

Math & Logic Student Success by Course Delivery Method:

Traditional FtF vs. Hybrid

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Abstract

The proposed study explores the success rate of students enrolled in the Math & Logic course at Chippewa Valley Technical College (CVTC). The Math & Logic course is a course designed for students in the IT Programming and IT-Networking programs. The course is currently offered using two delivery methods: the traditional face-to-face (FtF) classroom and a hybrid format. The hybrid format is a mix or blend of classroom and online delivery.

The success of the students enrolled in the hybrid format as compared to students enrolled in the traditional FtF classroom is unknown. In the past five years (Fall 2006 – Spring 2011), there have been three math instructors who have taught the Math & Logic course: Mike Davis, Joe Flackey, and myself. We suspect that the success rate of students in the FtF is higher than the success rate of students enrolled in the hybrid format. However, no formal study has been conducted to prove or disprove that assumption. This study will examine the success rate for students in Math & Logic at CVTC for the past five years to determine if there is a significantly higher success rate in FtF as compared to hybrid.

Keywords: traditional face-to-face (FtF) delivery method, hybrid delivery method

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1. Introduction

At Chippewa Valley Technical College (CVTC), the Math & Logic course is offered in two delivery methods: the traditional face-to-face (FtF) classroom and a hybrid format. The hybrid format for the Math & Logic course was the result of the instructors in the IT-Programming and IT-Network Services asking for the hybrid delivery method for this course. IT-Programming also requested that Math & Logic be offered as a 100% online course. Mike Davis (CVTC math instructor) has created an online curriculum consistent with the FtF and hybrid curriculum. The first online section will be offered in Fall 2011.

In general, CVTC is taking a look at all of the course delivery methods to determine which mix offers the best chance for student success and retention. The current delivery methods include the traditional FtF, online (100%), hybrid, and web-conferencing (using Microsoft Live Meeting). A recent goal was to offer 40% of all classes using an alternative delivery method (other than FtF). This was partially driven by Title III funding. That funding is ending and CVTC is taking new look at what delivery methods and/or mix of methods gives our students the best chance for success. At CVTC (as with many colleges), the number of non-traditional students continues to increase. Often times these students have full-time jobs and families. The alternate delivery methods are often a better option for these students.

As technology advances, many colleges are exploring the use of web-based instruction. The options range from hybrid courses, which are a blend of online and FtF, to full blown online courses. The main reason for offering online and hybrid courses

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is because of the advantage to students. Hybrid courses offer students more flexibility because they reduce the amount of time that students need to be on campus. For students who work full-time, this saves time, and make scheduling events in their lives much easier. Students do not have to find parking spaces, leave work early to go to class, or miss family time. It is recommended that students try to develop a study routine if they can. Students are able to plan their study time around the rest of their day instead of the other way around. Studying at nighttime or in the morning is up to the student. Having to work and attend classes at the same time can be very stressful. Online classes remove the stress by allowing students to learn when it is convenient for them. Typically online and hybrid courses offer students more flexibility in completing assignments. Often schedules are not as stringent.

For the instructor of hybrid classes, integration of out-of-class activities with in-class activities allows more effective use of traditional class time. Challenges for instructors include learning new course technologies and aiding students in learning and trouble-shooting new course technologies. The Learning Management System (LMS) at CVTC is Blackboard. The access to Blackboard is via CVTC's web homepage. Students access Blackboard for the schedule, learning materials, and assignments. Assignments may also be submitted in Blackboard. For students to be successful in online and hybrid classes, in addition to having high-speed internet service, they need some computer and technical skills, be self-motivated, have good reading and writing skills, and be able to complete assignments in a timely fashion.

Hybrid courses require students to be fairly competent with technology. Some students will navigate web-based programs with ease, while other students will become

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frustrated, which can impede their learning. The majority of Math & Logic students are IT program students and they are comfortable with technology in general. Many of their program courses are offered in the hybrid delivery format. They are adept in navigating Blackboard and completing their course work in Blackboard. The non-IT student tends to have more difficulty in using technology in general and Blackboard specifically in completing the course work. They may become frustrated with any software glitches (which occur too frequently with Blackboard), or when the internet access or Blackboard systems are down. This causes the student to get behind in their assignments or in some cases they may withdraw from the course.

There have been a number of formal and informal faculty discussions at CVTC about student success rates of the different delivery methods. The discussions that I have participated in have closely mirrored results nationally. Online and hybrid courses typically have success rates that are very similar to FtF in most subject areas such as business and technology, liberal arts, health, and the social sciences. In fact, hybrid classes tend to have a higher success rate than the traditional FtF classes. The exceptions at most colleges are math and science courses. Hybrid math and science courses typically have lower success rates than the traditional FtF courses. Online math and science courses have much lower success rates than FtF or hybrid. The online math and science courses also have much higher withdrawal rates.

No studies have been done at CVTC to compare the success rates of the Math & Logic course by delivery method. The purpose of this study is to compare the success

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rates of Math & Logic students by delivery method: FTF vs. hybrid. The study will include all CVTC Math & Logic students in the past five years; semesters Fall 2006 through Spring 2011.

The study will compare the success rate of the traditional FtF sections as compared to the hybrid sections. From Fall 2006 through Spring 2011, there have been a total of twenty-eight (28) sections of Math & Logic. Of the twenty-eight (28) sections, fifteen (15) were hybrid and thirteen (13) were the traditional FtF. Success is defined to be students completing the course with a final letter grade of C or better. A letter grade of C is seventy-two percent (72%).

There are always a number of students who withdraw from a math course each semester at CVTC. The maximum number of students per section in a math course at CVTC is twenty-seven (27). Typically Math & Logic sections are full. The number of students, on average, that withdraw from a section of Math & Logic is lower than the overall average compared to all CVTC math courses. Over the past five (5) years, withdrawal in Math & Logic averages three (3) students per section. The study will compare the withdrawal rate of FtF vs. hybrid for Math & Logic.

CVTC has a large non-traditional student population. The study will compare the success rates of FtF vs. hybrid of non-traditional students and traditional students. A non-traditional student will be defined as a student that is twenty-three (23) years of age or older at that time that they took the Math & Logic course.

The Math & Logic course curriculum is designed for both the IT-Networking and IT-Programming students. The study will examine the success rate of FtF vs. hybrid for these IT programs. In addition, there are also non-IT students who take the course. The

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majority of non-IT students are students who plan to pursue a four year degree at UW-Stout. Stout accepts the Math & Logic course for transfer for their Concepts of Mathematics (Math-118) course. A comparison of the success rates for FtF vs. hybrid will be done for these students.

