

**Introduction of Chemistry Accelerated Sequence Program
at Bronx Community College, City University of New York**

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Abstract

Introductory or gateway science courses often prove challenging for many community college students. At a Hispanic Serving Community College like Bronx Community College (BCC), many students abandon majors in science because they are unable to successfully complete the introductory science course requirements for their majors. To address this challenge we implemented an Accelerated Sequence Program (ASP). This paper evaluates the merits and functionality of the intensive ASP platform, which entailed combining the Chemistry 02 (CHM02) and chemistry17 (CHM17) courses offered by the Chemistry Department of Bronx Community College (BCC) in an accelerated one-semester sequence. This paper enumerates the program's impact on student performance and retention. It also indicates that the students enrolled in the remedial CHM02 ASP sections achieved the greatest benefit from the introduction of ASP to the Chemistry Department of BCC.

Keywords: Hispanic Serving Community College, Accelerated Sequence Program, General Chemistry, Remedial Chemistry, Supplemental Instruction Workshops, Peer Instructors

Introduction

Accelerated programs (AP) have been around for a long time. The trend of including this format in higher education has grown at a stunning pace. APs are among the fastest-growing transformation in higher education (Wlodkowski, 2013). Accelerated Sequence Programs (ASP) can be considered a subset of AP. It gives students the opportunity to advance to graduation faster and move on to 4 year colleges or to the work force, by enabling them to take courses and earn credits in a shorter period of time, compared to a traditional semester format (Boyd, 2017). ASP also improves academic performance, and progress. Students are able to complete their degree in fewer semesters (Tomas, 2013). It has been shown, that students taking different Summer and Winter sessions for 3 weeks, 4 weeks and 8 weeks and Winter session for 3 weeks are able to complete 6 to 12 credits, skip a semester, and graduate faster (Austin, Gustafson, 2006; Body, 1985). The passing and retention rates of these students tend to be well above those of students who follow the classic semester schedule. Community colleges are increasingly aware of the need to substantially increase the rates of completion of certificates and degree programs. There is now unprecedented urgency for this work because having more successful community college graduates is essential to sustaining our local and national economies as well as maintaining strong communities with engaged citizens (Austin 2006; Gustafson. 2006).

A growing number of colleges are designing accelerated or fast-track developmental education programs so that students can focus on specific, targeted issues for remediation; move through developmental education at their own pace; and most importantly, move into college level work more quickly. Research indicates that well-designed accelerated programs are efficient — and that students in these intensive courses perform as well as or better than, students in traditional developmental education (Body, 1985). The longer it takes a student to move through developmental education into a credit program, the more likely he or she is to drop out (Center for Community College Student Engagement, 2012). Accelerated or fast-track developmental programs can enhance learning and engagement and help students move into college-level work more quickly, leading to increased retention and graduation rates (Center for Community College Student Engagement, 2012).

ASP in the BCC Chemistry Department was designed to allow a select group of students to complete Chemistry 02 (CHM02) and Chemistry 17 (CHM17) in one semester. CHM02 and CHM17 are sequential courses required for students enrolled in science technology engineering and math (STEM) degree programs. Students passing the NYC Chemistry Regents with a score of 75 or higher are exempt from CHM02. Students can also take the department's CHM Placement exam to place out of CHM02 with a score of 25/40 or higher. Traditionally, these two courses have approximately 16% withdrawal and 24% failure rates. CHM02 is remedial chemistry. Most science, liberal arts major, and health-related programs (Nursing, Dietetics Nutrition, Medical Lab Technology, and Nuclear Medicine Technology etc.) must pass this course prior to taking any higher-level chemistry courses, such as CHM17, Fundamental General Chemistry. These students will ultimately transfer to 4 year colleges. Thus successful implementation of the ASP program

will also increase the number of students who move on to obtain a 4-year degree (Scott, 1991; Conrad, 1991; Wlodkowski, 2003; Bettinger, 1991; Long, 1991). Implement

The BCC department ran an accelerated CHM02 and CHM17 course sequence beginning in the Fall 2015 semester to Fall 2017, to provide students enrolled in degree programs requiring the two courses, the option to complete both courses in the same semester. The goal was to increase retention and pass rates for the students enrolled. CHM02 was offered in the first half of the semester and CHM17 was offered to students successfully completing the CHM02 component in the second half of the semester. The key adaptation of ASP implementation was to introduce the students to a more concentrated, focused format of the course material. Providing a learning experience based on quality of needed information rather than quantity as is usually the case in semester-long courses. In this paper we demonstrate the value of the ASP at BCC, as evidenced by the improvements in passing rates and reduced withdrawal rates of some students in the program.

