



College Quarterly

Spring 2014 - Volume 17 Number 2

▲ Home

◀ Contents

Tackling Student Literacy and Numeracy Underpreparedness in Ontario Colleges: Access, quality and funding

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Abstract

As more students enter postsecondary education without the numeracy and literacy skills necessary for success, Ontario colleges are facing a challenge. While enrolment-based funding drives the colleges to seek growth to ensure financial stability, the quality assurance mechanism leads them to divert millions of dollars from their operating budgets to support at-risk students through a multitude of remediation interventions. Improving the effectiveness of remediation supports is worth much attention, but it will not eliminate the need for continued investment. Overall, a system-wide funding mechanism change may be required to help colleges strike a balance between the incentives for growth and quality.

The inadequate literacy and numeracy abilities of many Canadians are in the public spotlight. "Canada's fall in math-education ranking sets off alarm bells" (Alphonso, 2013, title section) reads a headline in a recent issue of *The Globe and Mail*. "Canadians' reading and writing skills, including those of students attending postsecondary institutions in Ontario, are not meeting expectations" (Dion & Maldonado, 2013b) is the introduction in another recent article published by *University Affairs*. The media coverage, however, stops short of delving into this issue and its relationship to the many forces shaping higher education in Ontario today. In the environment of growing postsecondary education participation rates and increasing diversity of students, the Ontario colleges, with their mission of access, have become the higher education pathway choice for many students with a lower level of academic preparedness. The efforts that the colleges undertake to support at-risk students in their journey to graduation and credential attainment reflect the colleges' commitment to quality and maintenance of academic standards. However, the provision of extra language and mathematics supports to underprepared students places a substantial financial pressure on the already fiscally strained colleges. The issue of the support for students with skill deficits illustrates the interplay of the factors of access, quality and funding in the Ontario college system. The college funding mechanism, while fostering access, does not support a commitment to quality. There appears to be a gap between the espoused goal of postsecondary education, namely leading students to the achievement of learning outcomes, and the reality where the focus on learning outcomes appears to occur despite the funding mechanism which supports the goal of broad access rather than quality. This disparity points to the urgency of the need for a funding system that drives a focus on quality, while maintaining access.

In this paper I focus on the context of the Ontario Colleges of Applied Arts and Technology (CAAT) and, while recognizing the importance and complexity of the student point of view, I limit my scope to the institutional

perspective. I begin by setting the discussion of the poor language and math preparedness in the context of the transition to universal education and the broadening of postsecondary education access to diverse students, inclusive of at-risk students (so classified due to the higher likelihood of their leaving college programs before graduation). Next, I explore the need to provide academic supports to underprepared students under the colleges' commitment to educational quality. Finally, I weave the themes of student access and the maintenance of academic standards into the examination of the funding system and the cost of services for students at risk. The discussion of the factors of access, quality and funding leads me to an examination of the societal and economic value of the colleges' support of underprepared students and the question of the effectiveness of the current services in the climate of inadequate funding. I conclude with a set of suggestions for future research and consideration.

Note on Terminology

In the literature on postsecondary students' literacy and numeracy skills and institutional strategies to address them, a variety of terms are used. Literacy skills are also referred to as communication, reading and writing, or language skills (Dion & Maldonado, 2013a; Dion & Maldonado, 2013b; Fisher & Hoth, 2010; Perin, 2004); numeracy skills are also referred to as mathematics skills (Dion & Maldonado, 2013a; Orpwood, Schollen, Leek, Marinelli-Henriques, & Assiri, 2011, 2012)). Institutional strategies carry a number of labels, including remedial, developmental, or foundational (Bettinger, Boatman, & Long, 2013; Dion & Maldonado, 2013a; Fisher & Hoth, 2010). For the purpose of this paper, I use the terms interchangeably as my focus is on the common themes rather than the fine distinctions across the skills or the strategies.