CVTC uses the Compass test for placement of math students. Previous studies by the Mathematics Department at CVTC have determined that the Compass pre-Algebra score and the Compass algebra score are weak predictors of student success in math courses. We are currently looking at replacing the Compass pre-algebra and algebra placement test with another placement test (such as the Wisconsin Math Placement Test). A Compass pre-Algebra score of forty-five (45) is the cut score for Math & Logic. Students scoring less than forty-five (45) on the Compass pre-Algebra test are required to complete a remedial math course before entering Math & Logic. This requirement may be overridden by a student counselor at CVTC. The median Compass pre-algebra score for Math & Logic students over the past five years is seventy-three (73). The study will compare the success rates for FtF vs. hybrid for students who scored under and over the median score.

2. Literature Review on Hybrid Courses

Numerous empirical studies have compared student outcomes between the online course delivery format and its traditional classroom counterpart. Although the “no significant difference” phenomenon between face-to-face and distance education described by Russell (2001) continues to dominate the literature, the majority of studies in this area focus on well-prepared university students and ignore important concerns regarding higher withdrawal rates among online courses. The few empirical studies that have compared online and face-to-face outcomes in the community college setting suggest that students are substantially less likely to complete online courses, even after controlling for a wide array of student characteristics (Carpenter, Brown, & Hickman, 2004; Jaggars & Xu, 2010; Xu & Jaggars, 2010). Overall across studies, students who took a given course online had estimated withdrawal rates that were 10 to 15 percentage points higher than students who took the course face-to-face. Students in online courses often complain of technical difficulties, a sense of isolation, a relative lack of structure, and a general lack of support, all of which may contribute to low completion rates (Jaggars, 2011).

Starting in the late 1990s when online education began to flourish, some educators have discouraged students from taking fully online courses (Young, 2002), arguing that “technology cannot replace the human factor in higher education” (Merisotis & Phipps, 1999). To take advantage of the technical opportunities and convenience of an online environment, yet at the same time incorporate face-to-face contact with the instructor and social involvement with classmates, many researchers have recommended

that colleges focus more strongly on hybrid courses (Brown, 2001; Carnevale, 2002; Oblender, 2002; Ward, 2004; Young, 2002). A set of well-designed empirical studies suggest that hybrid courses result in similar or better learning outcomes in comparison to face-to-face courses (U.S. Department of Education, 2009), although none of these studies focused on community college students. A handful of case studies also suggest that hybrid courses can be an effective alternative to face-to-face courses among low income students (Twigg, 2005).

Hundreds of studies in other disciplines have been done comparing traditional lectures with distance learning in general and web-based instruction in particular. The results have indicated that there was no significant difference so consistently that a website named "The No Significant Difference Phenomenon" has been established with links to these studies (<http://www.nosignificantdifference.org/>).

Still, hybrid courses showed outcomes superior to distance and traditional courses when researchers controlled for other factors. Students who took all three types of courses generally performed best in the hybrid ones. And hybrid classes bested the other delivery methods in courses affiliated with the college's business and technology, health, and liberal arts and social sciences programs. Only in the math and science and bachelor's degree programs did traditional students do the best -- and hybrid-course students outperformed distance-education students in every instance (Kolowich, 2009).

A five year study of Online and Hybrid Enrollment and Performance in Washington State Community and Technical Colleges was conducted by the Community College Research Center (CCRC), Teachers College, Columbia University. The study began in 2004 and ended in spring 2009. Course completion rates between online,

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hybrid, and FtF courses for 2008 students who took at least one online course or hybrid course during their first year of college were compared. There was a wide gap between the rate of FtF courses (89%) and online courses (83%); in contrast, the completion rates of hybrid courses (88%) seemed no different from the FtF courses. While students were equally likely to succeed in hybrid courses, students were more likely to fail or withdraw from online courses than from face-to-face courses. In addition, students who took online coursework in early terms were slightly but significantly more likely to drop out of school in subsequent terms. Students who took a higher proportion of their coursework online were also significantly less likely than other students to eventually earn an educational award or transfer to a four-year school. For math courses, the overall completion rate was 83%; FtF (83%), online (73%), and hybrid (86%).

(Xu and Jaggars, 2011)

In 2003, a study Comparing Traditional and Hybrid Internet-Based Instruction in Introductory Statistics Classes was done at University of California, Davis. In the hybrid offering the class met once a week, but students were required to learn the material on their own using web-based materials and a textbook. Differences were examined in student performance and student satisfaction. Performance of students in the hybrid offering equaled that of the FtF students, but students in the hybrid were slightly less positive in their subjective evaluation of the course. (Utts, 2003)

The Center for Distributed Learning at the University of Central Florida reports that students attain higher grades in hybrid courses than in face-to-face and fully online courses. Their research found that blended (hybrid) courses have the potential to increase student learning outcomes while lowering attrition rates in comparison with equivalent

fully online courses. They found that the blended (hybrid) model was comparable to or in some cases better than FtF.

Table 1. Percentages of Students Succeeding (Grades of A, B, or C) in Face-to-Face, Blended, and Fully Online Courses at UCF

	Spring 2001	Summer 2001	Fall 2001	Spring 2002	Summer 2002	Fall 2002	Spring 2003
Face-to-face	91	93	91	90	94	91	91
Blended	91	97	94	91	97	92	91
Fully online	89	93	90	92	92	92	91

Table 2. Percentages of Students Withdrawing from Face-to-Face, Blended, and Fully Online Courses at UCF

	Spring 2001	Summer 2001	Fall 2001	Spring 2002	Summer 2002	Fall 2002	Spring 2003
Face-to-face	6	3	4	5	3	3	5
Blended	6	2	5	5	2	6	5
Fully online	10	6	8	8	6	6	7

(Dziuban, Hartman, and Moskal, 2004)

New research from South Texas College suggests that hybrid courses can produce better outcomes than online or FtF courses. Researchers at that community college analyzed the spring 2009 grades of every student enrolled there. The data showed that, over all, 82% of students of hybrid courses were successful, compared with 72% of FtF courses and 60% of online courses. The study showed that hybrid courses were particularly beneficial for courses in business and technology, health, liberal arts, and

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social sciences programs. Only in math and science did students perform better in FtF (Kolowich, 2009, Hybrid Courses Can Acquaint You with Online Learning)

Lane Community College (Eugene, OR) did a 2010 study of Success and Retention in Online and Hybrid courses at their college. The study included four academic years, 2005-2008. The results indicate that the number of online and hybrid sections continue to increase. The success and completion rates of the online and hybrid sections steadily improved and in 2008/2009 were slightly higher than the FtF sections.

