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The Impact of Mini-Computers and e-Books on the Success of At-risk College Students

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Abstract: Academically underprepared college students; i.e., those identified as needing developmental (remedial) English, mathematics and reading courses in order to maximize their potential for academic success at college-level studies, were provided with the opportunity to rent, for a minimal, subsidized fee, mini-computers bundled with digital course materials (e-books). The academic aptitude of the students who participated in the study was assessed when they entered the program, and their academic performance was assessed at the conclusion of the semester in which they were provided with these resources. The aptitude, performance and retention of program participants were then compared to those of similarly underprepared students who were not provided with these resources. Analysis of Variance revealed no statistically significant differences between the academic performance or retention of the two groups.

Introduction

As the global community continues its inevitable progression toward a knowledge economy, education will become increasingly relevant to both nations as well as individuals (Anderson, Cavanagh, & Lee, 2005). As such, the importance of obtaining a college degree or other certification – or at least of extending the formal learning experience beyond the secondary level -- is becoming ever more acknowledged throughout the world (Lumina Foundation, 2009). For many individuals, a college education is seen as the only realistic way out of poverty and of achieving a better quality of life for themselves and their children (Collins, 2010).

At the same time, technology is also having a profound effect on the fundamental nature of both work and the educational process. Indeed, the modern classroom, especially in the more industrialized and economically developed countries, looks nothing like its predecessor from the not-too-distant past (Collins & Halverson, 2009). Computers and their progeny now permeate virtually every aspect of the learning process – driven, at least in part, by the rise of an entire generation who never knew what the world was like in the pre-digital era (Peters, 2009).

As the importance of acquiring a postsecondary education becomes more widely understood and accepted, however, inequalities related to access and ability have become more pronounced and magnified (McClenny, 2009). The cost of attending college continues to outpace inflation even as the socioeconomic advantages enjoyed by those with access have tended to exacerbate the widening gap between those who are able to pursue their educational aspirations and those who are more challenged in this quest (Archibald & Feldman, 2010). The number of students who are underprepared for college has been growing for the last half century (Dunn, 2009). One of the greatest challenges we will face in the coming decades will be how to make higher education, in all its various forms, more available to those who can benefit from it the most (Collins, 2010).

The Commonwealth School

The Commonwealth School is a division within the University College at Western Kentucky University. At the initiation of this study, it was known as the Bowling Green Community College. The Commonwealth School serves students whose demographic profile differs substantially from that of the general University population; they are more likely to be from lower-income families, first generation, and academically underprepared. These differences are reflected and reinforced in their academic performance and persistence rates. The average first semester Grade Point Average (GPA) of University students is 2.45, compared to 2.09 for Commonwealth students.

And whereas the aggregate fall-to-fall semester retention rate for University students is over 70%, the rate is below 60% for students attending the Commonwealth School (WKU Institutional Research, 2011).

The Commonwealth School recruits students from a 10-county area surrounding the University. Within this service region, 7 counties have been federally identified as belonging to the Appalachian Regional Commission (ARC), which is designed to provide economic assistance to economically depressed counties. The ARC provides funding for projects that are designed to both increase the job opportunities as well as raise the per capita income among the residents who live there. One aspect of the Commonwealth School's mission is provide access and opportunity for students lacking the necessary pre-college courses and/or skills; i.e. those who are underprepared for enrolling in a regular 4-year program of study. These students are heavily represented in the counties served by ARC.

Although the Commonwealth School systematically evaluates the success of its students and has exhibited some improvement over the last few years, the passage of recent state legislation (13 KAR 2:020) focused increased attention on the achievement and persistence of students enrolled in developmental courses. This legislation was the result of a finding that while 80% of students in developmental courses enrolled for a second semester, only 56% enrolled for a third (Kentucky Council on Postsecondary Education, 2011). Of the students who are required by law and/or institutional policy to take developmental courses, the majority are low income, first generation students. Administrators at the Commonwealth School found that 37% of these targeted students needed three developmental classes: Developmental Reading, Developmental Math, and Developmental English. Further analyses revealed that only 38% of those needing these three developmental classes graduated in six years -- compared to a 62% rate for students who did not need these remedial courses.

