Current Issues in Education
Mary Lou Fulton Teachers College • Arizona State University
PO Box 37100, Phoenix, AZ 85069, USA

Volume 19, Issue 1 March 2, 2016 ISSN 1099-839X

Impact of Delivery Modality, Student GPA, and Time-Lapse since High School on Successful Completion of College-Level Math after Taking Developmental Math

Diane Acosta
Odessa College

Teresa North, and John Avella
University of Phoenix

Abstract:
This study considered whether delivery modality, student GPA, or time since high school affected whether 290 students who had completed a developmental math series at a community college were able to successfully complete college-level math. The data used in the study was comprised of a 4-year period historical student data from Odessa College based on the completion of the developmental math courses, Introductory Algebra and Intermediate Algebra, and subsequent completion of a college-level math course. Through an ex-post facto design with logistic regression analysis, the results revealed that GPA was a predictor ($p = 1.56 \times 10^{-9}$) of completing a college-level math course with a C or better. However, the delivery mode of developmental math ($p = .456$) and time lapse since completing high school ($p = .200$) were not found to be predictors of college math completion with a C or better. Although online education continues to be an area of concern in higher education, this study's results reveal there are other variables that may affect successful completion of a college-level course, with this study finding that for every 1-point increase in college GPA, students were 3.64 times more likely to complete college-level math with a C or better.

Keywords: developmental math, success factors

APA-Style Citation:
Acosta, D., North, T., & Avella, J. (2016). Impact of delivery modality, student GPA, and time-lapse since high school on successful completion of college-level math after taking developmental math. *Current Issues in Education, 19*(1). Retrieved from http://cie.asu.edu/ojs/index.php/cieatasu/article/view/1518

Accepted: October 31st, 2015

Higher education institutions open the door of opportunity for students to become global citizens and enter the workforce. For many, the community college system is an entry point into higher education, both because of lower cost (Schmid, 2009) and because of the community

college open-door policy that provides access to higher education for a diverse set of students who would otherwise not be able to attain a degree or certificate (Goldrick-Rab, 2010). An open-door policy provides all students with equal access to enrolling in courses offered at the College (American Association of Community Colleges, 2015). However, new college students, whether at four-year or community colleges, face a challenge. According to Barbatis (2010), a growing number of college students enrolling in colleges and universities need developmental education, non-credit courses that address the needs of students who are underprepared for college-level courses (National Association for Developmental Education, 2013).

The need for developmental education courses is particularly problematic for community college students because of the open-door admission policy, meaning that they are less likely to be prepared for college-level work (Goldrick-Rab, 2010). In addition, community college students typically have demanding work and home schedules that make it difficult to take courses on-campus (Capra, 2011). To help students overcome such challenges, community colleges offer developmental education courses both on-campus and online to provide students the opportunity to improve their knowledge base before beginning college-level coursework (Fike & Fike, 2008).

Typically, developmental education courses are offered in three areas, English, reading, and math (Boylan, 2011). Developmental math has one of the highest enrollments, with more than half of entering freshmen students needing to enroll in at least one developmental math course (Bonham & Boylan, 2011). Developmental classes are intended to prepare students for success in subsequent college-level courses, yet most research in this area focuses on performance and retention in the developmental classes (Waycaster, 2011; Woodard & Burkett, 2010; Zavarella & Ignash, 2009). This study focused on the success of 290 community college students who had completed their developmental math sequence and then took college-level math, looking at the impact of three risk factors: (a) developmental math modality, online or on-campus; (b) student GPA prior to taking college-level math, ≥ 2.0 or below on a 4-point scale, and (c) time lapse since completing high school.