Methods

To prepare the students for the intensive nature of the program and to ensure their success, students were first instructed of their required commitment and needed time investments. The ASP sequence was run on Saturdays/Sundays from 9:00 – 2:10 pm for CHM02 and subsequently from 9:00 – 3:10 pm for CHM17. Detailed explanation of key points of the course syllabus was provided to them in writing and on-line. These initial steps were crucial in engendering the mental preparedness, discipline and motivation required for successful completion of the program.

Students were engaged in in-depth discussions utilizing a higher student-centered instructional format in addition to practice exercises to create a sense of continuity and engagement. Though no pre-requisites were required for the students to enroll in the program, a passing grade of C or better in English and mathematics was required, to ensure the students' ability to comprehend and assimilate the course material. The teaching method included repetition of the chemistry theories, asking questions during the lecture, inviting students to complete problems on the blackboard, solving difficult homework questions during the class session, and relating the topic to the students' daily lives by engaging in content related discussion. Ideally, self-motivation is pivotal to any improvement in student performance. Due to the short duration of the courses in the ASP sequence, absenteeism was strongly discouraged; as such occurrences would have a detrimental effect on student outcomes. Absenteeism was addressed by requiring students who missed a class, to meet with the instructor during office hours to discuss the cause of the absence, the possible impact on their performance and strategies to avoid future absences. Students were assigned homework following each class session and quizzes were given at the beginning of each class to ensure that students kept pace with the fast paced program.

Two and four Supplemental Instruction (SI) workshops for CHM02 and CHM17 were respectively conducted after each class to support students working in small groups with peer instructors. Peer group leaders instructed these SI workshops. Two review sessions were conducted for CHM02 and three review sessions were conducted for CHM17 students, before final examinations. Instructional technology was included to support student review of the content by providing chemistry videos for student review. These were used to strengthen student retention of the course content. They also gave students access to the course content as needed to support self-directed student review for self-paced learners.

Data Sources

All student data was obtained from the Bronx Community College, Department of Institutional Research.

Analyses

Data was analyzed using descriptive statistics. Means and standard deviation were used to compare non-ASP versus ASP groups.

Results

Students who met the requirements for the CHM02/CHM17 courses were dually enrolled in the ASP classes during the Fall 2015, Fall 2016, Spring 2017, and Fall 2017 semesters. Due to scheduling challenges the program did not run in the Spring of 2016. Table 1 reflects the total enrollment numbers at the beginning of each semester for the CHM 02 students in both the non-ASP and ASP sections. These numbers reflect very low student enrollment in the ASP sections compared to the non-ASP sections (often less than 10%). The novelty of the program to the chemistry department of BCC underscores that ASP at BCC needs can be developed and expanded so that student enrollment can be increased in the future.

Semester	non- Accelerated Sequence Program	Accelerated Sequence Program
	CHM 02	CHM 02
Fall 2015	308	28
Fall 2016	344	14
Spring 2017	400	10
Fall 2017	446	12

Table 1. Student enrollments for ASP and non-ASP CHM02 for four semesters

The pass rates and withdrawal rates for CHM02 and CHM17 were analyzed for each of the semesters listed above. Figure 1 shows that the mean pass rate was lower for non-ASP than ASP CHM02 courses for Fall 2015, Spring 2017, and Fall 2017 semesters. This was not the case in the Fall 2016 semester, during which the non-ASP students achieved higher mean pass rates than the ASP students. The standard deviation of mean pass rates was higher for the ASP semesters compared to non-ASP semesters, 15.5% and 9.3% respectively. The low enrollments of the ASP section contributed to the higher standard deviation.