Methodology

The overall goal of the study was to see if higher education could be made more accessible to low-income and underprepared students by making relevant course materials, equipment and technological support available to them at a reduced cost. It was noted that while many faculty adhered to established best practices for the instruction and support of underprepared students, there was still a problem with timely and affordable access to course materials. Many students purchased their textbooks relatively late in the semester, while others did not buy them at all. It was also very evident that very few of these students had access to computers except for those furnished in institutional labs.

Population. Students involved in the study were all enrolled in the three previously identified developmental (remedial) courses at the Commonwealth School during Spring Semester 2010 and Fall Semester 2010. The grant made it possible for up to 50 students per semester to rent a mini-computer and digital textbooks for use during the semester in which they were enrolled in the three developmental courses. The rental fee for Spring Semester was \$350; it was reduced to \$200 for the Fall Semester in an effort to attract more participants. The goal was to have these resources in the hands of students prior to the beginning of the semester. Various avenues were pursued in an effort to market the program and recruit qualified students; specific strategies included providing information at new-student orientation meetings and having faculty members communicate with potential participants. Word-of-mouth was also considered to be an important recruitment mechanism.

Treatment and Comparison Groups. For definitional purposes, the "treatment" group refers to the students who participated in the initiative; i.e., they rented mini-computers and were given access to digital textbooks and other online resources. The "comparison" group consisted of students who were also enrolled in the three developmental courses but did not participate in the rental program. Over the course of the two semesters covered by this study, a total of 107 students were involved in the study; 46 (43.0%) students were in the treatment group and 61 (57.0%) were in the comparison group. (There were 21 students in the Spring Semester 2010 treatment group and 25 in the Fall Semester 2010 group. Similarly, there were 21 in the Spring Semester 2010 comparison group and 40 in the Fall Semester 2010 group. These smaller constituent groups were combined into two larger groups for purposes of statistical analysis).

Determining Academic Achievement. Grades in developmental courses are not used in determining a student's official Grade Point Average (GPA) at the institution where this study was conducted. Grade point averages for developmental courses were constructed using a 5-point scale in which a grade of "F" = 0 points, "D" = 1 point, "C" = 2 points, "B" = 3 points, and "A" = 4 points. Grades for each student in each developmental course were converted to numeric values using this scale, and then a GPA was calculated for these courses. In addition, GPAs were obtained for the semester in which the students were involved in the study, together with the cumulative GPAs as reported at the conclusion of their participation.

Satisfaction Survey. The 46 students in the treatment group were given the opportunity to complete a satisfaction survey regarding their experience with the equipment, e-books, and technical support provided them during the study. The survey consisted of 11 items designed to provide insight into their personal assessment of the efficacy of the resources provided. Students were asked to complete the survey at the conclusion of the semester when they returned their mini-computers to the program coordinator.

Statistical Analyses and Significance. Descriptive statistics were generated for all of the key variables examined in the study. Analysis of Variance (ANOVA) was used to determine the statistical significance of any observed differences between the means exhibited by the treatment and comparison groups. Pearson Product-Moment Correlation Coefficients were also computed in order to assess the degree of relationship between various study variables. The level of statistical significance for the current study was $p < .01$.

Academic Preparation and Demographics

Academic Preparation. In order to evaluate academic preparedness among the students involved in the study, composite ACT scores were examined for participants who had taken this particular instrument. The ACT is the most widely used college entrance examination (ACT, 2011). Of the 107 students involved in the study, ACT test scores were available for 71 (66.4%). The mean ACT score for these students was 14.21 ($SD = 1.59$; $R = 11 - 18$). Twenty-seven (38%) of the participants were in the treatment group and 44 (62%) were in the comparison group. The mean composite score for the 27 students in the treatment group was 14.30 ($SD = 1.38$) and the mean score for the comparison group was 14.16 ($SD = 1.73$). ANOVA revealed that the difference between the mean scores for the two groups was not statistically significant ($F = .122$; $df = 1, 70$; $p = .727$).

Age. The mean age for the entire sample was 21.10 years ($SD = 5.46$; $R = 17 - 47$). Eighty-nine (83.2%) of the participants were between the ages of 17 and 21, whereas 18 (16.8%) were over 21 years old. The mean age of member of the treatment group was 21.04 years ($SD = 4.89$), and the mean age for members of the comparison group was 21.15 ($SD = 5.88$). ANOVA revealed that the difference between the mean ages of the two groups was not statistically significant ($F = .009$; $df = 1, 106$; $p = .923$).