Fall 09	Hybrid	Online	College
Week 2	876	2,965	34,638

Table 1: Total Enrollment

2008/09	Sections	Week 2	Finish	Completion	Passing	Success	Class Size	% Total
Hybrid	59	1,374	1,268	92.29%	1,150	83.70%	23.29	1.58%
Online	313	6,643	6,093	91.72%	5570	83.85%	21.22	7.66%
Traditional	1,731	42,372	38,985	92.01%	34827	82.19%	24.48	48.86%
College	4,173	86,724	79,732	91.94%	71890	82.90%	20.78	100.00%

Table 2: Data Summary 2008/09

2007/08	Sections	Week 2	Finish	Completion	Passing	Success	Class Size	% Total
Hybrid	20	457	409	89.50	364	79.65	22.85	0.64%
Online	217	5,256	4,630	88.09	4,005	76.20	24.22	7.35%
Traditional	1,583	35,840	32,998	92.07	29,537	82.41	22.64	50.10%
College	3,735	71,533	65,475	91.53	58,986	82.46	19.15	100.00%

Table 3: Data Summary 2007/08

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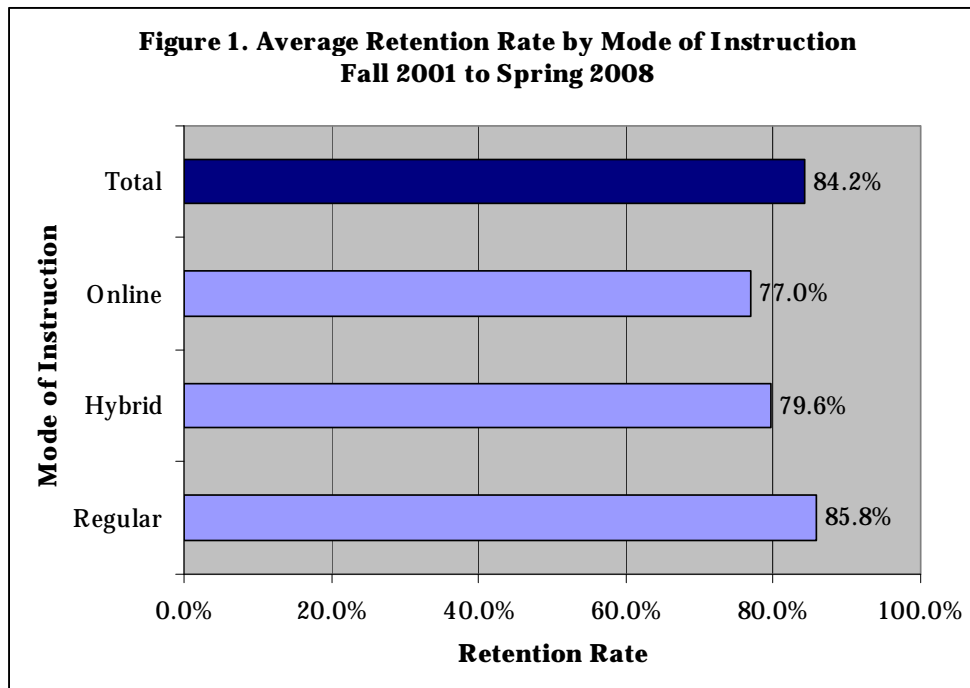
2006/07	Sections	Week 2	Finish	Completion	Passing	Success	Class Size	% Total
Hybrid	5	98	89	90.82%	75	76.53%	19.60	0.14%
Online	166	3,798	3,274	86.20%	2,830	74.51%	22.88	5.43%
Traditional	1,241	26,083	23,719	90.94%	21,366	81.92%	21.02	37.30%
College	3,843	69,934	63,740	91.14%	57,731	82.55%	18.20	100.00%

Table 4: Data Summary 2006/07

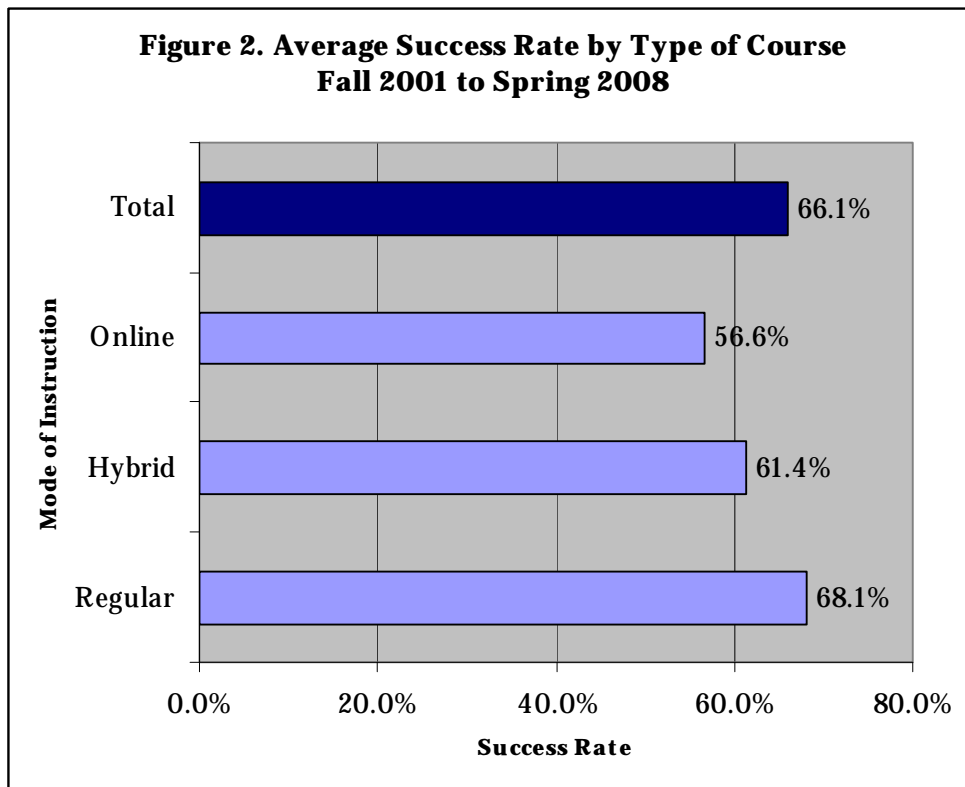
2005/06	Sections	Week 2	Finish	Completion	Passing	Success	Class Size	% Total
Hybrid								
Online	112	2,729	2,361	86.52%	2,087	76.47%	24.37	3.78%
Traditional	107	1,936	1,752	90.50%	1,593	82.28%	18.09	2.68%
College	3,983	72,138	65,792	91.20%	59,640	82.67%	18.11	100.00%

Table 5: Data Summary 2005/06

Mt. San Antonio reported the following results for comparing the retention and success rates of online, hybrid, and regular classes from fall 2001 through spring 2008: Overall, regular courses have the highest retention rates, while online courses have the lowest. The average retention rate for all courses in this study is 84.2%.



