

ACADEMIC SUCCESS OF GRADUATES WITH AND WITHOUT DISABILITIES: A COMPARATIVE STUDY OF UNIVERSITY ENTRANCE SCORES

In this article we summarize a research study that focused on the academic success of junior/community college (CEGEP) graduates with disabilities as well as on the obstacles they faced and the facilitators of their success (Jorgensen, Fichten & Havel, 2007). The goal of the project was to determine whether graduates with disabilities have the same opportunities to access higher education as their non-disabled peers. The CRC score (*cote de rendement au collégial*) is an important determinant in ensuring entrance to universities in Quebec following the completion of a DEC. The CRC score has a theoretical range of between 1 and 50 and is a weighted-grade average that uses a z score and an index of difficulty of the group against which the student is measured. In order to assess the competitiveness of the three groups in gaining access to university, we therefore chose to compare the CRC scores of graduates with disabilities (both those who registered for disability services and those who did not) with their non-disabled peers. In addition, we attempted to isolate factors which are important for academic success by examining whether the ease with which graduates experienced aspects of their college studies and their personal lives was related to their CRC scores.

The graduate sample consisted of all graduates who completed their diplomas between 2002 and 2006 (N=9,406; 5,872 males and 3,534 females). Of these, approximately a third completed at least one of the surveys administered by the college during that period. These surveys provided students with the opportunity to self-report their disabilities and this allowed us to include them in the disability sample. Examples of the surveys include the Incoming Students Survey administered annually, the Noel-Levitz Student Satisfaction Inventory which is administered once every three years and the CEGEP Experience Questionnaire (CEQ) which was used as part of this research. The CEQ provided the information on students' perceptions of their CEGEP experiences.

We were able to identify whether a graduate had a disability, as well as the nature of that disability, from two sources: the archives of the Services for Students with Disabilities office (N=275) and self-reports on surveys conducted at the college during this period (N=145). An estimated 300-400 graduates in the sample had a disability but could not be identified because they neither registered for services nor self-reported. Approximately 60% of all three groups included in the study were females. The three groups were: 1) graduates without disabilities, 2) graduates with disabilities who had registered for disability-related services, and 3) graduates with disabilities who had not registered but did self-report their disabilities. The CRC scores and the obstacles and facilitators of success of graduates with learning disabilities (LD) were also compared to those of graduates with disabilities other than LD and of graduates without disabilities.

In the process of analyzing the data, we found that graduates who completed at least one college survey had higher high-school-leaving grades and higher CRCs

than their counterparts who had not completed any surveys. This is consistent with the findings of others (eg, Woosley, 2005). This was true whether or not the graduate had a disability. Since one of our goals was to compare the CRC scores of registered graduates with disabilities (a group consisting of both survey-responders and non-responders) with the scores of unregistered graduates with disabilities (a group consisting of survey responders only), it was important to take this tendency for survey-responders to have higher scores into account since survey responders would have a range of scores that excluded many in the lower end of the range.

COMPARISON OF CRC SCORES OF GRADUATES WITH AND WITHOUT DISABILITIES

When the survey responder effect was taken into account, there was no significant difference between the CRC scores of graduates with disabilities who had registered and of those who had not registered for disability-related services from the college. This was true for both graduates with learning disabilities (LD) and graduates with disabilities other than LD.

We also found that graduates with LD tended to have lower CRC scores and high-school averages than either graduates with other disabilities or graduates without disabilities. However, there was no difference in CRC scores of graduates with disabilities other than LD and of graduates without disabilities.

Overall, males tended to have lower CRC scores and high-school averages than females. However, there were no differences in CRC scores of males and females without disabilities for equivalent high-school averages. This was also true for graduates with disabilities other



SHIRLEY JORGENSEN
Coordinator
Institutional Research
Dawson College



CATHERINE S. FICHTEN
Teacher
Department of Psychology
Dawson College



ALICE HAVEL
Counselling Ombudsperson
Centre for Students with
Disabilities, Dawson College

than those with LD. However, males with LD tended to obtain lower CRC scores than other male graduates who had similar high-school grades.