Gender. There were 53 (49.5%) men involved in the study and 54 (50.5%) women. Twenty-five (47.2%) of the men were in the treatment group and 28 (52.8%) were in the comparison group. Twenty-one (38.9%) of the women were in the treatment group and 33 (61.1%) were in the comparison group. ANOVA revealed that the difference between the gender composition of the two groups was not statistically significant ($F = .740$; $df = 1, 106$; $p = .392$).

Race/Ethnicity. Thirty-six (33.6%) of the students in the study were white, 68 (63.6%) were African-American, and 3 (2.8%) indicated other racial/ethnic backgrounds. Of the 36 white students, 14 (38.9%) were in the treatment group and 22 (61.1%) were in the comparison group. Of the 68 African-American students, 32 (47.1%) were in the treatment group and 36 (52.9%) were in the comparison group. All three (100%) of the students who indicated other racial/ethnic backgrounds were in the comparison group. ANOVA revealed that difference in the racial/ethnic composition of the two groups was not statistically significant ($F = .293$; $df = 1, 106$; $p = .590$).

Results

Academic Performance in Developmental Courses. The mean GPA in Developmental English for the 107 students in the study was 1.38 ($SD = 1.50$). The GPA for the 46 students in the treatment group was 1.30 ($SD = 1.53$); the GPA for the 61 students in the comparison group was 1.44 ($SD = 1.48$). ANOVA revealed that this difference was not statistically significant ($F = .222$; $df = 1, 106$; $p = .638$). The mean GPA in Developmental Math for the 107 students in the study was 0.72 ($SD = 1.13$). The GPA for the 46 students in the treatment group was 0.52 ($SD = 1.01$); the GPA for the 61 students in the comparison group was 0.87 ($SD = 1.20$). ANOVA revealed that this difference was not statistically significant ($F = 2.505$; $df = 1, 106$; $p = .116$). The mean GPA in Developmental Reading for the 107 students in the study was 1.27 ($SD = 1.34$). The GPA for the 46 students in the treatment group was 1.20 ($SD = 1.28$); the GPA for the 61 students in the comparison group was 1.33 ($SD = 1.39$). ANOVA revealed that this difference was not statistically significant ($F = .255$; $df = 1, 106$; $p = .615$). The mean GPA in all three developmental courses for the 107 students in the study was 1.12 ($SD = 1.12$). The GPA for the 46 students in the treatment group was 1.01 ($SD = 1.07$); the GPA for the 61 students in the comparison group was 1.21 ($SD = 1.16$). ANOVA revealed that this difference was not statistically significant ($F = .882$; $df = 1, 106$; $p = .350$).

Semester and Cumulative GPA. The mean GPA for the 107 students during the semester they were involved in the study was 1.50 ($SD = 1.40$). The GPA for the 46 students in the treatment group was 1.37 ($SD = 1.43$); the GPA for the 61 students in the comparison group was 1.60 ($SD = 1.38$). ANOVA revealed that this difference was not statistically significant ($F = .714$; $df = 1, 106$; $p = .400$). The mean cumulative GPA for the 107 students at the conclusion of their participation in the study was 1.32 ($SD = 1.22$). The GPA for the 46 students in the treatment group was 1.23 ($SD = 1.23$); the GPA for the 61 students in the comparison group was 1.40 ($SD = 1.22$). ANOVA revealed that this difference was not statistically significant ($F = .524$; $df = 1, 106$; $p = .471$).

Retention. Of the 107 students involved in the study, 51 (47.7%) enrolled for classes in the semester following their participation in the study, whereas 56 (52.3%) did not. Of the 51 students who were enrolled the following semester, 22 (43.1%) were in the treatment group and 29 (56.9%) were in the comparison group. Of the 56 students who did not enroll the following semester, 24 (42.9%) were in the treatment group and 32 (57.1%) were in the comparison group. ANOVA revealed that the difference in enrollment status between the two groups was not statistically significant ($F = .001$; $df = 1, 106$; $p = .977$).

