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Access to Information and Instructional Technologies in Higher Education I: Disability Service Providers' Perspective

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Abstract

Views and concerns of the professionals who deliver disability-related services at Canadian postsecondary education institutions about access to information and instructional technologies are presented. Findings are based on structured interviews with 156 individuals who represent 80% of the population of Canadian campus-based disability service providers. This makes the sample truly representative of the geographic, linguistic and institutional characteristics of the Canadian postsecondary educational system. Key findings in the following areas are highlighted: characteristics of participating professionals; their wish lists; current state of campus information and instructional technologies for students with disabilities at junior/community colleges and universities; important factors in meeting the computer-related needs of students; and the presence and technology needs of postsecondary faculty and staff with disabilities. The results point to (a) the need for better integration of adaptive computer technologies with general-use computer labs on campus; (b) improved learning opportunities for everyone involved, including disability service providers, students, and faculty; and (c) the need to ensure adequate technical support for adaptive computer technologies on campus.

Participation in the knowledge-based economy of today means that people must be comfortable using the new information and communication technologies. Postsecondary education addresses this need, in part, by providing opportunities to learn and use these technologies. Examples include online and "hybrid" courses, Web-based registration, and the ubiquity of computer labs on campus. The challenge is to ensure that these technologies are both physically and technologically accessible to all students, including those with various impairments. Unless this requirement is met, graduates with disabilities face the danger of being unable to compete fairly with their nondisabled peers in a labor market that demands technology literacy.

Currently, the two groups closest to the issue of accessibility of on-campus computing and instructional technologies are the students themselves and the professionals who provide disability-related services to the postsecondary community. Previously, we examined the student perspective (Fichten, Asuncion, Barile, Fossey, & Robillard, 2001a; Fichten et al., 2001b). In the present study the focus shifts to the on-campus disability service providers' technology-related needs and concerns. The goal was to understand these, highlight areas on concern, and propose possible solutions to existing and emerging problems.

Information and Communication Technologies in Postsecondary Education

The increasing use of multimedia, Web-based and other technologies has resulted in rapid changes in both theory and practice in postsecondary education (cf. Bernstein, Caplan, & Glover, 2001; Campus Backbone Connectivity, 1999; EDUCAUSE Guide to Evaluating Information Technology on Campus, 2002; Kiernan, 2002). The ability to quickly learn and use such technologies is a sought-after skill in the new North American labor market. In parallel with this trend is evolution in the accessibility and affordability of both general-use and adaptive computer technologies (cf. Adobe, 2003; Apple, 2003; Freedom Scientific, 2003; IBM, 2003; Microsoft Corporation, 2003). The challenge then becomes ensuring that adaptive technologies are compatible with those appearing in education. If this occurs, it will contribute to providing access for many students with disabilities and permitting them to acquire the same skill sets and opportunities as their nondisabled peers. Such an outcome is, of course, contingent on gaining seamless and timely access to needed technologies and adaptations.

There is a concern that today's emerging technology-driven curricula may pose barriers to many students with disabilities. What happens, then, to the student who is blind or Deaf and studying in a faculty that decides to deliver the majority of its courses using Web sites and authoring tools that do not adopt accessible and inclusive design standards (cf. Scott, Loewen, Funckes, & Kroeger, 2003)? The easy solution is to replace a technology-rich learning experience with one that fails to use computer technologies. This, of course, defeats part of the purpose of the intended learning goal (i.e., acquisition of technology literacy).

Campus-Based Professionals Who Provide Services to Students with Disabilities

At most North American postsecondary institutions, there is at least one designated professional who is responsible for providing disability-related services and accommodations to students as well as to liaise and advocate with the campus community (AHEAD, 2002a, 2002b). In Canada, addressing the computer technology needs of students with disabilities has become part of their job description (Fichten, et al., 2001a). However, the background of many of these professionals has not prepared them for this rapidly evolving "high-tech" component of their job. The trend to incorporate technology as part of classroom teaching and learning will necessitate their increasing involvement and expertise.

Several American (Burgstahler, 1992, 1993; Burris, 1998; Coomber, 1996; Horn & Shell, 1990; Jackson, Morabito, Prezant, & Michaels, 2001; Lance, 1996; Michaels, Prezant, Morabito, & Jackson, 2001) as well as Canadian studies (Epp, 1996; Killean & Hubka, 1999) deal, at least in part, with views of postsecondary disability service providers on computer and adaptive technologies. Several of these have relatively large samples (Burgstahler, 1992, 1993; Horn & Shell, 1990; Jackson et al., 2001; Killean & Hubka, 1999; Lance, 1996; Michaels et al., 2001). Nevertheless, none provides a comprehensive picture of the realities found in Canadian colleges and universities.

Faculty and Staff with Disabilities on Campus

Although we are aware of a handful of postsecondary educational institutions in Canada that provide computer supports to faculty and staff with disabilities (e.g., University of Alberta: cf. Vosahlo, Hyndman, Sears, & Sheridan, 2001), to the best of our knowledge there are no empirical data on demographic factors, the computer and learning technology needs of postsecondary employees with disabilities, or on who is providing disability-related services to them. Similarly, a number of American postsecondary institutions have policies governing technology accommodations to employees (e.g., Vickery & McLure, 1998). However, we are not aware of any systematic evaluation of this issue. What makes the situation of these employees different from those in other industries is that most colleges and universities have a commitment and a support structure to provide services to students with disabilities. Whether this extends to faculty and staff with disabilities requires further study.

The Present Investigation

The goal of this companion study to our previous work on technology access for postsecondary students with disabilities (Fichten et al., 2001a, 2001b) was to provide the other side — the perspective of the on-campus professionals who deliver disability-related services. Issues covered include views about actual and desired situations when it comes to access to technology on campus; perceptions about students' circumstances; and information on campuswide issues, including computer-related services for staff and faculty with disabilities.

Method

Participants

Participants were 156 on-campus professionals responsible for providing disability-related services to students with disabilities (110 females and 46 males).

Ninety-six worked at junior/community colleges, 58 at universities, and 2 at postsecondary distance education institutions (1 junior/community college, 1 university).

Participants represent 91 of the 115 community/junior colleges and 55 of the 68 universities that were listed on the Web pages of the ACCC (Association of Canadian Community Colleges, 2003) or the AUCC (Association of Universities and Colleges of Canada, 2003) on April 22, 2000. Interviewees met the following criteria: (a) their institution enrolled students, (b) they indicated that they had students with disabilities currently enrolled, and (c) they did not indicate that another postsecondary institution was responsible for services for students with disabilities. Several institutions had two or more campuses that were not individual members of AUCC or ACCC but that had different individuals delivering services to students with disabilities (e.g., some provinces have a regional college system with campuses in several cities). At several institutions, different individuals/units were accountable for specific impairments (e.g., learning disability versus physical disabilities). In these cases we attempted to interview all pertinent individuals. This resulted in more than one individual being interviewed at 10 postsecondary institutions. Thus, the 156 participants represent 146 independent institutional members of the ACCC or the AUCC. The overall participation rate was 80%.