Although online education affords students the flexibility they desire, the trend in most colleges is high attrition rates and re-enrollments among online students in general (Capra, 2011; Croxton, 2014; Hachey, Wladis, & Conway, 2012; Kegelman, 2011; Xu & Jaggars, 2013), and specifically for developmental education courses offered online at community colleges (Jaggars, Edgecome, & Stacey, 2013; Jantz, 2010). According to the National Center for Education Statistics (2015), the attrition rate is greater for students enrolled in two-year public institutions. Only 59% of students enrolled in a two-year public college were retained from academic year to the next (National Center for Education Statistics, 2015). One point of note that was observed is that students with prior experience in online courses have a higher probability of completing their future online courses, while students new to the online environment have higher failure and drop rates in online courses (Hachey et al., 2012). While this study did not specifically explore prior online experience, time lapse since high school completion could be an indicator since online learning is a newer modality that requires non-traditionally-aged students to ensure they are technologically experienced (Wuebker, 2013), meaning that students who completed high school many years prior may not have experienced prior online learning opportunities. Bahr (2012) also found that students who have weaker academic backgrounds historically do not complete their developmental sequence in math or English. Students with a higher overall GPA have a higher probability of persisting through college and completing their educational goals than their peers who are academically weaker and have a lower GPA (Bremer et al., 2013).

Therefore, it was important to examine if GPA is a contributing factor in the completion or non-completion of college-level math after completing the developmental sequence.

Methodology

A non-experimental ex-post facto study was used to determine whether successful completion of a college-level math course varied students who completed developmental math online and students who completed developmental math on-campus, while also investigating if GPA of the participant and the time lapse since completing high school were predictors of success or indicators of risk. Descriptive statistics were used provide an overview of study sample and logistic regression methodology was used to analyze how the predictor variables impacted successful completion of college-level math.

The study population included 290 students from Odessa College who completed a developmental math sequence either on-campus or online before completing college-level math, with successful completion of college math with a C or better representing the dependent variable. The participants in the study were selected based on their successful completion of a college-level math course after successfully completing Introductory Algebra and Intermediate Algebra either completely online or on-campus. The sample of participants was comprised of students stratified randomly across the following independent variables: (a) developmental math delivery modality, online or on-campus; (b) GPA prior to taking college-level math, ≥ 2.0 or below; and (c) and time lapse since high school.

Descriptive Data

The net sample was comprised of 290 students who took the two developmental math course sequence either in a face-to-face or online modality and had subsequently completed a college-level math course. Table 1 provides the descriptive data of the sample, including how the time lapse variable impacted the completion of college-level math with p = .002. In addition, the table indicates there is a substantial difference between the number of students who completed the developmental math sequence on-campus and those who completed it online. Out of the 290 students who completed college-level math with a C or better, 82.8% of them completed the developmental math sequence in the face-to-face modality, while 76.2% completed the sequence in the online modality.

Table 1

Time Lapse since Completing High School and GPA when Enrolling in College-Level Math

Statistic	Time Lapse (years)			GPA (4-point scale)		
	Overall	F2F	Online	Overall	F2F	Online
Mean	5.37	4.78*	8.20*	3.05	3.04	3.127
Std. Deviation	7.136	7.094	6.704	0.737	0.737	0.741
Minimum	0	0	0	1.00	1.00	1.62
Maximum	34	34	28	4.00	4.00	4.00

Note. Overall N = 290, On Campus (F2F) n = 240, Online n = 50
* Significant difference in time lapse, p = .002

As seen in Table 1, there was a significant difference (p = .002) in the time lapse between the online and on-campus (F2F) groups. However, subsequent analysis showed that time lapse did not significantly (p > .05) impact the dependent variable of passing college-level math with a C or better. Further analysis showed the key factor in predicting success in completing college-

level math with a C or better was GPA, a measure that was comparable ($p < .05$) for both the online and F2F groups.

Results

Logistic regression was used to analyze how the predictor variables in the non-experimental ex-post facto study impacted successful completion of college-level math. Successful completion of college-level math is defined as completing a college-level math course with a C or better. As shown in Table 2, a baseline model was established incorporating the three independent variables of (a) developmental math delivery modality, online vs. on-campus; (b) student GPA prior to taking college level math, ≥ 2.0 or below; and (c) time lapse since high school completion. How these independent variables impact the dependent variable of successful completion of college-level math was then assessed, beginning with a logistic regression baseline model of $[\log (P / (1-P)) = [\beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_1X_2 + \beta_5X_1X_3]$ (Field, 2009) and determining the significance of the coefficients, β_0, β_1, β_2, β_3, β_4, β_5, using Wald's X^2 statistic (Field, 2009).