Background

Literacy and numeracy skills are considered critical to success in postsecondary education (Dion & Maldonado, 2013a; Fisher & Engemann, 2009; Fisher & Hoth, 2010; Perin, 2004; Reason, 2009). The importance of language and math skills is underscored by the standards set by the Ontario Ministry of Training, Colleges and Universities in their Essential Employability Skills framework. The Essential Employability Skills standards require that all graduates of certificate, diploma and advanced diplomas demonstrate well developed communication and numeracy skills (Ministry of Training, Colleges and Universities, 2009a). Yet many students entering Ontario colleges have reading, writing and numeracy skills that are not considered sufficient for college-level work. Dion and Maldonado (2013a), reporting on the literacy levels of Ontario students, indicated that many students choosing college (or non-university postsecondary education) tended to function at Level 2 of the Programme for International Student Assessment (PISA), which measures reading, math and science skills of 15-year-old students (p. 15), while the Organisation for Economic Co-operation and Development (OECD) "identifies Level 3 as the minimum proficiency level needed to complete secondary school and cope with the demands of daily life" (Dion & Maldonado, 2013a, p. 6). The inadequacy of literacy and numeracy preparedness of college students is also revealed through post-admission testing administered by the majority of Ontario colleges for the purpose of streaming underprepared incoming students into developmental English and math courses. The placement assessment

results demonstrate that a high proportion of students are not ready to begin college-level English and math courses. Dion and Maldonado (2013a) provided data from two large Ontario colleges where 40% to 50% of students were placed in developmental English courses. With respect to math skill development, the College Math Project (CMP), a program gathering research on the mathematics performance of first-year students in Ontario colleges, reported that in 2010 “10% of all first-year college students were enrolled in foundation programs and a further 10% take preparatory mathematics courses as part of regular programs” (Orpwood et al., 2011, p. 5). The CMP’s 2012 report highlighted the trend of declining math skills when it indicated “a 30% increase in the numbers of students taking college foundation programs over the past three years and a 20% increase in the numbers taking preparatory mathematics courses (where these are offered)” (Orpwood et al., 2012, p. 62).

The inadequate preparedness of new students with regard to reading, writing and math skills poses a serious challenge to the colleges. The Ontario college mandate of access (Ontario Department of Education, 1967) requires institutions to serve a growing number of students who require additional supports. On the one hand, these supports are essential to maintaining the quality of college education and to retaining students. On the other hand, they carry a substantial cost that the colleges struggle to absorb under the current funding mechanism that does not provide additional resources to fund these supports.

Access

Context

The issue of academically underprepared students cannot be considered outside the broader context of postsecondary education’s transition from elite to mass to universal education. Trow’s (1973) seminal work, published four decades ago, saw the aim of higher education evolving from preparing elite groups of students for entry into prestigious professions to equipping a multitude of students with skills and attitudes to adapt to the fast-changing needs of contemporary society and economy. Trow characterized this transformation as marked by growth in the rate of individuals participating in postsecondary education and in the unprecedented diversification of student populations. He observed that the shift of focus to the educational attainment across diverse groups would inevitably lead to a higher proportion of students entering postsecondary education without the qualifications once considered indispensable to success (1973, p. 24). Given this context, the broad range of contemporary students’ academic preparedness levels is an inevitable result of the higher education evolution and, instead of being lamented, must be seen as an aspect of postsecondary schooling that requires a long-term, well-planned and well-resourced strategy.

The Ontario college student population is very diverse. Unlike universities, colleges attract students from the full socioeconomic and parental education spectrum (Clark, Moran, Skolnik, & Trick, 2009, p. 32). Research, both American and Canadian, shows that students from low-income families and from families with lower levels of parental education are less likely to have sufficient preparation for postsecondary education (Finnie, Mueller, Sweetman, & Usher, 2010; Reason, 2009). In addition,

developmental language needs, affecting academic success and leading to the *at-risk* classification, are demonstrated by postsecondary students for whom English is not their first language (Deloitte, 2012). According to the 2009 Colleges Ontario data, 21% of college students self-reported that English was not their first language – a number that is likely underreported for a variety of reasons (Fisher & Hoth, 2010, p. 18).

Projections on Participation Rates in Ontario

Postsecondary participation and attainment rates have been steadily growing and are expected to continue growing. Clark et al. (2009) reported that half a decade ago slightly over 50% of young Ontarians earned a higher education credential and 83% of Ontarians in the 24-26 age group had at least participated in postsecondary education (p. 23). In 2011, almost 65% of Ontarians had a postsecondary credential (Wiggers, 2013) and the percentage is on the rise through the Ontario government's commitment to increase it to 70% (Deloitte, 2012). In less than a decade, the postsecondary system in Ontario is projected to grow by 100,000 or more students (Boggs and Trick, 2009). Although, according to Clark et al. (2009), college participation rates are more closely related to economic circumstances and, therefore, more difficult to predict than university participation rates (p. 26), it is highly likely that, with the increasing overall postsecondary enrolment, college enrolment will grow as well.