Procedure

To recruit participants we telephoned the 247 institutional members of the AUCC and the ACCC that were listed on their Web sites on April 22, 2000. If an institution was a member of both, it was counted as a junior/community college because most of these institutions did not have charters to grant their own degrees.

We asked to speak to the person who had responsibilities for providing services to students with disabilities. Of the 247 institutions/campuses listed, 46 were ineligible because their services for students with disabilities were delivered by another campus or institution (e.g., affiliate colleges). Three member institutions were administrative or research units with no students. Fifteen had students, but declared that they were unaware of any students with disabilities currently enrolled. This left 183 eligible institutions.

Potential participants at the 183 eligible institutions were asked to volunteer. Despite repeated attempts, we were unable to reach potential participants at 11 institutions. Twenty-six individuals either refused to participate or had scheduling challenges. The remaining 156 were faxed or e-mailed the questions and an informed consent form before the scheduled interview. To encourage candid responses, participants were assured that information they provided would never be linked either to themselves or to their institution.

Interviews were conducted by telephone during the spring of 2000. Questions were loosely based on findings from our previous studies on students and smaller samples of campus-based disability service providers (Fichten et al., 2001a, 2001b). The interview protocol was subjected to multiple drafts. The procedure was pretested on a small sample of junior/community college and university professionals.

Structured Interview Questions

Interview questions consisted of 60 items, including demographic questions (all questions are available in Fichten et al., 2001c). Most took two forms: "actual situation," which asked about the current situation at the respondents' campus or sector, and "desired situation," which asked about what would make things better. For the most part, "actual situation" items were positively worded, described a set of conditions at the institution (e.g., computer equipment is up-to-date), and stated that the characteristic met the needs of students with disabilities (e.g., "At my institution, computer and/or adaptive computer technologies are sufficiently up-to-date to meet the needs of students with disabilities"). "Desired situation" items focused on conditions that would make interviewees' jobs easier to perform (e.g., "It would make my job easier if students with disabilities were knowledgeable users of computer and/or adaptive computer technologies"). For 12 topics the two types of items, "actual " and "desired" situation, were paired (e.g., "The availability of adaptive computer technologies in specialized labs/centres for students with disabilities at my institution meets their needs" and "It would make my job easier if there were more adaptive computer technologies available in specialized labs/centres at my institution"). This allowed for comparisons between actual and desired situations.

A key criterion item inquired about how well, overall, the computer and/or adaptive computer technology needs of students with disabilities were met at the respondent's institution. Additional items included asking for the numbers of students with and without disabilities on the respondent's campus and questions about technology-related support for faculty and staff with disabilities.

Results

Data Analysis

Institutional status (junior/community college vs. university) was treated as an independent variable in most analyses. (a) We examined characteristics of postsecondary disability service providers using descriptive statistics, chi square and a 2-way analysis of variance (ANOVA) comparison (2 Sex x 2 Institution, Junior/Community College, University). (b) When comparing institutions with and without specialized computer equipment for students with disabilities, we again used descriptive statistics and chi square. Here we also performed a discriminant analysis and *t*-tests. (c) When evaluating the nature of institutional and computer and adaptive computer technologies, we examined aspects of the 23 "actual situation" variables using descriptive statistics, multivariate analysis of variance (MANOVA), correlations, regression, and *t*-tests. (d) Comparison of "actual" and "desired" situations was carried out using descriptive statistics, t-tests, and MANOVA and (e) The wish lists of disability service providers and issues related to faculty and staff with disabilities were examined using descriptive statistics and chi square.

Characteristics of Postsecondary Disability Service Providers

The sex distribution for individuals responsible for providing services to students with disabilities indicates that women outnumbered men by a ratio of 2:1 (i.e., 110 women and 46 men = 71% women). A nonsignificant chi square test showed that this was true of both junior/community colleges and universities.

Participants had an average of 9.25 years of experience working with students with disabilities (median = 9.50, mode = 10 years, range 1 to 26 years). A 2-way analysis of variance comparison (ANOVA: 2 Sex x 2 Institution (Junior/Community College, University)) showed that males (M = 10.73) had significantly more experience than females (M = 8.60), $F(1,150)=3.92$, $p<.05$. Neither the main effect for institution nor the interaction was significant.

Overall, participants indicated that they were not especially knowledgeable about adaptive computer technologies. The mean score was 3.70 (SD = 1.52) on a 6-point scale, with higher scores indicating being more knowledgeable. Indeed, the scores of 12% of participants suggested that they were not at all knowledgeable, while only 9% of scores suggested that the respondent was an expert. A 2-way ANOVA (2 Sex x 2 Institution) showed no significant differences between males and females or between individuals from community/junior colleges and universities.

Institutions With and Without Dedicated Computer and Adaptive Computer Technologies on Campus

Of the 154 non-distance education respondents, 132 (86%) indicated that they had equipment for students with disabilities on campus; 22 (14%) did not. Community/junior colleges (81%) were significantly less likely than universities (93%) to have specialized computers for their students with disabilities, $X^2(1)=4.00$, $p<.05$.

To determine how institutions with and without computer equipment for students with disabilities differed, we conducted a discriminant analysis. Predictor variables were three institutional enrollment characteristics (number of students with disabilities, total student enrollment, proportion of students with disabilities). Because virtually all universities had equipment for students with disabilities, we did this only for colleges. Test results showed that none of the predictor variables was able to discriminate those colleges that did have equipment from those that did not. We also carried out a series of three *t*-tests to compare enrollment scores on campuses with and without equipment for their students. Although the means showed that institutions that had equipment had more students with disabilities (M=234.17, SD=299.42) than those which did not (M=107.06, SD=197.41), the *t*-test only approached significance, $t(93)=1.67$, $p<.10$. Neither the *t*-test on total institutional enrollment nor that on the percentage of students with disabilities was significant.

Advisory/steering committee. Only 23% of respondents indicated that their institution/campus had a multidisciplinary advisory/steering committee that deals with the accessibility of computer technologies for students with disabilities. Significantly more universities (35%) than community/junior colleges (17%) had such a committee, X^2 (1)=5.14, $p<.05$. All committees had representation from the office for students with disabilities. Most (88%) had an administrator, a student with a disability (81%), and faculty (78%). Few had nondisabled students (31%). It is especially noteworthy that only one fourth (25%) of the committees included staff from computer services.