Table 2
Depiction of Independent and Dependent Variables of Study

	Variable	Value
Let	X_1 =	1, if developmental math was completed online 0, if developmental math was completed on-campus
	X_2 =	the GPA to the nearest tenth of a point
	X_3 =	the number of full years elapsed since high school
	Y =	1, if college math course was completed with a C or better 0, if college math course was completed with a D, F, or W
	Where Y is distributed as a binomial random variable with success probability P	

Fit of Baseline Model

After adding the variables to the logistic baseline model, as per Field (2009), was $[\log (P / (1-P)) = [\beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_1X_2 + \beta_5X_1X_3]$, with the log-likelihood statistic used to determine the overall fit of the variables in the model. The model was examined to ensure adding the variables was creating variation or changes in Y (dependent variable) using chi-square tests of the Omnibus Tests of Model Coefficients. Table 3 provides the results from the overall model fit after adding the independent variables.

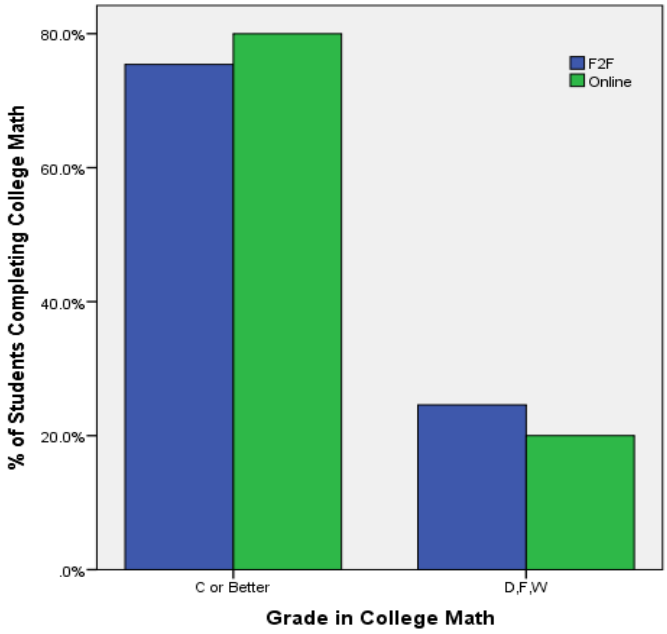
Table 3
Depiction of Overall Fit of Model after Addition of Independent Variables

	Omnibus Tests of Model Coefficients		
	Chi-Square	Significance	Naglekerke R^2
Step	43.365	.000	
Block	43.365	.000	
Model	43.365	.000	.208

After adding the independent variables to the baseline model, the dependent variable was shown to be significantly affected, $p \leq .05$. With all independent variables added to the baseline model together, the Model chi-square result in Table 3 provides the final model coefficient of 43.365 with $p \leq .05$. The Naglekerke R^2 of .208 indicates that the incorporation of the three independent variables into the model accounted for approximately 21% of the variation in the outcome of the completion of college-level math with a C or better, indicating one or more of the independent variables affected the dependent variable. Wald (X^2) and *Exp(B)* were then calculated to determine the specific impact of each of the independent variables.

Impact of Developmental Math Delivery Mode

As seen in Figure 1, initial statistics indicated little likelihood that the modality students chose in taking their developmental math courses impacted their subsequent success in college-level math courses. This finding is contrary to that of others (Bonham & Boylan, 2011; Capra, 2011; Croxton, 2014; Hachey et al., 2012; Jaggars et al., 2013; Jantz, 2010; Kegelman, 2011; Xu & Jaggars, 2013).



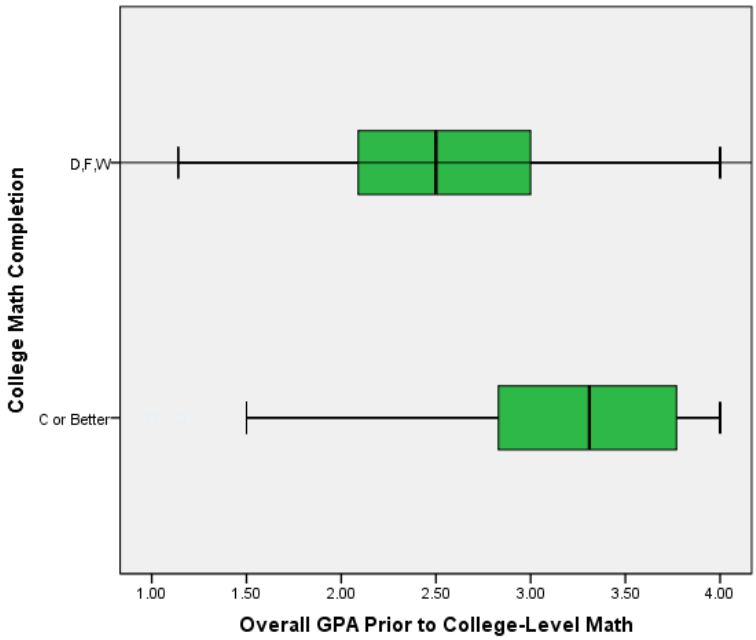
Delivery Mode	Statistics
B	-0.315
Exp(B)	0.730
Wald (X^2)	0.555
Sig. (p)	.456

