Journal of Interdisciplinary Studies in Education

Volume 14, Issue 1 (2025), pp. 83-111
Journal of Interdisciplinary Studies in Education
ISSN: 2166-2681Print 2690-0408 Online | https://ojed.org/jise

Transitioning to University in Botswana: What Developmental Education Intervention is Timely for Entry into STEM Baccalaureate Degree Programs?

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ABSTRACT

Academic and social deficits, a nine-month secondary school-to-university learning loss, a readiness gap for university-level coursework, and limited cultural capital characterize the transition to university for Botswana's secondary school completers seeking a STEM qualification. This study investigated internationally implemented developmental education interventions that STEM-offering public universities in Botswana may proactively implement to ease the transition and improve matriculant's chances of success from their first year at university. Findings indicate that a Developmental Winter Bridge Program presents the best option for secondary school completers' acclimatization, assimilation, and university success. Policy recognition of the Bridge Program as a pre-entry requirement for STEM undergraduate programs is recommended as the first step towards increasing confidence in the preparation of future-ready engineers and scientists.

Keywords: Botswana, college readiness, developmental education, foundation year, summer bridge, STEM, transitional programs

INTRODUCTION

> …if a college or university admits a student, the institution has an obligation to help that student succeed. Matriculation implies that the institution has confidence that the student has the necessary skills and knowledge to experience academic success. It would be morally reprehensible for an institution to admit a student knowing that he or she would have little or no chance of passing the courses without informing the student. (Phipps, 1998, p. 15)

Poor student performance in first year and senior-years' undergraduate Introductory Mathematics and Mathematics-underpinned courses offered by Science and Engineering Faculties, and rising dropout among STEM students in their first year of university, have become persistent challenges in Botswana's higher education landscape. These challenges arise as secondary school completers transition into their first year of university with several potential threats to their initial and subsequent academic and social integration with their new institutions.

A nine-month learning loss is the first threat. This threat arises from the long transition to university as students wait to commence their undergraduate studies in August of a given year after writing the Botswana Certificate of Secondary Education (BGCSE) or Grade 12 examinations in October/November of the previous year. A second threat arises when academic deficits accumulated over their years of primary and secondary education result in a readiness gap for core university-level courses (Swail & Perna, 2002). A readiness gap occurs between students' academic skills upon enrolling in university, and the skills they need to be ready for university-level studies (Manpower Demonstration Research Corporation, 2011). Students consequently have skills, knowledge, motivation, and/or academic ability "significantly below those of the 'typical' student in the college or curriculum in which they are enrolled" (Maxwell, 1997, p. 2). A third threat arises when incoming students demonstrate insufficient cultural capital to navigate university requirements and systems (Bettinger et al., 2013; Sparrow, 2017).

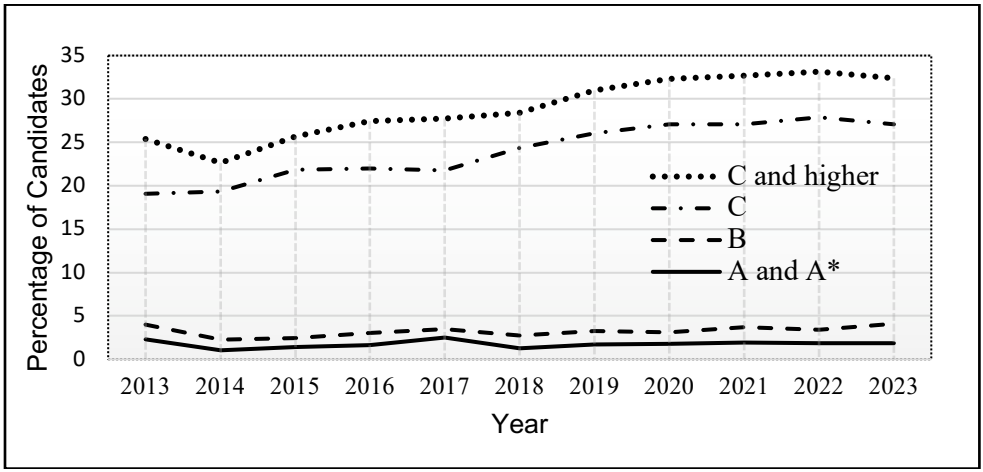
This study focused on how universities could manage the second and third threats. The readiness gap is particularly problematic. Initial evidence of a gap becomes prominent every February/March when the Botswana Examinations Council (BEC) releases the results for the previous October/November's BGCSE examination cycle. According to BEC, "grade C or better represents credits and are used as a measure of quality" (BEC, 2023, p. 26). The annual BGCSE results historically indicate that only one-fifth to one-third of secondary school completers finish ready for college and university work in Mathematics, English Language and Science. Over the last decade, Grades D and below have characterized BGCSE completers' performance in the core subjects of Mathematics, English Language,

Science (single award) and Science (double award), with over 70%, 80%, 90% and 80% of candidates respectively, attaining a Grade D and below on average in these subjects (Botswana Examinations Council [BEC], 2013-2023). At the 2023 examinations, Grades F was the most frequently awarded grade in single award Science (BEC, 2023).

Figure 1 displays the performance trend in Mathematics over the 2013-2023 period. On average, less than 2% of examinations candidates attained Grades A* and A, 3% attained Grade B grade and under 30% attained Grade C (BEC, 2013-2023). Performance tends to be better in Biology, Chemistry, and Physics. Of the 2000 candidates that annually sit the examinations in each of these three subjects, the trend has been that over 80 percent on average pass Chemistry with a Grade C and higher grade while over 70 percent pass similarly in Biology and Physics (BEC, 2013-2023).

Figure 1

Botswana BGCSE Mathematics Pass Rates 2013-2023



Note. Source: Botswana Examinations Council (2013-2023). *Botswana Certificate of Secondary Education (BGCSE) Provisional Summary of Results*. BEC.

No empirical research has been undertaken to unpack whether the poor performance in Mathematics and Science annually is due to specific within-school effects (e.g., teacher effects, learning facilities, etc.), out-of-school factors (e.g., parents' education level and other socioeconomic factors) or a combination of both factors. Available scholarly research on student performance at BGCSE is mostly confined to the Agriculture subject area. However, media reports capture the perspectives of the teachers' union and others on overall performance. These reports attribute poor student performance to the incidence of automatic progression of primary and secondary education students to higher class levels,

high student/teacher ratios, shortages of resources (e.g., exercise books, textbooks, desks and chairs), under-resourced subject area laboratories, unqualified teachers, low literacy levels among learners, students' indiscipline, ineffective pedagogy, small stream schools becoming larger, extended hours of work for the teaching profession that reduces contact time with learners, among other factors (Kaelo, 2021; Kgosikebatho, 2016; Koboyatau, 2022; Mathala, 2023; Motlhabane & Adamson, 2018).

Regardless of the annual BGCSE results or the factors shaping those results at the secondary education level, the country's thirty-plus accredited public (including its three STEM-offering public universities) and private universities, colleges and institutes compete to craft their first-year cohorts from the same pool of completing students with the profile described above. Despite the poor Mathematics and Science grade profiles of the bulk of BGCSE completers, public universities do not routinely offer remediation or developmental education programs to the incoming class and no research studies have examined what such remediation could look like.

This study therefore sought to investigate what developmental education interventions public universities in Botswana can proactively implement to improve the chances of its STEM matriculants' academic success in Mathematics and other core subjects in their first year and successive years at university. The study also sought to identify the most feasible intervention that could be offered to admitted students. Accordingly, two research questions drove this study:

1. What developmental education interventions may public universities in Botswana implement to smooth matriculating STEM students' transition to university and reduce academic deficits threatening first-year performance?
2. Which context-driven developmental education intervention has the greatest promise for increasing matriculating STEM students' success in the first year of university in Botswana?

The rationale for the study is based on the premises that: a) student engagement through a range of interventions is critical to achieving students' university success; b) such interventions are in part due to the amount of time and effort student put to their studies and other success-oriented on-campus activities, and in part due to actions the university takes in terms of organizing learning opportunities and services to assist students to participate in and benefit from such activities (Kuh et al., 2010, p. 9).

