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Comparing Developmental Math Students with their Non-Developmental Peers in MAT 101

by Penelope Parmer and Jared Cutler

Increasing success rates in developmental math courses and college level math courses is a top priority at Sinclair, and increasing the performance of former developmental math students in college level math courses has been specified as a major goal of this effort. In Winter 2005, three projects were conducted with students enrolled in Math 101. The studies compared the performance of students who had taken developmental math with that of peers who had not required developmental math. The projects also identified content areas and concepts that were difficult for these students.

Project #1

Analysis of Pre-Course Assessments

The first of these projects involved an analysis of the pre-course assessment given at the beginning of MAT 101. Students who successfully completed developmental math at any time before Winter 2005 were compared to students who had not been required to take a course in developmental math. While on most questions a significantly higher percentage of students who did not require DEV math answered correctly, there were some questions on which a higher percentage of students who had completed DEV 108 answered correctly. Interestingly, students who had taken DEV math had a similar pattern of correct responses to those who had not required DEV math in that the questions that were most often answered incorrectly by students who had completed DEV math were also the questions that students not required to take DEV math most frequently got wrong.

Overall, students who successfully completed developmental math scored an average of 9.86 on the assessment test compared to an average of 10.22 for those who had not been required to take developmental math. This indicates that, on average, these groups of students are less than one question apart, and appear to be roughly equivalent in terms of their level of math preparation at the time that they enter MAT 101, with both groups getting approximately two-thirds of the questions correct (10 out of 15).

The concepts that appear to be most troublesome to incoming MAT 101 students in general are simplification, order of operations, absolute value, finding the area of a triangle, fractions, and solving linear equations. Fewer than 50 percent of these students answered questions testing these concepts correctly.

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There were four areas where the percentage of developmental math completers who answered correctly was about ten percentage points lower than their peers who had not taken developmental math: simplification, absolute value, solving linear equations involving fractions, and calculating a percent. For a couple of questions the percent of developmental math completers who answered correctly was about ten percentage points higher than the percent of students who had not required developmental math. These were items that dealt with solving linear equations and expressing a phrase as an algebraic expression.

Project #2 *Analysis of Academic* *Performance in MAT 101*

The second project involved an analysis of academic performance in MAT 101, comparing students who had completed developmental math with those who did not require developmental math. This involved an analysis not only of final grades in the course, but also an analysis of each exam taken in MAT 101. Of particular interest is the finding that performance on the first exam is roughly the same for the two groups of students. This first exam is largely a review of concepts that should have been mastered prior to beginning MAT 101, and the similarity in scores between students who completed DEV 108 and those who were not required to take it would seem to indicate that initially these two groups are on equal footing. When tested on review material, both groups scored approximately 75 percent correct. As the course progressed, however, **students who were not required to take developmental math outperformed those who completed developmental math by statistically significant margins on all subsequent exams.**

Project #3 *MAT 101 Surveys*

Finally, a two-part survey was administered to MAT 101 students during the fourth and eighth weeks of the course. Students were asked to rate the level of difficulty and their level of understanding for a number of specific concepts being presented in the course. As was the case in previous projects, students who had completed developmental math were compared to students who were not required to take it.

Again, there were similarities between the two groups in that both groups tended to rate the same content areas as being difficult. However, while the pattern of responses was similar, the developmental math students rated every item as being more difficult than students who had not been required to take developmental math. Results were similar for ratings of the degree to which students said they understood these concepts. Responses from students who had completed developmental math were similar to those who were not required to take it, but, a higher percent of developmental math students reported that they did not understand the concepts well.

Both for students who completed developmental math and students who were not required to take it, application problems, solving linear inequalities, and factoring basic trinomials were seen as the least understood concepts. It is interesting to note that both in ratings of difficulty and ratings of understanding, students who had completed DEV 108 gave lower ratings than students who were not required to take DEV 108 for solving linear equations, although in the pre-course assessment students who had completed DEV 108 outperformed their peers in this area. *(Continued on Page 7)*



- Making an Informed Decision - Should a Student Withdraw and Repeat a Class? *By Pam Combs*

Is a student having difficulty in your class? Is he or she considering withdrawing and repeating the class next quarter? If so, it is important they ask some key questions, perform some calculations, and obtain information from various sources in order to make an informed decision. Their decision may impact their quarterly and cumulative grade point averages, the amount of time it takes for them to obtain a certificate or degree, their eligibility for a program, financial aid, VA benefits, etc.