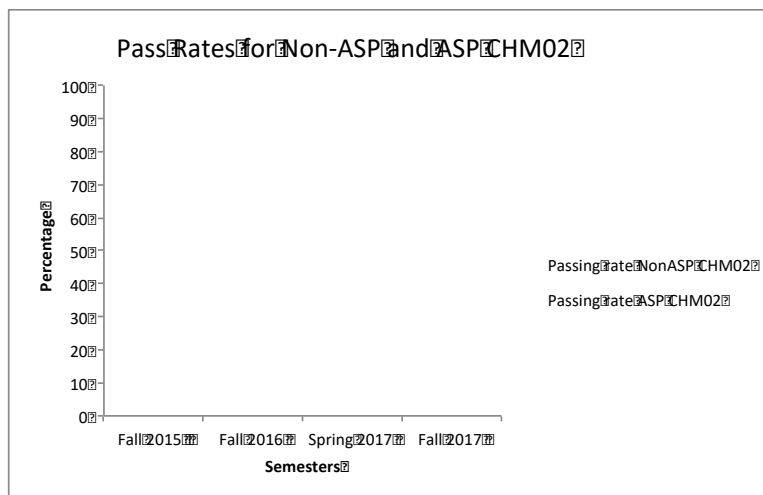


Figure 1. Passing rate of Non-ASP and ASP CHM02 courses.

Figure 2 shows the mean withdrawal rates of the CHM02 students. Dramatically, none of the ASP CHM02 students withdrew for Spring 2017. The withdrawal data complements the ASP pass rates in that the withdrawal rates for the CHM02 ASP students is lower than that of the non-ASP students for each of the four semesters. The standard deviations for the non-ASP and ASP sections were 2.7% and 12.5% respectively. Therefore, in three of the four semesters that the CHM02 ASP sections were offered, these students outperformed the non-ASP students, demonstrating higher average pass rates and lower average withdrawal rates.

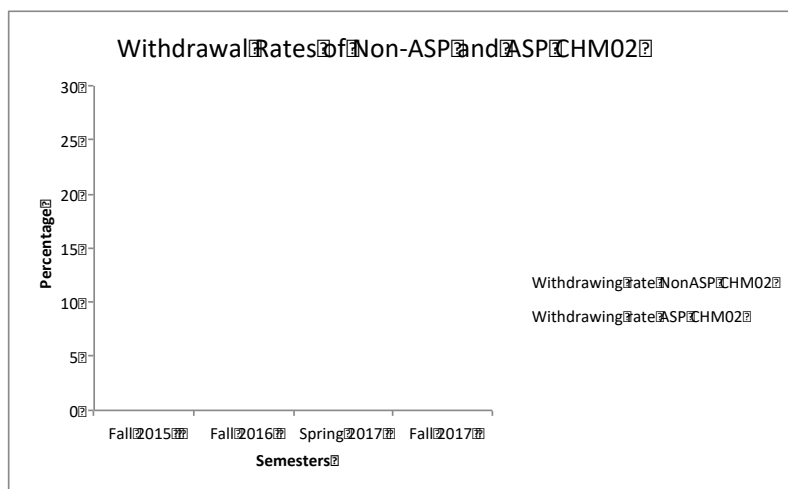


Figure 2. Withdrawal rate of Non-ASP and ASP CHM02 courses

A major challenge of accelerated sequence programs is to maintain consistent performance between courses in the sequence. This challenge is reflected in the observed results of the second course in the sequence - CHM17. Figure 3 shows the average pass rates of the CMH17 ASP students compared to non-ASP CHM17 students. The mean pass rate for the ASP CHM17 students was lower than that of the non-ASP CHM17 students for each of the four semesters of the ASP program, the standard deviations were 5% and 10.5% respectively. Similarly, the mean withdrawal rates of the CHM17 ASP students were higher in each of the four semesters compared to the non-ASP students (figure 4), the standard deviation was 13% and 1.5% respectively. A comparison of the CHM17 students who participated in the ASP program against those not enrolled in the program indicates that the second course in the college level general chemistry sequence, remains challenging for students as is suggested by the higher average pass rates observed for students enrolled in the classic semester format (non-ASP) compared to the students enrolled in the ASP

CHM17. Therefore, acceleration of the second course in the ASP sequence has a negative impact on student performance.