Figure 1. College-level math completion among face-to-face (F2F) and online students.

This initial perspective is supported by the logistic regression model analysis, where B = -0.315 with an exponentiation of *Exp(B)* = 0.730. *Exp(B)* < 1 indicated that the predicting variable of course modality did not affect the successful completion of college math with a C or better. The Wald statistic $X^2 = 0.555$ with $p = .456$ is > .05 indicated there is no statistical significance for the modality students used to complete their developmental math courses. Therefore, delivery mode of developmental math did not contribute to the outcome of the successful completion of college math with a C or better.

Impact of GPA

As seen in Figure 2, initial statistics indicate a very strong likelihood that GPA impacted students' subsequent success in college-level math.



Student GPA	Statistics
B	1.294
Exp(B)	3.647
Wald (X^2)	36.457
Sig. (p)	1.56×10^{-9}

Figure 2. College-level math completion with confidence interval as student GPA increases.

This perspective is supported by the logistic regression model analysis, where B = 1.294 with an exponentiation of *Exp(B)* = 3.647, which tells the researcher the odds of the predicting variable affecting the outcome. *Exp(B)* > 1 indicated that the predicting variable of student GPA did affect the successful completion of college math with a C or better. The Wald statistic X^2 = 36.457 with p = .000 is ≤ .05 indicated there is a very strong statistical significance of student GPA predicting college-level math success. The odds ratio indicated that for every 1-point increase in college GPA, students were 3.64 times more likely to complete college-level math with a C or better.

Impact of Time Lapse since High School

As seen in Figure 3, initial statistics indicated there was more likelihood that time lapse since completing high school impacted students' subsequent success in college-level math courses (p = .200 of the Wald X^2 statistic) than did delivery mode with p = .456; however, this value was not statistically significant (p > .05). The graph indicates that the percentage of students completing college-level math with a C or better was considerably greater for students who completed high school within 0-2 years, but the differential between ≥ 2.0 GPA or below were relatively the same as for students who had been out of high school for 3-30 years.

Figure 4 verifies that the differences in the percentage of students completing college-level math with a C or better vs. D, F, or W was relatively the same, regardless of time lapse since completing high school. This finding is contrary that of Rodrigues (2012).

This perspective is supported by the logistic regression model analysis, where B = -0.027 with an exponentiation of *Exp(B)* = 0.974, which is closer to *Exp(B)* > 1 than the delivery mode variable. This explains the variation for students who completed high school 0-2 years prior as seen in Figure 3, but because *Exp(B)* < 1, the predicting variable of time lapse since completing high school does not affect the odds of successful completion of college math with a C or better. Further supporting this lack of significance, the Wald statistic X^2 = 1.641 with p = .200 is > .05 indicates there is no statistical significance of high school time lapse predicting college-level

math completion. Therefore, high school time lapse is not contributing to the outcome of the successful completion of college math with a C or better.