Priority of computer-related services. The priority placed upon computer-related services was average when weighted against other disability-related support services, with a mean of 2.25 (SD =.87) where 1 indicates very high priority and 4 indicates very low priority. The difference between universities (72% rated computer re-

Table 1

Adequacy Meeting the Computer Related Needs of Students with Disabilities: Mean Scores for Actual Conditions Inside the Institution

Actual Situation: Adequacy Meeting the Needs of Students with Disabilities	Whole Sample		
	N	Mean [1]	*SD*
Overall rating about how well students' computer related needs are met	141	4.20	1.40
Average		**4.20**	
Inside & Outside the Institution Factors			
Funding			
Funding for Institution's Adaptive Computer Technologies	148	3.50	1.76
Average		**3.50**	
Inside the Institution Factors			
Access to adaptive computer technologies			
Hours of access to computers	124	4.28	1.43
Computer technologies up-to-date	130	4.26	1.44
Off-campus loan program	77	3.75	1.62
Availability in specialized labs/centres	116	3.74	1.63
Physical space available for computer technologies	124	3.58	1.72
Training for students on adaptive computer technologies	119	3.17	1.68
Availability in mainstream computer labs	141	2.81	1.72
Average		**3.66**	
Internet/Library & Adaptive Computer Technologies			
Enough adapted computers with Internet access	124	3.70	1.81
Library's computers accessible	145	3.43	1.66
Internet-based distance education accessible	90	2.54	1.51
Average		**3.22**	
Support for Adaptive Computer Technologies			
Administration reacts positively concerning computer accessibility	141	4.25	1.42
Technical support	126	3.48	1.65
Opportunities for employees to learn about adaptive technologies	150	3.24	1.73
Specialist in adaptive computer technologies on campus	144	3.06	1.91
Computer support people can service adaptive technologies	136	3.00	1.73
Consulted when computer infrastructure decisions made	146	2.26	1.71
Advisory/steering committee deals with computer accessibility	145	2.20	1.82
Average		**3.07**	
Faculty and Computer Accessibility			
Computer-based teaching materials used by professors accessible	122	3.14	1.56
Faculty trained in adaptive computer technologies	136	1.96	1.38
Average		**2.52**	
Outside the Institution Factors			
Agencies provide students with appropriate equipment	142	4.27	1.34
Agencies provide students with adequate training	142	3.30	1.61
Average		**3.79**	

Note. Sample sizes reflect the number of individuals who responded to each question.

[1] Based on a 6-point scale, with higher scores indicating stronger agreement with the statement.

lated services as high or very high priority) and colleges (61%) was not significant.

Regional computer technology loan programs to institutions. Of the 132 institutions that indicated that they had computer technologies on campus for their students, 35 (27%) noted that a provincial (Canadian equivalent of a state) or regional loan program supplied some of the computer and/or adaptive computer technologies. Mean response to the question inquiring about perceptions about the adequacy of resources provided by the loan program in meeting the needs of students with disabilities was 4.72 (*SD* = 1.43) on a 6-point scale, with higher scores indicating greater satisfaction. This reflects considerable satisfaction. Indeed, only 16% of respondents indicated that the equipment provided failed to meet students' needs. There was no significant difference between community/junior colleges and universities.

Good Institutional Computer and Adaptive Computer Technologies

Twenty-three variables evaluated the adequacy of the institution's program in meeting students' computer related needs. These are detailed in Table 1. A key criterion was a 6-point Likert scale rating on the following item, *"Overall, the computer and/or adaptive computer technology needs of students with disabilities at my institution are adequately met."* As can be seen in Table 1, the computer-related needs of students were moderately well met at respondents' institutions (mean = 4.20 on a 6-point scale, *SD* = 1.40, range 1-6, median = 5).

Funding for the institution's computer technologies. Scores in Table 1 indicate a mean of 3.50 on a 6-point scale on a question about the adequacy of funding for the institution's computer technologies, with higher scores indicating more favorable responses. In fact, 19% of respondents strongly disagreed with the statement that the level of funding at their institution for specialized computer technologies was adequate in meeting students' needs, with an additional 20% disagreeing moderately. Six percent disagreed slightly. Only a little more than half of the respondents indicated that funding was adequate.

Access to adaptive computer technologies. Table 1 also shows that of the factors related to access, the hours of access to computers and the extent to which they were up-to-date were reasonably good (scores greater than 4 on a 6-point scale). However, the availability of adaptive computer technologies in general-use computer laboratories was seen as less than adequate (score =< 3). Only 77 institutions indicated that they had an off-campus computer technology loan program for students.

Internet/library and adaptive computer technologies. When it came to Internet and library access, the means in Table 1 indicate that Internet-based distance education was seen as inadequate in meeting the needs of students with disabilities (score =< 3). It should be noted, however, that many participants reported that they were unaware of Internet-based distance education courses at their institution.

Support for adaptive computer technologies. Table 1 also shows that the only favorable aspect of support for adaptive computer technologies was the administration's positive response (score greater than 4 on a 6-point scale). Other aspects of support were seen as somewhat or very problematic. For example, available technical support, the presence of an adaptive computer technologist on campus, and the ability of computer support staff to service adapted computer technologies received ratings between 3 and 3.49, as did opportunities for employees to learn about computer and adaptive technologies. The degree to which individuals who provide services to students with disabilities are consulted when computer infrastructure decisions are made and the existence of an advisory/steering committee that deals with computer accessibility were seen as inadequate in meeting the needs of students with disabilities. As noted earlier, only 23% of institutions had an advisory/steering committee that deals with computer accessibility.

Faculty and computer accessibility. Table 1 also reveals that, according to the participants, computer-based teaching materials used by professors were not very accessible (mean was 3.14 on a 6-point scale). In addition, when faculty are trained to use computer technologies in their courses, information about making their courses accessible to students with disabilities was rarely part of the curriculum (score less than 2).

Outside the institution factors. As can be seen in Table 1, disability service providers generally felt that outside agencies provide students with appropriate equipment, although they were less positive about the training provided to students by these agencies.

