reasons of the protection of private data amongst others. Even the *FernUniversität* Officer for Disabled Students may not pass on to third parties the names and addresses of those who voluntary registered with him as disabled without their explicit permission. Drawing up and providing regional contact lists for disabled students therefore seems to be easiest to organise through the self-help group of disabled and chronically ill *FernUniversität* students (TANDEM). Special

news groups for disabled students shall be discussed below (under suggestions on the www-site).

Ad d): Currently *FernUniversität* does not reduce or waive fees for whole groups of students. Fees may however be reduced or waived for low-income students upon application and under certain circumstances; this "social clause" therefore is a rule applying to single cases. It is not tailor-made for specific groups, such as the disabled. Individual members of diverse groups may profit from it.

Suggestions on examination procedures:

a) It should be permitted to use a PC during written examinations – especially to those disabled students who, because of their disability, can write by hand only with great effort.
b) Opportunities for disabled students with limited mobility to sit end-of-term and final exams at home.
c) Written exams handed in by disabled students should on principle receive better marks.
d) It should be possible, to send in assignments through e-mail or the internet (in order to avoid unnecessary trips to the post office or the post box).

Ad a) and b): The DSW points out that universities are under the obligation, to grant disabled students compensation for disadvantages during the course of their studies and examinations.[35] The advisory council to the *DSW 'Advice Centre for University Applicants and Students with Disabilities'* recommends that study and examination regulations at all German universities should contain the following or similar sentences: "If a candidate presents a medical certificate as plausible proof that due to long-term or continuous physical trouble or handicap he or she is unable to sit the examinations completely or partly in the form intended, the chair of the examining board must allow the candidate to take longer to fulfil the examination requirements or to fulfil them in a different form which is considered equivalent to the official form."[36]

FernUniversität so far has tried to comply with this obligation for compensating disadvantages by allowing regulations applying to single cases (for instance letting end of term papers or written examinations take place in the disabled students homes[37]; or through modifications of the examination regulations taking into consideration an examinees individual disabilities). Altogether this has led to satisfactory arrangements; problems do, however, arise

35 Deutsches Studentenwerk 1998, p. 174 f.
36 Deutsches Studentenwerk 1998, p. 175.
37 Additionally, video conferences during which the examiner is at the main seat in Hagen and the examinee in a study centre, can be used increasingly in order to spare students with limited mobility longer journeys to Hagen.

occasionally. Thus interviewees pointed out that some examiners show little understanding of difficulties due to disabilities. They may for instance forbid the use of the PC in written examinations; such a ban presents a grave difficulty for instance for those disabled students who cannot or only with great effort write by hand. The DSW recommendations in contrast mention the admission of necessary technical aids, computers included.[38]

Ad c): Also, the compensation for disadvantages mentioned in the DSW recommendations ought not to be interpreted as disabled students receiving better marks as a rule; compensation for disadvantages refers to the conditions under which the examination performance is produced and which should take the individual disability into account. It does not refer to the criteria for notation.

Ad d): In the near future, *FernUniversität* will probably develop different forms of sending in assignments. These will amongst other things depend on the course in question. With further steps taken towards the goal of the Virtual University, any form of electronic communication (mailing solutions or using forms provided on the internet) will become more important.

Suggestions for providing advice on hardware and software:

a) More hardware and software advice; PC and Internet training tailor made for disabled students (e.g. on offer during disabled students' conferences); training at home for those who are severely disabled or completely lack mobility.
b) Information on assistive technology (hardware and software) specific to the needs of the disabled; advice on how to acquire and install this equipment; advice on which costs may be borne by the authorities; possibility to acquire this equipment centrally, i.e. through *FernUniversität*

Ad a): The university computer centre tries very hard to meet the diverse requests for advice and training by publishing brochures, installing offers on the net and offering a hotline. It does, however, not offer any specific advice for disabled students. It would certainly be helpful if training sessions were to be offered during the student representatives' conferences for disabled students, since these training sessions could give much more time and attention to the needs of these users.