We found that the percentage of graduates with LD who had high-school averages below 75 was especially high (65%) when compared both to graduates without disabilities (34%) and to graduates with disabilities other than LD (40%). The figure was particularly high for male graduates with LD (78%). The high-school average had a relatively high correlation with the CRC score and was moderately successful in predicting whether a graduate obtained a CRC above or below 26 (a score usually considered acceptable for admission by major universities). Therefore, a higher percentage of graduates with LD had CRC scores in the lower range, thus limiting the university programs available to them.

► RELATIONSHIP BETWEEN CRC SCORES AND PERCEPTIONS ABOUT COLLEGE EXPERIENCES

Graduates were surveyed on their own perceptions of the ease/difficulty with which they experienced various aspects of their college environment and their personal lives. Graduates who were registered for disability-related services experienced aspects of their college experience to be easier than both graduates with disabilities who did not register and graduates without disabilities. Graduates with disabilities who did not register rated their college experience as hardest. Overall, graduates who perceived aspects of their college experience to be harder had, on average, lower CRC scores. This pattern of lower CRC scores held true both for

unregistered graduates with disabilities and for graduates without disabilities. It did not hold for graduates registered for disability-related services. Graduates who registered for disability-related services tended to have a higher proportion of graduates who reported more facilitating experiences; however this did not necessarily translate into better CRC scores. CRCs of graduates who had registered for disability-related services did not differ significantly from those of unregistered graduates with disabilities. For registered graduates, only 3% had a score in the non-facilitating (harder) range. This compares with 23% of unregistered graduates with disabilities and 10% of graduates without disabilities.

When all graduates were considered, nine of the items pertaining to college experiences rated by respondents were significantly related to CRC scores. Three of these were also significant for graduates with disabilities. *Study Habits* and *Level of Personal Motivation* showed the strongest relationship with CRC scores for graduates with and without disabilities. *Disability Related Support Services Off-Campus* was also significant for graduates with disabilities. *Level of Personal Motivation* was particularly important for graduates with disabilities and accounted for the largest variability in CRC scores after high-school grades.

For students with and without disabilities, the high-school grade had the strongest relationship with the CRC score, accounting for 51%-54% of the total variability. Once the high-school grade was accounted for, only four additional variables contributed to the variability in the CRC score for students without disabilities. These included *Study Habits* (3.6%) followed by *Attitudes of Professors* (0.7%), *Computers Off-Campus* (0.5%) and *Level of Personal Motivation* (0.4%). For students with disabilities only one perception about their college experiences (*Level of Personal Motivation*) proved to be related to the CRC score. The *Level of Personal Motivation* accounted for 8% of the linear relationship with the CRC score and the *High-School Grade* accounted for 54% of the variability.

The high-school average proved to be a moderately good predictor of whether both non-disabled graduates and graduates with disabilities obtained a high (>26) or low (<=26) CRC score as it classified correctly between 75% and 80% of graduates in each of the categories. The perceptions-about-college-experiences variables added little in predictive ability. Although, the variables alone did result in better-than-chance prediction, they were a poor predictor of the low CRC group.

We found that underachievers (*i.e.*, those who performed below expectation based on their high-school average) perceived that their *Financial Situation*, *Level of Personal Motivation* and *Availability of Computers Off-Campus* made their studies harder while the *Accessibility of Classrooms and Labs* made their studies easier. In a similar manner, differences between correctly-classified and misclassified overachievers were compared. The only variable showing a significant difference in the mean CRC was *Private Tutoring*. Graduates who overachieved reported higher or more facilitating scores on this variable (4.65) than those who were correctly classified (4.05) in the low group (on a scale range of 1-6).



DISCUSSION AND IMPLICATIONS FOR PRACTICE

The objectives of the study were to determine whether graduates with disabilities have the same opportunities to access higher education as their non-disabled peers, and to determine whether the ease with which graduates experienced aspects of their CEGEP studies correlated with their college-exit grades. The CEQ allowed us to isolate those factors that are considered to be important for college success, as perceived by graduates themselves. These outcomes have implications both for service providers and for teachers. The fact that higher college-exit grades could not be associated with registration for disability services should not be interpreted to be indicating that registration for disability-related services does not result in improved success for this group of students. Although such services ease students' progress through their college studies, we do not know the extent to which disability-related services contribute to improved retention and graduation of students with disabilities. Evidence was provided for this from our examination of graduate responses to the CEGEP Experience Questionnaire. Graduates with disabilities who registered for disability-related services perceived aspects of their college experience to be significantly easier than both non-disabled graduates and graduates with disabilities who did not register.