Similarities and differences between community/junior colleges and universities. To find out whether college- and university-based disability service providers differed on the 23 variables, a multivariate analysis of variance (MANOVA) comparison was carried out. Because it is necessary for all subjects to complete all dependent measures, the MANOVA was carried out only on 21 variables (because relatively few institutions had an equipment loan program or Internet based courses, the two items that dealt with these issues were left out of

Table 2

Adequacy in Meeting the Needs of Students with Disabilities: Correlations with Actual Conditions Inside the Institution in Rank Order Within Sections

Actual Situation: Adequacy in Meeting the Needs of Students with Disabilities (in rank order)	Whole Sample[1] *r*	*p*
Inside & Outside the Institution Factors		
Funding		
Funding for institution's adaptive computer technologies	0.536	***
Inside the Institution Factors		
Access to adaptive computer technologies		
Computer technologies up-to-date	0.603	***
Off-campus loan program	0.592	***
Availability in specialized labs/centres	0.534	***
Training for students on adaptive computer technologies	0.459	***
Physical space available for computer technologies	0.308	***
Hours of access to computers	0.298	***
Availability in mainstream computer labs	0.287	***
Internet/Library & Adaptive Computer Technologies		
Enough adapted computers with Internet access	0.460	***
Library's computers accessible	0.180	*
Internet-based distance education accessible	0.177	
Support for Adaptive Computer Technologies		
Technical support	0.399	***
Specialist in adaptive computer technologies on campus	0.211	*
Opportunities for employees to learn about adaptive technologies	0.209	*
Administration reacts positively concerning computer accessibility	0.203	*
Consulted when computer infrastructure decisions made	0.096	
Advisory/steering committee deals with computer accessibility	0.056	
Computer support people can service adaptive technologies	-0.018	
Faculty and Computer Accessibility		
Computer-based teaching materials used by professors accessible	0.348	***
Faculty trained in adaptive computer technologies	0.050	
Outside the Institution Factors		
Agencies provide students with adequate training	0.162	+
Agencies provide students with appropriate equipment	-0.050	
Personal Factors		
Knowledgeable about adaptive computer technologies	0.291	***

Note. Pearson product-moment correlation coefficients (*r*).

[1] Values based on *Ns* ranging from 115 to 140 (except for loan program (*n*=77) and Internet-based distance education (*n*=86).

***$p<.001$ **$p<.01$ *$p<.05$ +$p<.10$.

the MANOVA). The MANOVA was not significant, $F(21,132)=1.46$, $p>.05$.

Institutional enrollment. To explore whether institutional enrollment factors are important in adequately meeting the computer-related needs of students, we conducted a stepwise regression analysis to predict scores on the criterion item (i.e., the overall rating about how well students' computer-related needs were met). The three institutional predictor variables were number of students with disabilities, total student enrollment, and percentage of students with disabilities. None of the variables entered the regression equation significantly. This is hardly surprising given the magnitude of the correlation between the criterion item and the three institutional variables (Pearson $r(138) =.135$, $p>.05$, $r(139) =.149$, $p>.05$, $r(138) =.114$, $p>.05$, respectively).

Institutions with and without specialized computer equipment for students with disabilities. A comparison was carried out of non-distance education institutions with ($N = 132$) and without computers ($N=22$) on campus specifically for students with disabilities on overall adequacy in meeting students' computer and adaptive computer technology needs. Surprisingly, there was no significant difference between institutions that did ($M=4.26$, $SD=1.36$) and those that did not ($M=3.55$, $SD=1.81$) have specific/dedicated equipment on campus for their students, $t(136)=1.63$, $p>.05$.

Importance of actual situation variables. The importance of the 23 variables listed in Table 1 in meeting students' computer-related needs was examined in a series of correlations between scores on the 23 actual situation variables and score on the overall criterion rating. Coefficients are presented in rank order of importance in Table 2. These show that funding for the institutions' adaptive computer technologies, good access to adaptive computer technologies, accessibility of Internet and library computers, and aspects of technical support for adaptive computer technologies were all important. This is also true of the accessibility of computer-based teaching materials used by professors. Although the services provided by external community agencies were not seen as important, the extent to which the campus-based disability service provider was knowledgeable about computer technologies was seen as a moderately important factor. These results were used to develop the Accessibility of Campus Computing for Students with Disabilities Scale (ACCSDS), a 19-item self-administered tool that evaluates institutional computing accessibility for students with disabilities (Fossey et al., 2003).

Actual" Vs. "Desired" Situation

To help compare "actual" and "desired" situations in terms of the adequacy of meeting the computer- related needs of students with disabilities, Table 3 provides "actual situation" means as well as uncorrected means for the pairs of "desired situation" items ("It would be helpful if …"). It should be noted however, that "desired situation" scores need to be interpreted in the context of the "actual situation" in each institution. This is evident from the Pearson correlation coefficients in Table 3, which showed that scores on 11 of the 12 "paired" items (i.e., paired "actual situation" and "desired situation" items) were significantly negatively correlated with each other (e.g., the less likely it is that computer support personnel can service adaptive computer technologies, the more highly desired it is for them to be able to do so). Table 3 also shows that all 12 paired t-tests comparing "actual" and "desired" situation means were significant. Thus, "desired" scores were significantly greater than "actual" ones (e.g., the mean "actual situation" score for the item that deals with the presence of a specialist in adaptive computer technologies on campus is 3.06 while the mean for the "desired situation" score is 5.28). The most pronounced differences were on items related to support for adaptive computer technologies.

What do individuals responsible for providing services to students with disabilities who have poor "actual situations" feel would be most helpful for them? To answer this question we divided the sample, based on their responses to the "actual" item, into those whose "actual situation" did or did not meet the needs of students with disabilities (i.e., score between 4 and 6 vs. score between 1 and 3). After a significant MANOVA we compared the scores of the two groups using paired *t*-tests.

Means and test results presented in Table 4 showed differences that were significant or approached significance on 10 of the 12 pairs of variables examined. These indicate that service providers whose existing conditions failed to meet the needs of students with disabilities wished to have the situation rectified. The variables that did not differ significantly were both affected by ceiling effects (i.e., scores in both groups over 5 on a 6-point scale).

