

Hybrid Course Development – MATH 021
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Design: Fall 2010 – Summer 2011
Implementation: Fall 2011
Final Report: Spring 2012

Introduction

The main objective for the Math 21 hybrid course was to improve the structure and stability of Math 21 and reaffirm the foundation to build advancement for higher math.

The pedagogical reason to implement a hybrid course was to address the need of enriching more enabled students in their pursuit of higher math courses (including Math 22, Math 40, Math 26, Calculus 110 or 140, and Statistics 200) to learn more on their own while setting aside more quality time for learners who needed a significant amount of individual attention. In previous semesters, the more enabled students were frustrated at the slow pace of the class necessary to address the needs of some fellow students and the requirement to be in class when they had grasped the concept at a superior level of understanding. In addition, the learners who needed a significant amount of individual attention felt that the class was too fast paced and did not address the additional explanations that they need.

To address this need, seat time was decreased by 50 minutes / week after Exam 1 for the more enabled students, who are the students that receive a 75% or more on the most recent exam taken after Exam 1. The 50 minutes / week for the students who needed a significant amount of individual attention, who are the students that receive less than a 75% on the most recent exam taken after Exam 1 were used for additional practice / working sessions in order to address individual needs, as well as, improve student learning and retention. In addition, the well-enabled students were allowed to have self-selected attendance for the additional practice / working sessions.

The additional reason for implementing a hybrid course is that the Berks campus deals with many non-traditional learners, such as older adults, students in the military, or traditional age students who have jobs, where time is a big factor in academic success. By moving 50 minutes / week after Exam 1 to an online format for the more enabled students it provides flexibility of fitting classes into their busy schedules while allowing time to address the students who needed additional individual attention. The implementation of a hybrid model was also thought to help improve student confidence by having them work independently through the many online resources provided. The extra tools and practice were intended to get the students ready for real world skills where constant learning is necessary to progress in their careers.

Project Design Timeline

Prior to the TLI Grant, the investigators wanted to address the stated need indicated in the section above for Spring 2011. Due to another TLI grant not coming to fruition, the investigators were able to work with the CLT intern and Instructional Designer to create a “textbook dependent” hybrid for Spring 2011. In addition, the investigators had already identified the higher level course outcomes, the detailed course objectives, and ensured alignment of the course objectives, course content, review items, and assessment items as part of a 2009-2010 Berks Assessment Grant.

Fall 2010 – Integrated several accessory online resources from the required electronic textbook author including built-in tutorials, class lectures, group work, homework, and quizzes to not just address incorporating the latest technology, but to truly promote practice and gaining expertise in all course objectives and self-management of the study skills needed in the workplace. Integrated additional ancillary textbook resources within ANGEL. Received, reviewed, and adapted Penn State University Blended Learning Initiative content (<http://weblearning.psu.edu/blended-learning-initiative>) to be included into the course. Designed, developed, and implemented daily agendas that emphasized resources of concentration by focusing on the before, during, and after class learning procedures. The daily agendas further enhanced the concept of alignment of course outcomes, course objectives, course content, review items, and assessment items in a way that was clear to the student. Modified the syllabus to include several key items including an explanation of hybrid courses and how the Math 21 version of the hybrid is run, adherence to Course Policy 42-23, etc., as well as, ensured additional key items were in the syllabus. The key items in the syllabus included several sub-topics in the following areas: course information, instructor information, text/readings/materials, course description/objectives, course policies, available support services, and the course calendar/schedule. Integrated Blended Learning Course Introduction module and designed and integrated mid-semester survey to collect quantitative data.

Spring 2011 – Textbook dependent hybrid implementation in one course section that did not have the Friday working session requirement of a 75% or higher after Exam 1. Students self-selected attending on Fridays.

Spring and Summer 2011 – Altered the integration of textbook dependent resources to address the need of the hybrid course to be textbook independent in case of a switch of textbooks in the future. Designed, developed, and integrated textbook independent resources that consisted of mini-lectures that included the course objectives, in-class worksheets, and outside assignments. Closely reviewed and modified in-class activities, as well as, Friday working session activities. Modified the daily agendas to address the new hybrid version of the course. Modified Blended Learning Course Introduction module and mid-semester survey to collect quantitative data.

Fall 2011 – Hybrid course implementation in three course sections that included the requirement of students to attending on Fridays through Exam 1. After Exam 1, students with less than a 75% on the previous exam were required to attend and the more enabled students could self-select to attend.