The study breaks new ground with regards to studies that specifically examine university transition and readiness among secondary school students in Botswana. It contributes to the body of knowledge on developmental education interventions and supports that STEM-offering universities can implement to achieve first year success and persistence to graduation. This study also constitutes scholarship of practice as it combines knowledge generation with knowledge use through its aim to simultaneously develop the knowledge base for university

leadership and improve university leadership practice in the university (Lyken-Segosebe, 2017, Lyken-Segosebe & Braxton, 2021). Study findings will present an innovative solution for public STEM-offering universities in Botswana and the Global South and be relevant to a range of higher education administrators, from administrative leaders (e.g., vice chancellors, deans, provosts, and department chairs) to those in support roles in student affairs and registry services (e.g., in student counsellors, academic advisors, and admissions officers, etc.) and extending to faculty members in the STEM fields.

This study is furthermore significant for at least three reasons. First, timely developmental education intervention is critical for students in their first year of university life to reduce dropout. Researchers (e.g., Blanc et al., 1983; Noel, 1985; Pascarella & Terenzini, 1980; Tinto, 1987) have found that approximately three-fourths of all university dropouts leave during the first year and that the rate of student departure is highest during the first six to eight weeks of the first semester. Students' transition to university can be difficult if the campus environment does not provide the necessary support to help first-year students integrate into the social and academic systems of their universities (Astin, 1975, 1977; Beal & Noel, 1980, Gordon & Grites, 1984; Pascarella et al., 1986).

Second, the study is significant given the importance of knowledge and skills in Mathematics and other critical core courses to the practical preparation of the next engineers and scientists. Third, transition programs provide students with additional skills such as critical thinking skills and intellectual independence necessary for them to thrive in university-level work (Sparrow, 2017).

With the Government of Botswana's emphasis on increasing access to higher education amid the country's rising levels of youth unemployment, consideration should be given to developmental education as a structural intervention strategy for public universities.

LITERATURE REVIEW

Developmental education programs are considered transition or academic preparation programs. Academic preparation is itself a critical factor for continued student enrollment and academic success, yet a high percentage of incoming students are not prepared for the academic rigors of college/university-level work (Kallison & Stader, 2012; Strayhorn, 2011). These students therefore require academic foundational work before taking a full schedule of credit-bearing courses (Strayhorn, 2011).

The main purpose of developmental education programs is to enable students to integrate into university-level coursework and persist to graduation (Bettinger & Long, 2009a, 2009b; Boatman, 2012). These programs comprise remedial courses offered in combination with developmental student supports that typically include academic and psychological support services such as orientation,

tutoring, advising, counseling, peer support, early alert programs, study skills training, learning assistance centers, Supplemental Instruction, support groups, freshman seminars, and learning community clusters (Mulvey, 2008; Shields, 2005). Developmental education therefore utilizes a comprehensive approach to students and their learning (Mulvey, 2008).

When availed, remedial courses are taken from the first year of students' enrollment into university and may either be credit- or non-credit-bearing. Students are assigned to these courses based on their high/secondary school transcripts, institutionally developed subject area tests, or scores on a standardized placement exam or assessment (Bettinger et al., 2013). The content of remedial courses is usually below university-level and intended to help students accumulate skills missed or underdeveloped in high/secondary school. Universities typically make successful completion of remedial courses mandatory before students can enroll in university-level classes (Rutschow & Schneider, 2011).

Researchers of developmental education programs implemented in US colleges and universities have identified both benefits and limitations of this strategy. Critics argue that time to degree or graduation is made longer and chances for student drop-out increased when students need to take multiple levels of remedial courses in a particular subject, before they are ready for university-level courses (Bettinger, et al., 2013; Rutschow & Schneider, 2011). Hern (2010) describes the non-completion rate among developmental education students as "the pipeline effect", that is, students "leak" away by not enrolling, not passing, and/or not persisting to a subsequent level. Some critics also argue that, at a time when emphasis is on university accountability, standards and limited budgets, universities lower their standards and academic quality when they teach high/secondary school-level classes at the university level and encourage underprepared students to enroll (Shields, 2005).

On the other hand, proponents of developmental education argue that students who place into academic foundational work, especially those who also lack academic capital (e.g., first-generational students), have greater chances of assimilation into the university, and the time spent in developmental education is positively correlated with persistence, degree completion, intellectual and social self-confidence, and satisfaction with the university experience (Attewell et al., 2006; Bettinger & Long, 2009a, 2009b; Boatman & Long, 2011; Wathington et al., 2016). Furthermore, it is argued that the social costs of not offering developmental education may exceed the institutional costs of the programs and the direct costs to students combined (Bettinger & Long, 2005).

RESEARCH METHOD

We conducted a semi-systematic or narrative review of the extant literature to find out what is known about first year remediation and developmental education.

While with narrative reviews, unintentional bias may be introduced through extra weight being placed on one research article over another, this method was selected because of its ability to collate findings from studies in diverse disciplines, namely science, engineering, teaching and learning, and higher education, that characterize the body of knowledge for our study (Ferrari, 2015; Snyder, 2009).

Two databases - ProQuest and ScienceDirect - and Google Scholar were searched for relevant peer-reviewed journal articles, reports, and peer-reviewed conference papers. Searches were made using the terms: "accelerated developmental education," "bridging courses," "college transition," "developmental education", "fast track developmental education," "first year retention", "first year students," "foundation year," "remediation," "remedial education," "summer bridge programs", and "transition programs." These terms were searched for in titles, abstracts and keywords for each peer-reviewed journal article found in the databases and online generally. The terms "bridging programs," "foundation year," and "summer bridge programs" were also used to search webpages of a sample universities in Australia, South Africa, United Kingdom and the USA.

The inclusion criteria were (i) peer-reviewed journals published in English between the years 1980 and 2020; (ii) research that focused on first year remediation and developmental education; (iii) articles with accessible abstracts and full text; (iv) peer-reviewed conference papers; and (v) higher education reports. Exclusion criteria were (i) editorials, commentaries, conference abstracts, reviews, and duplicates; (ii) journals/studies focusing on the first-year experience.

This search process yielded 121 journal articles and 22 reports for review. The identified peer-reviewed journal articles, reports and university webpages were then assessed for evidence in relation to the study's two research questions that seek to identify the developmental education interventions public universities in Botswana may implement to smooth matriculating STEM students' transition to university, reduce academic deficits threatening first-year performance and offer the greatest promise for increasing matriculating STEM students' success from the first year of university in Botswana.

FINDINGS

Findings are organized according to the two research questions that guided this study.

Research Question One: What developmental education interventions may public universities in Botswana implement to smooth matriculating STEM students' transition to university and reduce academic deficits threatening first-year performance?

The extant literature reveals four types of potential developmental education interventions for implementation in Botswana's STEM-offering public universities. The first type of intervention is *developmental education avoidance programs*. These target secondary school completers who are eligible for admission to a university, are implemented before admitted students commence their undergraduate program and therefore enable them to avoid placement into a first-year developmental education program (Rutschow & Schneider, 2011).

The second type is an intervention that shortens the timing or content of remedial courses. *Developmental education acceleration programs* increase completers' rate of progress through developmental education (Rutschow & Schneider, 2011).

The third type is an intervention based on a South African model in which the first semester of the first year in an undergraduate program is lengthened by 18 months with academic support and skills development integrated with regular academic work. Academic content is delivered over a longer time-period during these *extended degree programs*.

The fourth type is an intervention that may be offered either as developmental education avoidance or acceleration programs. *Summer Bridge programs* are offered prior to students' enrollment into the first semester of their undergraduate programs and have historically targeted four major groups of US high school students: students admitted to a college/university; students categorized as underrepresented in college/university e.g., ethnic/racial minorities, low-income and first-generation students; students who test into developmental education; and students in traditionally difficult majors such as STEM (Sablan, 2014).