In addition to comparing the means, it is also interesting to examine the proportion of individuals who felt that their "actual situation" on specific variables did or did not meet students' needs. In this regard it is noteworthy that, as illustrated in Table 4, similar numbers of respondents indicated that their situation met the computer-related needs of their students on 5 of the 12 items. Substantially more respondents indicated that the needs

Table 3

Meeting the Computer-Related Needs of Students: Similarities and Differences Between Actual and Desired Situations

Actual Situation (How Well the Needs of Students with Disabilities Are Met)	Actual Situation		Desired Situation		Desired Situation (It Would Be Helpful If …)	Correlation Between Actual and Desired Situation	
	Mean [1]	*SD*	Mean [1]	*SD*		Correlation	Sig.
Inside & Outside the Institution Factors							
Funding							
Funding for Institution's Adaptive Computer Technologies	3.50	1.76	4.84	1.49	More funding for institution's adaptive computer technologies	-0.440	***
Inside the Institution Factors							
Access to Adaptive Computer Technologies							
Availability in specialized labs/centres	3.74	1.63	4.54	1.58	More equipment available in specialized labs/centres	-0.256	**
Physical space available for computer technologies	3.58	1.72	4.65	1.55	More physical space for equipment	-0.503	***
Training for students on adaptive computer technologies	3.17	1.68	4.99	1.46	A person to train students	-0.392	***
Availability in mainstream computer labs	2.81	1.72	4.82	1.43	Equipment available in more computer labs	-0.402	***
Support for Adaptive Computer Technologies							
Administration reacts positively concerning computer accessibility	4.25	1.42	4.63	1.60	If administration were to react more positively	-0.494	***
Opportunities for employees to learn about adaptive technologies	3.24	1.73	5.18	1.19	Professional development time to learn about adaptive technologies	-0.166	*
Specialist in adaptive computer technologies on campus	3.06	1.91	5.28	1.14	If there were a specialist in adaptive computer technologies on campus	-0.047	
Computer support people can service adaptive technologies	3.00	1.73	5.10	1.31	If computer support people took responsibility for adaptive technologies	-0.244	**
Consulted when computer infrastructure decisions made	2.26	1.71	5.09	1.34	If consulted when computer infrastructure decisions made	-0.257	**
Advisory/steering committee deals with computer accessibility	2.20	1.82	4.48	1.61	Have multidisciplinary advisory/steering committee for adaptive computers	-0.171	*
Faculty and Computer Accessibility							
Computer-based teaching materials used by professors accessible	3.14	1.56	5.17	1.19	If computer-based teaching materials used by professors were more accessible	-0.408	***

Note. Significance tests based on *Ns* ranging from 107 to 147.

[1] Based on a 6-point scale, with higher scores indicating stronger agreement with the statement.

$^{***}p<.001$ $^{**}p<.01$ $^{*}p<.05$ $^{+}p<.10$.

Table 4

Responses of Participants Whose Actual Situations Do Vs. Do Not Meet the Computer Related Needs of Students

Desired Situation	Existing Situation Meets the Needs of Students	*N*	Mean [1]	*SD*	*t* [2]	Sig.
Inside and Outside the Institution Factors						
Funding						
More funding for institution's adaptive computer technologies	Yes	75	4.39	1.68	-3.99	***
	No	68	5.32	1.09		
Inside the Institution Factors						
Access To Adaptive Computer Technologies						
More equipment available in specialized labs/centres	Yes	68	4.25	1.70	-2.59	*
	No	43	4.98	1.24		
More physical space for equipment	Yes	66	4.12	1.70	-4.99	***
	No	53	5.34	0.92		
A person to train students	Yes	44	4.43	1.74	-3.35	***
	No	63	5.41	1.03		
Equipment available in more computer labs	Yes	53	4.21	1.77	-3.97	***
	No	87	5.16	1.08		
Support for Adaptive Computer Technologies						
If administration were to react more positively concerning accessibility of computers on campus	Yes	91	4.22	1.72	-4.82	***
	No	37	5.62	0.64		
Professional development time to learn about adaptive technologies	Yes	71	5.03	1.40	-1.55	
	No	71	5.34	0.92		
If there were a specialist in adaptive computer technologies on campus	Yes	45	5.20	1.34	-0.52	
	No	80	5.31	1.04		
If computer support people took responsibility for adaptive technologies	Yes	50	4.88	1.48	-1.65	+
	No	73	5.27	1.18		
If consulted when computer infrastructure decisions made	Yes	37	4.65	1.74	-1.93	+
	No	109	5.24	1.16		
Have multidisciplinary advisory/steering committee for adaptive computer technologies	Yes	20	3.85	1.93	-1.82	+
	No	109	4.56	1.54		
Faculty and Computer Accessibility						
If computer-based teaching materials used by professors were more accessible	Yes	46	4.63	1.50	-3.44	***
	No	72	5.47	0.90		

[1] Based on a 6-point scale, with higher scores indicating stronger agreement with the statement.
[2] Sample sizes vary from 107 to 146.
***p<.001 **p<.01 *p<.05 +p<.10.

of students were met when it came to two variables. On the remaining five items, substantially more respondents indicated that their situations did not meet the needs of their students. In particular, 109 participants indicted that neither the availability of a multidisciplinary advisory committee nor the extent to which they were consulted about campuswide technology infrastructure decisions met the needs of students with disabilities.

Adequate in meeting the needs of students. Substantially more respondents indicated that the computer-related needs of students were met on the following two items:

- Availability of adaptive computer technologies in specialized labs/centres
- Administration reacts positively concerning accessibility of computers

Mediocre. Approximately one half of the respondents indicated that their situation met the computer-related needs of their students on the following five items:

- Funding for institution's adaptive computer technologies
- Physical space available for computer technologies
- Training for students on adaptive computer technologies
- Opportunities for employees to learn about adaptive technologies
- Computer support personnel can service adaptive technologies

Inadequate in meeting the needs of students. Substantially more respondents indicated that the computer related needs of students were not met on the following five items:

- Availability of adaptive computer technologies in general-use computer labs
- Specialist in adaptive computer technologies on campus
- Consulted when computer infrastructure decisions are made
- Advisory/steering committee dealing with computer accessibility
- Computer based teaching materials used by professors are accessible

Wish List of Personnel Who Provide Services to Students with Disabilities

As shown in Table 5, overall, disability service providers wished that students were better equipped and prepared for the postsecondary experience. For example, three of the four highest-ranked items expressed the wish for students to be more knowledgeable computer users, for students to be able to get subsidized computer technologies for home use more easily, and for students to have better access to computers off campus. The next group of highly ranked items relate to the need for accessibility of computer-based teaching materials used by professors and for support services.

When only the responses of participants who felt that their current situation did not meet the needs of students with disabilities were considered, the top-ranked item was the need for more favorable response from the administration. The need for accessible materials from professors, for a person to train students, for more space for the equipment, for more professional development time and more funding topped the list. Additional details may be found in Table 5.

Faculty and Staff with Disabilities

To study the presence of faculty and staff with disabilities at Canadian community/junior colleges and universities, participants' responses to the following question were evaluated, "*To the best of your knowledge, how many employees with disabilities, including yourself if applicable, are there at your institution?"* Because institutions varied tremendously in size, we also examined the ratio of number of employees with disabilities to the total student enrollment.