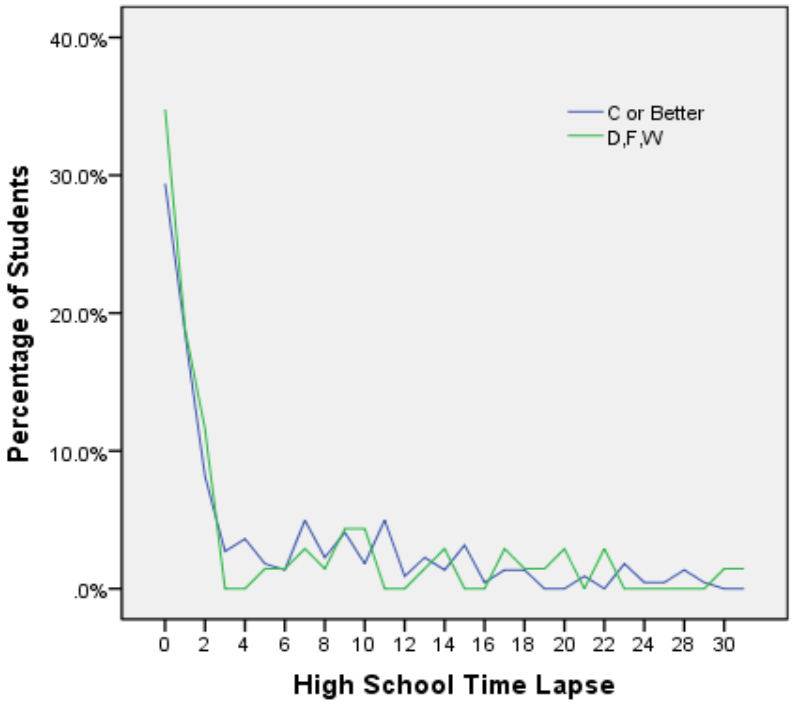
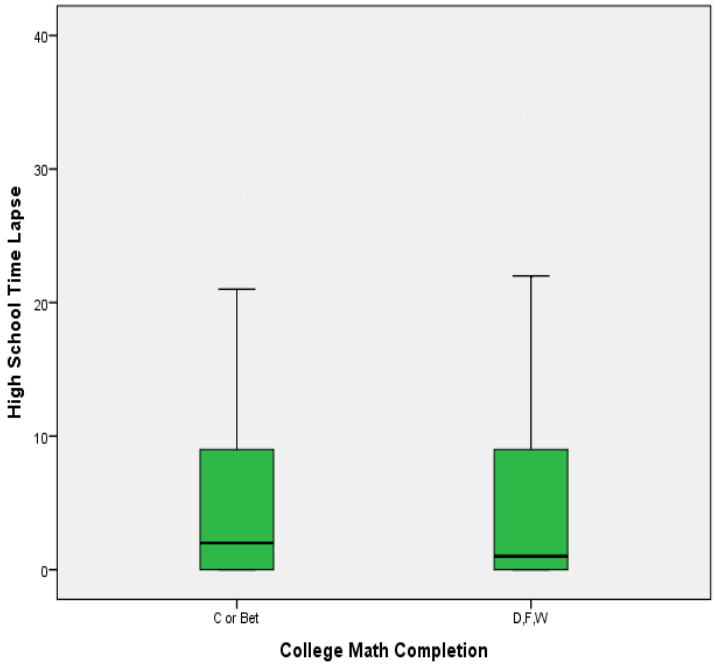


Figure 3. Time lapse difference for college-level math completion.



Time Lapse	Statistics
B	- 0.027
Exp(B)	0.974
Wald	1.641
Sig.	.200

Figure 4. College-level math completion based on high school time lapse.

Logistic Regression Summation

Table 4 provides a summation of the logistic regression analysis of whether each independent variable affected the successful completion of college level math. Neither high school time lapse nor delivery mode were predictors of the completion of college-level math with a C or better. Only student GPA prior to taking college-level math was a significant predictor of success. In addition, the interactions between the three independent variables did not provide statistical significance in the test results. Rather, the student's GPA upon completing the second developmental math course was the lone predicting variable for the odds of successful completion of college-level math as is indicated with $p < .05$.

Table 4
Summary of Logistic Regression Results

Variables in the Equation				
	B	*Exp (B)*	*Wald*	*Sig.*
High school time lapse	- 0.027	0.974	1.641	.200
Delivery mode of developmental math	- 0.315	0.730	0.555	.456
Delivery mode of developmental math by high school time lapse	0.025	1.026	1.195	.659
Delivery mode of developmental math by college GPA	0.596	1.815	1.167	.280
Student GPA	1.294	3.649	36.457	$1.56x10^{-9}$