1. Developmental Education Avoidance Programs

Public STEM-offering universities in Botswana may adopt an intervention implemented in universities in the United Kingdom, Australia, New Zealand, and other countries, which permit secondary school completers to avoid placement into first year developmental education programs. Underprepared students may be admitted into a ***Foundation Year*** **or** ***Foundation Studies Program*** offered prior to their enrollment into the first semester of their undergraduate STEM degree programs. Depending on the host university, the Foundation Year or Foundation Studies program is offered to either incoming international or local students. Students must achieve a passing grade in the program to progress onto their undergraduate degree program. The Foundation Year for international students typically seeks to strengthen students' English language proficiency and the subject-specific skills they need to be successful in their undergraduate degrees, while also providing a common academic skill background to students who undertook their secondary school education in varied education systems in other countries.

Two exemplar programs are:

Example 1: The University of Oxford Astrophoria Foundation Year

This Foundation Year targets UK state school students seeking to pursue a qualification in Chemistry, Engineering Science or Materials Science, Humanities, Law and Philosophy, Politics or Economics at the University of Oxford. The Astrophoria Foundation Year is free for students and is designed to be a one-year intensive academic course that bridges any gaps between secondary school and the University's academically challenging undergraduate courses. Students who pass the Foundation Year at the required level will be automatically admitted into the University of Oxford as an undergraduate student (University of Oxford, n.d.). In, for example, the Foundation Year Chemistry, Engineering and Materials Science (CEMS) course, over three-terms students take modules relevant to the subject they aim to study at undergraduate level, alongside essential mathematics modules (University of Oxford, n.d.).

Example 2: University of Melbourne (Australia) Trinity College Foundation Studies (TCFS) Program

International students seeking to study at the University of Melbourne in Australia undergo the fee-based Trinity College Foundation Studies program. Students take eight courses over two semesters, comprising two compulsory core subjects (English and History of Ideas) and three 2-semester electives selected from 11 subject areas that include Biology, Chemistry, Environment, Development and Design, Mathematics, and Physics. Students are assessed through quizzes, assignments, practical classes, tests, and an examination. Those who successfully complete the program will qualify for the first year of most undergraduate degrees at the University of Melbourne and other universities in Australia (University of Melbourne, n.d.).

2. Developmental Education Acceleration Programs

Public STEM-offering universities in Botswana may alternatively select an appropriate acceleration program to increase incoming students' progress through developmental education. Possible program options are *compressed, fast-track or paired courses, self-paced* or *modularized courses,* or *mainstreamed courses.* Offered at US colleges and universities, these courses are implemented "after" students enroll on their degree programs, typically along with their first-year courses.

Acceleration refers to "*the reorganization of instruction and curricula in ways that facilitate the completion of educational requirements in an expedited manner*" (Edgecombe, 2011, p. 4). Advocates of Acceleration believe it reduces the effective time-to-degree by enabling students to proceed through their developmental education requirements more quickly and minimizing the number

of exit points they encounter at this stage of their post-secondary preparation (Edgecombe, 2011). Two sets of Acceleration models, developed by Edgecombe (2011) and Rutschow & Schneider (2011, can be found within the research literature.

2.1 Compressed, Fast-track and Co-Requisite Models

If public universities select these options, they will either modify their developmental education course curriculum or modify instructional time to reduce the time necessary to fulfill developmental education requirements. *Fast-track courses* allow students to complete sequential courses in one semester. Instructional contact hours remain the same as in a traditional 16-week course, implying that class periods may be longer and involve modified lesson plans. Students must pass the first course to progress to the second (Edgecombe, 2011). *Compressed courses* combine multiple fast-track courses that offer classes in a compressed time frame, usually over several weeks during the summer or in half a semester during the regular school year (Rutschow & Schneider, 2011; Edgecombe, 2011). *Co-requisite courses* link developmental education courses with college/university-level courses that have a complementary subject matter. For example, an upper-level developmental writing course may be paired with a college literature class. The purpose of such a combination is to provide students with the opportunity to develop their writing skills using literature as content.

As an example, degree-seeking students in the Colorado Community College System requiring developmental education must complete developmental course work in math and English before taking college algebra and freshman composition (Biswas, 2007). FastStart@CCD allows students to complete multiple developmental education courses within a single intensive semester. In addition, the program pairs courses e.g., developmental English (writing) and reading courses with college-level courses (Edgecombe et al., 2013). FastStart students must also satisfy a 25-hour per semester one-credit out-of-class lab, a requirement for all developmental math students, by using CCD's learning labs (i.e., tutoring center), forming study groups (which meet before class and are facilitated by the instructor), or logging time using designated instructional software, such as Pearson's MyMathLab (Edgecombe et al., 2013; Epper & Baker, 2009).

2.2 Modularized Courses

Public STEM-offering universities may opt for an intervention that involves incoming students taking self-paced or modularized courses that divide semester-long developmental education classes into smaller, competency-based units (Rutschow & Schneider, 2011). Students must prove mastery of specific skills by taking a series of short, focused assessments before they can progress to advanced modules. Modularized courses may be instructor-led or offered in a self-paced format. In self-paced modularization programs, tutorial software packages

such as MyMathLab, Plato, ALEKS, and Math Zone are used to supplement in-class instruction or as the primary vehicle for teaching new skills. These packages begin by identifying students' skill deficits and then allow them to work independently on building these skills through increasingly challenging content, built around frequent assessments of students' developing abilities (Epper & Baker, 2009; Rutschow & Schneider, 2011).

As an example, at Jackson State Community College, the Survive, Master, Achieve, Review, Transfer (SMART) Math program involves breaking-up the traditional math curriculum into a series of modules. The SMART program is delivered through twelve online instructional modules with supplemental assistance from instructors in a math lab center, where students are required to work at least three hours each week. Students take online pretest at each level; if their skills fall below an 80 percent mastery level, they are required to complete a series of lessons and homework assignments and then pass a proctored posttest. Students can complete the modules at their own pace, and it is possible to complete all three levels of the developmental math sequence in a single semester (Bassett, 2009; Radford et al., 2012; Rutschow & Schneider, 2011).

2.3 Mainstreaming into College-level Courses with Supplemental Support

With this option, universities may place developmental education students directly into university-level courses, often with additional supports such as tutoring, study groups, study skill courses, and additional class periods. The supplemental support experiences are designed to increase the likelihood of success in the college course (Edgecombe, 2011). Mainstreaming relies on the assumption that students who have remedial needs are, with extra assistance, capable of mastering college-level work (Rutschow & Schneider, 2011).

As an example, Arizona State University's Stretch program was launched in fall 1994 as a two-semester sequence that stretched ENG 101 (basic writing) over two semesters. The aim was to give students more time and require students to use the same textbooks and work on the same assignments as students in the traditional ENG 101 classes. It rested on the premise that students needed "more time to think, more time to write, more time to revise" (Glau, 2007, p. 31).

Studies report higher relative positive outcomes for students in US accelerated courses in terms of completion rates (Bassett, 2009; Bragg, 2009; Brancard et al., 2006; Brown & Ternes, 2009; Sheldon & Durdella, 2010); pass rates (Bassett, 2009; Bragg et al., 2010; Edgecombe et al., 2013; Epper & Baker, 2009; Glau, 2007; Hern, 2010; Sheldon & Durdella, 2010; Zachry, 2008); retention/persistence (Bassett, 2009; Brancard et al., 2006; Brown & Ternes, 2009; Glau, 2007; Hern, 2010; Zachry, 2008); developmental credits (Bragg, 2009); and likely to pass college-level courses (Bragg, 2009).

3. Extended Degree Programs

Another option for Botswana's public STEM-offering universities is to offer Extended Degree programs, like those implemented in South African universities such as the University of Pretoria and Nelson Mandela University. As an example, the Extended Degree programs at the University of Pretoria effectively add an additional year to the first year of the regular undergraduate degree programs in Mathematics, Physics, Biology, Chemistry, Engineering, Built Environment and Information Technology, Veterinary Science and Health Sciences. These programs are designed for students who are academically underprepared and serve as gateways to undergraduate science and science-based degree programs. The Extended Degree programs comprise two phases. The first phase has a duration of 18 months (three semesters). During this phase, students are developed academically and psychologically for further studies through small group instruction at a slower pace. Students who successfully complete the first phase will obtain credits equivalent to the first semester of the first year of the BSc and BSc Agric programs. These students may then register for second semester Year 1 modules in their preferred BSc programs (University of Pretoria, n.d.).