Students should speak with you first.

Hopefully your student will talk with you first to confirm his/her current grade and to determine if it is possible to successfully complete the class. The student should be aware of how tests, quizzes and assignments factor into their current grade, and know what steps would need to be taken to be successful in the course. You may also examine options that are open to you, such as assigning an incomplete grade for the course. (See the Math Department Handbook for guidelines on assigning an incomplete grade.)

Students should consider the impact the expected grade will have on their quarterly grade point average (GPA).

Here is how a student's quarterly GPA is calculated: Quality Points are assigned to each grade received that quarter (A = 4, B = 3, C = 2, D = 1 and F = 0). Multiply Credit Hours x Quality Points for each class to obtain Points. Sum the Points for each class to obtain the Total Points for the Quarter. Divide Total Points by Total Credit Hours Attempted to obtain the Quarterly GPA.

For example:

Class	Credit Hours x Quality Points (expected grade)	Points
MAT 191	4 Credit Hours x 1 Quality Point (expected grade D) =	4
ENG 111	3 Credit Hours x 3 Quality Points (expected grade B) =	9
PSY 119	5 Credit hours x 2 Quality Points (expected grade C) =	10
TOTALS	12 = Total Credit Hours Attempted	23 Total Points

23 Total Points / 12 Total Credit Hours Attempted = 1.916 Expected Quarterly GPA.

What impact would withdrawing (by the deadline date) have on the expected quarterly GPA?

In this example, if the student withdrew from MAT 191 prior to the withdraw date, the expected quarterly GPA would be higher because the Credit Hours and Points associated with the class would not be factored into the calculation.



For example:

Class	Credit Hours x Quality Points (expected grade)	Points
ENG 111	3 Credit Hours x Quality Points (expected grade B) =	9
PSY 119	5 Credit Hours x Quality Points (expected grade C) =	10
TOTALS	8 = Total Credit Hours Attempted	19 Total Points

19 Total Points / 8 Total Credit Hours Attempted = 2.375 Expected Quarterly GPA.

For more information on Grade Point Average, refer to Sinclair 2007-2008 Course Catalog, page 43.

What happens if the student repeats the course in the future? What impact will repeating the course have on the cumulative GPA?

Well, it depends. Are you asking about the academic or financial aid cumulative GPAs? There are two cumulative GPAs at Sinclair and they are calculated differently. With regards to Academic GPA, if a class is repeated once (except repeatable classes, such as PED), only the most recent grade and credit hours are factored into the calculation. Both grades remain on the transcript, but the most recent one is figured into the calculation. If a class is taken more than two times, each of the grades and credit hours (except for the first attempt) are factored into the calculation. With regards to Financial Aid GPA, the most recent class does not replace a prior grade. Each class grade and credit hours are tallied into the Financial Aid cumulative GPA.

What impact will withdrawing or continuing in the course have on the student's certificate or degree program?

The student is strongly encouraged to speak with their Academic Advisor (Building 11/ Room 11346) if they are considering withdrawing from a course. The Academic Advisor is knowledgeable of valuable information which may impact the decision to continue or withdraw from the class. For example, the academic advisor will take into consideration the student's academic standing. Students who are on academic probation are required to obtain a quarterly GPA of 2.0 to continue at Sinclair the following quarter. In addition, course offerings per quarter, grade requirements, and prerequisites will be addressed since withdrawing may impact the amount of time it will take to successfully complete a certificate or program.

What impact will the student's grade or withdrawal from the course have on their financial aid?

Students are also encouraged to consult with the Financial Aid Office (Building 10/Room 10324). They will examine the possible consequences if a student withdraws from a class or does not successfully complete the course. Withdrawing from a class or failing a course can impact various financial aid awards. For example, withdrawal from a course may impact student loans and the amount of state, federal and scholarship assistance received.



In addition, if a student is on financial aid probation, future federal aid may be terminated until probation requirements are completed. In fact, if a student withdraws from all classes, they may owe the government back. In terms of grade point average, if a student does not earn a cumulative GPA of 2.0, they would be ineligible to receive an institutional scholarship the following quarter. For additional information, visit www.sinclair.edu/stservices/fas/index.cfm.