Projections on Canadian and Ontarian Literacy and Numeracy

Looking ahead, the literacy and numeracy development needs will continue to be an integral aspect of postsecondary education. In their 2013 report, Dion and Maldonado (2013a) reviewed the findings of a number of surveys introduced by Statistics Canada and the Organisation of Economic Co-operation and Development (OECD) to follow the development of literacy and numeracy in the general population. The surveys – the International Adult Literacy Survey, the Adult Literacy and Life Skills Survey, the International Adult Literacy and Skills Survey, the Programme for International Student Assessment, the Programme for the International Assessment of Adult Competencies – collectively measured the development of a variety of competencies related to literacy and numeracy since 1994 and mapped them to the five OECD international literacy levels. The data collected by the surveys administered between 1994 and 2008 showed that 42% of Canadians functioned below Level 2, with Level 3 being the minimum level of proficiency identified by the OECD. The findings from the surveys administered later showed no change. To conclude the analysis of their findings on literacy, Dion and Maldonado stated that “Canadians’ literacy scores have not been improving, neither in Ontario nor at the national level” (2013a, p.10).

With respect to mathematical skill levels changing over time, the findings of the Programme for International Student Assessment are particularly relevant as the 2003 and 2012 administrations of the assessment focused specifically on the math skills of 15-year-old students (Brochu, P., Deussing, M.-A., Houme, K., & Chuy, M., 2012). The findings were mapped onto a six-level scale, with Level 2 being the minimum level “required to participate fully in modern society” (Brochu et al., 2012, p.25). Close to 15% of Canadian students did not reach Level 2. Overall, in their summary of the results, Brochu et al. indicated that “Canadian students

performed consistently well in mathematics over the last nine years, but there is a clear trend showing a decrease in average score in most provinces [including Ontario], as well as an increase in the number of countries outperforming Canada” (p. 31).

Although the results of the international tests, especially those addressing literacy, have been observed to be overly focused on the traditional understanding of language skills and found to insufficiently capture the emerging skills of communicating through non-textual channels of image, audio and video (Hunter, 2013), those standardized measures do suggest limited conventional literacy improvements and likely a decline with respect to mathematical abilities of Canadians.

Synthesizing the above findings leads me to note two characteristics of the emerging picture of college education in Ontario. First, examining the trends in the evolution of literacy and numeracy skills in Canada and Ontario appears to indicate that Canadian and, specifically, Ontario students entering postsecondary education will continue to lack preparedness in communication and mathematical skills, at the current or, possibly an increasing rate. Coupled with these trends in literacy and numeracy skills, the projection of growth in participation rates in Ontario and the diversity of students associated with postsecondary participation clearly indicate that not only will underprepared students continue to enter college programs, but also that the proportion of academically at-risk students, relative to the overall student population, will increase.

Quality

Context

As Clark et al. (2009) wrote, “with the expansion of higher education and the increase in the scale of public funds going to universities and colleges that began in the 1960s, interest grew in the performance of higher education systems” (p. 113). The increasing interest in ways to measure the quality of postsecondary education gradually shifted from the focus on, primarily, “admission selectivity, resources and educational resources” (Clark et al., 2009, p.118) to the emphasis on learning outcomes. The current quality assurance process in the college system, focused on learning outcomes, is guided by the Ontario College Quality Assurance Service (OCQAS) that originated from the 2002 provincial legislation (Ontario College Quality Assurance Service, n.d., Who we are section). The OCQAS “follow[s] an outcomes-based credentialing model which guarantees that colleges work to educate students in full accordance with pre-established outcomes required for each certificate, diploma and degree” (OCQAS, n.d., Services section). Under the quality assurance mechanism, the *Published College Program Standards*, set by the Ministry of Training, Colleges and Universities, list the Essential Employability Skills learning outcomes that “apply to all programs of instruction” (Ministry of Training, Colleges and Universities, 2009b, Introduction section).

In the context of the growing student literacy and numeracy development needs, the quality assurance mechanism that mandates the colleges to ensure that all their graduates possess the Essential Employability Skills communication and numeracy skills has required the colleges to formulate strategies to achieve this goal. The resulting

remediation strategy has been implemented to enable incoming underprepared students to develop language and math skills, and to support them in meeting the learning outcomes of the college-level communication and mathematics courses, as well as other courses reliant on literacy and numeracy skills.