4. Summer Bridge Programs

Summer Bridge programs present another strategy for public STEM-offering universities in Botswana. These programs have demonstrated to be a high impact practice in the USA. As their name implies, most summer bridge programs in the USA are delivered in the summer before matriculation and the commencement of formal study in the fall semester. The type, content and structure of Summer Bridge programs vary by implementing institution and population served. While these programs have been utilized for general education students or interested students, historically they have targeted US-based students categorized as ethnic/racial minority or underrepresented in college/university, low-income, first-generation, and who, due to these identities, can occupy an intersectionality of "at risk" for drop-out (Kitchen et al., 2018; Institute of Education Sciences, 2016; Murphy et al., 2010; Sparrow, 2017).

Summer Bridge programs may be provided as voluntary/mandatory, residential/non-residential, and fee-based/free. They may be offered as general or developmental education avoidance programs or as developmental education acceleration programs.

4.1 General Summer Bridge Programs

Summer Bridge programs, when offered as *general or developmental education avoidance programs*, are designed to ease students' transition from high school to college/university, and in so doing, promote retention and graduation rates (Institute of Education Sciences, 2016). The programs are mostly optional for incoming students. Their purpose is to promote acclimatization, assimilation and

postsecondary success by providing them with academic support that prepares them for college/university level work, and academic skills and social resources they need to succeed in a college/university environment, before they actually begin their undergraduate programs (Engle et al., 2006; Engle & Tinto, 2007; Garcia & Paz, 2009; Grace-Odeleye & Santiago, 2019; Howard & Sharpe Jr., 2019; Institute of Education Sciences, 2016; Murphy et al., 2010; Myers, 2003; Simon et al., 2021; Tomasko et al., 2016). The programs provide students with cultural and social capital and help them navigate and adjust to their new environment (Institute of Education Sciences, 2016). Socialization to college/university is central to the programs. They transmit the cultural capital for the college/university environment, which leads to the development of habitus (Sparrow, 2017). These positive outcomes lead to a mitigation of "belonging uncertainty," a negative mindset associated with student doubts about their academic skills and their ability to successfully acclimate and assimilate to a college/university campus (Sparrow, 2017; Winograd & Rust, 2014).

These general Summer Bridge programs tend to be offered over 2–8 weeks, although some programs have been implemented over a few hours, others a week, and some others run for a month or longer (Grace-Odeleye & Santiago, 2019). At Northampton Community College, for example, their summer bridge program runs for 4 days, and a larger summer bridge program at the University of Arizona runs for six weeks.

Key program components may include (a) an in-depth orientation to college/university life and resources (e.g., the library, activity center, and student health center) and encouragement of family members' involvement in students' academic support networks, (b) academic advising, and (c) training in skills necessary for college success with both academic components (e.g., time management, study and test-taking skills, learning styles, career assessment, and financial aid) and social components (personal financial responsibility, motivation, behavioral expectations and stress management) (Institute of Education Sciences, 2015, 2016; Muraskin et al., 2004; Murphy et al., 2010; Swail et al., 2003). During some general Summer Bridge programs, students may also be enrolled in short, non-credit-bearing courses in Calculus, Chemistry, Computer Science and English composition (Murphy et al., 2010).

As an example, Georgia Tech offers a six-week residential summer bridge program named The Challenge. Students take non-credit mini courses in Calculus, Chemistry, Computing for Engineers, and Communication and Development, in addition to team building and personal and professional development activities. While no credit is offered for these courses, the curricula track closely with what students can expect in full-term credit-bearing courses later in the fall term. During The Challenge, incoming students attend courses taught by Georgia Tech professors and obtain an academic head start on the Institute's curriculum; experience living on campus and interacting with roommates; get to know over

100 incoming and current Georgia Tech students; foster a close peer network on campus before the beginning of the fall semester; and network with representatives from Fortune 500 companies (Muraskin et al., 2004).

Participation in a general summer bridge program is associated with higher graduation or degree attainment rates (Murphy et al., 2010); GPA and first-year retention (Cabrera et al., 2013; Muraskin et al., 2004; Tomasko et al., 2016) and feelings of greater self-efficacy (Strayhorn, 2011).

4.2 Developmental Summer Bridge Programs

Developmental Summer Bridge Programs present a strategy for Botswana's universities, different from the general Summer Bridge Programs which focus primarily on transition to college/university and provide opportunities for incoming students to avoid developmental education. Developmental Summer Bridge programs are designed to reduce the need for developmental education to take place during the regular college/university years. Students are enabled to complete their developmental education courses during the summer period, before they enroll in their first-year college/university level coursework (Edgecombe, 2011). The programs provide students with accelerated instruction in areas where additional knowledge and skills are needed to help them succeed in higher education (Institute of Education Sciences (2015). Program students are identified when their scores on college placement tests indicate the need for remediation. Students must successfully complete their Developmental Summer Bridge program to progress to the first year of their undergraduate program.

Developmental Summer Bridge programs are based on theories and empirical evidence suggesting that the transition to college can be difficult for academically underprepared students. The focal population have historically been US-based students categorized as ethnic/racial minority or underrepresented in college/university, low-income, first-generation, or at risk for drop-out (Institute of Education Sciences, 2016). Research studies (e.g., Clauss-Ehlers & Wibrowski, 2007; Reid & Moore, 2008; Strayhorn, 2011; Turner et al., 2021) have found that U.S. students of color, low-income, and first-generation college students may struggle to successfully transition to and persist in college due to their lack of preparation during their high school years. High school students in Reid & Moore's (2008) study observed that they felt "cheated" because their high school experiences did not prepare them for the rigors of college courses, provide the social skills necessary to navigate their college environments, or develop the critical thinking, problem solving, and writing skills needed in college (p. 251).

The type, content and structure of Developmental Summer Bridge programs varies by implementing institution. The programs tend to be offered during 3–7 hours a day over 4–6 weeks in summer. The key components of these programs are a) accelerated developmental instruction addressing identified academic deficiencies, typically in math, reading, and writing; and b) college

preparation training designed to ease students' emotional and psychological adjustment to the college/university environment.

The math, reading and writing courses may include mandatory computer-aided instruction and independent practice in a lab setting (Barnett et al., 2012). Students may also receive academic support such as tutoring, mentoring, and/or computer-based learning labs. Some institutions may assign a tutor to each class for a few hours per week, placing a tutor in every classroom for the entire period or having several tutors roaming among the different developmental classes. Where tutors are not provided in class, math students may be encouraged to spend at least ten hours per week in the math lab, where tutoring is provided (Barnett et al., 2012).

The college preparation training component is similar to that offered under General Summer Bridge programs and may include an in-depth orientation to college/university life and resources, academic advising, and training in skills necessary for college success skills, with academic and social components (Barnett et al., 2012; Institute of Education Sciences, 2015, 2016; Muraskin et al., 2004; Swail et al., 2003). College preparation training may be allocated one-hour per week and programs may use mentors to help students better understand the transition to college (Barnett et al., 2012). The academic advising and counseling support component of college preparation may be designed to orient students to the college/university and the Summer Bridge Program; assist students with course selection, career-planning, and decision-making; help students clarify values and develop self-concept; and provide personal counseling (Delaware Country Community College, n.d.). Developmental Summer Bridge programs may also include evening activities to ease transition and encourage peer engagement e.g., diversity workshops, outdoor athletic events, and seminars on leadership and money management (Strayhorn, 2009, 2011).

As an example, Texas A&M International University's Developmental Education Summer Bridge Program emphasizes Mathematics skills development. The program offers three hours of differentiated instruction, four days a week, for five weeks. Students are provided with class tutors, individual mentors, and comprehensive academic advising and are also given instruction in financial aid awareness, study skills, and time management. The program has the strong support and cooperation of the university leadership and faculty (Texas Higher Education Coordinating Board, 2011).