What impact will a student's grade or withdrawal have on VA benefits?

Students who are receiving VA benefits are strongly advised to speak with the Veterans Affairs Office located in Building 10, Room 10324. Withdrawal or failure to successfully complete a course may have an adverse effect on benefits.

Here are some available resources for your student to explore.

Department / Area	Websites/Numbers
Academic Resource Center (ARC)	(937) 512-3495 (Library L07C)
Counseling Services	www.sinclair.edu/stservices/cnsl
Education Support Services	www.sinclair.edu/stservices/edu
Tutorial Services	(937) 512-2792 (Library L07) Panic Sheet list all the Learning Labs (includes Math Lab and Help Room)
Student Support Services	www.sinclair.edu/stservices/sss
Student Success Planning Services	www.sinclair.edu/stservices/stssps
Tutoring & Learning Center	www.tlc.sinclair.edu

Pam Combs, M.A., L.P.C.C
Counselor, Counseling Services, 10424
937/512-5104, fax: 973/512-2392
pamela.combs@sinclair.edu

Test Your Understanding

A student receives the following grades over three quarters. Compute the Academic GPA and the Financial Aid cumulative GPA.

Class	Credit Hours	Grade Received
DEV 110-06	4	F
MAT 101-17	4	D
DEV 110-50	4	F
MAT 101-11	4	W
DEV 110-03	4	C
MAT 101-07	4	B

[Answers appear on page 7.]

AMATYC Student Mathematics League Competition

2008 Winter Quarter Test (Round II) Top Five Sinclair Finishers

Diamond Welsh	11.0	\$50 winner
Sean Duffy	10.5	\$30 winner
Austin Krohn	10	\$20 winner
John Papie	8.5	} Four-way tie for fifth-place
Robert Crabtree	8	
Sarah McClain	8	
Justin Nelson	8	
Selina Walker	8	
Sinclair Team Score	48	
Number of Participants	39	



2007 – 2008 Cumulative Top Two Sinclair Finishers (Students taking Rounds I & II)

Diamond Welsh	25.5	\$50 winner
Ziad Mohi	23.5	\$25 winner

Third Annual SCC High School Mathematics Invitational

The Third Annual Sinclair Community College High School Mathematics Invitational was held on Saturday, April 19, 2008. The day-long event hosted eight teams from Beavercreek, Carroll, Fairborn and the Miami Valley School and had students competing individually and as a team in various competition events. Beavercreek took the top three individual competition places, while Fairborn won the team competition and quiz bowl tournament. Prizes were awarded to the top individual and team finishers, and teams were provided with continental breakfast and lunch. Participating department faculty were Moez Ben-Azzouz, Al Giambrone, Karl Hess, Lyn Keeler and David Stott. The annual high school outreach initiative was initially funded by an Innovative Project Grant and has been funded the last two years by Student Services. For more information, please contact David Stott at 512-2261.

Pictured (left to right): Karl Hess, Beavercreek students Colin Hu, Deepak Chona and Michael Fu, David Stott and Moez Ben-Azzouz. These students were the top three winners in the individual competition in that order (left to right).



This Fairborn team won the team competition and the Quiz Bowl tournament. Front row, left to right: Chris McAuley, Daniel Steck, Stephen Doucet, Michael Reiff
Back row: Karl Hess, David Stott and Moez Ben-Azzouz.



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Discussion

These results highlighted areas where more effort was needed both in preparing developmental math students for college level math courses and in helping all students succeed once they reach this course. The Developmental Studies department discussed and implemented several strategies to put these findings to use. The department began an extensive review of their curriculum based on the knowledge this study provided regarding areas in MAT 101 where former developmental math students have particular difficulty.

Revision of the developmental math curriculum is ongoing, and it is not yet known whether these changes have increased success for developmental math students who move on to college level math. The Developmental Studies Department also changed their criteria for awarding grades, making the requirements for earning an A or a B more stringent in developmental math courses.