A similar pattern was found for course success rates. The average success rate for all courses in the study is 66.1%.



Studies show mixed results on the success of hybrid college courses. The University of Wisconsin-Milwaukee's faculty claimed its students learned more from and produced higher quality assignments for hybrid courses than for traditional class formats (University of Wisconsin-Milwaukee). Professor Gordon Hensley at Appalachian State University, however, writes that he observed no difference between the pass and drop-out rates between face-to-face courses and his pilot hybrid (Smith, 2010).

Students taking hybrid courses spend much less time on campus, which saves them the hassle of commuting multiple times a week. While the student is enjoying these

advantages, he/she also knows that he can interact in person with his/her instructor and fellow classmates the next time the class comes together on campus. For students who prefer a bit of social interaction in their classes, hybrid courses are a good option.

Students who were employed for more hours and students who had demographic characteristics associated with stronger academic preparation were more likely to enroll in online courses; however, students who enrolled in hybrid courses were quite similar to those who enrolled in a purely FtF curriculum. After controlling for student characteristics using multilevel regression techniques, results indicated that students were more likely to fail or withdraw from online courses than from FtF courses. In addition, students who took online coursework in early terms were slightly but significantly less likely to return to school in subsequent terms, and students who took a higher proportion of credits online were slightly but significantly less likely to attain an educational award or transfer to a four-year institution. In contrast, students were equally likely to complete a hybrid course as to complete a FtF course. (Xu & Jaggars, 2011).

The advantages for a student taking a hybrid class include:

- This format can help keep your schedule flexible with reduced meeting times.
- Course components are online and can be accessed from anywhere.
- There is a moderate level of real-time social interaction.
- Students receive regular face-to-face time with an instructor.
- You can generally take courses from multiple schools at once.
- You can enhance your computer skills.
- There are reduced commuting costs (save money on gas).

The challenges for a student taking a hybrid class include:

- You need a fairly strong level of self-motivation and self-discipline.
- Time management can be a concern.
- A computer with high-speed internet access is needed (it can be a significant cost).
- Having scheduled sessions on campus may be less-flexible.
- Online components require excellent writing skills.
- You already need to have mastered basic computer skills, including word processing, Internet browsers and e-mail software.

(Advantages and Challenges for Hybrid Courses)

The research that has been done to date indicates that student success rates for online courses are generally lower than those for the traditional FtF courses. However, the student success rates for hybrid courses compared to FtF is somewhat inconclusive. Some studies report higher success rates for hybrid than for FtF, some report no significant difference, while other studies indicate that hybrid success rates are lower than FtF.

3. The Math & Logic Course at CVTC

The Math & Logic course at CVTC is designed for students in the IT-Programming and IT-Networking programs. There are often 2 to 3 non-IT students in each section that take the course as transfer credits to a university (typically UW-Stout).

There are no pre-requisites for the course. A student must have scored at least a 45 on the Compass pre-algebra test. There is no Compass algebra requirement. A Compass pre-algebra score of 45 demonstrates that the student has basic math skills. The basic math skills include basic operations with integers, fractions, and decimals; ratios and proportions; conversions between fractions and decimals; absolute values of numbers; exponents, square roots, and scientific notation; percentages; multiples and factors of integers; and averages.

The course is 16 weeks (a full semester). The FtF classes meet 4 days a week, 1 hour per day or 2 evenings a week for 2 hours. The hybrid classes meet 2 days a week, 1 hour per day or 1 evening a week for 2 hours. There are 3 sections of Math & Logic offered each semester. The maximum number of students per section is 27.

Each class "hour" is actually 55 minutes. The typical FtF class period includes questions from the previous class assignment, a lecture or discussion of new material, practice of new material, and a new assignment given. In the hybrid course, the instructor typically answers question from the previous assignment, gives an "overview" of the new material, and demonstrates the new material. The assignments (including reading and practice exercises) are given and maintained on Blackboard. The hybrid student is asked to learn some of the new material by reading the textbook or material stored on Blackboard. The instructor has less lecture time to present the new material. The

“overview” includes the more difficult skills only. This material is determined by the instructor’s past experience teaching the course. There is also less time to practice the new skills. The students are required to practice the new skills using examples from the textbook or online examples on Blackboard.

There is an exam for each unit (5 written, in class). There are also labs for building binary logic circuits on the Vulcan breadboard. Assignments are normally collected with the exam at the end of each unit. Additional quizzes, mid-term, and comprehensive final exams are given by some but not all instructors. For hybrid courses, the unit exams and quizzes may be online in Blackboard.

The course curriculum includes the following five (5) units:

Unit 1:

- a review of algebra (equation solving)
- basic electricity (Ohm's Law and the Power formula)
- metric prefixes and applications

Unit 2:

- the decimal, binary, and hexadecimal number systems
- converting between decimal, binary, and hexadecimal numbers
- binary and hexadecimal arithmetic
- memorizing the powers of 2 and 16 (requirement of the IT-Networking and IT-Programming instructors)

Unit 3:

- binary logic and truth tables

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Unit 4:

- Boolean algebra
- logic circuits and gates

Unit 5:

- building logic circuits on the Vulcan breadboard

Assessment for Units 1-4 is a combination of daily assignments, quizzes, and a unit test. The Unit 5 assessment consists of labs building binary logic circuits on the Vulcan breadboard. These labs may be done using the online “virtual” Vulcan breadboard.

Student success is defined as completing the course with a minimum letter grade of a "C" (72%).

4. The Student

CVTC Student Profile

- Enrollment exceeds 7,000 credit students (enrolled in a diploma or associate degree program) per year. 98% of the students are in-state students. Half of the students are twenty-four (24) years of age or under. The student population is 43% male and 57% female.
- About two thirds of CVTC students work part-time or not at all. Many students who work full-time take classes on a part-time basis. Other reasons for enrolling as a part-time student include family responsibilities and/or the desire to go at a slower pace.
- Approximately 65% of full-time, first-time degree-seeking students receive financial aid.