Barnett et al. (2012) found that incoming students were more likely to pass their introductory college-level math and writing courses during the first few semesters in college/university after participation in a Developmental Summer Bridge program. However, the researchers found that the higher rates of first college-level course completion began to diminish in the final semesters of a two-year follow-up period. They concluded that it may be difficult to expect long-term

impacts on credit accumulation and persistence from a short, intensive summer program (Barnett et al., 2012).

Research Question Two: Which context-driven developmental education intervention has the greatest promise for increasing matriculating STEM students' success in the first year of university in Botswana?

This study sought to address the problem and context whereby incoming students to Botswana's STEM-offering public universities demonstrate a readiness gap or poor preparation for Mathematics and other core university-level courses. The readiness gap is linked to secondary school completers' performance at the Botswana Certificate of Secondary Education (BGCSE) or Grade 12 examinations where Grades D and below tend to characterize their performance in the core and science subjects of Mathematics, English Language, Science (single award) and Science (double award).

Four types of potential developmental education interventions are suggested in the literature to raise the university readiness of the incoming classes. These interventions are developmental education avoidance, developmental education acceleration, extended degree and summer bridge programs. Of these, two types of interventions - the Foundation Year or Foundation Studies programs implemented in the United Kingdom, Australia, New Zealand, and the Extended Degree Programs implemented in South Africa - will add an additional year to the start of incoming students' undergraduate programs and therefore their time-to-degree. Both are developmental education avoidance programs. This delay in time-to-degree is not feasible given Botswana's national skills priorities. The 2023-2024 Priority Skills identified for training at undergraduate degree level by the country's Human Resource Development Council (HRDC) include as many as 56 Science and Technology and 22 Engineering skill areas (Human Resource Development Council HRDC, n.d.). HRDC functions as Government's advisor on human resource development and provides a platform for the coordinated achievement of the National Human Resource Development Strategy by the relevant sectors and agencies.

If Botswana's public universities were to implement the third intervention type - Developmental Education Acceleration Programs - underprepared tertiary-level students will be required to enroll in regular first-year university-level courses while also addressing their academic deficits. The onus will be placed on the universities to accommodate the additional instructional time required for these restructured courses into their regular teaching timetables/schedules. This intervention carries the risk of dropout as it overloads students with content at a time when they are underprepared for university work and their academic and social integration to the institution should be developing. Some of these courses, e.g., modularized courses require high levels of academic capital (faculty

interactions, self-advocacy, etc.) and motivation, which BGCSE completers may not have developed. Furthermore, at risk students may experience an attached stigma of not being as "smart" or university-ready as their peers, potentially leading to lower self-esteem, higher frustration, and higher drop-out rates (Bettinger & Long, 2009a, 2009b; Jacob & Lefgren, 2004; Long & Boatman, 2013).

The university readiness gap of Botswana's secondary school completers requires a proactive program that can be tailored neatly to meet the needs of incoming students who may also not possess all the mindsets, academic capital, and knowledge to successfully transition to the role of university student. The Developmental Summer Bridge Program offers the greatest promise in terms of pre-entry preparation of these students. When it is offered, its duration and commitments in terms of finances and staff availability and use are critical beneficial factors. Developmental Summer Bridge Programs may be implemented anywhere between four and six weeks. The shorter 3-week programs are typically more cost effective and demand fewer financial and human resources to run while the longer 6-week programs involve more sustained contact with students and a more robust curriculum.

Enrolling on a Developmental Summer Bridge Program helps overcome the research finding that the length of time students spend in developmental education courses is negatively related to degree completion (Adelman, 1998; Attewell et al., 2006). Bridge programs include a range of support services to ease the transition, both academically and socially, from high/secondary school to college/university. At-risk students derive benefits from the non-academic support components that help them create social relationships, clarify their aspirations and academic commitments, and develop college know-how (Karp, 2011). Furthermore, through summer bridge programs, students have opportunities to form relationships with mentors, peers, and faculty members that may strengthen their academic and social support networks as well as their ties to the institution, which may in turn promote student persistence (Barnett et al., 2012).

A non-credit-bearing *Developmental Winter Bridge Program* is therefore proposed for all incoming students for Botswana's public STEM-offering universities. The program title reflects that June-August are the winter months in the Southern Hemisphere where Botswana is located.

RECOMMENDATIONS FOR POLICY AND PRACTICE

Successful implementation of the *Developmental Winter Bridge Program* will require policy and practice interventions that guarantee the Program satisfies the cumulative needs of policymakers, higher education institutions, faculty members, parents, and students. A lack of alignment between secondary education and tertiary/higher education systems often requires additional clarity for secondary

students and their parents, and postsecondary measures to remedy what students need to know and need to be able to do to enter and succeed in university (Venezia et al., 2003).

Recommendations for Policy

Policy recognition of the *Developmental Winter Bridge Program* as a pre-entry requirement to higher education studies in STEM is the first critical implementation milestone to be achieved by Botswana's STEM-offering public universities. The educational deficit context highlighted in this study provides the catalyst for action. It is recommended that the public universities engage the four key stakeholders within Botswana's higher education landscape, namely their line Ministry, the national higher education accreditation authority, the council that coordinates the country's human resource development strategy, and the government agency that funds qualifying students to attend college/university.

The line Ministry and accreditation authority both seek to ensure Education and Training Providers (ETPs) uphold quality standards in their education and training, consistent with the national Vision 2036. STEM-offering universities will present these two stakeholders with a Core Educational Skills Situational Analysis that presents historic internal student performance in core STEM courses such as Mathematics and Mathematics-based courses, and external BGCSE performance in core subjects for the past decade, and which establishes the need for all incoming students to enroll in a non-credit-bearing developmental education program that covers critical Mathematics and other STEM-critical skills, prior to the commencement of their undergraduate learning programs. Such a Situational Analysis will emphasize the importance of knowledge and skills in Mathematics and other critical core courses to the practical, occupational preparation of the next engineers, scientists, and other STEM professionals.

Public STEM universities may either individually or collaboratively draft the non-credit-bearing Developmental Winter Bridge Program and seek its recognition from HRDC, the council that coordinates the country's human resource development strategy. Program developers must intentionally ensure the exit requirements of the developmental courses match the entry requirements for the university Mathematics and Mathematics-related courses (Boylan, 2002). The fourth stakeholder, the government agency that funds qualifying students to attend college/university, should be engaged regarding extending their sponsorship (100% tuition and maintenance) for qualifying new students, to the 1-2 months prior to the commencement of formal undergraduate degree programs. This agency should aim to finalize its sponsorship decisions and confirmations by late May/early June annually, to enable incoming students to enroll into a Winter Bridge program that commences mid to late June.

At the university level, the *Developmental Winter Bridge Program* also warrants policy recognition. It is recommended that the Program be embedded into institutional missions to avoid it being implemented in a vacuum and not respected

by academic departments where some faculty members may consider that university is not the place to be focusing on skills not learned in secondary school (Long & Boatman, 2013). Shields (2005, p. 48) notes that "when the programs are stereotyped with a lower status on campus, the institution, as well as faculty and students involved in the programs, suffers." Boylan and Saxon (1998) found the highest retention rates occurred at institutions that considered developmental education an institutional priority. In addition, it is important that, at the university level, the Bridge Program is not conceived solely as an intervention to address students' academic deficits and increase their university readiness. The Program must encompass the entire developmental supports component to achieve the beneficial focus on skills students need for their academic progress (Long & Boatman, 2013).

Recommendations for Practice

Effective implementation of the *Developmental Winter Bridge Program* will require the support and cooperation of university leadership, the commitment of program staff and faculty members from the planning and design stages through to the implementation and evaluation stages of the program, the integration of learning and study skills development across the Program's curriculum, and comprehensive academic advising and peer mentoring (Texas Higher Education Coordinating Board, 2011). Public universities should use their best teaching staff to deliver the developmental courses to avoid a situation whereby ineffective teaching perpetuates the deficiencies with which BGCSE completers entered the Program. According to Shields (2005), these students need,

> instructors who can foster a supportive, nurturing environment and relate material to them in ways that teach them to not only learn the material, but to learn how to monitor their own learning, to think critically and strategically, and, most importantly, to appreciate the subject. (p. 48)

Staff members teaching on the bridge program may be offered an extra responsibility salary addition for the period of the program, as compensation for the use of their winter vacation time.

