Hybrid Course Development – MATH 026

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Design: Spring 2015 – Summer 2015

Implementation: Fall 2015

Final Report: Spring 2016

# Introduction

The main objective for the Math 26 hybrid course was to improve the structure and stability of Math 26, reaffirm the foundation to build advancement for higher math, and align the structure to the previously developed hybrid versions of Math 21 and Math 22.

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 40, 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. As with previously developed Math 21 and Math 22, it was found that in previous semesters of Math 26 that 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, Selvi Jagadesan had a previous TLI Grant and went through the Berks eLearning Academy. Selvi had in-depth experience with course design due to creating hybrid and online versions of Math 21 and Math 22 in partnership with JoAnne Pumariega. It was also decided that although the full implementation of Math 26 in a hybrid format would be applied for Fall 2015, that a pilot of some aspects of the hybrid course could be done for the Summer 2015 course section.

## Spring 2015

Amy Roche, instructional designer within the Center for Learning and Teaching, and Selvi Jagadesan first worked together to identify the higher level course outcomes, the detailed course objectives, and ensured alignment of the course objectives, course content, review items, and assessment. Due to her previous experience, Selvi worked independently to design and develop mini-lectures that included course objectives and the mini-lectures would prepare students prior to coming to class. It was also decided to initially postpone the development of in-class worksheets that students would to bring to class and work out the problems step-by-step. These were created for Math 21 and 22; however, due to timing would not be ready for Math 26 for Summer 2016.

During this time, Selvi also integrated several accessory online resources from the required electronic textbook author including built-in optional tutorials, 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.

To bring all of the lecture-based resources, practice items, and assessments together, Selvi and Amy designed and developed 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.

Amy and Selvi modified the syllabus to include several key items including an explanation of hybrid courses and how the Math 26 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. To ensure that students were well-equipped for the hybrid version of the course, a Start Here / Course Orientation module was integrated including a quiz to identify if the hybrid course was the best modality for the student.

In regards to instructional modules, Mary Ann Mengel and Selvi Jagadesan previously identified a process and workflow for creating these items. As part of this process, Selvi started to record whiteboard-style worked examples with Doceri to narrate and illustrate the solving of example problems. These worked examples would eventually provide students with their instructor’s personalized support as they work through their Mini-Lecture documents. Students could then review examples on each video repeatedly as they work through the objectives from the related Mini-Lecture. To further support student learning, Mary Ann prepared and integrated an animated, narrated slide-based introduction for each topic. She recorded and incorporated Selvi’s narrated introduction of each topic, further introducing a sense of instructor presence into the online format.

Mary Ann then utilized a template that was previously created to package the online modules which grouped each topic’s animated introduction with the instructors’ video recordings of worked examples within an easy-to-navigate interface. The resulting series of self-paced presentation packages related to each unit of the course. Within each module, students choose their own path as they navigate the instruction, opting to watch the topic’s animated introduction, or view one or all of the worked examples. During spring 2015, Selvi and Mary Ann were able to complete the entire package for Unit 1 which included self-paced presentation of introductory materials that were then followed by worked-out examples. Simultaneously during this time the videos that were part of Unit 1 were closed captioned.

## Summer 2015

During Summer Session I, a pilot / partial implementation of the hybrid version of Math 26 was offered to students. The course was listed as a traditional residential course and class time was adjusted based upon the student’s understanding of the content. Informal feedback was collected in regards to the daily agendas, mini-lectures, and the instructional modules that were created thus far. Students liked having these learning aids in the classroom and online.

During this time the presentation of introductory materials was also created for Units 2 and 3. Worked-out Doceri Examples with corresponding narration were done for Unit 2; however, were not posted since they were not closed captioned in time for the course.

During Summer Session II, Amy and Selvi modified the daily agendas and the syllabus to address the hybrid version of the course for the fall/spring semesters. After gathering informal feedback for students, it was decided that worksheets would not need to be created as it seemed like the students had enough information and example problems.

## Fall 2015

In September, Amy and Selvi designed and developed the mid-semester survey to collect quantitative data. The survey was in alignment with previously conducted surveys in Math 21 and Math 22.

The hybrid course was implemented in two course sections. This implementation required that students attend each Friday class 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. Selvi, closely reviewed and modified in-class activities, as well as, Friday working session activities. During the implementation, the mid-semester survey was conducted to collect the quantitative data for the report and to assess what features of the hybrid course needed refinement.

Also during this time, the continuation of the finalization of the instructional modules were completed for the remaining Units. These were posted just-in-time for students to use within the course with the exception of sections 4.1 – 4.4 and two videos for 2.5 and 2.6.

## Spring 2016

During the Winter Break, the remaining instructional modules that were listed above were finalized, as well as, the conclusion of all of the closed captioning.

For Spring 2016, the hybrid course was offered in a complete package and is currently being implemented.

# Learning Outcomes & Discussion

During mid-semester of Fall 2015, students in the two 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) and Section 002 is labeled (2). For Section 001: n = 4; mid-semester enrollment = 38 and for Section 002: n = 5; mid-semester enrollment = 35. Due to the low participation numbers of the survey, it may not represent an accurate reflection.