(College Search)

Today's CVTC students are increasingly more diverse than ever before. The number of non-traditional students is greater. The majority of the non-traditional students have other responsibilities including jobs and families. Students in Math & Logic may be full time or part time students. They may be enrolled in a program (typically IT-Programming or IT-Networking) or pre-program taking general education courses.

Most Math & Logic students are first-year students. The recommended semester class schedule for IT-Networking includes Math & Logic in the first semester of the first year. For IT-Programming, Math & Logic is included in the second semester of the first year.

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The majority of Math & Logic hybrid students have high-speed internet access in their homes. Many also have laptops which they use in class. The CVTC campuses have high speed wireless internet access in all classrooms.

5. A Study of Math & Logic Student Success by Course Delivery Method: FtF vs. Hybrid

A. Research Question

For the Math & Logic course at CVTC, are student success rates higher for the traditional FtF delivery than for hybrid?

B. Research Methods

The entire Math & Logic student population for the past five years (Fall 2006 – Spring 2011 semesters) was included in the study. Typically there are three sections total of Math & Logic each semester with 20 – 27 students per section. There were six-hundred and ninety-six (696) students included in the study. There were thirteen (13) FtF sections and fifteen (15) hybrid sections.

Microsoft Excel was used to analyze the data. The data contains the following information for each student:

- Final letter grade/withdrawal/audit
- Delivery type: FtF or hybrid
- Compass pre-algebra score
- Age
- Program (IT-Networking, IT-Programming, or other)

This data was obtained from CVTC's Institutional Review Board (IRB).

C. Research Results

C.1 The Data

From the Fall 2006 semester through the Spring 2011 semester, there was a total of twenty-eight (28) sections of Math & Logic. Fifteen (15) of the twenty-eight (28) were hybrid and thirteen (13) were FtF.

There were six hundred and ninety-six (696) students enrolled during this time. Of the six hundred and ninety-six (696) students, forty-one (41) repeated the class. Thirty-four students repeated the class one time. Six (6) students repeated the class twice. One (1) student repeated the class three (3) times.

The number of students enrolled in FtF sections was 321 (46.12%) and the number of students enrolled in hybrid sections was 375 (53.88%). The number of IT-Networking students was 332, IT-Programming 255, and Other (non-IT) 109. The number of traditional students was 396 and non-traditional 300. For this study, a traditional student is a student less than 23 years of age. A non-traditional student is a student 23 years of age or greater. *

The two groups (FtF students and hybrid students) were compared on the preliminary measures of program, traditional/non-traditional, and compass pre-algebra score.

* See Appendix A – Percent of Students by Delivery Method, Program, and Student Type

C.2 Student Success by Delivery Method*

1. Success rates by delivery method: FtF vs. hybrid. Success is defined as a final letter grade of C (72%) or greater. Note that withdrawals will not be included in this statistic. An audit status will be considered as a withdrawal.

Table 1 – Percentage of Student Success by Delivery Method

	N Enrolled	N Successful	Percent Successful
FtF	321	209	71.33%
Hybrid	375	261	75.65%

*See appendix B for the data.

The results show that the success rate for hybrid is higher than it is for FtF.

For FtF, eighty-four (84) students did not successfully complete the course. Of the eighty-four (84) students, sixty-two (62) were traditional students (under age 23), and twenty-two were non-traditional students (23 years of age or greater).

For hybrid, eighty-four (84) students did not successfully complete the course. Of the eighty-four (84) students, fifty-one (51) were traditional students, and thirty-three (33) were non-traditional students.

The percent of non-traditional students in the hybrid sections (46.67%) is higher than the FtF sections (38.94%). Non-traditional students tend to be more committed, attend class regularly, and complete their assignments on time.

C.3 Withdrawal Rate by Delivery Method*

2. Withdrawal rates by delivery method: FtF vs. hybrid.

Table 2 – Percentage of Withdrawals by Delivery Method

	N Withdrawals	N Enrolled	Percent Withdrew
FtF	28	321	8.72%
Hybrid	30	375	8.00%

*See appendix B for the data.

The withdrawal rate is higher for FtF.

For FtF, twenty-eight (28) students withdrew from the course. Of the twenty-eight (28) students, eighteen (18) were traditional students, and ten (10) were non-traditional students.

For hybrid, thirty (30) students withdrew from the course. Of the thirty (30) students, twenty-four (24) were traditional students, and six (6) were non-traditional students.

Again, the percent of non-traditional students is higher for hybrid than for FtF. The non-traditional students are more committed than the traditional students. They are less likely to withdraw from the class.

C.4 Student Success and Withdrawal Rates by Delivery Method by Program*

3. Success and withdrawal rates by delivery method and program.

Table 3 – Percentage of Successful Students and Withdrawals by Delivery Method and Program enrollment. Other includes any non-program student or a student in any program other than IT-Networking or IT-Programming.

	N Enrolled	Percent Successful	Percent Withdrew
FtF			
IT-Networking	172	69.43%	8.72%
IT-Programming	108	71.00%	7.41%
Other (non-IT)	41	76.32%	7.32%
Hybrid			
IT-Networking	160	78.23%	8.13%
IT-Programming	147	76.87%	8.84%
Other (non-IT)	68	69.35%	8.82%

*See appendix C for the data.

The success rate for IT-Networking students enrolled in hybrid is higher as compared to FtF. The withdrawal rate for hybrid is lower than FtF.

The success of IT-Programming students enrolled in hybrid was also higher than FtF. The withdrawal rate for hybrid is higher than for FtF.

For Other (non-IT) students, the success rate is higher for FtF than for hybrid. The withdrawal rate is lower for FtF than for hybrid. For many of the non-IT students, Math & Logic is their first exposure to number systems and binary logic. They require the additional lecture time and practice offered in FtF.

C.5 Student Success and Withdrawal Rates by Delivery Method by Traditional/Non-Traditional Student*

4. Success and withdrawal rates by delivery method and traditional/non-traditional student type.

Table 4 – Percentage of Successful Students and Withdrawals by Delivery Method and Traditional/Non-traditional student type. A non-traditional student will be considered a student that is age 23 or greater.

	N Enrolled	Percent Successful	Percent Withdrew
FtF			
Traditional	196	67.60%	8.67%
Non-Traditional	125	78.07%	8.80%
Hybrid			
Traditional	200	71.02%	12.00%
Non-Traditional	175	81.66%	3.43%

*See appendix D for the data.

The success rate for non-traditional students is higher than traditional students for FtF and hybrid.

There is no difference in FtF withdrawal rates for traditional and non-traditional students. However, for hybrid, there is a much higher withdrawal rate for traditional students than for non-traditional students. Non-traditional students are more self-disciplined and self-motivated, characteristics needed to complete a hybrid class.