Ad b): Since the importance of PCs in distance study is going to increase, it is certainly desirable for *FernUniversität* to offer more information on additional assistive equipment suited to the needs of the disabled students. It might at least install links to useful www-pages published by associations of the disabled and other institutions. Acquiring this equipment centrally for all students might meet with the difficulty of assessing the demand for the

38 Deutsches Studentenwerk 1998, p. 178.

equipment; considering the rapid technological change in this area it is moreover hardly advisable to store such equipment in any great numbers.

Suggestions on the media on offer and on the use of media for the presentation of contents

a) Information should be accessible both acoustically and visually (e.g. in multimedia-presentations); the presentation should allow easy access to students with visual as well as to those with hearing difficulties.
b) For the visually impaired: more acoustically accessible learning material; all course units available on audio tape, if possible.
c) Efforts should be increased to adapt graphical material to the needs of visually impaired students; formulas and illustrations should always be accompanied by additional verbal descriptions.
d) Texts for all courses, if possible, should be made available on disks or CD-ROM or in the internet (this would be particularly helpful for visually impaired students, who can only read texts on screen if they are enlarged).

Ad a), b) and c): These three aspects refer to the accessibility of the media offer to persons with various impairments of the senses.

The question of accessibility has already been discussed with regard to wheel-chair users. It entails designing environments with the aim of making them accessible by everybody, people with handicaps included, with a minimum number of problems. The concept of accessibility also lies behind any guidelines for designing and organising our world in accordance with the needs of the disabled, for instance the German Guidelines for the form and lay out of public paths and buildings and for residential housing adequate to the needs of the disabled (DIN 18024 and 18025).

It has often been pointed out that people without any disability also often profit from arrangements or organisation originally aimed at meeting the needs of particular users, for instance with handicap. The standard example concerns the lower kerbs meant to aid wheel-chair users, which are also helpful to mothers pushing prams or to people using a trolley for their shopping.

When designing software, user interfaces, multimedia offers or web sites, designers also discuss accessibility or "design for all", as it is sometimes called. The basic idea is to design products accessible to *all* potential users.[39] Examples show that here too products which were specifically designed for users with specific needs or handicaps mostly also come to serve the needs of other users. According to Bergman & Johnson the dichotomy

[39] Bergman & Johnson 1995 offer a readable introduction to accessibility with relation to human-computer interaction, giving due consideration to the needs of handicapped people; cf. also Bühler 1998 and the contributions in Bühler & Knops 1999 (amongst others the contribution by Emiliani & Stephanidis 1999).

"handicapped / not handicapped" simplifies too much anyway. All users – be they "handicapped" or "not handicapped" – differ in many dimensions with regard to their skills on the computer. Additionally, as they get older, most people suffer diminished capacities (e.g. long-sightedness due to old age, diminished mobility, diminished hearing) and even young people may, for instance as a result of accidents or illness, suffer from considerably reduced capacities for a certain time.[40]

Being able, therefore, to use various ways of sending commands within a programme not only helps people with specific handicaps, but also renders working with a computer much more comfortable for all users with their different preferences and skills. Larger characters on internet web sites may have originated from somebody considering the needs of people with impaired sight; they do, however, also serve the many users who are long-sighted due to their age. If illustrations in multimedia products are accompanied by explanatory text this may also be done for people with impaired sight – it does however also help all users understand them. Multimedia products addressing several senses or allowing the user to choose between visual and acoustic information not only makes access easier for people with impaired senses but also makes the product altogether more attractive.

Schulmeister therefore advises the following with regard to using the visual or the acoustic mode in multimedia products: "Use as many redundant media as possible and let the user choose his/her preferred medium..."[41] Such redundancy may, according to him, also help in adapting the product to different users, especially in supporting disabled users.[42]

Ad d): Currently quite a number of courses for the visually disabled use different media (braille, tapes, computer files in shorthand for the blind which may be shown in braille-line displays), with the offer growing continuously. Many people with a visual handicap, however, prefer course texts as computer files (on disk/CD-ROM or for downloading) which they may listen to with the help of the screen reader or – when having residual sight – read appropriately enlarged on screen. (This does however pose the problem of what to do with the many non-text elements – i.e. illustrations, formula etc. – which would have to be supplemented or even substituted by verbal descriptions.)