The preceding contains excerpts from and is based on the article "Easing the Transition: Building Better Bridges between Developmental and College-Level Math" by Penelope Parmer and Jared Cutler which was published in the *Journal of Applied Research in the Community College*, Vol. 15, No. 1, Fall 2007.

Answers to the GPA computations:

$$\text{Academic GPA} = \frac{0 + 2 \cdot 4 + 3 \cdot 4}{4 + 4 + 4} = \frac{20}{12} = 1.67$$

$$\text{Fin. Aid GPA} = \frac{0 + 1 \cdot 4 + 0 + 2 \cdot 4 + 3 \cdot 4}{4 + 4 + 4 + 4 + 4} = \frac{24}{20} = 1.2$$

And the Winner is...



Pictured are Tony Ponder (Mathematics Department Chair), Bob Chaney, and Rodney Null (OhioMATYC President)

OHIOMATYC TEACHING EXCELLENCE AWARD

Mathematics Professor **Bob Chaney** was awarded the first ever **Ohio Mathematical Association of Two-Year Colleges Teaching Excellence Award** at the OhioMATYC Spring Meeting on Friday, April 18, 2008 at Hueston Woods State Park. Bob received a recognition plaque and a \$100 check. Bob will be OhioMATYC's nominee for the subsequent national AMATYC Teaching Excellence Award to be awarded at the 2009 AMATYC Conference in Las Vegas, Nevada.

Bob was nominated by colleagues in the Mathematics Department. The award criteria for selection were instructional effectiveness and support of students, professional involvement and development, interaction with colleagues, and service to the department, division and college. Bob has been teaching full-time in the Mathematics Department at Sinclair since 1989.

For more information, please contact Tony Ponder at 512-2585.



DOUBLE or NOTHING

by Lyn Keeler

My mother-in-law, Joan Keeler, who works for Urbana Adult Education in Illinois, sent me this unusual solution to a multiplication problem. Joan administers the WRAT (Wide Range Achievement Test) to students wishing to enter the diploma program there. The test has 40 questions beginning with $1 + 1 = \underline{\quad}$ and progressing to five basic algebra problems.

The student who had taken the test had neglected to enter an answer for a multiplication problem: 823×96 . Joan asked him if he had overlooked the problem or had not been able to do it. The student said he had worked it out on scratch paper (which a clerk had already disposed of) but had neglected to put the answer on the test sheet. Joan gave him an opportunity to rework the problem and watched him as he wrote out the solution shown below. Afterward she asked him where he had learned this method and he told her he had figured it out himself.

$$\begin{array}{r}
 823 \\
 \times 96 \\
 \hline
 4938 \\
 +74070 \\
 \hline
 79008
 \end{array}$$

$$\begin{array}{r}
 1646 \\
 +1646 \\
 \hline
 3292
 \end{array}$$

$$\begin{array}{r}
 3292 \\
 +3292 \\
 \hline
 6584
 \end{array}$$

$$\begin{array}{r}
 6584 \\
 +6584 \\
 \hline
 13168
 \end{array}$$

$$\begin{array}{r}
 13168 \\
 +13168 \\
 \hline
 26336
 \end{array}$$

$$\begin{array}{r}
 26336 \\
 +26336 \\
 \hline
 52672
 \end{array}$$

$$\begin{array}{r}
 52672 \\
 +52672 \\
 \hline
 105344
 \end{array}$$

$$\begin{array}{r}
 80 \times 52672 \\
 + 26336 \\
 \hline
 79008
 \end{array}$$

Although he seems to have some small error in notation ($80x$ instead of $96x$), his method is correct and follows a basic mathematical fact that any positive integer can be expressed as a sum of distinct powers of 2. In this case, $96 = 2^6 + 2^5$. So, 823×96 becomes 823 added 64 times combined with 823 added 32 times.

Test Your Skills: Prove that if n is a positive integer then n can be expressed as a sum of distinct powers of 2.



Students try their luck playing against Chair Tony Ponder at speed chess.

An infinite palindromic salute to Bob Chaney on his outstanding teacher award:

“Yay Bob Bob Yay...”

A bowl of ice cream contained three irregularly spaced pralines. They formed a “praline triangle.”

Sinclair food service sign: “Find the food and endeavor to eat it.”

If Ed Gallo wrote the joke corner, we could call it “Gallo’s Humor.”