Conclusions

The purpose of this study was to examine whether developmental math delivery modality, student GPA, or time lapse since high school affected student success in passing college-level math with a C or better. Despite multiple assertions in the literature that students do not succeed as well in online courses as they do in traditional campus-based courses (Capra, 2011; Croxton, 2014; Hachey et al., 2012; Kegelman, 2011; Xu & Jaggars, 2013), particularly among developmental education courses (Jaggars et al., 2013; Jantz, 2010; Xu & Jaggars, 2013), especially math (Bonham & Boylan, 2011), this study found no impact ($p = .456$) of developmental math delivery modality in the success of students successfully completing college-level math, with the high *p* value suggesting that little impact by the small sample size of online students. Nor was time lapse since high school a contributing factor in the successful completion of college-level math ($p = .200$), contrary to assertions by Rodrigues (2012). However, while it had received little prior investigation (Bremer et al., 2013), student GPA prior to taking college-level math was found to be an extremely important predictor of success in completing college-level math with a C or better ($p = 1.56x10^{-9}$).

Implications

Not only do the majority of students need to take a developmental math course (Boylan, 2011), they often fail and repeat the same developmental math course multiple times. Studies such as this one can provide meaningful data to administrators as they continuously seek solutions to help students complete developmental education courses in order to finish gateway courses such as college-level math (Bissell, 2012).

Although 100% of the students in the study completed the two developmental math course sequence with a C or better, 23.8% of these students did not pass college math with a C or better. The college GPA independent variable, defined as GPA prior to taking college-level

math, was a strongly significant predictor for the completion of college math with a C or better (see Figure 2, Table 4). One factor that may have contributed to the GPA being a predicting variable is students' use of their resources at Odessa College. Some of the resources available to students include the Student Success Center with math tutors, a Math Lab tutoring center with more math tutors and computers equipped with software available for students to practice their math skills, and a library with a computer lab equipped with study skills software (K. Clemmer, personal communication, September, 25, 2015). Although there are many resources available, students with a lower GPA often do not utilize their resources, seek out help from their instructors, or develop a routine of study hours for the week (K. Clemmer, personal communication, July, 14, 2014). In contrast, students who do take advantage of these resources not only earn a higher GPA, but have learned to use resources that can help them be successful in their college-level courses (Zeidenberg, Jenkins, & Scott, 2012).

Odessa College has applied suggestions of less instructor lecture and more computer-aided instruction (Epper & Baker, 2009; Twigg, 2011) to help students practice math problems either in groups, independently, or with the instructor (Epper & Baker, 2009). Odessa College has also incorporated intrusive advising and student support (Bonham & Boylan, 2011; Fowler & Boylan, 2010) for its developmental education students. According to Fowler and Boylan (2010), intrusive advising and student support is a structured contextual intervention process that changes according to the student's needs and development. The goal is to understand the areas of improvement a student needs and help them by having the advisor make initial contact, rather than waiting on the student who may not be aware they are in need of extra support (Fowler & Boylan, 2010). Student support includes providing one-on-one advising, counseling, and tutoring to help the student improve in any areas of concern (Fowler & Boylan, 2010). However, with 23.8% of student who completed the developmental math course sequence still not passing college-level math, more support is needed, particularly for students with lower GPAs. One area of note is that in this study, it was not possible to track if students were using the available resources. Adding this tracking ability is an area for future research that has been suggested to Odessa College.

The implication for administrators potentially goes beyond developmental education to encompass students with lower GPAs, not just those who are taking developmental math. For example, administrators could create a structured support program similar to developmental education programs just for students who have a lower GPA (Fowler & Boylan, 2010). Further, as noted in Table 1, the overall mean of students examined in this study indicated they had been out of high school for 5.37 years, thus being a non-traditional, adult student. Although this study found no significance ($p > .05$) in time lapse since high school, and hence, age of the student, recognition of the normative non-traditional age suggests that andragogy, a newer teaching philosophy designed around specific needs of adult learners and how adult learners engage with the content of a class (Connell, 2011) may be important. It may be that it is not age that produces the benefit of the andragogical approach to teaching, but that it is an important part of helping developmental education students succeed in their courses, and potentially all students who are struggling in courses (Rodrigues, 2012). A key element of andragogy is that the student must learn to take control of their own learning experience (McGrath, 2009). This becomes a key aspect of a structured support program similar to developmental education programs just for students who have a lower GPA (Fowler & Boylan, 2010). Hence, a key aspect of a structured support program for students with lower GPAs would be to not only focus on the content of the course, but also how each student can view the information differently based on their own

learning experience (McGrath, 2009). Thus, it may be beneficial to train all faculty members in all subject areas in the andragogical approach so that students will not only learn content, but also take control of their own learning and future (McGrath, 2009; Rodrigues, 2012; Ruey, 2010; Smart, Witt, & Scott, 2012).