Learning Outcomes & Discussion

During mid-semester of Fall 2011, students in the three hybrid course sections were surveyed about the various topics of both the hybrid course method and the instructor's teaching style. Focusing on the questions asked with regard to the hybrid course method, Tables 1 and 2 summarize the responses for all course sections where Section 001 is labeled (1), Section 002 is labeled (2), and Section 003 is labeled (3). For Section 001: n = 25; mid-semester enrollment = 39, for Section 002: n = 14; mid-semester enrollment = 36; and for Section 003: n = 18; mid-semester enrollment = 34.

Table 1. Student satisfaction with hybrid component based assignments / course content

Response	Daily Agendas are valuable.	Mini Lectures are valuable.	Worksheets are valuable.	Online Homework Assignments are valuable.
Strongly Agree	52.0% (2); 57.1% (3); 38.9% (4).	56.0% (2); 57.1% (3); 38.9% (4).	36.0% (2); 50.0% (3); 38.9% (4).	36.0% (2); 35.7% (3); 33.3% (4).
Agree	36.0% (2); 21.4% (3); 50.0% (4).	40.0% (2); 35.7% (3); 55.6% (4).	48.0% (2); 35.7% (3); 44.4% (4).	56.0% (2); 50.0% (3); 55.6% (4).
Neutral	12.0% (2); 21.4% (3); 11.1% (4).	04.0% (2); 07.1% (3); 05.6% (4).	16.0% (2); 14.3% (3); 16.7% (4).	00.0% (2); 07.1% (3); 11.1% (4).
Disagree	00.0% (2); 00.0% (3); 00.0% (4).	00.0% (2); 00.0% (3); 00.0% (4).	00.0% (2); 00.0% (3); 00.0% (4).	04.0% (2); 07.1% (3); 00.0% (4).
Strongly Disagree	00.0% (2); 00.0% (3); 00.0% (4).	00.0% (2); 00.0% (3); 00.0% (4).	00.0% (2); 00.0% (3); 00.0% (4).	04.0% (2); 00.0% (3); 00.0% (4).
Not Applicable	00.0% (2); 00.0% (3); 00.0% (4).			

As identified in Table 1, the majority of students found all of the hybrid component based assignments / course content favorable while the small minority of students found them neutral and/or less favorable.

Table 2. Student perception of active learning in the hybrid course format

Response	This course requires students to be active participants in the teaching and learning process.
Always	32.0% (1); 21.4% (2); 22.2% (3)
Very Often	28.0% (1); 21.4% (2); 27.8% (3)
Often	28.0% (1); 42.9% (2); 44.4% (3)
Occasionally	12.0% (1); 14.3% (2); 05.6% (3)
Rarely or never	00.0% (1); 00.0% (2); 00.0% (3)

As identified in Table 2, the majority of students (88.0%, 85.7%, and 94.4% respectively) found this course format required active learning as part of their course progression. This is consistent with literature that finds when a hybrid course is designed carefully and combines the best features of in-class teaching with the best features of online learning, active student learning is promoted (Riffell S. &, 2005) (Lin, 2008).

After the conclusion of Fall 2011, quantitative data from the Student Rating of Teaching Effectiveness (SRTE), final exam grade outcomes, and final grade outcomes were reviewed thoroughly. Focusing on the items within the SRTE that relate to the hybrid course method, the results were compared among various course sections. The course sections that were compared included the same professor's Fall 2010 course sections which were conducted prior to the start of the hybrid conversion process and the Fall 2011 hybrid course sections.