Remediation Strategies at Ontario Colleges

The remedial interventions that the Ontario colleges have developed have some similarities to the remedial strategy in the United States, adopted in response to the skill deficits of a large number of students admitted to numerous open-admission colleges (Brothen & Wambach, 2012, p. 34). The Ontario colleges' interventions to serve students with insufficient language and math skills include, primarily, post-admission testing, remediation courses, and English and math learning/tutoring supports.

According to the 2010 *College-level Literacy* report (Fisher & Hoth, 2010), 62% of Ontario colleges conducted some form of post-admission language assessment of incoming students for the purpose of placing students in foundation English courses. The 2013 *College Student Achievement Project Discussion Paper* reported that 14 out of 24 Ontario colleges conducted a post-admission assessment of math skills (Orpwood & Brown, 2013).

With regard to communication skill development interventions, Fisher and Hoth (2010) indicated that all 24 colleges offered some form of remediation. Twenty nine percent of colleges reported offering courses with modifications that allowed provision of remedial supports within communication courses; the course credits counted towards program completion. A quarter of the colleges offered remedial or foundation courses, but the course credits did not count toward program completion. A combination of the two above remediation methods was offered at 17% of the colleges. With respect to numeracy skill development, an extensive math remediation effort, taking the form of foundation-level courses, upgrading math courses and math instruction embedded in program core courses was reported by Orpwood et al. (2012).

Outside-of-class literacy and numeracy learning supports are an integral part of the remediation strategy at many colleges. Language and math assistance, along with generic learning skill development and course-specific help, is provided by a variety of student support services including learning centres, writing centres, math centres, student help centres, etc. They operate with faculty, support staff and peer student tutors and, therefore, represent a very different model of learner support from that of faculty-taught remediation courses. Twenty-nine percent of colleges reported a primary reliance on non-course language remediation, such as learning centres and student services (Fisher & Hoth, 2010).

The provision of a variety of literacy and numeracy skill development interventions by Ontario colleges is driven by the well-defined quality assurance mechanism that mandates institutions to ensure that students achieve the Essential Employability Skills learning outcomes and, on a larger scale, the learning outcomes of other courses and, finally, the program outcomes.

Funding

Context

As quality and funding are closely interrelated, a question arises as to the cost of serving underprepared students and to the mechanisms that incentivize colleges to make additional investments in preparing at-risk students to achieve the learning outcomes of their courses and programs.

The government funding for Ontario colleges operates through funding formulas. Most of the funding is enrolment driven where the government grants are calculated per student and weighted by program (Clark et al., 2009, p. 90). In addition, targeted funding is provided to serve specific needs. The college funding scheme, based primarily on enrolment, demonstrates insufficient recognition of the additional funding needs experienced by the colleges in providing literacy and numeracy supports to underprepared students and, more broadly, supports to at-risk students. While the cost of providing language and math supports through remedial coursework and other services in Ontario does not seem to be well documented, the report commissioned by Colleges Ontario is illuminating in providing an estimated overall cost of providing support services to students at risk at Ontario colleges (Deloitte, 2012). According to the report, Ontario's colleges spent \$211,862,000 to serve students at risk with support programs and services in the 2010-2011 academic year. This total includes funding for programs and initiatives that are outside of the MTCU/post-secondary grant funding structure. With these exclusions, the total cost of programs and services delivered to students at risk is \$144,193,000. This represented 11% of the total operating and special purpose grant allocations to colleges in Ontario in 2010-2011. (Deloitte, 2012, p.14)

Further, the report highlighted the insufficiency of the targeted funding allocated to colleges to support at-risk students.

Colleges received approximately \$37 million of such targeted funding. Compared to the approximately \$144 million spent on support programs and services delivered to students at risk, this leaves a difference in \$107 million. Colleges are therefore diverting over \$100 million of funding from basic operations and academic programming to deliver a range of supports to students at risk. (Deloitte, 2012, p.15)

Summarizing the primary targeted funding needs, as identified by the colleges, the report listed English and math remediation coursework as one of the three top priorities related to serving at-risk students (Deloitte, 2012, p. 46). This funding need was echoed by other research, for example, the report on language remedial supports in Ontario published by the Higher Education Quality Council of Ontario (Dion & Maldonado, 2013a, p. 19).