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40 In this context Bergman & Johnson quote a sentence by McMillan (1992, p. 144): „From the point of view of a computer, all human users are handicapped."

41 Schulmeister 1997, p. 57, referring to Bork 1992.

42 Schulmeister 1997, p. 57, referring to Edwards 1992. – Furthermore, Schulmeister (1997, p.57) points out that there can be no general answer as to which are the relative advantages and disadvantages of the visual and acoustic media.

Suggestions on the internet:

a) The use of the internet should not become a prerequisite for studies at *FernUniversität*, since not all disabled applicants use the internet, either because they cannot do so or because they do not wish to use it.
b) Web sites and multimedia products should avoid excluding people with a visual or hearing impairment through their design. Illustrations should be supported by text.
c) The FernUni-homepage should contain links to web sites carrying information for the disabled – e.g.: net and e-mail addresses of important contact persons for disabled students (for instance the Disabled Students Officer, self-help groups run by disabled students); pages containing information on assistive technology suited to the needs of disabled students.
d) Establish special newsgroups for disabled students.
e) More references to interesting *www*-addresses.
f) Extend the *www*-offer and the virtual university: the internet should offer comprehensive information for all subjects; there should be more virtual seminars; more contents should be made available for downloading, particularly literature.

Ad a): Currently web- and multimedia offers as a rule only supplement *FernUniversität* study contents. Most subjects may be studied without using the internet or even a PC.[43] Further steps towards the "Virtual University" will however be taken. This means that in the future the university will have to face the question whether it is possible to pursue distance studies without using the internet. This might mean excluding certain applicants – a problem *FernUniversität* should tackle, like other educational institutions have to do.

Ad b): We have already discussed the necessity to design multimedia products with as many different users in mind as possible. At this point we shall just add a remark on designing www-pages: *The Center for Applied Technology (CAST)* has developed BOBBY, a tool checking www-pages for accessibility to disabled people on the basis of certain minimum criteria.[44] The criteria used by BOBBY are for instance the existence of textual equivalents for all non-text elements or the provision of (verbal) abstracts and explanations for illustrations, diagrams and tables. BOBBY also checks whether the www-pages are compatible with different browsers.

Ad c): The *FernUniversität* web site already makes available the addresses of important contacts for disabled students, albeit distributed over several pages; it might however be useful to group all such links on a special page containing information for disabled students. This page could also contain a collection of links to other web sites with information on assistive technology for disabled people (see above).

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43 But, the *FernUniversität* already offers some degree programmes, which can be studied online.
44 Available on the internet under http://www.cast.org/bobby/.

Ad d) Setting up special newsgroups for disabled students might indeed prove helpful. This should best be done by the self-help group for disabled and chronically ill distance students. FernUniversität could then refer to these newsgroups on its web site and also contribute articles.

Ad e) and f): The *FernUniversität* web site already contains a great number of links and pointers to interesting addresses on the web. It may be assumed that the number of such links will increase, for instance via the pages provided by the different departments.

The number of www-pages and multimedia products offered by *FernUniversität* will also increase in the future. Whether this process gathers speed will amongst other things depend on whether the university succeeds in obtaining additional finance for instance from the land, the federal government or European institutions.

Conclusions

Altogether the survey presents a quite mixed and complex picture of computer use amongst disabled students: For the majority of interviewees, the advantages of PC- and Internet-Use by far outweigh the disadvantages. With this altogether positive assessment in mind, they do see many possibilities for improvement; some also see dangers or refuse to use the PC or the Internet themselves, for various reasons.

It may be hoped that those responsible within the various educational institutions will not loose sight of the special needs of disabled applicants, or may even give them greater consideration in the future. This is particularly important since university studies and participation in academic life are of central importance to many disabled people and are of considerable help to them in realising their wish for a fulfilled life.

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