References

American Association of Community Colleges. (2015). *About community colleges*. Retrieved from http://www.aacc.nche.edu/AboutCC/Pages/default.aspx

Bahr, P. R. (2012). Deconstructing remediation in community colleges: Exploring associations between course-taking patterns, course outcomes, and attrition from the remedial math and remedial writing sequences. *Research in Higher Education, 53*(6), 661-693. doi: 10.1007/s11162-011-9243-2

Barbatis, P. (2010). Underprepared, ethnically diverse community college students: Factors contributing to persistence. *Journal of Developmental Education, 33*(3), 14-24.

Bissell, A. N. (2012). Architecture and impact of an open, online, remixable, and multimedia-rich algebra 1 course. *Journal of Asynchronous Learning Networks, 16*(5), 49-59. http://files.eric.ed.gov/fulltext/EJ1000090.pdf

Bonham, B. S., & Boylan, H. R. (2011). Developmental mathematics: Challenges, promising practices, and recent initiatives. *Journal of Developmental Education, 34*(3), 2-10.

Boylan, H. R. (2011). Improving success in developmental mathematics: An interview with Paul Nolting. *Journal of Developmental Education, 34*(3), 20-27.

Bremer, C. D., Center, B. A., Opsal, C. L., Medhanie, A., Jang, Y. J., & Geise, A. C. (2013). Outcome trajectories of developmental students in community colleges. *Community College Review, 41*(2), 154-175. doi: 10/1177/009155211348963

Capra, T. (2011). Online education: Promises and problems. *Journal of Online Learning and Teaching. 7*(2), 288-293. Retrieved from http://jolt.merlot.org/vol7no2/capra_0611.htm

Connell, J. (2011). Adult learners and universities. *International Journal of Arts & Sciences, 4*(16), 93-122.

Croxton, R. (2014). The role of interactivity in student satisfaction and persistence in online learning. *Journal of Online Learning and Teaching, 10*(2), 314-325. Retrieved from http://jolt.merlot.org/vol10no2/croxton_0614.pdf

Epper, R. M., & Baker, E. D. (2009). *Technology solutions for developmental math: An overview of current and emerging practices*. Seattle, WA: Gates Foundation. Retrieved from https://docs.gatesfoundation.org/Documents/technology-solutions-for-developmental-math-jan-2009.pdf

Field, A. P. (2009). *Discovering statistics using SPSS* (3rd ed.). Los Angeles, CA: SAGE Publications.

Fike, D. S., & Fike, R. (2008). Predictors of first-year student retention in the community college. *Community College Review, 36*(2), 68-88. doi: 10.1177/0091552108320222

Fowler, P. R., & Boylan, H. R. (2010). Increasing student success and retention: A multidimensional approach. *Journal of Developmental Education, 34*(2), 2-10. Retrieved from http://files.eric.ed.gov/fulltext/EJ986268.pdf

Goldrick-Rab, S. (2010). Challenges and opportunities for improving community college student success. *Review of Educational Research, 80*(3), 437-469. doi: 10.3102/0034654310370163

Hachey, A. C., Wladis, C. W., & Conway, K. M. (2012). Is the second time the charm? Investigating trends in online reenrollment, retention and success. *Journal of Educators Online*, *9*(1), 1-25. Retrieved from http://www.thejeo.com/Archives/Volume9Number1/HacheyetalPaper.pdf

Jaggars, S., Edgecombe, N., & Stacey, G. W. (2013). *What we know about online course outcomes*. New York, NY: Community College Research Center, Teachers College, Columbia University. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/online-learning-practitioner-packet.pdf

Jantz, C. (2010). Self regulation and online developmental student success. *Journal of Online Learning and Teaching*, *6*(4), 852-857. Retrieved from http://jolt.merlot.org/vol6no4/jantz_1210.pdf

Kegelman, N. M. (2011). *Online courses at a community college: A study of student characteristics* (Unpublished doctoral dissertation). Rowan University, Glassboro, NJ.