Issues

In the climate of insufficient funding to support the needs of diverse and at-risk students, it remains uncertain what mechanisms exist to compel colleges to continue to make investments in preparing students to meet learning outcomes. The enrolment-based funding creates a clear incentive for the colleges to seek growth through both new enrolments and retention. The colleges' fiscally-motivated interest in growing new enrolments is

consistent with their mandate of access as it supports the participation of an increasingly diverse student population. The colleges' retention efforts are focused on keeping students in programs and encouraging students to persist from semester-to-semester until graduation. While enrolment-based funding creates a mechanism of financial incentive for access and retention, it does not, or only indirectly, promote a commitment to quality. The emergence of performance-based funding might be seen as a promising mechanism that promotes the emphasis on the educational attainment of students. However, performance-based funding related to outcomes, referred to as Key Performance Indicators (for example, graduation rates and graduate employment rates) constitutes only a minor proportion of the overall funding - in the range of one to two per cent (Clark et al., 2009, pp. 125-126; Lang, 2005, p. 10). The effectiveness of performance funding also remains questioned. In the U.S. context, Jenkins and Rodriguez (2013) wrote about a very limited success of outcomes-related funding in undergraduate education to date and the failure to lead to "systemic reforms in instruction and student services necessary to improve student learning" (p. 201). Lang (2013a), referring to Canadian university funding, cautioned that performance funding addressed "those outputs that can be conveniently measured" (p. 223) and stated that "performance indicators, at their very best, rarely measure quality reliably" (p.226).

Overall, the Ontario college funding system fails to provide institutions with an incentive to support underprepared students in their achievement of educational outcomes. While the system supports growth, it does not offer a mechanism to mandate colleges to maintain quality standards through the emphasis on the achievement of learning outcomes by underprepared students.

Return on Investment, Cost and Benefit, and Effectiveness

In the environment of growing participation rates and an increase in the number of at-risk students, the Ontario colleges face an enormous challenge. As Jenkins and Rodriguez (2013) put it, "colleges are not more productive if they graduate more students but with weaker skills; they are more productive only if the added graduates have at least equivalent skills" (p. 190). On the one hand, supporting the needs of underprepared students is critical to ensuring the maintenance of academic standards and enabling at-risk students to meet the learning outcomes of their courses and programs. On the other hand, the shrinking public funding makes it clear that funding discussions can no longer be about adequacy, but must shift to questions of allocation (Lang, 2005). This status quo gives rise to a number of questions.

Return on Investment and Cost and Benefit

Given the extent of public funding in operating Ontario colleges, the basic question pertains to the economic and societal value of offering additional supports to at-risk students or, in other words, to the value of investment in this human capital. Paulsen (2001), following other scholars, defined human capital as "the productive capacities – knowledge, understandings, talents, and skills – possessed by an individual or society" (p. 56) and investment in human capital as "the expenditures on education, health and other activities that augment these productive capacities" (p. 56). The report commissioned by Colleges Ontario provided a detailed

analysis of the benefits of the expenditures on supports for at-risk students and indicated a clear return on investment.

Programs and services for students at risk increase graduation rates by an estimated 35 percentage points among students at risk. Graduates in turn contribute to a labour force that is shrinking and requires an increasing number of skilled workers to meet labour demand. These graduates generate returns to government in terms of increased income tax revenue and reduced payments for social assistance and Employment Insurance. The return on investment to government is estimated at 14%, including a significant reduction in social assistance costs (Deloitte, 2012, p. 10). This return on investment was also referenced in the TD Bank report on literacy:

A Statistics Canada study found that a 1 per cent increase in literacy relative to other countries produces a 2.5 per cent increase in the level of labour productivity and a 1.5 per cent increase in output per capita compared to the other nations. (Alexander, 2007, p. 13)

The Colleges Ontario report, projecting future needs, captured the gap between the growing needs and the declining resources.

In order to fulfill half of the Ontario government's commitment to creating an additional 60,000 post-secondary education spaces, Ontario colleges will have to spend an additional \$22 to \$37 million annually on targeted programming. This range is based on a lower bound of 30% of the new students being at risk (the same as amongst the current student population) and an upper bound of 50% of the new students being at risk (based on an assumption that these new students may be somewhat more likely to be at risk than current students). (Deloitte, 2012, p. 8-9)

Measuring Effectiveness

Recognizing that the need to provide supports to students at risk will grow, with funding lagging behind, the second question that arises is that of the effectiveness of language and math support system to ensure the best allocation of the available resources.