C.6 Student Success by Compass Score by Delivery Method *

5. Success and withdrawal rates by delivery method and compass score.

Table 5 – Percentage of Successful Students and Withdrawals by Delivery Method and Compass score. The median compass score is 73. The split is 73 and below and above 73.

	N Enrolled	Percent Successful	Percent Withdrew
FtF			
73 and below	110	68.75%	12.73%
above 73	106	71.29%	4.72%
Hybrid			
73 and below	138	74.60%	8.70%
above 73	133	77.87%	8.27%

*See appendix D for the data.

* The Math & Logic course prerequisites: COMPASS-Prealgebra 45 or ACT Mathematics pre-entry assessment 17 or Credit Programs/Classes level [804 110](#) Minimum Grade of C or (Bachelor's Arts Y or Bachelor's Science Y or Assoc Degree pre-entry assessment Y).

The success rate for hybrid is higher than for FtF.

For students enrolled in FtF, the withdrawal rate for students below the median Compass pre-algebra score is much higher than for students above the median pre-algebra Compass score. The under prepared student is much more likely to withdraw from the course, especially the traditional student who lacks commitment.

There is small difference in the withdrawal rates for hybrid.

C.7 Results Summary

The results indicate that for the Math & Logic course at CVTC, the success rate of students is higher for hybrid than it is for FtF. This reflects the national average for courses of all types except for math and science.

The Math & Logic course is not the typical math course. It is not an algebra based course. The bulk of the curriculum is the binary and hexadecimal number systems and binary logic. This may explain why the results are not the same as the typical math course.

The percent of non-traditional students in the hybrid sections (46.67%) was higher than the percent of non-traditional students in the FtF sections (38.94%). The non-traditional student is more committed than the traditional student. They complete more of the course work (on time) and attend class more regularly than their traditional counterparts. They frequently seek additional help when needed. They do not fall behind during the length of a semester.

If the Other (non-IT) students were removed from the study, the difference of the success rate for hybrid compared to FtF would be even higher. The percent of Other (non-IT) students taking the course in the hybrid format was 62.39%. The percent of Other (non-IT) non-traditional students was 33.03%. The combination of these two factors produced the lowest success rate in the hybrid sections.

The withdrawals for FtF and hybrid were much higher for traditional students than for non-traditional students. Of the total of fifty-eight (58) withdrawals in all sections, forty-two (42) were traditional students and only sixteen (16) were non-traditional students. The non-traditional students are more committed even though they often have full or part-time jobs and family responsibilities.

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The success rate for students with a Compass pre-algebra score above the median was about 3% higher than for students below the median. This is an indicator that the Compass pre-Algebra score is not a strong predictor of success. However, the withdrawal rate for students below the median was much higher. This indicates that the Compass pre-algebra test may have some strength for predicting withdrawals. The underprepared student is much more likely to withdraw from class. There was very little difference in the average test scores between traditional (69.6) and non-traditional students (71.1).

6. Explanation of Results

The results of the research were discussed with two other CVTC math instructors that have also taught the Math & Logic course in the past five years; Mike Davis and Joe Flackey.

Why is the success rate higher for hybrid than for FtF?

The consensus is that the hybrid courses have less commitment for class attendance. The student is committed to two class hours per week for hybrid and four for FtF. This gives the student more flexibility with their schedule to do the course work.

The curriculum material that the student needs the most instruction for is presented in class. The student is able to learn the other material online. The majority of Math & Logic students are in the IT programs. They are “comfortable” with technology and online learning.

The percent of non-traditional students in the hybrid sections (46.67%) is higher than the FtF sections (338.94%). Non-traditional students tend to be more committed, complete their assignments on time, and attend class regularly.

Removing the Other (non-IT) students from the study, suggest an even larger difference in the success rate for hybrid compared to FtF.

Why is the hybrid success rate for other students (non-IT) lower than for FtF?

The bulk of the Math & Logic curriculum is number systems and binary logic. The IT students are exposed to the concepts in their IT courses. The Other (non-IT) students do not have this background.

Also, non-IT students may have more issues in navigating technology when

completing the online portion of the course.

Why are withdrawal rates lower for hybrid sections?

Again, the commitment of two class hours per week for hybrid is less than the four hours for FtF. Also the percent of non-traditional students in the hybrid sections was higher than in the FtF.

Why are success rates higher for non- traditional students than for traditional students?

Non-traditional students are more committed than non-traditional students. They are more mature and have more life experience.

Why is there no significant difference in success rates for students who are below the median Compass pre-algebra score and for the students that are above the median?

The Compass pre-algebra score is a weak predictor of student success in Math & Logic. However, the withdrawal rate was higher for students below the median. The Compass pre-algebra score is a predictor of student retention.

7. Conclusion

The results of this study show that the student success rate in the Math & Logic course at CVTC is actually slightly higher for the hybrid delivery method than for the traditional FtF classroom delivery method. This result was somewhat surprising to the instructors at CVTC that have taught the Math & Logic course in the past five (5) years, including myself. Although we knew that the hybrid delivery method had been successful, we suspected that the student success rate was higher for FtF than for hybrid.

Not surprising is that there is a higher percentage of non-traditional students enrolled in the hybrid sections than traditional students. The non-traditional students work more hours per week and have family obligations. The hybrid delivery method gives them more flexibility in their busy schedules. Overall, the non-traditional students are more committed than their traditional counterparts. My belief is that the biggest factor for the hybrid student success rate being higher than the FtF is because the percentage of non-traditional students enrolled in the hybrid Math & logic sections was greater than the percentage of non-traditional students enrolled in FtF.

The research of hybrid courses has also given me some ideas on how to improve the hybrid course. With collaboration from Mike Davis, hybrid course changes may include having students read the new material before it is presented in lecture and using videos to present topics such as building binary circuits. (Mike has created videos for an online section of the course that he is teaching this semester - Fall 2011). This will free up more time in the classroom to answer assignment questions and to practice new skills. The research indicates that these are the two largest requests of students in a hybrid course.

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

The Math & Logic course has been offered as a full online course for the first time this semester (Fall 2011). Continuing research will be conducted by the CVTC math department to determine the success rates for Math & Logic for all three (3) delivery methods: FtF, hybrid, and online.