Education Strategy Group's (2024) Brief outlines critical considerations and strategies for implementing institutional-led and statewide summer bridge programs, including a timeline with key milestones to be achieved. When implemented, some of the key components of a Developmental Summer Bridge Program will include an in-depth orientation to college/university life and resources, academic advising, and training in skills necessary for students' college success that includes academic and social components. Regarding orientation, college/university campuses are, in many meaningful ways, different from high school, and one area where these differences are particularly pronounced is in campus resources. College/university resources, unlike those in high school, are much less likely to be integrated into the academic experience and are far less

likely to be mandatory (Gartland & Strosnider, 2023). The language also changes—guidance counselor (high school) vs. academic advisor (college/university), for example—further forcing incoming students to confront "baffling and confounding sets of norms, rules, and values" (Simon, 2021, p. 127). It is therefore recommended that coordinators of the *Developmental Winter Bridge Program* allocate time to educate incoming students on university services offered, how to access those services, and identify a point of contact in each division/department.

Regarding training in skills necessary for university, it is recommended that, on the academic side, the *Bridge Program* introduce incoming students to study skills such as test taking, note taking, textbook reading, and time management, forming the basic building blocks of being a college/university student. On the social side, it is proposed that mindsets be a focal item. There are many non-academic barriers to successful student transition, and unproductive mindsets can be among the biggest challenges for incoming students to overcome. Notable examples of these unproductive mindsets include fixed mindset (Dweck, 2006), stereotype threat (Steele, 2010), and imposter syndrome (McCarthy et al., 2023). The *Developmental Winter Bridge Program* may seek to help students identify these unproductive mindsets and destigmatize the feelings associated with these mindsets, and ultimately replace these mindsets with more productive worldviews that are conducive to student acclimation and academic success. The potential issue of attitude and negative self-authorship by male students should be addressed.

In addition, the *Developmental Winter Bridge Program* may address the issue of *c*onnections for incoming students. The transition to college can be isolating and lonely for any student and especially for first-generation students who have fewer college/university-educated role models available in their families. The Winter Bridge Program, as a result, may prioritize creating intracohort connections with other students through group work and extracurricular activities (Grace-Odeleye & Santiago, 2019). This peer-to-peer connection is critically important, according to Calvo-Armengol (2009), who considers peer influence as serving as "a multiplier on the outcome of the isolated individual" (p. 1240). There is a role here for teaching assistants. Connections with administrators and faculty members are equally important so that the Winter Bridge Program serves as a conduit for relationship building between incoming students and college/university staff (Sparrow, 2017).

It is recommended that after its implementation, rigorous methods should be used to evaluate the *Developmental Winter Bridge Program.* Such an evaluation will help identify best practices, their impact on student performance in first year courses, persistence and graduation, and additional opportunities to increase incoming students' academic and social integration into university life.

CONCLUSION

This study sought to investigate the developmental education interventions public STEM-offering universities in Botswana can proactively implement to improve the chances of its matriculants' academic success in Mathematics and other core subjects in their first year and successive years at university. The study was prompted by the readiness gap for core university-level courses that distinguish entering or matriculating STEM students and arise from a tendency for Grades D and below to characterize BGCSE completers' performance in the core and science subjects of Mathematics, English Language, Science (single award) and Science.

Many incoming students arrive with gaps in knowledge and academic know-how, and several approaches exist to remedy this challenge of facilitating incoming student academic success, particularly for students in need of foundational work in the STEM field. This study explored several options, namely Foundation Year or Foundation Studies Programs, Extended Degree Programs, compressed, fast-track or paired courses, modularized foundational courses, mainstreaming strategies, university-level courses fortified with additional mandated supports, and shorter-term proactive approaches like summer bridge programs.

Of the interventions explored in this paper, the one that holds the most promise in the Botswana context is a modification of the summer bridge model. STEM universities have the option to effectively utilize a short-term program (4-6 weeks) – the *Developmental Winter Bridge Program* – to remind, reinforce and redirect secondary school completers of core concepts and provide necessary academic capital they need to successfully access university-level coursework, while managing their time-to-degree. Developmental summer bridge programs increase the chances of a high level of habitus for incoming students and thereby increase student persistence. Not only are summer bridge programs effective, they run on truncated timelines, require limited personnel investments, and are therefore relatively inexpensive to start up and run. Universities who commit to this small investment in time and resources should not only recoup the investment but realize a profit through additional tuition and fees from more retained students. The study provides a base for the planning, development and policy implementation of a bridge program that may increase confidence in the preparation and occupational competence of future engineers and scientists.

REFERENCES

Adams, P., & McKusick, D. (2014). Steps and missteps: Redesigning, piloting, and scaling a developmental writing program. *New Directions for Community Colleges, 167*, 15-25. https://doi.org/10.1002/cc.20107

Adelman, C. (1998). The kiss of death? An alternative view of college remediation. *National Crosstalk*, *6*(3), 11.

Anyidoho, P. A., & Gallant, D. J. (2024). Benefits and challenges of virtual Early Arrival or Summer Bridge Programs for underrepresented minority students majoring in STEM. *Journal of College Science Teaching,* 1–6. https://doi.org/10.1080/0047231X.2024.2401724

Astin, A. W. (1975). *Preventing students from dropping out.* Jossey-Bass.

Astin, A. W. (1977). *Four critical years.* Jossey-Bass.

Attewell, P., Lavin, D., Domina, T., & Levey, T. (2006). New evidence on college remediation. *Journal of Higher Education, 77*(5), 886-924. https://doi.org/10.1080/00221546.2006.11778948

Barnett, E. A., Bork, R. H., Mayer, A. K., Pretlow, J., Wathington, H. D., & Weiss, M. J. (2012). *Bridging the gap: An impact study of eight developmental summer bridge programs in Texas.* National Center for Postsecondary Research. http://files.eric.ed.gov/fulltext/ED539188.pdf.

Bassett, M. J. (2009). Jackson State Community College, Course Title: Basic Math, Elementary and Intermediate Algebra. Tennessee Board of Regents: Developmental Studies Redesign Initiative. http://www.thencat.org/States/TN/Abstracts/JSCC%20Algebra_Abstract.htm

Beal, P. E., & Noel, L. (1980). *What works in student retention.* American College Testing Program.

Bettinger, E., & Long, B. T. (2005). Remediation at the community college: Student participation and outcomes. *New Directions for Community Colleges, 129,* 17-26. https://doi.org/10.1002/cc.182

Bettinger, E., & Long, B. T. (2009a). Remedial and developmental courses. In S. Dickert-Conlin & R. Rubenstein (Eds.), *Economic inequality and higher education: Access, persistence, and success (pp. 69–100).* Russell Sage Foundation.

Bettinger, E., & Long, B. T. (2009b). Addressing the needs of underprepared students in higher education: Does college remediation work? *Journal of Human Resources, 44*(3), 736–771. https://doi.org/10.1353/jhr.2009.0033

Bettinger, E. P., Boatman, A., & Long, B. T. (2013). Student supports: Developmental education and other academic programs. *The Future of Children, 23(1), Postsecondary Education in the United States*, 93-115. https://doi.org/10.1353/foc.2013.0003

Biswas, R. R. (2007). Accelerating remedial math education: How institutional innovation and state policy interact. *An Achieving the Dream Policy Brief*. Jobs for the Future.