[...] we found that graduates who completed at least one college survey had higher high-school-leaving grades and higher CRCs than their counterparts who had not completed any surveys.

The more-positive perceptions about their college experiences of graduates who were registered for disability-related services may well be related to a number of services provided to students with disabilities as they proceed through to graduation. It is possible that many students with disabilities who do not register for disability-related services will fail to persist. In a research study comparing high school completers and non-completers with LD, it was suggested that it may not be academic skill *per se* but rather a student's application of skills such as motivation to attend class and to complete assigned tasks that are important factors in determining high-school completion (Bear, Kotering & Braziel, 2006). This may be true of college completion as well. Graduates in the present study who registered for disability-related services reported higher levels of motivation and more facilitating study habits than unregistered graduates with disabilities. These may be important determinants of persistence that are facilitated by the service provider.

The availability of disability-related services off-campus was related to higher CRC scores. Therefore, students with disabilities may need to be made aware of the types of community-based resources and services available to meet their needs. Students who overachieved relative to expectations rated *Private Tutoring* as a facilitator of their college success; therefore students need to be encouraged to seek tutoring in areas where they are weak academically.

Nine perceptions about college experiences were positively related to the CRC score for graduates without disabilities. These were: 1) *Study Habits*, 2) *Level of Personal Motivation*, 3) *Availability of Computers Off-campus*, 4) *Previous Educational Experience*, 5) *Attitudes of Professors*, 6) *Financial Situation*, 7) *Family*, 8) *Level of Difficulty of Courses*, and 9) *Willingness of Professors* (to adapt courses to the needs of students).

For graduates with disabilities, *Study Habits*, *Level of Personal Motivation* and *Disability Related Support Services Off-Campus* were most strongly related to the CRC score. College units and departments that provide support for students in the nine areas identified are likely to enhance student success for both groups of students.

The findings show that graduates with disabilities who register with the college for disability-related services perceive their circumstances, including aspects of the college environment, to be more facilitating of their academic success than do graduates with disabilities who do not register for such services. This suggests that students who currently do not register for such services may benefit from doing so. Thus, the results suggest that publicity campaigns that showcase the benefits of registering may promote the success of students with disabilities.

That motivation is important has been demonstrated in our findings and the findings of others (e.g., Barbeau, 1994). Registering for disability-related services may help students sustain the level of personal motivation that is required for them to succeed. In this study we found that the score for *Study Habits* on the CEQ was correlated with college-exit grades and accounted for 3.6% of the variability. This is consistent with the findings of Murray & Wren (2003) where the Study Habit construct on the SSHA survey (Survey of Study Habits and Attitudes) was found to account for 5% of the variability in GPA. It is important, therefore, that advisors and service providers support students' efforts to improve their study habits.

In a study of the experiences of students with disabilities at a Canadian university, Duquette (2000) found that moral



support and accommodations provided by professors were considered by many students to be critical factors contributing to their success; while Cox & Klas (1996) found that professors' attitudes and lack of understanding of the needs of students with disabilities were seen by students to be barriers to their success. In this study we found that graduates with disabilities who registered for disability-related services had more positive experiences of professors' willingness to make accommodations than either unregistered graduates with disabilities or graduates without disabilities. They also experienced no greater difficulties with respect to the attitudes of professors. These findings may well be related to the advocacy work undertaken with professors by the Services for Students with Disabilities in order to overcome negative attitudes that either constrain the achievements of students with disabilities or discourage them from continuing their studies. This has implications for both academic advisors and teachers. Academic advisors need to provide a forum for students with disabilities to discuss how teachers can become more sensitive to the needs of these students as well as to the role the students themselves may play in achieving the self-advocacy skills that would allow them to request and obtain the accommodations they need. On the other hand, teachers need to be sensitized to the special needs of this group of students and they also have to actively seek assistance from their campus-based disability service providers.