Another alternative delivery method used at CVTC is web-conferencing. For web-conferencing courses, CVTC uses Microsoft Live Meeting. The student can join the live meeting session from any location that has high-speed internet access (including from home). All students wear a headset when attending the live meeting class session and have the ability to participate in class like in a FtF classroom. The CVTC math instructors use a pc tablet in place of a classroom whiteboard or overhead camera. Tests are proctored at the various campuses and sent to the instructor. Online tests are also used in some classes. The technology works pretty well but class attendance and participation tends to be an issue. Additional research needs to be conducted by the CVTC math department to determine the student success rate for the math courses offered via live meeting. For each course offered, it needs to be determined if live meeting is a viable delivery method. Live meeting could also be an option for the Math & Logic course in future semesters.

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Appendix A. Percent of Students by Delivery Method, Program, and Student Type.

Number of students by delivery method

FtF	321	(46.12%)
Hybrid	375	(53.88%)
Total	696	

Number of students by delivery method / program

FtF:	IT-Networking	172	(53.58%)
	IT-Programming	108	(33.64%),
	Other (Non-IT)	41	(12.77%)
	Total	321	
Hybrid:	IT-Networking	160	(42.67%)
	IT-Programming	147	(39.20%)
	Other (Non-IT)	68	(18.13%)
	Total	375	

Number of students by program / delivery method:

IT-Networking:	FtF	172	(51.8%)
	Hybrid	160	(48.19%)
	Total	332	
IT-Programming:	FtF	108	(42.35%)
	Hybrid	147	(57.65%)
	Total	255	
Other (non-IT):	FtF	41	(37.61%)
	Hybrid	68	(62.39%)
	Total	109	

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

Number of students by student type:

Traditional (less than age 23)	396 (56.90%)
Non-traditional (Age 23 or greater)	300 (43.10%)
Total	696

Number of students by delivery method and student type:

FTF:	Traditional	196 (61.06%)
	Non-traditional	125 (38.94%)
	Total	321
Hybrid:	Traditional	200 (53.33%)
	Non-traditional	175 (46.67%)
Total		375

Number of students by program and student type:

It-Networking:	Traditional (less than age 23)	194 (58.43%)
	Non-traditional (Age 23 or greater)	138 (41.57%)
	Total	332
IT-Programming :	Traditional (less than age 23)	135 (52.94%)
	Non-traditional (Age 23 or greater)	120 (47.06%)
	Total	255
Other (non-IT):	Traditional (less than age 23)	73 (66.97%)
	Non-traditional (Age 23 or greater)	36 (33.03%)
	Total	109

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

Number of students by student type and delivery method:

Traditional:	FtF	196 (49.50%)
	Hybrid	200 (50.50%)
	Total	396
Non-Traditional:	FtF	125 (41.67%)
	Hybrid	175 (58.33%)
	Total	300

Appendix B. Section Summaries by Delivery Method.

FtF summary by section.

FtF Sections

<u>CRN</u>	Grades					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>E</u>	<u>W</u>		
11207	22	2	0	4	0	26	
11208	21	1	0	5	0	26	
10636	21	1	1	2	2	26	
10637	14	1	1	3	1	19	
11179	13	0	1	8	2	24	
11180	18	0	1	4	4	27	
11045	7	0	7	8	5	27	
11046	18	0	0	5	4	27	
20883	16	0	1	5	1	23	
10831	16	0	2	5	2	25	
10832	19	0	0	6	1	26	
20696	16	0	1	4	2	23	
20767	14	1	1	3	4	22	
<hr/>							
13 sections	215	6	16	62	28	321	Totals

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

Hybrid summary by section.

Hybrid Sections

<u>CRN</u>	Grades					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>		
11662	21	1	1	4	0	26	
10638	24	0	0	1	1	26	
21072	14	0	0	9	3	26	
21073	16	0	0	7	1	24	
21391	11	0	0	5	1	17	
11181	22	0	0	4	1	27	
20705	16	1	0	9	2	27	
20706	12	0	0	8	0	20	
11047	24	0	0	3	0	27	
11465	14	0	1	3	8	26	
20884	14	1	0	8	3	25	
10883	18	0	2	5	2	27	
20697	23	0	0	4	1	28	
20768	18	0	0	3	3	24	
20769	18	1	1	2	4	25	
<hr/>							
15 sections	265	4	5	75	30	375	Totals

Appendix C. Programs by Delivery Method and Section.

IT-Networking by Delivery Method and Section

FtF

<u>CRN</u>	Grades					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>		
10636	6	0	1	0	2	9	
10637	9	0	1	1	1	12	
10831	11	0	2	5	2	20	
10832	14	0	0	4	1	19	
11045	2	0	6	4	3	15	
11046	8	0	0	2	1	11	
11179	7	0	1	2	0	10	
11180	9	0	1	1	3	14	
11207	14	2	0	4	0	18	
11208	12	0	0	2	0	14	
20696	4	0	1	1	1	7	
20767	7	1	1	1	0	9	
20883	9	0	1	3	1	14	
13 sections	112	3	15	30	15	172	Totals

Hybrid

<u>CRN</u>	Grades					<u>Total</u>
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>	
10638	16	0	0	1	1	18
10833	9	0	1	2	2	14
11047	10	0	0	2	0	12
11181	14	0	0	2	0	16
11465	4	0	0	0	3	7
11662	10	1	0	1	0	11
20697	14	0	0	3	0	17
20705	11	1	0	6	2	19
20706	2	0	0	2	0	4

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

20768	5	0	0	1	2	8	
20769	2	0	0	1	1	4	
20844	6	1	0	4	0	10	
21072	8	0	0	1	2	11	
21073	5	0	0	1	0	6	
21391	2	0	0	1	0	3	
<hr/>							
15 sections	118	3	1	28	13	160	Totals

IT-Programming by Delivery Method and Section

FtF

<u>CRN</u>	Grades					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>		
10636	13	1	0	1	0	14	
10637	4	1	0	2	0	6	
10831	2	0	0	0	0	2	
10832	4	0	0	2	0	6	
11045	5	0	1	4	2	12	
11046	7	0	0	3	3	13	
11179	4	0	0	3	0	7	
11180	8	0	0	2	1	11	
11207	6	0	0	0	0	6	
11208	5	1	0	2	0	7	
20696	10	0	0	3	1	14	
20767	3	0	0	1	1	5	
20883	3	0	0	2	0	5	
<hr/>							
13 sections	74	3	1	25	8	108	Totals

Hybrid

<u>CRN</u>	Grades					<u>Total</u>
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>	

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

10638	7	0	0	0	0	7	
10833	6	0	1	3	0	10	
11047	11	0	0	1	0	12	
11181	6	0	0	2	0	8	
11465	4	0	0	3	5	12	
11662	7	0	0	2	0	9	
20697	7	0	0	1	1	9	
20705	2	0	0	1	0	3	
20706	7	0	0	1	0	8	
20768	11	0	0	0	1	12	
20769	15	1	1	1	3	20	
20844	4	0	0	4	3	11	
21072	3	0	0	2	0	5	
21073	8	0	0	5	0	13	
21391	6	0	0	2	0	8	
<hr/>							
15 sections	104	1	2	28	13	147	Totals

Other by Delivery Method (totals only)

FtF

<u>CRN</u>	Grades					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>		
13 sections	29	0	0	7	5	41	Totals

Hybrid

<u>CRN</u>	Grades					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>		
15 sections	43	0	2	19	4	68	Totals

Appendix D. Traditional/Non-Traditional Student by Delivery Method and Section.