Blanc, R., DeBuhr, L., & Martin, D. C. (1983). Breaking the attrition cycle: The effects of Supplemental Instruction on undergraduate performance and attrition. *Journal of Higher Education, 54*(1), 80-89.

https://doi.org/10.2307/1981646
Boatman, A. (2012). *Evaluating institutional efforts to streamline postsecondary remediation: The causal effects of the Tennessee Developmental Course Redesign Initiative on Early Student Academic Success* (An NCPR Working Paper). The National Center for Postsecondary Education.
Boatman, A., & Long, B. T. (2011). *Does remediation work for all students? How the effects of postsecondary remedial and developmental courses vary by level of academic preparation* (NCPR Working Paper). New York, NY: National Center for Postsecondary Research.
Botswana Examinations Council [BEC] (2013-2023). *Botswana Certificate of Secondary Education (BGCSE) Provisional Summary of Results*. BEC.
Boylan, H. R. (2002). *What works: Research-based best practices in developmental education*. Continuous Quality Improvement Network. National Center for Developmental Education.
Boylan, H., & Saxon, D. (1998). *An evaluation of developmental education in Texas public colleges and universities.* Texas Higher Education Coordinating Board.
Bragg, D. D. (2009). *Community College of Denver Breaking Through Outcomes Report*. Community College of Denver.
Bragg, D. D., Baker, E. D., & Puryear, M. (2010). 2010 follow-up of Community College of Denver FastStart program. University of Illinois, Office of Community College Research and Leadership.
Brancard, R., Baker, E. D., & Jensen, L. (2006). *Accelerated Developmental Education Project: Research Report (Community College of Denver).* Community College of Denver.
Brown, R., & Ternes, R. (2009). *Final Report to the Lilly Endowment Grant: Grant for targeted and accelerated remediation.* Ivy Tech Community College.
Cabrera, N., Miner, D., & Milem, J. (2013). Can a summer bridge program impact first-year persistence and performance? A case study of the new start summer program. *Research in Higher Education, 54*(5), 481-498.
Calvo-Armengol, A., Patacchini, E., & Zenou, Y. (2009). Peer Effects and Social Networks in Education. *The Review of Economic Studies, 76*(4), 1239-1267. https://doi.org/10.2139/ssrn.1309101
Carew, R. S. (2024). *Using a Summer Bridge Program to address college readiness for first year community college students*. (Publication No. 570) [Doctoral dissertation, Nova Southeastern University]. NSUWorks. https://nsuworks.nova.edu/fse_etd/570.
Clauss-Ehlers, C., & Wibrowski, C. R. (2007). Building educational resilience and social support: The effects of the educational opportunity fund program among first- and second-generation college students. *Journal of College Student Development, 48*(5), 574-584.
Delaware Country Community College (n.d.). *Summer bridge program.*

https://www.dccc.edu/summer-bridge-program
Dweck, C. (2006). *Mindset: The new psychology of success*. Random House.
Edgecombe, N. (2011). *Accelerating the academic achievement of students referred to developmental education (CCRC Working Paper No. 30, Assessment of Evidence Series).* Columbia University, Teachers College, Community College Research Center.
Edgecombe, N., Jaggars, S. S., Baker, E. D. & Bailey, T. (2013). *Acceleration through a holistic support model: An implementation and outcomes analysis of FastStart@CCD.* Columbia University, Teachers College, Community College Research Center.
Education Strategy Group (2024, March). *Bridging the gap: A state leader's guide to implementing Summer Bridge Programs.* ESG. https://edstrategy.org/wp-content/uploads/2024/03/ESG-Summer-Bridge_FINAL.pdf
Engle, J., Bermeo, A., & O'Brien, C. (2006). *Straight from the source: What works for first-generation college students.* The Pell Institute for the Study of Opportunity in Higher Education.
Engle, J., & Tinto, V. (2007). *Moving Beyond access: College success for low-income, first-generation students.* The Pell Institute. https://files.eric.ed.gov/fulltext/ED504448.pdf
Epper, R. M., & Baker, E. (2009). *Technology solutions for developmental math: An overview of current and emerging practices*. Report prepared with funding from the William and Flora Hewlett Foundation and the Bill & Melinda Gates Foundation.
Ferrari, R. (2015). Writing narrative style literature reviews. *Medical Writing, 24*(4), 230–235. https://doi.org/10.1179/2047480615Z.000000000329
Garcia, L. D., & Paz, C. C. (2009). *Evaluation of summer bridge programs. About Campus, 14*(4), 30-32. https://doi.org/10.1002/aca.299
Gartland, D., & Strosnider, R. (2023). Consideration for transition from high school to postsecondary education. *Learning Disability Quarterly, 46(*3), 230-242. https://doi.org/10.1177/07319487221111099
Georgia Institute of Technology (n.d.). *Challenge Summer Program*. https://provost.gatech.edu/challenge-summer-program
Glau, G. (2007). Stretch at 10: A progress report on Arizona State University's Stretch Program. *Journal of Basic Writing, 26*(2), 30-48. https://doi.org/10.37514/JBW-J.2007.26.2.03
Gordon, V. N., & Grites, T. (1984). The freshman seminar course: Helping students succeed. *Journal of College Student Personnel, 25*(4), 315–320.
Grace-Odeleye, B., & Santiago, J. (2019). A review of some diverse models of

summer bridge programs for first-generation and at-risk college students. *Administrative Issues Journal: Connecting Education, Practice, and Research, 9*(1), 35-47. https://doi.org/10.5929/9.1.2

Hern, K. (with Snell, M.) (2010). *Exponential attrition and the promise of acceleration in developmental English and math.* Chabot College.

Howard, B., & Sharpe Jr., L. (2019). The summer bridge program: An effective agent in college students' retention. *Journal of Interdisciplinary Studies in Education, 7*(2), 20-30. https://doi.org/10.32674/jise.v7i2.1207

Human Resource Development Council HRDC (n.d.). *About The Human Resource Development Council*. HRDC.

Institute of Education Sciences (2015). *WWC Intervention Report – Developmental Summer Bridge Programs*. US Department of Education.

Institute of Education Sciences (2016). *WWC Intervention Report – Summer Bridge Programs*. US Department of Education.

Jacob, B. A., & Lefgren, L. (2004). Remedial education and student achievement: A regression-discontinuity analysis. *Review of Economics and Statistics, 86*(1), 226–244. https://doi.org/10.1162/003465304323023778

Kallison, J. M. Jr., & Stader, D. L. (2012). Effectiveness of summer bridge programs in enhancing college readiness. *Community College Journal of Research and Practice, 36*(5), 340-357. https://doi.org/10.1080/10668920802708595

Karp, M. M. (2011). *Toward a new understanding of non-academic student support: Four mechanisms encouraging positive student outcomes in the community college (CCRC Working Paper No. 28, Assessment of Evidence Series).* Teachers College, Columbia University.

Kaelo, G. (2021 October 15). BEC blames poor results on unqualified teachers. *Mmegi Online.* https://www.mmegi.bw/news/bec-blames-poor-results-on-unqualified-teachers/news

Kgosikebatho, K. (2016, February 29). Botswana: Why local BGCSE students fail. *The Patriot*. https://www.facebook.com/ThePatriotOnSunday/posts/why-local-bgcse-students-fail-keitebe-kgosikebathokeitebethepatriotcobwat-the-ba/988368084585261/

Kitchen, J., Sadler, P., & Sonnert, G. (2018). The impact of summer bridge programs on college students' stem career aspirations. *Journal of College Student Development, 59*(6), 698-715. https://doi.org/10.1353/csd.2018.0066

Koboyatau, T. (2022, February 18). MoBE, BEC education weakest link. *Weekend Post*. https://www.weekendpost.co.bw/33548/news/mobe-bec-education-weakest-link/