We found that graduates with LD had lower college-exit grades compared both to graduates with other impairments and to graduates without disabilities. This puts LD graduates at a disadvantage in the competition for places at university. It has been shown that young people with learning disabilities attend colleges and universities at lower rates

than their non-disabled peers (Murray & Wren, 2003). In this study we found that male graduates with learning disabilities had lower college-exit grades than all other groups, an outcome that could not simply be explained by their poorer high-school grades when entering college. It is possible that students with learning disabilities continue to experience greater academic difficulties with the increasing complexity of learning tasks as they progress from high school through college (Deshler, Schumaker, Lenz, *et al.*, 2001). The results suggest that students with learning disabilities, particularly males, may be considered a population at risk and that more intense efforts to assist them in college are required. As the number of students with LD enrolled in CEGEPs continues to increase, the role of faculty in accommodating the special needs of this group of students becomes increasingly important. Institutional support is therefore required in order to assist teachers to become aware of accommodations that best meet the needs of this group of students and to help them integrate these accommodations into their teaching practice. ♦

REFERENCES

- BARBEAU, D., *La motivation scolaire: plans d'interventions et d'observation*, Programme d'aide à la recherche sur l'enseignement et l'apprentissage (PAREA), Québec, PAREA, 1994.
- BEAR, G. G., L. J. KORTERING & P. BRAZIEL, "Remedial and Special Education", Vol. 27, N° 5, pp. 293-300, 2006.
- COX D. H. & L. D. KLAS, "Students with Learning Disabilities in Canadian Colleges and Universities: A Primer for Service Provision", *Journal of Learning Disabilities*, Vol. 29, N° 1, pp. 93-97, 1996.
- DUQUETTE, C., "Experiences at University: Perceptions of Students with Disabilities", *The Canadian Journal of Higher Education*, Vol. 30, N° 3, pp. 123-232, 2000.
- JORGENSEN, S., C. H. FICHTEN & A. HAVEL, *CEGEP Graduates with Disabilities—College Exit CRC Scores of Graduates Registered for Disability Related Services Compared to Non-disabled Graduates and Graduates without Disabilities*, PAREA Final Report, Montreal, Dawson College, 2007.
- MURRAY, C. & C. T. WREN, "Cognitive, Academic and Attitudinal Predictors of Grade Point Averages of College Students with Learning Disabilities", *Journal of Learning Disabilities*, Vol. 36, N° 5, pp. 407-415, 2003.
- WOOSLEY, S., "Survey Response and its Relationship to Educational Outcomes Among First Year Students", *Journal of College Student Retention: Research, Theory and Practice*, Vol. 6, N° 4, pp. 413-423, 2005.
- DESCHLER, D., J. B. SCHUMAKER, K. LENZ, J. A. BULGREN, M. F. HOCK & J. KNIGHT, "Ensuring Content Area Learning by Secondary Students with Learning Disabilities", *Learning Disabilities Research and Practice*, Vol. 16, pp. 90-108, 2001.

Shirley JORGENSEN, M.BA. has worked for over 15 years in the field of Institutional Research both at the University of Western Sydney in Australia and, for the past 9 years, at Dawson College in Quebec. She is currently leading a project funded by both the Canadian Council on Learning and PAREA to examine various risk factors related to males and students with disabilities.

sjorgensen@dawsoncollege.qc.ca

Alice HAVEL completed her Ph.D. in Counselling Psychology at McGill University in 1993. For the past 14 years she has been involved in providing services at the college level to students with both physical disabilities and learning disabilities. She is a member of the Advisory Board of the Adaptech Project and has participated in several projects and presentations.

ahavel@dawsoncollege.qc.ca

Catherine S. FICHTEN holds a Ph.D. in Psychology. She is a teacher in the Department of Psychology at Dawson College. She also is an Associate Professor in the Department of Psychiatry at McGill University. She co-directs the Adaptech Research Network.