FtF - Traditional Student

<u>CRN</u>	Grades					<u>Total</u>
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>	
10636	7	0	0	0	0	7
10637	8	0	1	2	0	11
10831	8	0	2	4	1	15
10832	9	0	0	3	1	13
11045	5	0	6	8	4	23
11046	13	0	0	4	3	20
11179	9	0	0	6	2	17
11180	8	0	1	3	2	14
11207	19	1	0	3	0	22
11208	13	1	0	4	0	17
20696	6	0	1	4	1	12
20767	9	0	0	0	3	12
20883	9	0	1	3	0	13
<hr/>						
Totals 13 sections	123	2	12	44	17	196

Hybrid - Traditional Student

<u>CRN</u>	Grades					<u>Total</u>
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>	
10638	12	0	0	1	1	14
10833	6	0	2	3	2	13
11047	7	0	0	1	0	8
11181	14	0	0	4	0	18
11465	6	0	1	2	6	15

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

11662	12	1	1	3	0	16
20697	9	0	0	2	1	12
20705	8	0	0	4	2	14
20706	4	0	0	6	0	10
20768	10	0	0	2	3	15
20769	9	0	0	1	2	12
20844	7	0	0	4	2	13
21072	9	0	0	6	1	16
21073	9	0	0	3	1	13
21391	4	0	0	4	3	11
<hr/>						
Totals 15 sections	126	1	4	46	24	200

FtF - Non-Traditional Student

<u>CRN</u>	Grades					<u>Total</u>
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>	
10636	14	1	1	2	2	19
10637	6	1	0	1	1	8
10831	8	0	0	1	1	10
10832	10	0	0	3	0	13
11045	2	0	1	0	1	4
11046	5	0	0	1	1	7
11179	4	0	1	2	0	7
11180	10	0	0	1	2	13
11207	3	0	0	1	0	4
11208	8	0	0	1	0	9
20696	10	0	0	0	1	11
20767	5	1	1	3	1	10
20883	7	0	0	2	1	10
<hr/>						
Totals 13 sections	92	3	4	18	11	125

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

Hybrid - Non-Traditional Student

<u>CRN</u>	Grades					<u>Total</u>
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>	
10638	12	0	0	0	0	12
10833	12	0	0	2	0	14
11047	18	0	0	1	0	19
11181	8	0	0	0	1	9
11465	8	0	0	1	2	11
11662	9	0	0	1	0	10
20697	14	0	0	2	0	16
20705	8	1	0	5	0	13
20706	8	0	0	2	0	10
20768	8	0	0	1	0	9
20769	9	1	1	1	2	13
20844	7	1	0	4	1	12
21072	7	0	0	2	0	9
21073	7	0	0	4	0	11
21391	6	0	0	1	0	7
<hr/>						
Totals 15 sections	141	3	1	27	6	175

Appendix E. Course Compass Scores by Delivery Method and Section.

Compass Score by Delivery Method and Section

FtF (73 or below)

<u>CRN</u>	Grades					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>		
10636	5	1	1	0	2	8	
10637	4	0	1	0	0	5	
10831	6	0	0	4	0	10	
10832	4	0	0	3	0	7	
11045	2	0	3	1	4	10	
11046	7	0	0	2	0	9	
11179	5	0	1	2	1	9	
11180	7	0	1	0	3	11	
11207	5	0	0	1	0	6	
11208	8	0	0	2	0	10	
20696	5	0	1	1	1	8	
20767	4	0	1	1	3	9	
20883	5	0	0	3	0	8	
<hr/>							
13 sections	67	1	9	20	14	110	Totals

Hybrid (73 or below)

<u>CRN</u>	Grades					<u>Total</u>
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>	
10638	5	0	0	0	1	6
10833	5	0	1	1	0	7
11047	10	0	0	3	0	13
11181	9	0	0	1	1	11
11465	7	0	0	1	2	10
11662	12	0	0	1	0	13
20697	10	0	0	2	1	13

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

20705	6	1	0	3	0	9	
20706	2	0	0	3	0	5	
20768	8	0	0	2	1	11	
20769	4	1	0	1	1	6	
20844	5	1	0	2	1	8	
21072	5	0	0	4	3	12	
21073	6	0	0	4	1	11	
21391	3	0	0	0	0	3	
<hr/>							
15 sections	97	3	1	28	12	138	Totals

FtF (Above 73)

<u>CRN</u>	<u>Grades</u>					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>		
10636	6	0	0	1	0	7	
10637	5	1	0	0	0	5	
10831	5	0	2	1	0	8	
10832	11	0	0	1	0	12	
11045	1	0	1	5	0	7	
11046	5	0	0	2	1	8	
11179	4	0	0	5	1	10	
11180	4	0	0	2	1	7	
11207	11	1	0	0	0	11	
11208	4	0	0	3	0	7	
20696	7	0	0	1	1	9	
20767	5	1	0	1	0	6	
20883	7	0	0	1	1	9	
<hr/>							
13 sections	75	3	3	23	5	106	Totals

MATH & LOGIC STUDENT SUCCESS BY COURSE DELIVERY METHOD

Hybrid (above 73)

<u>CRN</u>	Grades					<u>Total</u>	
	<u>A - C-</u>	<u>C-</u>	<u>D</u>	<u>F</u>	<u>W</u>		
10638	9	0	0	0	0	9	
10833	6	0	1	3	1	11	
11047	9	0	0	0	0	9	
11181	7	0	0	3	0	10	
11465	3	0	0	1	3	7	
11662	5	0	0	1	0	6	
20697	8	0	0	1	0	9	
20705	6	0	0	2	2	10	
20706	6	0	0	2	0	8	
20768	6	0	0	0	0	6	
20769	7	0	1	1	3	12	
20844	5	0	0	5	2	12	
21072	7	0	0	2	0	9	
21073	5	0	0	1	0	6	
21391	6	0	0	3	0	9	
<hr/>							
15 sections	95	0	2	25	11	133	Totals