Entry and exit testing. Measurement being central to any evaluation, the calls for a pre- and post-assessment of postsecondary students' literacy and numeracy skills appear justified. Dion and Maldonado (2013b), stressing that "reading and writing skills are a key learning outcome of postsecondary education," urged us to "consider the rigorous and systematic assessment of students' literacy skills as they enter and exit postsecondary education" (2013b, para. 2). This call was consistent with the recommendations posed by Barr and Tagg (1995) in their discussion of the shift from the instructional to the learning paradigm, advocating for an external assessment of the achievement of learning outcomes. Yet, while pre-testing, in the form of placement testing streaming students into appropriate English and math courses, is a common practice at Ontario colleges, post-testing is not. With regard to literacy assessments, Fisher and Hoth (2010) stated that only a quarter of colleges "conducted some type of formal 'exit' testing that mirrored entry-level criteria," with only a handful of colleges considering their exit testing practices rigorous" (p. 2). Math skill exit testing practices, if they exist, are not well documented. Overall, although the measurement of exit literacy and numeracy gains

appears much needed, it is very likely that colleges cannot afford this practice as it would further diminish their resources.

Remediation Interventions. Another question pertains to whether there is sufficient evidence of the value and effectiveness of remediation interventions to justify their cost. Empirical research on the effectiveness of foundational communication courses at Ontario colleges is underway (Dion and Maldonado, 2013a, p. 19). In this research, led by Mohawk College and the Ontario College Language and Communications Council, the effectiveness of remedial language courses at five colleges is evaluated through a formal pre- and post-assessment of students' language skills.

Although American college developmental education varies from the Ontario foundational coursework model in that it operates through multiple levels of mandatory remedial courses (Bettinger et al., 2013, pp. 95-96), the U.S. findings may be of some relevance to the Ontario context. They overwhelmingly show consistently mixed results with respect to the general effectiveness of remedial education, to the factors contributing or hindering its effectiveness, and to the justification for the high proportion of students streamed into remedial courses, overall leading to what Brothen and Wambach (2012) called a "crisis in developmental education" (p. 34).

In light of the U.S. findings, there is a steadily growing interest among both researchers and policy makers in seeking better solutions (Bettinger et al., 2013; Brothen & Wambach, 2012). Among the alternatives or complements to remediation courses, skill development through supplemental learning initiatives and services is prominent (Bettinger et al., 2013; Brothen & Wambach, 2012). Although the Ontario research on the effectiveness of learning, writing and math centres as related to remediation efforts is sparse, American studies offer some insights. One study involving 15 colleges from six states found a positive link between the services of the learning centres providing reading, writing and math assistance and students' outcomes "including retention in college English and increase in GPA" (Perin, 2004, p. 559). Another, a large-scale study conducted in the 1990s at 47 postsecondary institutions to assess the impact on student outcomes of a broad range of student services, inclusive of services similar to those offered by the Ontario college learning, writing and math centres, also reported generally positive results (Bettinger et al., 2013, p. 103).

Summing up, the effectiveness of the remediation strategy is not well ascertained. The U.S. research indicates mixed results of the traditional course-based remediation and calls for new solutions, for example in the area of supplemental learner supports. In Ontario, formal cross-college evaluation studies are under way. Given the high cost of the current remediation interventions, new or alternative options need to be considered.

Future Directions

In the context of the projected growth in the demand for literacy and numeracy supports for students at risk, a number of possible future directions emerge. The most pressing need appears to be related to changes of the funding system to foster a system-wide ability to sustain the focus on quality, with a concurrent commitment to access. At the same

time, institutions, individually and jointly, may explore amendments to existing strategies or develop alternative approaches to supporting at-risk students more effectively: conduct a review of assessment practices; consider expanding supplemental academic, numeracy and literacy supports to further extend remediation beyond the classroom, and explore the use of technology to enhance academic supports.