catherine.fichten@mcgill.ca

JUST COMPUTER-AIDED INSTRUCTION IS NOT ENOUGH

COMBINING WEBWORK WITH IN-CLASS INTERACTIVE SESSIONS INCREASES ACHIEVEMENT AND PERSEVERANCE OF SOCIAL SCIENCE CALCULUS STUDENTS

INTRODUCTION

In the late 1500's Clavius introduced Mathematics to university studies and ever since, instructors have struggled with how to teach/learn Mathematics (Smolarski, 2002). Complaints about Mathematics instruction are not a new phenomenon. The Bulletin of the American Mathematical Society in 1900 (October 1900, pp. 14-24) states, "The fundamental principles of Calculus must be taught in a manner wholly different from that set forth in the textbooks" (Ewing, 1996). One hundred years later, while student success and understanding ebb, we still debate how to teach Calculus.

Teaching Mathematics in science programs at the post-secondary level has been abundantly studied over the past decades (e.g., Springer, Stanne and Donovan, 1999) while teaching Mathematics in so-called service courses has received much less attention. This is unfortunate because students' lack of success and perseverance at college-level Mathematics can seriously jeopardize their career plans in the Social Sciences. Successful completion of a course in Differential Calculus is a condition of admission into business programs at any Quebec university. Although a college-level course in Mathematics is not a prerequisite for admission to a variety of other Social Science programs (e.g., Sociology, Psychology, Economics), mathematical knowledge is necessary for success in subsequent compulsory statistics courses.

Current trends in the CEGEP system indicate a declining enrolment of Social Science students in Calculus courses. This is illustrated at Vanier College by a drop in the percentage of Social Science students taking Calculus I from 74% of the 1994 cohort to 55% of the 2001 cohort. Similar trends are observed across the CEGEP network (*Profil Scolaire des Étudiants par Programme*, SRAM, 2005). Summary statistics from the registrar of Vanier College indicate that this problem of Social Science students' low enrolment in Calculus courses persists; it decreased significantly from 39.4% in 2004 to 31.2% in 2006 (Pearson $P_2(2,3322)=16.516, p < .001$). This continuing decline cannot be attributed to student performance because average grades in high school Mathematics courses remained constant over that period. Alarming, in these three cohorts, 10.3% of students graduating with distinction (an average grade of 75.12) from the highest level Mathematics courses at both Secondary IV and V decided not to pursue CEGEP Mathematics courses. Further, although women formed the majority in two of the three cohorts, nevertheless in all three cohorts fewer women than men enrolled in Mathematics courses.

Failure rates in Social Science Calculus courses hover around 40%, compounding the problem of low enrolment. Too many CEGEP Social Science program graduates are ill-prepared for their chosen program of university studies and this has consequences that are bound to harm any society aiming to succeed in the intense economic competition of the twenty-first century.

The purpose of this study was to determine whether Social Science students' success and perseverance in Calculus courses could be improved, thereby reversing current

trends. To this end, three instructional strategies were examined in Calculus classes and we report below on the outcomes of this experiment in terms of students' academic performance (grades and knowledge of Calculus), their persistence in Mathematics courses, and then on the implications of this research for the CEGEP network.

[...] students' lack of success and perseverance at college-level Mathematics can seriously jeopardize their career plans in the Social Sciences.

THEORETICAL PERSPECTIVE

Currently, in a typical CEGEP Mathematics learning environment, the teacher presents a new concept and then assigns problems that students can only solve if they have understood the concept. Although most CEGEP instructors assign weekly homework, for reasons of workload they can rarely collect and correct homework. That is, teachers ask students, largely on their own: to do problems, to monitor their own success and to self-correct their understanding until concepts are mastered. From the perspective of socio-cognitive theory (Bandura, 1997), this type of internal feedback loop works well only for highly self-efficacious students possessing appropriate self-regulatory strategies (Zimmermann & Pons-Martinez, 1990). It is unlikely that such educational practices promote effective learning for any other group of students. When ineffective learning processes are followed by summative assessment, the combination delivers an educational one-two punch: it diminishes self-efficacy beliefs and effort expended in completing assignments and it also promotes adoption of less adaptive achievement goals. All of this further lowers achievement.