Table 3. Student satisfaction as measured by the SRTE

SRTE Item	Fall 2010 Section 01 Traditional	Fall 2010 Section 04 Traditional	Fall 2010 Section 05 Traditional	Fall 2011 Section 01 Hybrid	Fall 2011 Section 02 Hybrid	Fall 2011 Section 03 Hybrid
# Respondents (N)	25/37 (67.6%)	16/36 (44.4%)	14/35 (40.0%)	20/34 (58.82%)	20/36 (55.56%)	16/34 (47.06%)
A1 Percentage of sheets marked as elective	0.00%	12.5%	14.3%	6.25%	33.33%	0.00%
A2 Percentage expecting a grade of A/B/C or below	30.43% / 52.17% / 17.39%	28.57% / 64.29% / 7.14%	27.27% / 27.27% / 45.45%	27.8% / 38.9% / 33.3%	46.2% / 38.5% / 15.4%	61.5% / 30.8% / 7.7%
A3 Overall quality of this course	6.12	5.56	6.29	5.55	6.00	5.38
A4 Overall quality of the instructor	6.52	5.44	6.50	6.35	6.00	5.69
MATH Q1 Clarity of the instructor's presentations	6.00	6.00	6.29	5.95	6.00	5.44
MATH Q2 Effectiveness of the examples used to clarify difficult concepts	6.22	5.93	6.29	6.21	6.11	5.69
MATH Q3 Instructor's skill in communicating at a level appropriate for students	6.30	5.56	6.5	6.25	5.95	5.44
MATH Q6 Effectiveness of the instructor's responses to student questions	6.26	5.75	6.36	6.35	5.89	5.56
MATH Q7 Instructor in terms of his/her preparation for class.	6.48	5.94	6.43	6.40	6.16	5.88
MATH Q8 Instructor's skill in emphasizing main points in lectures and discussions	6.35	5.75	6.43	6.40	6.16	5.94
MATH Q9 Effectiveness of homework and out-of- class assignments as contributing to the learning process	6.30	6.13	6.29	6.30	5.89	6.00
MATH Q10 Effectiveness of instructor in demonstrating the significance of subject matter	6.30	6.00	6.07	6.45	5.84	5.56
MATH Q11 Extent to which the instructor's attitude contributed to a positive attitude about course content	6.48	6.13	6.50	6.45	6.00	5.50
MATH Q14 Instructor's skill in emphasizing learning rather than tests and grades	6.13	5.81	5.64	6.15	6.00	5.19
MATH Q15 Effectiveness of the instructor in stimulating your thinking	6.09	5.81	6.07	6.05	5.89	5.38

As identified in Table 3, the SRTE ratings truly are dependent upon the student demographics of the course section. Comparing Fall 2010 to Fall 2011 it is easily identifiable that course section demographics are different among the course sections per a given semester. This is reflected by having one course section receiving lower ratings per semester. Taking the average / section for Fall 2010 and

average / section for Fall 2011 in each category and by taking account for the various student enrollments, for all but one of the categories the hybrid course sections received a higher average score. The only category where the traditional courses received a higher average score was the instructor's skill in emphasizing learning rather than tests and grades with a .18 difference. This is consistent with literature that students enrolled in a hybrid course had higher degrees of satisfaction, higher communication with teachers, and increased student interest and self-exploration (Riffell S. K., 2004, 2005) (Amrein-Beardsley).

The results and instructors' experiences emphasize the need for placement of students in the proper version of the course. This includes students understanding that they are signing up for a hybrid course, with assistance of their advisor, and what a hybrid course means. This also includes ensuring that students who may require specialized and structured academic support services are not enrolled in hybrid course sections. Although the hybrid does help students who need some additional assistance, students who need an extensive amount of remediation are not intended to be in the hybrid course section.

Table 4. Comparison of grade expected (e) vs. actual grade earned (a) for hybrid vs. traditional course. Does not take into consideration the students who did not complete the SRTE for the estimation of the grade expected.

	A	B	C or below
Fall 2010 Section 01 Traditional	30.43% (e) vs. 24.32% (a)	52.17% (e) vs. 32.43% (a)	17.39% (e) vs. 43.24% (a)
Fall 2010 Section 04 Traditional	28.57% (e) vs. 20.00% (a)	64.29% (e) vs. 28.57% (a)	7.14% (e) vs. 51.43% (a)
Fall 2010 Section 05 Traditional	27.27% (e) vs. 20.59% (a)	27.27% (e) vs. 32.35% (a)	45.45% (e) vs. 47.06% (a)
Fall 2011 Section 01 Hybrid	27.8% (e) vs. 23.53% (a)	38.9% (e) vs. 20.59% (a)	33.3% (e) vs. 55.88% (a)
Fall 2011 Section 02 Hybrid	46.2% (e) vs. 24.24% (a)	38.5% (e) vs. 24.24% (a)	15.4% (e) vs. 51.52% (a)
Fall 2011 Section 03 Hybrid	61.5% (e) vs. 20.59% (a)	30.8% (e) vs. 38.24% (a)	7.7% (e) vs. 42.18% (a)

As identified in Table 4, the students' expected grade in all course sections were mainly higher than their actual grade. The two exceptions were B for Fall 2010 Section 05 Traditional and B for Fall 2011 Section 03 Hybrid. These were attributed to more students expecting A's but getting B's within both class sections. There are several students in both traditional and hybrid versions of the course who did not expect a C or below, but received a lower score.