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

| Response | Daily Agendas are valuable. | Instructional Modules are valuable. | Mini Lectures are valuable. | Online Homework Assignments are valuable. |
| --- | --- | --- | --- | --- |
| Strongly Agree | 50.0% (1);33.3% (2). | 50.0% (1);60.0% (2). | 50.0% (1);40.0% (2). | 100.0% (1);60.0% (2). |
| Agree | 50.0% (1);66.6% (2). | 25.0% (1);40.0% (2). | 50.0% (1);40.0% (2). | 0.0% (1);40.0% (2). |
| Neutral | 0.0% (1);0.0% (2). | 25.0% (1);00.0% (2). | 0.0% (1);20.0% (2). | 0.0% (1);0.0% (2). |
| Disagree | 0.0% (1);0.0% (2). | 0.0% (1);00.0% (2). | 0.0% (1);0.0% (2). | 0.0% (1);0.0% (2). |
| Strongly Disagree | 0.0% (1);0.0% (2). | 0.0% (1);0.0% (2). | 0.0% (1);0.0% (2). | 0.0% (1);0.0% (2). |
| Not Applicable | 0.0% (1);0.0% (2). | 0.0% (1);0.0% (2). | 0.0% (1);0.0% (2). | 0.0% (1);0.0% (2). |

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 | 25.0% (1); 20.0% (2) |
| Very Often | 25.0% (1); 40.0% (2) |
| Often | 25.0% (1); 0.0% (2) |
| Occasionally | 25.0% (1); 40.0% (2) |
| Rarely or never | 00.0% (1); 00.0% (2) |

As identified in Table 2, many of the students (75% and 60% 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). There were a few students (25% and 40% respectively) that found the course required them to be an active learner on an occasional basis rather on a more regular basis.

After the conclusion of Fall 2015, quantitative data from the final exam grade outcomes, and final grade outcomes were reviewed thoroughly. The results that were compared included the same professor’s Fall 2014 course sections which were conducted prior to the start of the hybrid conversion process and the Fall 2015 hybrid course sections.

**Table 3. Students’ final exam grade outcome by grade distribution for hybrid course implementation Fall 2015 vs. traditional course implementation Fall 2014.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Grade distribution in percentages | Fall 2014Section 01Traditional | Fall 2014Section 02Traditional | Fall 2015Section 01Hybrid | Fall 2015 Section 02Hybrid |
| Raw Average | 77.6% | 74.5% | 78% | 73.5% |
| A | 12 | 10 | 10 | 4 |
| B | 8 | 4 | 9 | 8 |
| C | 4 | 6 | 4 | 10 |
| D | 5 | 6 | 5 | 8 |
| F | 7 | 9 | 6 | 2 |
| Total amount of students who took exam | 36 | 35 | 34 | 32 |

As identified in Table 3, the students’ final exam grade in all course sections for Fall 2014 and Fall 2015 were about the same. Taking the average / section for Fall 2014 and average / section for Fall 2015 in each category and by taking account for the various student enrollments, there was a higher percentage of A’s in the traditional courses (21.2% hybrid vs. 30.9% traditional). The hybrid course sections had a higher percentage of B’s due to less students getting A’s (25.7% hybrid vs. 16.9% traditional). The rest of the averages showed a big shift of students from getting F’s to a higher grade in the hybrid course sections. This is indicated in the grades of C’s (21.2% hybrid vs. 14.1% traditional), D’s (19.7% hybrid vs. 15.5% traditional), and F’s (22.5% hybrid vs. 12.1% traditional). The raw average was slightly was very similar in the corresponding course sections with less than a 1% difference.

**Table 4. Students’ final grade outcome by grade distribution for hybrid course implementation Fall 2015 vs. traditional course implementation Fall 2014.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Grade distribution in percentages | Fall 2014Section 01Traditional | Fall 2014Section 02Traditional | Fall 2015Section 01Hybrid | Fall 2015 Section 02Hybrid |
| A (A; A-) | 11 | 10 | 11 | 6 |
| B (B+; B; B-) | 10 | 9 | 11 | 12 |
| C (C+; C) | 9 | 8 | 6 | 11 |
| D | 2 | 6 | 3 | 2 |
| F | 4 | 2 | 7 | 4 |
| Total student enrollment (minus W’s, WN’s and DF’s) | 36 | 35 | 38 | 35 |
| Number of W’s, WN’s and DF’s per course | W – 0WN – 2DF – 0 | W – 0WN – 3DF – 0 | W – 1WN – 0DF – 0  | W – 1WN – 3DF – 0  |

As identified in Table 6, the amount of A’s, B’s, and C’s remained similar from the traditional and hybrid course sections. The amount of D’s slightly decreased while the amount of F’s slightly increased in the hybrid course sections. After investigating this further, the number of F’s for both course sections of the hybrid version could have been decreased if the 3 students in section 001 and 4 students in section 002 (7 in total) would have taken the final exam and most likely would have earned a D in the course). These results also reemphasize the need for correct math placement and correct placement in a hybrid or traditional class format.

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).

Overall for the quantitative data, 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.

# Future Plans for Enhancement

The design and development of a hybrid course is not a “once and done” procedure. Selvi 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, Selvi 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, Selvi Jagadesan makes 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: <https://weblearning.psu.edu/FacultySelfAssessment/> and taking OL2000: Effective Online Teaching (<http://wcfd.psu.edu/programs/courses/>). 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. When developing custom instructional resources for a hybrid or online course, take time to structure your topics and content with a target length of 5- minutes for multimedia-based resources. This strategy aligns with research related to optimal length for instructional video to promote learning and student engagement.
9. Video-based instruction which will be repeatedly utilized in online/hybrid courses should be designed with consideration for future accommodation of students who may require closed captioning. (<http://accessibility.psu.edu/courseguidelines>) Transcribing such a large body of video-based instruction for closed captioning is very time consuming and our campus is not staffed to this process. Hiring an outside service to provide this service may be necessary in cases where large amounts of custom video-based instruction are created to support online courses.
10. 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 26 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 investigator has 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 26 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. Lastly, the alignment of the course design and structure to Math 21 and Math 22 hybrid versions of the course produce a structured course sequence for students taking mathematics.

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