McGrath, V. (2009). Reviewing the evidence on how adult students learn: An examination of Knowles' model of andragogy. *The Irish Journal of Adult and Community Education*, 99-110. Retrieved from http://www.aontas.com/download/pdf/adult_learner_2009.pdf

National Association for Developmental Education. (2013). *About developmental education*. Retrieved from http://www.nade.net/aboutdeved.html

National Center for Education Statistics. (2015). *Institutional retention and graduation rates for undergraduate students*. Retrieved from http://nces.ed.gov/programs/coe/indicator_cva.asp

Rodrigues, K. J. (2012). It does matter how we teach math. *Journal of Adult Education*, *41*(1), 29-33. Retrieved from http://files.eric.ed.gov/fulltext/EJ991442.pdf

Ruey, S. (2010). A case study of constructivist instructional strategies for adult online learning. *British Journal of Educational Technology*, *41*(5), 706-720. doi: 10.1111/j.14678535.2009.00965.x

Schmid, C. (2009, August). *Community colleges: Access and outcomes.* Paper presented at the annual meeting of the American Sociological Association, San Francisco, CA.

Smart, K. L., Witt, C., & Scott, J. P. (2012). Toward learner-centered teaching: An inductive approach. *Business Communication Quarterly*, *75*(4), 392-403. doi: 10.1177/1080569912459752

Twigg, C. A. (2011). The math emporium: Higher education's silver bullet. *Change*, *43*(3), 25-34. doi: 10.1080/00091383.2011.569241

Waycaster, P. (2011). Tracking developmental students into their first college level mathematics course. *Inquiry*, *16*(1), 53-66. Retrieved from http://files.eric.ed.gov/fulltext/EJ952026.pdf

Woodard, T., & Burkett, S. (2010). A follow-up study to compare success rates of developmental math students. *Inquiry*, *15*(1), 21-27. Retrieved from http://files.eric.ed.gov/fulltext/EJ881562.pdf

Wuebker, M. P. (2013). Adult learners: Improving persistence and performance in online learning environments. *Journal of College Literacy & Learning*, *39*, 38-46.

Xu, D., & Jaggars, S. S. (2013, February). *Adaptability to online learning: Differences across different types of students and academic subject areas* (Working Paper No.54). New York, NY: Community College Research Center. Retrieved from http://ccrc.tc.columbia.edu/media/k2/attachments/adaptability-to-online-learning.pdf

Zavarella, C. A., & Ignash, J. M. (2009). Instructional delivery in developmental mathematics: Impact on retention. *Journal of Developmental Education, 32*(3), 2-13.

Zeidenberg, M., Jenkins, D., & Scott, M. A. (2012). *Not just math and English: Courses that pose obstacles to community college completion* (Working Paper No. 52). New York, NY: Community College Research Center. Retrieved from http://files.eric.ed.gov/fulltext/ED538998.pdf

.

Author Notes

Dianne Acosta
Odessa College
diane94@sbcglobal.net
Received Ph.D. in Higher Education Administration from University of Phoenix in 2015. Has been in higher education for fifteen years as a professor, department chair, and administrator. Currently serves as Dean of Teaching and Learning at Odessa College.

Teresa North
University of Phoenix
teren1956@gmail.com
Received PhD in Nutrition from University of California – Davis (1984) and PhD in Higher Education Leadership from Capella University (2007). Retired from teaching and administration at Western Illinois University (1984-2012). Teaches and mentors doctoral students at University of Phoenix (since 2009).

John Avela
University of Phoenix
jackavella@hotmail.com
Received EdD in Educational Nova Southeastern University (1999). Public school education service as special education teacher, principal, and superintendent for over 30 years, retiring in 2010. Teaches and mentors at University of Phoenix (since 2005) and Western Governors University (since 2010).

Acknowledgements:
Odessa College, a two-year public institution in the west Texas region that serves approximately 5,400 students, provided data in support of this study.

Current Issues in Education
Mary Lou Fulton Teachers College • Arizona State University
PO Box 37100, Phoenix, AZ 85069, USA

Volume 19, Issue 1 March 3, 2016 ISSN 1099-839X