Only 106 disability service providers felt able to answer the question about the number of individuals with disabilities employed on campus. Their responses indicated that there was an average of 13 employees with disabilities per institution (SD = 28, range = 0 to 200, median = 3, mode = 0). Comparable proportion data (i.e., number of employees with disabilities per 1,000 students) were as follows. The range of scores is 0/1000 to 20/1000, with a mean of 2/1000, a median of 1/1000 and a mode of 0/1000 employees with disabilities.

Who should provide computer-related services/accommodations to faculty and staff with disabilities? Only 112 participants were able to answer this question. Of these, 23% indicated that they or their office would provide this service. Seventy-seven percent indicated that this was not the case. The chi square test indicated no significant difference between junior/community colleges and universities, X^2=.362, p>.05.

So who, if not the Office for Students with Disabilities, is expected to provide compute- related services to employees with disabilities? Eighty-six respondents provided 100 answers. Detailed in Table 6, these indicated that the most frequent response (cited by 37 participants) was "Human Resources." This was followed by the employee's department or the employee himself or herself. Eight disability service providers did not know. Other

Table 5

Wish List of Personnel Providing Services to Students with Disabilities in Rank Order

Desired Situation (It Would Make My Job Easier If ...)	*N*	Mean	Std. Dev.	Rank
All Respondents				
If students were knowledgeable computer users	151	5.43	0.93	1
If students were able to get subsidized computer technologies for home use more easily	146	5.33	1.06	2
If there were a specialist in adaptive computer technologies on campus	130	5.28	1.14	3
If students had adequate access to computers off campus	144	5.25	1.11	4
Professional development time to learn about adaptive technologies	143	5.18	1.19	5
If computer-based teaching materials used by professors were more accessible	132	5.17	1.19	6
If computer support people took responsibility for adaptive technologies	133	5.10	1.31	7
If consulted when computer infrastructure decisions made	148	5.09	1.34	8
If organizations that provide students with technologies were to work cooperatively	146	5.01	1.36	9
A person to train students	114	4.99	1.46	10
More funding for institution's adaptive computer technologies	145	4.84	1.49	11
Equipment available in more computer labs	147	4.82	1.43	12
More physical space for equipment	122	4.65	1.55	13
If administration were to react more positively concerning accessibility of computers on campus	131	4.63	1.60	14
More equipment available in specialized labs/centres	119	4.54	1.58	15
Have multidisciplinary advisory/steering committee for adaptive computer technologies	132	4.48	1.61	16
Respondents Who Indicated that The Current Situation Did Not Meet the Needs of Students with Disabilities [1]				
If administration were to react more positively concerning accessibility of computers on campus	37	5.62	0.64	1
If computer-based teaching materials used by professors were more accessible	72	5.47	0.90	2
A person to train students	63	5.41	1.03	3
More physical space for equipment	53	5.34	0.92	4
Professional development time to learn about adaptive technologies	71	5.34	0.92	5
More funding for institution's adaptive computer technologies	68	5.32	1.09	6
If there were a specialist in adaptive computer technologies on campus	80	5.31	1.04	7
If computer support people took responsibility for adaptive technologies	73	5.27	1.18	8
If consulted when computer infrastructure decisions made	109	5.24	1.16	9
Equipment available in more computer labs	87	5.16	1.08	10
More equipment available in specialized labs/centres	43	4.98	1.24	11
Have multidisciplinary advisory/steering committee for adaptive computer technologies	109	4.56	1.54	12

[1] Responses of those participants whose answers to the "paired" question was <=3 (i.e., below the midpoint of the scale).

Note. There were no "pairs" for 4 items:

If students were able to get subsidized technologies for home use more easily

If students had adequate access to computers off campus

If students were knowledgeable computer users

If organizations that provide students with technologies were to work cooperatively

responses noted by several participants included computer services, the institution's administration, an employment equity/human rights committee, rehabilitation services external to the institution, and occupational health and safety.

Discussion

Limitations of the Research

We were fortunate to obtain the participation of 156 individuals who provide disability-related services to students. They represent 80% of the population of campus-based disability service providers. Thus, our sample is truly representative of the geographic, linguistic, and institutional characteristics of the Canadian postsecondary educational system. Nevertheless, certain limitations should be kept in mind when interpreting the findings.

First, the majority of participants admitted to having limited knowledge of adaptive and computer-based learning technologies. Therefore, we cannot be sure about how they interpreted certain concepts (e.g., computer-based teaching materials). A related problem involves interpretation of the term "accessibility" (e.g., available vs. usable by students with different impairments). When asked, we clarified what we meant. Also, some participants consulted their institution's adaptive technology expert. Most did not. This, too, could have influenced the findings.

A second concern relates to respondents' difficulty in answering questions about the number of students on campus. This applies both to the question about the number of students with disabilities and the one about overall campus enrollment. This occurred because there are many different categories of students: full-time, day, evening, continuing education, and so on. In general, the number provided by respondents reflected the number

Table 6

Who Does or Is Supposed to Provide Computer-Related Services to Faculty and Staff with Disabilities?

Response	Responses[1]		
	Rank	Number	Percent
Human resources	1	37	37%
Employee's department	2	13	13%
Employee himself or herself	3	10	10%
Don't know	4	8	8%
Computer services	5	7	7%
Institution's administration	6	6	6%
Employment equity/human rights committee	6	6	6%
Rehabilitation services external to the institution	7	5	5%
Occupational health and safety	8	4	4%
Disability and accommodation office for staff	9	1	1%
Dean of faculty	9	1	1%
Dean of student services	9	1	1%
Grant	9	1	1%

[1] 100 responses made by the 86 (77%) participants who indicated that computer-related services for employees with disabilities were not provided by the office for services to students with disabilities; 26 (23%) participants indicated that services were provided by their office.

of students registered to receive disability-related services.

In spite of these limitations, available validity indices suggest that responses in our study accurately reflect the situation of these professionals. Wherever comparisons were possible with American or Canadian data from smaller samples, the results show remarkable consistencies. This is true of the number and the proportion of students registered to receive disability related services on campus and overall institutional enrollments (Fichten et al., 2003), as well as the nature of issues and concerns raised by the participants. In spite of these favorable checks on ecological validity, the limitations noted above must be taken into consideration.

Who Are They? Characteristics of Professionals Who Provide Services to Students with Disabilities

Two thirds of our participants were women, a figure only slightly lower than the 80% reported in a recent American study (Michaels et al., 2001). Although there was great variability, participants had, on average, spent between 9 and 10 years working in this field. Males had more experience than females. The experience of those working in colleges and universities did not differ significantly. No significant differences were found between males and females or between college- and university-based staff on knowledge about information and instructional technologies. Generally, participants indicated that they were not very knowledgeable about computer technologies for students with disabilities. In their recent American investigation, Michaels et al. (2001) also found this to be the case. Surprisingly, this is very similar to data collected by Lance (1996) almost a decade ago. What is different between her results and ours is that participating professionals now recognize the need for training in this area.