Funding

Considering the well-demonstrated social and economic benefits of helping at-risk students attain postsecondary education (Deloitte, 2012), there is a clear need to develop a funding mechanism that fosters the colleges' ability to support the needs of academically underprepared students, ultimately ensuring the quality of their education. It is the position of the colleges that the "Ontario government must consider these costs when calculating additional funding required to expand post-secondary enrolment" (Deloitte, 2012, p. 24). Alexander (2007), in his discussion of the broader context of literacy needs in Canada, urged that "the reality of fiscal constraints means that policy makers will have to set some priorities" (p. 15). This broadly expressed need was recognized by the Minister John Milloy (2011) in his *Putting Students First* plan remarks:

The new approach we have outlined today will require a modernization of our funding formula away from one that simply rewards growth at all costs, to one that makes sure that we are achieving our goals in areas like teaching, overall quality and helping institutions fulfill long-term plans and mandates. (p. 5)

However, with two years into the new plan, there have been no major changes to the college funding system (Lang, 2013b) that would ensure a climate of greater stability for the colleges' support of students at risk. College areas responsible for the provision of the majority of literacy and numeracy supports – placement testing, remediation courses, learning centres, etc. – continue to find themselves in a vulnerable position of seeking allocations to cover the cost of service delivery.

Review of Assessment Practices

The review of assessment practices should focus on the enhancement of the assessment process validity, its outcomes, inter-institutional cooperation and possible expansion to exit testing.

American research indicated that students achieving test results close to the foundational placement cut-off often did not benefit or were adversely affected by the remediation coursework (Bettinger et al., 2013). Although the American college remediation system is different from the Ontario system in that it operates with multiple levels of remediation, the findings are likely relevant to the Ontario context in light of persisting reliance on single-measure testing mechanisms. Educational assessment research strongly recommends the use of multiple measures in placement assessment practices as single-measure testing mechanisms tend to be poor predictors of student remediation needs (Driver & Krech, 2001). Yet only seven of the 15 Ontario colleges conducting formal post-admission language skill assessments employed multiple measures in their assessment practices (Fisher & Hoth, 2010, p.28). Further, based on my

own discussions with colleagues from college Assessment Centres over the years (related to my role as an Assessment Centre manager), it appears that there is inconsistency in the application of the methodology to determine the minimum level of performance that students should demonstrate to be placed in college-level English and math courses. As the use of standard setting methodology in establishing the so-called cut scores leads to greater validity of testing results (Cizek & Bunch, 2007), colleges may consider using this methodology more consistently. Both strategies – the implementation of multiple measures and methodologically sound cut scores – will result in the provision of remediation interventions only to those students who are most likely to benefit from them. This solution could be seen as an investment with a return in the form of potential savings from limiting the offering of high-cost remediation courses to a narrower group of at-risk students, and flagging borderline students as likely to benefit from other, less costly interventions.

Secondly, Ontario-based research on language and math post-admission testing calls for the development of a system-wide framework of assessment tools and practices (Fisher & Hoth, 2012; Orpwood & Brown, 2013). Such a framework “could (...) better facilitate communication among service providers, support transportability of learner outcomes without unnecessary re-assessment, and provide a common framework for interpreting and reporting student achievements (Fisher & Hoth, 2010, p. 17). While the initial investment into creating a common assessment would likely be high, this approach could offer long-term savings in eliminating the need to retest students and in enabling more efficient collection of data to aid system-wide planning of the allocation of resources to underprepared students.

Thirdly, there appears to be mounting interest in the development of an exit assessment strategy as critical to a sound system of measuring the effectiveness of remediation interventions and student achievement of learning outcomes (Dion & Maldonado, 2013a, 2013b; Fisher & Hoth, 2010). Given the very limited practices in rigorous exit testing on the one hand, and, on the other hand, a shift to contextualized testing of outcomes, this strategy could only be considered as a long-term solution, with a considerable initial investment required.

Supplemental academic, numeracy and literacy supports as a complement to course-based remediation.

U.S. researchers, calling for a re-evaluation of college remediation education delivery (Bettinger et al., 2013; Brothen & Wambach, 2012) have recommended a number of approaches that mirror the practices already in place at Ontario colleges, for example, integration of remedial with college-level coursework and expansion of supplemental academic supports. With the in-progress evaluations of the course-based English and math remediation, academic learning support services should be given more attention as a growing complement to course-based remediation. Learning, writing and math centres at Ontario colleges provide language and numeracy assistance, often combined with generic learning skill development and course-specific help. As Perin (2004) noted, remediation coursework and supports offered by learning centres were different in that the former targeted at-risk students, while the latter were open to all students in college programs. The mandate of supporting all students is