Table 5. Students' final exam grade outcome by grade distribution for hybrid course implementation Fall 2011 vs. traditional course implementation Fall 2010.

Grade distribution in percentages	Fall 2010 Section 01 Traditional	Fall 2010 Section 04 Traditional	Fall 2010 Section 05 Traditional	Fall 2011 Section 01 Hybrid	Fall 2011 Section 02 Hybrid	Fall 2011 Section 03 Hybrid
Raw Average	68.20%	70.34%	72.49%	66.35%	67.02%	73.47%
A (A; A-)	6	6	4	6	6	9
B (B+; B; B-)	8	8	12	6	7	5
C (C+; C)	8	3	5	4	7	6
D	3	4	5	4	2	5
F	11	14	8	14	10	8
Total amount of students who took exam	36	35	34	34	32	33

As identified in Table 5, the students' final exam grade in all course sections for Fall 2011 and Fall 2010 were about the same. Taking the average / section for Fall 2010 and average / section for Fall 2011 in each category and by taking account for the various student enrollments, there was a higher percentage of A's in the hybrid courses (21% hybrid vs. 15% traditional). The traditional course sections had a higher percentage of B's due to less students getting A's (18% hybrid vs. 27% traditional). The rest of the averages showed no significant difference for C's (17% hybrid vs. 15% traditional), D's (11% hybrid vs. 11% traditional), and F's (32% hybrid vs. 31% traditional). The raw average was slightly higher in many of the traditional course sections; however, the highest raw average was in the third hybrid course section. The higher amount of A's for the exam grade in the hybrid course is consistent with literature that states when a hybrid course is designed carefully, students enrolled in the hybrid course had higher estimates of learning activity and the model allowed them to accomplish learning objects more successfully than either an online or a traditional course (Riffell S. &, 2005) (Amrein-Beardsley). In addition, hybrid courses that effectively integrated pedagogical strategies in both the face-to-face and online components increased the student learning outcomes (Dziuban, 2005).

Table 6. Students' final grade outcome by grade distribution for hybrid course implementation Fall 2011 vs. traditional course implementation Fall 2010.

Grade distribution in percentages	Fall 2010 Section 01 Traditional	Fall 2010 Section 04 Traditional	Fall 2010 Section 05 Traditional	Fall 2011 Section 01 Hybrid	Fall 2011 Section 02 Hybrid	Fall 2011 Section 03 Hybrid
A (A; A-)	9	7	7	8	8	7
B (B+; B; B-)	12	10	11	7	8	13
C (C+; C)	3	7	9	6	5	5
D	7	8	5	7	5	5
F	6	3	2	6	7	4
Total student enrollment (minus W's, WN's and DF's)	37	35	34	34	33	34
Number of W's, WN's and DF's per course	W - 1 WN - 0 DF - 0	W - 0 WN - 0 DF - 0	W - 2 WN - 0 DF - 0	W - 0 WN - 0 DF - 0	W - 1 WN - 0 DF - 0	W - 1 WN - 0 DF - 0

As identified in Table 6, there were a few more A's on average in the hybrid course sections; however, there were also a few more F's. This reemphasizes the need for correct math placement and correct placement in a hybrid or traditional class format.

Overall, the students' final grade in all course sections relatively show no significant difference among the course sections. The no significant difference also is shown in the number of W's, WN's, and DF's per course. These results are consistent with those in Thomas Russell's book and companion website, "The No Significant Difference Phenomenon," which utilizes hundreds of scholarly articles, books, etc. that back-up the notion that online and hybrid modalities show no significant difference in student outcomes than the traditional classroom (Russell, *The No Significant Difference Phenomenon: A Comparative Research Annotated Bibliography on Technology for Distance Education*). The results are also consistent with Richard Clark's theory that the delivery medium has no effect on learning (Clark).

Future Plans for Enhancement

The design and development of a hybrid course is not a "once and done" procedure. We will continue to evaluate the course after each semester and go through the reiterative process. This process is based upon the generic instructional systems design model called the ADDIE model that many hybrid / online course development models use as a basis today. The ADDIE model represents each phase including Analysis, Design, Development, Implementation, and Evaluation (Dick). In addition, the investigators will continue to work with the Instructional Designer as part of this process to strive for a continual improvement of learning and retention.