Relationships Between Variables. In addition to the statistical analyses described above, all of the variables in the study were subjected to Pearson Product-Moment Correlation procedures in order to determine where statistically significant relationships might exist. The only correlations found to be statistically significant were as follows: Developmental English GPA and Developmental Math GPA ($r = .47$; $p = .001$), Developmental English GPA and Developmental Reading GPA ($r = .72$; $p = .001$), Developmental Reading GPA and Developmental Math GPA ($r = .53$; $p = .001$). In addition, the Developmental GPA was found to be significantly related to each of its constituent courses (Developmental English, $r = .89$; $p = .001$; Developmental Math, $r = .76$; $p = .001$; and Developmental Reading, $r = .89$; $p = .001$). The developmental GPA also correlated significantly with the Semester GPA ($r = .67$; $p = .001$) and the Cumulative GPA ($r = .66$; $p = .001$). Finally, Semester GPA correlated significantly with Cumulative GPA ($r = .89$; $p = .001$).

Satisfaction Survey. Twelve (57%) of the 21 participants in the first semester treatment group completed satisfaction surveys; 17 (68%) of the 25 participants in the second semester treatment group completed surveys. Overall, 29 (63%) of the students in the treatment group completed satisfaction surveys. The following is a summary of their responses: Twenty-two (75.9%) of the respondents indicated that they used their assigned mini-computer (laptop) everyday; five (17.2%) reported using their machines 2-3 times a week; while two respondent (6.9%) used the machine less than once a week. Nineteen (65.5%) respondents indicated that they used their assigned mini-computer (laptop) to connect to the Internet every day; 9 (31.0%) reported connecting to the Internet 2-3 times a week; and one (3.5%) respondent connected to the Internet less than once a week. Twenty-one (72.4%) respondents indicated that their mini-computer (laptop) was “very” helpful in their studies; 7 (24.1%) reported that it was “somewhat” helpful; and 1 (3.5%) indicated that it was “not” helpful. Twenty-seven (93.1%) respondents indicated that their assigned mini-computer (laptop) helped them to be successful during the semester, while two (6.9%) reported that it did not help them be successful. Twenty-two (75.8%) respondents indicated that participation in the program “very much” made a difference in their studies during the semester; 6 (20.7%) respondents reported that participation “somewhat” made a difference; and 1 (3.5%) respondent reported that it did not make a difference “at all.”

Discussion and Conclusion

The mini-computers, digital textbooks and online support provided to the students in the treatment group did not appear to enhance either their academic performance or retention when compared to the students in the comparison group who did not receive these resources. There are a number of plausible explanations for these findings. First, all of the students could have been underprepared to the extent that the provision of these resources was relatively inconsequential (Pizzolato, 2004; Shields, 2001). The relatively low mean ACT score (14.21; $SD = 1.59$) for the students participating in the study tends to support this notion, as does their mean Developmental GPA (1.38; $SD = 1.50$). The technological support provided could have simply been insufficient to overcome the deficiencies exhibited by these students. Further research should explore the potential benefit that could be realized by providing students who are better prepared with similar resources.

Second, it could be that the training and acclimation to using the technology was ineffective; i.e., the tools might have made a difference had the students in the treatment group been more familiar with their features and how to incorporate their use into a comprehensive study framework (Bursuck & Damer, 2010; Davidson & Goldberg, 2009; O’Riley, 2003). In other words, the concept may be viable but the implementation could have been flawed. Of

the 29 students who completed satisfaction surveys, 28 (96.5%) indicated that their mini-computer (laptop) was “very” or “somewhat” helpful in their studies; 27 (93.1%) indicated that their mini-computer helped them to be successful during the semester. Twenty-eight (96.5%) also indicated that participation in the program “very much” or “somewhat” made a difference in their studies during the semester. The discrepancy between these students’ perceptions and the reality of their academic performance and persistence warrants further inquiry.

Finally, it could be that key factors in working with students from lower socioeconomic backgrounds and/or historically disadvantaged racial/ethnic groups were overlooked (Swim, Hyers, Cohen, Fitzgerald, & Bylsma, 2003; Terenzini, Cabrera, & Bernal, 2001). As higher education becomes more available to students irrespective of their academic preparation and socioeconomic characteristics, it could be that different configurations of attributes and defining features are evolving that require different types of support structures. Additional study would help to better articulate how the needs of more diverse students can be adequately met.

The researchers feel that the current study contributes to our growing understanding of the complex interaction between technology and the learning process. As the use of computers and advanced communication technologies becomes more ubiquitous throughout our various educational institutions, including colleges and universities, it is imperative that we continue to explore how their use continues to affect students on a number of levels (November, 2009). Their potential and propensity for augmenting access and success among underprepared, lower socioeconomic, and various racial/ethnic student groups remains largely untapped.

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