Expertise in the use and deployment of computer and adaptive computer technologies for students with disabilities is rapidly becoming a necessity in postsecondary education. This suggests that money and time need to be invested in professional development opportunities.

Actual Situation of Specialized Computers on Canadian Campuses

Institutions with and without computer and adaptive computer technologies on campus for students with disabilities. In previous research we showed that close to one half of postsecondary students with disabilities need some type of adaptation to use a computer effectively (e.g., keyboard and input device modifications, screen magnification or voice output, dictation software) (Fichten et al., 2001a). Given the large numbers of students needing adaptations, it was not surprising to find that most institutions (86%) had some specialized computer equipment for them. This is a marked improvement over American data from a decade ago, which showed that only 60% to 70% of institutions provided computer equipment for their students with disabilities (Burgstahler, 1992, 1993; Horn & Shell, 1990).

Our data show that virtually all universities had specific/dedicated equipment. Even though the average number of students with disabilities enrolled in junior/community colleges and universities is very similar (Fichten et al., 2003), colleges were significantly less likely to have such equipment. The main difference between the 81% of community/junior colleges that had some type of specialized *co*mputer or adaptive computer technologies and the 19% that did not was the number of students with disabilities on campus.

Multidisciplinary advisory/steering committee that deals with the accessibility of computer technologies for students with disabilities. It is important to note that less than one fourth of institutions had a multidisciplinary advisory/steering committee that deals with the accessibility of computer technologies for students with disabilities, a finding similar to American statistics (Lewis, Farris, & Greene, 1999). Universities were somewhat more likely than community/junior colleges to have such a structure. Thus, 34% of universities had them, while only 17% of community/junior colleges did so. Neither distance education institution had one.

These committees generally included at least one representative from the office for students with disabilities, the administration, students with disabilities, and the faculty. Only one fourth had computer services staff representation. This is similar to American findings from the early 1990s (Burgstahler, 1992, 1993), where only about one third of higher education institutions made decisions after formal broad-based consultation. With the increased use of computer technologies in the delivery of postsecondary education, this is an important area where broader consultation will be needed. Specifically, in the future, it will become necessary to ensure that course and department Web pages, materials in courses using authoring tools such as WebCT, off-the-shelf software loaded onto networks, and so on, meet accessible and inclusive design guidelines (cf. Do-It, undated; Scott et al., 2003) and are compatible with adaptive technologies.

If the use of technology in higher education contin-

ues to be an important priority on North American campuses, these types of committees with the necessary mix of expertise are vital to ensure that disability-related concerns can be addressed. This would also provide a more prominent role for accessibility and would go a long way toward ensuring that all interested parties are consulted when campuswide computer infrastructure decisions are made.

Priority placed upon computer-related services. In general, when asked to consider their full range of disability-related services, respondents told us that computer-related services were accorded a priority between high and low. American data indicate greater importance (Michaels et al., 2001). Indeed, U.S. data show that adapted equipment ranks seventh among the most prevalent disability services and accommodations in community colleges (cited in Most college students with disabilities attend community colleges, undated). Universities accorded somewhat higher priority to such services than colleges. In the future we expect this function will gain in importance as all postsecondary institutions proceed along the road to greater integration of computer technologies across curricula.

Regional computer technology loan programs to institutions. An important finding concerns the strong satisfaction expressed by service providers with the equipment provided by centralized regional loan banks for computer technologies. Thus 35% of institutions indicated that a centralized loan program supplied some of the specialized computer and/or adaptive computer technologies on campus. There was no significant difference on this variable between community/junior colleges and universities. Indeed, only 16% of respondents who had access to a loan bank indicated that the equipment provided failed to meet students' needs.

Institutional Computer and Adaptive Computer Technologies

Overall, respondents reported that the computer-related needs of students with disabilities were moderately well met at their institutions. This was true for both community/junior colleges and universities. Neither the size of the institution nor the number or proportion of students with disabilities was related to overall adequacy in meeting students' technology needs.

It was counterintuitive to find that availability of specialized equipment on campus was unrelated to meeting students' computer-related needs. Nevertheless, similar findings have been reported by others (e.g., Lance, 1996). It should be noted that it was primarily the community/junior colleges that had relatively low enrollments of students with disabilities that were likely to have no dedicated equipment on campus. The lack of a link between availability of specialized technologies and the institution's ability to meet the computer-related needs of these students may reflect three possibilities. First, students on campuses with no dedicated equipment may not need any specialized computer technologies because using computers on campus is not required by their programs. Second, it is feasible that many of them do not need specific adaptations and are able to use the equipment available in the college's general-use computer labs. The third possibility is that they are able to cope by using their own equipment and/or extensive human assistance on campus.

We do not have data bearing directly on this issue. The findings of our previous investigations (Fichten et al., 2001a, 2001b) do suggest, however, that it is a combination of all three possibilities that best explain the findings. First, most students with disabilities are enrolled in social sciences and creative arts programs, which, at this point, tend not to use computer technologies in sophisticated ways. Second, data from our previous investigations indicate that somewhat less than half of them need adaptations to use a computer effectively. Third, our previous findings indicate that most students have computer equipment available to them off campus. Finally, anecdotal information from our respondents (cf. Fichten et al., 2000) suggests that in smaller colleges, service providers are able to make available human assistance to students (e.g., have someone read material for students with print impairments, arrange for a scribe or a note taker to assist students with writing).

Those who work at smaller community/junior colleges and on campuses that have little or no dedicated computer equipment or support for their students with disabilities felt that the lack of equipment has not posed significant problems. This is because enrollments are still low enough so that human assistance is available in place of technological adaptations (Fichten et al., 2000, 2001a). Thus, service providers in smaller community/junior colleges may have been proceeding with an individualized, case-by-case approach. In this regard, however, it should be noted that Paul Grossman, in recapping a recent landmark decision by the U.S. Department of Education's Office for Civil Rights, pointed out that providing human assistance in lieu of making computer adaptations available was not an appropriate accommodation (Hamilton, Grossman, Black, & Tate, 2001). This is because such assistance does not afford students with disabilities the same opportunities as those available to their nondisabled peers. For example, assistance is avail-

able only when the human assistant is available, there is a loss of autonomy, and skills needed to function in the academic environment are not learned. In the near future, all campuses must make computer technologies available to meet the needs of students with disabilities. The need to ensure adequate access and usage of appropriate computer technologies is also underscored by the findings of Rumrill, Koch, Murphy, and Jannarone (1999). Their in-depth interview study of a small sample of recent graduates suggests the need for postsecondary institutions to play a more active role in introducing students to computer and adaptive technologies if they wish to facilitate transition from higher education to the workplace.