Scholarly Outcomes

There are currently no publications or presentations that resulted from this project.

Recommendations

Based on the experiences of designing and developing a hybrid course, the experiences of a teaching a hybrid course, the findings of the qualitative and quantitative data, and the students comments about their experiences in both the hybrid and traditional course sections, the investigators make the following recommendations.

Generic Recommendations

1. All advisors and those advisors especially for first year students need to be more aware of hybrid courses, truly understand how hybrid courses are different from traditional courses, that students of hybrid courses need to be prepared to learn more on their own without guidance, and ensure those students who those students who need extensive remediation or may require specialized and structured academic support services are not enrolled in hybrid course sections.
2. It is also recommended that for any given course there are options for the student to be enrolled in a hybrid course section or a traditional course section. By limiting a course, especially a 100 level or 200 level course, to only hybrid course sections it will prevent Penn State Berks from accommodating students who may not find the hybrid model to fit their learning support needs.
3. It is essential to segment the design and development of a hybrid or online course from the teaching of the already developed hybrid or online course. There must be a clear understanding from both the administration and faculty that the numerous hours put forth to design and develop

a hybrid or online course do not count for teaching the hybrid or online course during the semester.

4. Continued administrative support for faculty release time or faculty compensation for the numerous hours needed by faculty for designing and developing a hybrid or online course.

Instructors considering a hybrid / online course are encouraged to:

1. Work with the Instructional Designer for support and hybrid / online pedagogy expertise during the design and development of the course and every time the course is run to ensure the quality of the hybrid / online course.
2. Work with the Center for Learning & Teaching to adhere to proper PSU Policies such as Course Policy 42-43, copyright and intellectual property, accessibility, PSU Quality Assurance Standards, etc.
3. Start early in the design and development of hybrid / online courses. The suggested timeline for design and development at World Campus, most of the colleges at University Park, and those at other commonwealth campuses is 36 weeks. Due to the knowledge of faculty commitments at Berks including most hybrid course design/development over the summer months, the timeline used with Berks TLI Grant hybrid courses is a condensed, significantly time-intensive 17 week timeframe that is adapted to the needs of the instructor's availability.
4. Dedicate enough time to the design and develop a hybrid / online course. Most faculty underestimate the total amount of time that they will need to spend on this process.
5. Consider first incorporating aspects of a hybrid / online course as part of a "web-enhanced" traditional course and then transitioning to a hybrid or online course in future semesters. The term "web-enhanced" traditional course means it incorporates online elements; however, does not reduce any time that you typically meet during the week (i.e. still meet MWF 10:00–10:50)
6. Ensure that the pedagogy drives the technology and not incorporate technology for the sake of incorporating technology.
7. Consider taking training to prepare you for teaching a hybrid / online course before you start designing and developing the hybrid / online course. This includes taking a faculty self-assessment at: <http://weblearning.psu.edu/news/faculty-self-assessment> and taking OL2000: Effective Online Teaching (<http://psuwcfacdev.ning.com/group/ol2000effectiveteachingonline>). It gives you the experience of the online course / online component of a hybrid course from a student perspective while also learning the essential skill set to teach online or teach the online component of a hybrid course.
8. While teaching the hybrid / online course, be flexible to adapt to student needs. Since hybrid / online courses are well structured, you may gravitate towards "sticking to the schedule"; however, it is essential to adapt the schedule to ensure that students grasp a concept before progressing to the next topic.

Conclusion

The hybrid version of Math 21 addresses the need of enriching more enabled students to learn more on their own while setting aside more quality time for learners who need a significant amount of individual attention. The hybrid version is not intended for every student, especially those who need extensive remediation and/or may require specialized and structured academic support services in addition to those offered in the course. Furthermore, from the student evaluations and other input from students of hybrid courses, the investigators have found that the students participate more, ask better questions, focus on

more difficult objectives, attend Friday sessions / seek additional help if necessary, and develop more responsibility. In addition, these student have thrived in this class format. The Math 21 hybrid has increased the flexibility of fitting classes into the busy schedules of students including those students who are non-traditional learners, such as older adults, students in the military, and traditional age students who have jobs, where time is a big factor in academic success.

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