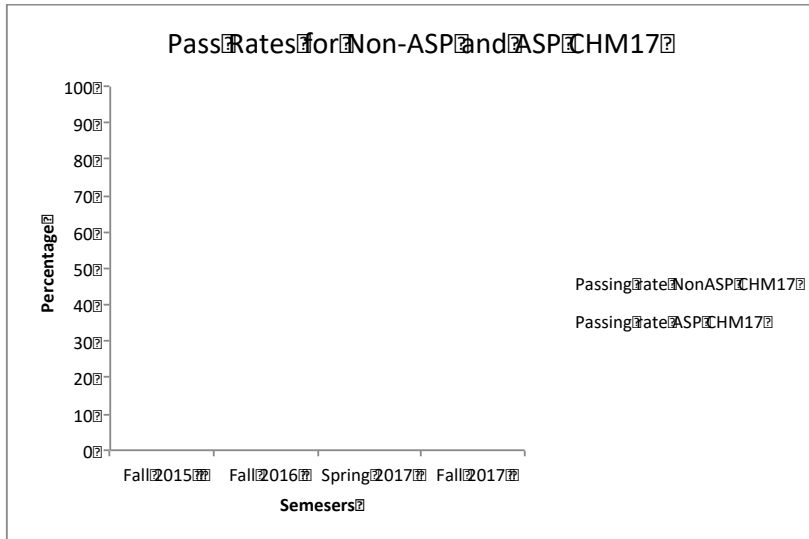


Figure 3. Passing rate of Non-ASP and ASP CHM17 courses

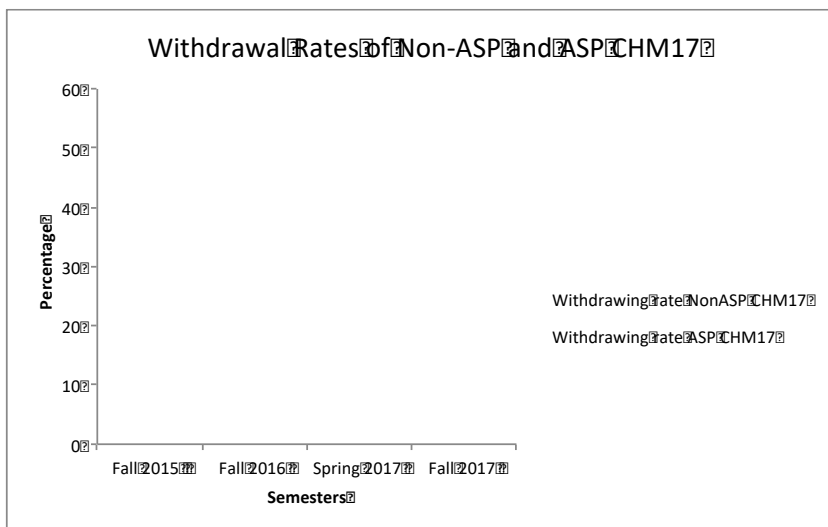


Figure 4. Withdrawing rate of Non-ASP and ASP CHM17 courses.

Discussion

Accelerated Sequence Programs (ASP) have a demonstrated track record of improving student outcomes. However, implementation of these programs must be adapted to the realities of varied educational environments. The current study reveals only partial benefit from the implementation of ASP at BCC. The CHM02 developmental groups demonstrated increased pass rates and lower withdrawal rates compared to the non-ASP students. Therefore, the accelerated format worked well for these students. However, the CHM17 groups for each semester tracked, underperformed compared to the non-ASP students. The demanding course schedule on back -to -back Saturdays/Sundays for the whole semester possibly contributed to lower outcomes in CHM17, the more challenging of the two courses. They started strong but their intensity of effort likely waned with time. If a student missed one class or one whole weekend the outcomes were generally poor. The observed drop in performance might also be explained by the need to instruct students in effective time management skills, study habits, and supporting compliance completing homework and willingness to ask for extra help from a support system (SI, tutors or instructors). (Ackerman & Kanfer 2009) The effect of student fatigue must also be addressed. ASP session is six and seven hours long for CHM02 and CHM17 respectively that can result in cognitive fatigue which can negatively impact student performance.

Conclusion

The principle of accelerated learning has the ability to improve student retention and pass rates and support the students' ability to achieve college completion goals. However, the results of the

current study indicate that the program needs to be reformed to support successful student completion of both the CHM02 and CHM17 ASP sequence. Supplementary instructional workshops can be used to provide additional support to the CHM17 ASP students, to address the high withdrawal and low pass rates observed for this cohort. The results demonstrate that the students enrolled in the developmental CHM02 ASP sections achieved the greatest benefit from the program.

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