# Empirical Study of Face-to-Face, Hybrid, and Online Instructional Delivery of Computer Literacy Courses in 2 and 4 Year Colleges

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*Abstract*— Online and Hybrid Education are now a reality in most Colleges and Universities. And they span all levels, from undergraduate to graduate education. In this paper, we present our preliminary data and thoughts on the effectiveness of these alternative methods for teaching Computer Literacy courses in a 2 year and 4 year institutions.

#### Keywords—Computing Education; Computer Literacy

## I. INTRODUCTION

The introduction of online courses across colleges and universities of all types is driven by the need to meet student demand, increase enrollments and to reduce teaching cost [1,2]. Educational institutions are also trying to ease campuses that are nearing capacity, and lessen the financial impact, without having to pass on the costs to students. Reduction of teaching and facilities costs, while servicing the educational needs of an incoming student body can be met by reducing the physical presence of time spent on campus. This trend towards online teaching is complimented with the offering of hybrid courses, in which face-to-face and online teaching co-exist. The target audience for these courses includes traditional and non-traditional students. We are now witnessing an expansion of this trend from 4 year colleges to 2 year community colleges [3].

Recently reported works in the field of distance learning include the conversion of introductory computing courses and its development into a blended learning model [4], creation and delivery of an online writing course [5], a hybrid course development model for existing courses [6], deciding which course delivery method effectively targets the learning outcomes [7]. Furthermore other works considered the effectiveness of online and blended learning, in comparison to the traditional method of instruction [8, 9], students' perceptions, and impressions of face-to-face (F2F), hybrid courses, and online courses [10, 11].

In this paper we present an empirical study of face-to-face, hybrid and online instructional delivery of computer literacy courses in a 4-year college, Montclair State University (MSU), and a 2 year college, Bergen Community College (BCC). In Minas Kousoulis Department of Information Technology Bergen Community College Paramus, NJ 07652 mkousoulis@bergen.edu

section 2 we present the course specifics and the methodology. In section 3 we present the numerical data and in section 4 our preliminary conclusions.

#### II. EMPIRICAL STUDY BACKGROUND

This study of looking at student learning performance in two and four year colleges, began last year in an effort to understand the academic behavior of the student bodies in two and four year colleges. The course taught at BCC is named INF 101 Introduction to Information Technology, and the course taught at MSU is named CSIT 100 Introduction to Computer Concepts. Both are three credit courses and cover the same topics. The topics covered in both courses include: computer hardware concepts, software and operating system basics, Internet and web programming, computer networking fundamentals, and Microsoft Office. Both courses included in the calculation of the overall grade, exams, homework assignments and lab assignments.

A total of six sections were observed at BCC, with two face-to-face (F2F), two hybrid, and two online sections. The data from those courses was grouped together per instruction method. At MSU, five sections were observed in the following modalities: two F2F, two hybrid, and one online sections. The hybrid sections met 50% of the time face-to-face, and 50% of the time online.

As a measure of performance for this study, we chose the waited average (final grade) and scores on exams. The waited average included all exams, home works and lab assignments. The performance on exams is measured differently in the two colleges. At BCC students performance is the average of four exams, cumulatively covering all topics. At MSU, exam performance is measured on a final exam, which is cumulative and also covered all topics. Examinations in the face-toface, hybrid, and online sections where done in class, in class and online, and online respectively.

### A. Participants

In the course sections looked at in BCC, there were 46, 39, and 38 students in the face-to-face, hybrid, and online



modalities respectively. For face-to-face, hybrid, and online modalities observed at MSU, the students respectively were 50, 45, and 20. The two courses, from both schools, cover the same topics, with the difference being the required textbooks, and supplementary materials.

#### III. EMPIRICAL DATA

Student performance results are presented in the following subsections: face-to-face, hybrid and online.

A. Face-to-Face

We start with a comparison of the face-to-face class performance data at the two schools. At BCC, students performed similarly on the exams and the weighted average for the course. This can be attributed to the fact that the four exams were spread out over the semester. At MSU we see that students did worst on their final exams than they did overall for the class. Comparing the two schools we see that the final overall grades have a similar distribution, despite the difference in exam performance.



Figure 1. BCC face-to-face



Figure 2. MSU face-to-face

#### B. Hybrid

Next a comparison of the hybrid class performance data at the two schools is presented. At BCC, students again performed similarly on the exams and the weighted average for the course. But performance was not as strong as it was in the face-to-face class. In contrast, at MSU students performed better overall in the hybrid course compared to the face-toface. The difference between final exam and overall performance remains but is not as large. Interestingly, at the top performance (90 and above) we see very little difference between final exam and overall performance







Figure 4. MSU Hybrid

#### C. Online

Finally, we observe the comparison of the online class performance data at the two schools. At BCC, students again performed similarly on the exams and the weighted average for the course. The performance is better that the hybrid course but not as strong as the face-to-face class. At MSU, students in the online class performed similarly in the hybrid course and the online course. We also notice that in the online class the difference between final exam and overall performance has been minimized.



Figure 5. BCC Online



Figure 6. MSU Online

## IV. DISCUSSION

Our study is a preliminary study that collected data from a small number of course sections. As the study grows in number of sections and number of students, we will be able to provide more meaningful analysis of the data.

The preliminary data show some interesting differences between the various modalities and between the two institutions. At BCC, students performed stronger in the face-to-face and on-line sections. It should be mentioned that the online sections at BCC were offered during the summer. A time that BCC sees an influx of external students taking courses at BCC in order to save on course tuition costs as four year college tuition is much higher. Thus the stronger performance on the online course should not be taken as an indication that BCC students preferred it and did better. With this in mind the weaker performance on the hybrid sections might be indicative of what we will see this year when the online course is offered in the Fall of 2015. Our preliminary observation is that students did better in the face-to-face sections at BCC.

Another interesting observation from the performance data at BCC is that the difference in performance between exams and overall grade was not large. This can be attributed to the fact that the exams were given through out the semester, as students are working on homework and lab assignments.

At MSU, students received a better overall grade than they performed on their final exam. The difference is noticeable and shows that in all modalities students were not prepare enough for the final exam. This is in contrast to BCC, where students had the materials tested over five exams (the lowest grade is dropped) instead of one. As mentioned above the overall final grade was much closer to the performance on the exams.

Looking at final exam performance at MSU, we can see that students did much better in the hybrid and on-line sections. We suspect that the absence of continuous in class lectures motivated students to be more responsible for each weeks materials leading to better performance at the end of the semester on their final exam. We also need to mention that the hybrid and online sections at MSU were offered during summer session. During this time more motivated students take short session summer classes to advance their studies. We have started to collect data from online sections that are now offering during the year, so a comparison can be made.

When looking at the overall grade performance at MSU, the online section performed the worst, showing a weakness on the students' ability to collect as many points from their homework and lab assignments. As mentioned above, these were short summer sessions and thus it appears that more time might be needed for students to learn and perform better on their lab assignments.

## V. CONCLUSION

In this paper we presented preliminary data on differences between face-to-face, hybrid and on-line instructional delivery at two institutions of higher education. One being a two year community college and the other a four year university.

Our research on this topic will continue with the collection of data for many more sections from these two institutions. We are also expanding our study to include more information about our students (major, years in college, gender and race). This will allow for a statistical analysis of various aspects of student data and performance.

Finally, we also plan to expand this study to include more courses, going beyond the introduction to computer literacy course. As the two institutions have a number of 100 and 200 level courses in common in computer science and information technology, we plan to gradually include these next.

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