Kuh, G. D., Kinzie, J., Schuh, J. H., Whitt, E. J., & associates. (2010). *Student*

success in college: Creating conditions that matter. Jossey-Bass.
Long, B. T., & Boatman, A. (2013). The role of remedial and developmental courses in access and persistence. In Anthony Jones and Laura Perna (Eds.). *The State of College Access and Completion: Improving College Success for Students from Underrepresented Groups.* Routledge Books.
Lyken-Segosebe, D. (2017). The scholarship of practice in applied disciplines. In J.M. Braxton (Ed). *New Directions for Higher Education. No. 178. Toward a Scholarship of Practice.* Jossey-Bass. https://doi.org/10.1002/he.20231
Lyken-Segosebe, D. E., & Braxton, J. M. (2021). Towards a scholarship of practice for university leadership in southern Africa: The two-way practitioner-researcher loop. International Journal of Higher Education, 10(1), 93-105. https://doi.org/10.5430/ijhe.v10n1p93
Manpower Demonstration Research Corporation [MDRC] (2011). *Can summer bridge programs narrow the "college readiness gap"?* Issue 02/2011. https://www.mdrc.org/publication/can-summer-bridge-programs-narrow-college-readiness-gap
Mathala, S. (2023, February 27). Education system renders students' future hopeless'- BOSETU. *Mmegi Online* https://www.mmegi.bw/news/education-system-renders-students-future-hopeless-bosetu/news
Maxwell, M. (1997). *Improving student learning skills.* H&H Publishing.
Motlhabane, D., & Adamson, K. (2018, February 19). BGCSE pass rate falls. *The Patriot on Sunday*. https://m.facebook.com/ThePatriotOnSunday/photos/bgcse-pass-rate-falls-72-fail-form-5-only-28-per-100-candidates-manage-a-pass-re/1651367831618613/
McCarthy, K. Chavez, K., Sastelum, K. Gomez, J., & Salas, J. (2023). Imposter phenomenon: The occupational experiences of first-generation college students. *Open Journal of Occupational Therapy, 11*(2), 1-18. https://doi.org/10.15453/2168-6408.2011
Mulvey, M. E., (2008). Under-prepared students - A continuing challenge for higher education. *Research and Teaching in Developmental Education, 24*(2), 77-87.
Muraskin, L., Lee, J., (with Wilner, A., and Swail, W. S.). (2004, December). *Raising the graduation rates of low-income college students.* The Pell Institute for the Study of Opportunity in Higher Education.
Murphy, T. E., Gaughan, M., Hume, R., & Moore, S. G. Jr. (2010). College graduation rates for minority students in a selective technical university: Will participation in a summer bridge program contribute to success? *Educational Evaluation and Policy Analysis, 32*(1), 70–83. https://doi.org/10.3102/0162373709360064

Myers, R. D. (2003). *College success programs*. Pathways to College Network Clearinghouse.

Noel, L. (1985). Increasing student retention: New challenges and potential. In Noel, L., Levitz, R., Saluri, D., & Associates. *Increasing student retention: Effective programs and practices for reducing the dropout rate*. Jossey-Bass.

Pascarella, E. T., & Terenzini, P. T. (1980). Student-faculty and student-peer relationships as mediators of the structural effects of undergraduate residence arrangements. *Journal of Educational Research, 73*(6), 344-353. https://doi.org/10.1080/00220671.1980.10885264

Pascarella, E. T., Terenzini, P. T., & Wolfle, L. W. (1986). Orientation to college and freshman year persistence/withdrawal decisions. *The Journal of Higher Education, 57*(2), 155-175. https://doi.org/10.2307/1981479

Phipps, R. (1998). *College remediation: What it is, what it costs, what's at stake.* Institute for Higher Education Policy.

Radford, A. W., Pearson, J., Ho, P., Chambers, E. & Ferlazzo, D. (2012). *Remedial coursework in postsecondary education: The students, their outcomes, and strategies for improvement.* MPR Associates, Inc.

Reid, M. J., & Moore, J. L. (2008). College readiness and academic preparation for postsecondary education: Oral histories of first-generation urban college students. *Urban Education, 43*, 240-261. https://doi.org/10.1177/0042085907312346

Rutschow, E. Z., & Schneider, E. (2011). *Unlocking the gate: What we know about improving developmental education*. MDRC.

Sablan, J. R. (2014). The challenge of summer bridge programs. *American Behavioral Scientist, 58*(8), 1035-1050. https://doi.org/10.1177/0002764213515234

Sheldon, C. Q., & Durdella, N. R. (2010). Success rates for students taking compressed and regular length developmental courses in the community college. *Community College Journal of Research and Practice, 34*(1–2), 39-54.

Shields, D. J. (2005). Developmental education: Criticisms, benefits and survival strategies. *Research and Teaching in Developmental Education, 22*(1), 43-51.

Simon, N., Hornung, R., & Dugan, K. (2021). Summer bridge program: Helping underserved students develop social and cultural capital. *Journal of Interdisciplinary Studies in Education, 11*(1), 126-148.

Snyder, H. (2009). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104*, 333-339. https://doi.org/10.1016/j.jbusres.2019.07.039

Sparrow, M. (2017). *A bridge to a smart start: A case study of Northampton*

Community College's summer bridge program. (Publication No. 10265059) [Doctoral dissertation, Northeastern University]. ProQuest Dissertations Publishing.

Steele, C. (2010). *Whistling Vivaldi: How stereotypes affect us and what we can do.* Norton.

Strayhorn, T. L. (2009). Bridging the gap from high school to college for "at risk" first-year students. *E-Source for College Transitions, 6*(3), 9–11.

Strayhorn, T. L. (2011). Bridging the pipeline: Increasing underrepresented students' preparation college through a summer bridge program. *American Behavioral Scientist, 55*(2), 142–159. https://doi.org/10.1177/0002764210381871

Swail, W. S., & Perna, L. W. (2002). Pre-college outreach programs: A national perspective. In W. Tierney & L. Serra (Eds.), *Increasing access to college: Extending possibilities for all students, (pp. 15 - 29).* State University of New York Press.

Swail, W., Redd, K. E., & & Perna, P. (2003). Retaining minority students in higher education: Framework for success. *ASHE-ERIC Higher Education Report, 30*(2). Jossey Bass.

Texas Higher Education Coordinating Board (2011). *Institutional strategies for increasing postsecondary student success.* https://nacada.ksu.edu/Portals/0/Clearinghouse/documents/906836THECBStudentSuccess.pdf

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition.* University of Chicago Press.

Tomasko, D., Ridgway, J., Waller, J., & Olesik, S. (2016). Association of summer bridge program outcomes with STEM retention of targeted demographic groups. *Journal of College Science Teaching, 45*(4), 90-99.

Turner, M., McCallum, C., & Benson, J. (2021). Beyond the bridge: Exploring the experiences of a summer bridge program through student voices. *Journal of College Orientation, Transition, and Retention, 28(1).* https://doi.org/10.24926/jcotr.v28i1.3540

University of Melbourne (n.d.). *Foundation Studies/ Pathway School – Trinity College h*ttps://www.trinity.unimelb.edu.au/pathways-school

University of Oxford (n.d.). *Foundation Year in Chemistry, Engineering and Materials Science*. University of Oxford. https://www.ox.ac.uk/admissions/undergraduate/courses/course-listing/fycems

University of Oxford (n.d.). *The University of Oxford Astrophoria Foundation Year.* University of Oxford. https://www.ox.ac.uk/admissions/undergraduate/increasing-access/foundation-year

University of Pretoria (n.d.). *University of Pretoria BSc - Extended Programs.*

https://www.up.ac.za/mamelodi-campus/article/2760637/extended-curriculum-programs-teaching-and-learning-activities

Venezia, A., Kirst, M., & Antonio, A. (2003). *Betraying the College Dream: How disconnected K-12 and Postsecondary education systems undermine student aspirations.* Stanford Institute for Higher Education Research.

Wathington, H., Pretlow, J., & Barnett, E. (2016). A good start? The impact of Texas' developmental summer bridge program on student success. *The Journal of Higher Education 87*(2), 150-177. https://doi.org/10.1353/jhe.2016.0010

Winograd, G., & Rust, J. (2014). Stigma, awareness of support services, and academic help seeking among historically underrepresented first-year college students. *The Learning Assistance Review, 19*(2), 17-41.

Zachry, E. (with Schneider, E.). (2008). *Promising instructional reforms in developmental education: A case study of three Achieving the Dream colleges.* MDRC. https://www.up.ac.za/mamelodi-campus/article/2760637/extended-curriculum-programs-teaching-and-learning-activities

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Manuscript submitted: ***May 15, 2024***
Manuscript revised: ***November 8, 2024***
Accepted for publication: ***November 15, 2024***