important as it normalizes the experience of finding learning difficult and validates seeking help as a learning strategy, thus integrating students at risk into the broader student community. Further, learning centre services, unlike remediation courses, are not course-specific or limited to providing support at discrete times during the student's course of study; instead, they constitute supports across the curriculum, available on a per-need basis. In addition, as learning centres operate with faculty, support staff and peer student tutors, they constitute a unique approach to the involvement of non-faculty college staff in supporting student learning. In their discussion of the shift from the instruction to the learning paradigm, Barr and Tagg (1995) emphasized extending learning beyond the classroom and making it the responsibility of both faculty and non-faculty staff (as well as the co-responsibility of the learner); learning, writing and math centres fit into this learning-driven model particularly well. The sharing of commitment to student success between faculty and non-faculty staff was also seen as essential in Ontario research on the role of student services in fostering student success (Seifert, Arnold, Burrow, & Brown, 2011, p. 4). My own experience of managing an English and math learner support centre at one of the Greater Toronto Area colleges also leads me to see the strength of academic support services in their learner-centredness and focus on learner empowerment. At my college's English and math centre, students using the services most often do so on a voluntary basis and seek support in response to their frequently self-identified and time-sensitive needs. As a result, students receive support in the areas that they individually experience as difficult and, taking advantage of the supports, they often feel some measure of control over their own success with learning. The attention to individual needs and the availability of cross-course supports are consistent with Perin's (2004) suggestion of testing a hypothesis that "the generic instruction in developmental education courses may be less effective than the contextualized learning of skills that may occur when students are coached on reading, writing, or math skills while completing specific subject-matter assignments in learning centers or skill labs" (p. 580).

However, given the need to seek the most cost-efficient interventions, it would appear that further extensive research is needed to identify the most effective language and mathematics support services. This poses a research methodology challenge as student use of support services is primarily voluntary and, therefore, may result in the "self-selection bias" of the research findings; this bias was identified as limiting the validity of some American studies that found a positive link between supplemental academic services and student outcomes (Bettinger et al., 2013, p. 103). Secondly, there may be limited promise in the approach based on supplemental support services as the U.S.-based review of a variety of interventions, including student services, "found few programmatic interventions whose estimated effects on student completion justified their costs" (Jenkins & Rodriguez, 2013, p. 197).

Use of Technology

Trow's (1973) work on the transition to universal education indicated information technology as an area of growth and promise in the transformation and delivery of higher education. Technology, popularly seen as providing opportunities for cost-effective alternatives to traditional

approaches of delivery, could offer efficient solutions in the delivery of literacy and numeracy supports. U.S.-based research on alternatives and complements to traditional remediation (Bettinger et al., 2013) referenced some encouraging practices in the use of technology, where the advantages included allowing the student a self-paced progression through the material, with practice and feedback available in the areas of the individual needs. Smith (2011) noted another advantage of technology-based learning supports, namely, their capacity to recreate a sense of small group learning, where the learner appears to be the focus of attention through the tailoring of the material. The Ontario College Student Achievement Project (Orpwood & Brown, 2013) planned to make use of a technology platform to offer a diagnostic mathematics placement assessment process where students would be directed to self-paced materials and practice of the skill revealed through the assessment as insufficiently developed. However, other research cautioned that academically underprepared students might be less likely to benefit from technology-based solutions (Jenkins & Rodriguez, 2013). Jenkins and Rodriguez (2013) reported findings showing that academically at-risk students did not do as well in online courses as they did in face-to-face environments (p. 198). While the promises of technology are encouraging, on the one hand, more research is needed to identify the types of technological solutions that support reading, writing and math development of underprepared students and, on the other hand, more work is needed to help at-risk students acquire skills to use technology-based supports more effectively. It may well be the case that the use of technology in offering supports to at-risk students will require further extensive investments before it offers returns.

Conclusion

In the environment of increasing participation rates and a growing number of students entering postsecondary education without the language and mathematics skills necessary for success, Ontario colleges have found themselves in a challenging position. Relying, to a considerable extent, on enrolment-based funding, colleges are driven by the fiscal policy to seek growth to ensure financial sustainability. Concurrently, mandated by the quality assurance mechanisms, colleges make substantial efforts to provide supports to students at risk through a variety of remediation interventions. However, the high cost of these interventions forces colleges to divert millions of dollars from their operating budgets to meet the needs of academically underprepared students. While there is much room for exploration to enhance the effectiveness of remediation supports, they all seem to require an initial investment and do not offer a guarantee of better returns. Above all, it is evident that institutional level process changes will not suffice as it is a system-wide change to the funding mechanism that is required to help colleges strike a balance between the incentives for growth and quality.

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