Evaluation Criteria: Meeting the Computer-Related Needs of Students with Disabilities

The following factors were deemed important in ensuring that the institution is technologically welcoming to its students with disabilities:

- Sufficient funding for computer and adaptive computer technologies
- Adequate training opportunities for students from agencies in the community
- Good access to adaptive computer technologies on campus
- Computer and adaptive computer technologies that are up-to-date and available in both general-use computer labs and specialized labs/centres
- The existence of an off-campus computer technology loan program
- Availability of training for students on adaptive computer technologies
- Adequate physical space to house computer technologies
- Extensive hours of access to computers, including adapted computer technologies
- Availability of support for adaptive computer technologies on campus
- Good technical support for adaptive computer technologies on campus
- Opportunities for employees to learn about adaptive technologies
- Favorable reactions from administration concerning the accessibility of computers
- Expertise with adaptive computer technologies of disability service providers
- Accessible computer based teaching materials used by professors
- Availability of sufficient numbers of adapted computers with internet access
- Library computers that are accessible to students with a variety of impairments
- Internet-based distance education designed to be accessible to students with disabilities

Report Card: Adequacy of Computer and Instructional Technologies On Campus

In general, the responses indicated that the overall computer-related needs of students with disabilities on campus were reasonably well met. This is similar to ratings in others' studies (e.g., Burris, 1998). There were relatively few differences between community/junior colleges and universities. However, where institutional differences did exist, ratings at universities were generally more favorable than those at colleges. There were areas of strength and weakness for both community/junior colleges and universities.

Areas of strength were:

- Hours of access to computers and the extent to which they were up-to-date
- Administrations generally respond favorably when it comes to issues related to the accessibility of computers for students with disabilities
- Community agencies provided students with appropriate equipment

Participants felt that college administrations were supportive of the computer-related concerns of students with disabilities. Yet, there was a suggestion that this support may not extend to good funding. A common comment was, "They are certainly supportive in words, but in terms of being proactive, and putting money where their mouths were, that is a totally different issue." For example, the rating concerning the adequacy of the current state of funding received a score below 4 on a 6-point scale and additional funding for computer and adaptive computer technologies was a highly rated item on service providers' wish lists.

Problem areas were:

- Poor technical support for adapted computer technologies
- Inadequate availability of adaptive computer technologies in general-use computer laboratories and lack of physical space for adapted computers in specialized labs/centers
- No off-campus computer technology loan program for students
- Few opportunities for employees to learn about computer and adaptive technologies

- Lack of consultation of disability service providers when campuswide computer infrastructure decisions are made
- Absence of multisectorial advisory/steering committees to deal with computer accessibility
- Inaccessible Internet-based distance education courses
- Computer-based teaching materials used by faculty are frequently inaccessible and faculty are not informed about computer related needs of students with disabilities
- Community agencies do not provide adequate training for students using adaptive technologies

Overall, ratings related to support for computer and adaptive computer technologies for students with disabilities were generally poor as was the overall level of interdepartmental collaboration. Also, many noted a lack of awareness by faculty regarding computer-related problems. For example, in training programs aimed at promoting the educational use of computer technologies by faculty, issues related to accessibility for students with disabilities were generally not discussed. An anecdotal example highlights this. One of us, while taking a seminar at a large metropolitan university on how to develop course-related Web pages, was told when asking about the accessibility of a course tool that, "Professor, don't you know? Students who are blind cannot see the monitor. So they can't use a computer." Q.E.D.

Wish Lists

Examination of respondents' wish lists showed, not surprisingly, that desired items followed low ratings concerning the institution's actual situation. In particular, they indicated that their jobs would be easier to carry out if students were better equipped and prepared for the computer-related aspects of the college experience. For example, three of the four most highly ranked items expressed the wish for students to be able to get subsidized computer technologies for home use more easily, for them to have better access to computers off campus, and for students to be more knowledgeable computer users.

The next group of highly ranked items related to technical and financial support, including having the institution's computer support people take more responsibility for adaptive computer equipment, an adaptive computer specialist, better funding for computer-related activities, and more space for equipment. Respondents also wanted to be consulted when campuswide IT infrastructure decisions are made and professional development time to learn about adaptive computer technologies.

Last but not least, respondents wished that technology-based teaching materials and techniques used by faculty were more accessible. Indeed, lack of faculty awareness about students' computer and instructional technology needs is echoed by recent American findings (Michaels et al., 2001).

Faculty and Staff with Disabilities

Presence on campus. Many respondents were unable to even estimate the number of employees with disabilities at their institution. When responses were provided, the most common response was 0 employees with disabilities at the respondent's institution. The median response was 3 individuals and the mean was 13. There were large discrepancies, with a range of 0 to 200. Community/junior colleges and universities did not differ significantly on either the number or the proportion of employees with disabilities.

Who should provide computer- related services/ accommodations to faculty and staff with disabilities? Less than one fourth of respondents indicated that they or the Office for Students with Disabilities would do so. So if not them, then who? Here, there was considerable confusion. The most popular answer (37%) was Human Resources. This was followed by the employee's department (13%). It was especially dismaying to find that the next most popular response was that the employee himself or herself was responsible (10%), or that the respondent simply did not have any ideas about who should provide computer-related services to these employees (8%). This is an issue that has to be addressed in the near future.

Future Research

Our findings highlight the need for further study in a variety of areas. These include: what are the best means of ensuring the availability of adaptations in general-use computer labs; what kinds of training opportunities about adaptive computer technologies are best suited for disability service providers and for faculty; how can the institutional IT staff best be motivated to take responsibility for adaptive computer technologies; what are different ways of ensuring that students have access to training and needed adapted equipment for home use; how many individuals with disabilities work in postsecondary education and who is responsible for providing services, including computer-based accommodations.

In Conclusion

It is important to ensure that postsecondary administrators, instructors, and other campus-based technicians and professionals incorporate accessible and inclusive design principles when planning and implementing learning and computer technologies. These must be accessible to the whole campus community. Professionals who provide disability-related accommodations and students with disabilities have to be at the table during such discussions. Otherwise, higher education institutions will contribute to widening the digital divide and to disenfranchising individuals with disabilities by denying them opportunities to learn and compete on an equal footing for employment in the new economy. Recommendations and practical suggestions about how to accomplish changes are provided in a companion article in this issue

Author Notes

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