Undergraduate Students' Preferences and Willingness to Pay for College Course Attributes

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Introduction

The market for college-credit courses is in the process of a dramatic transition. This transition is the combined result of growing student demand for college courses and the availably of computer technology and the internet. In order to meet the growing student demand, many institutions are now including online courses and programs as part of their regular course offerings (Allen and Seaman 2010). However, the demand for online courses has recently been outpacing that for face-to-face (F2F) courses. As a result, many public and private institutions of higher education have significantly increased the number of online course offerings. In fact, between 2002 and 2008 distance education (DE) course enrollment grew from 9.6% to 25.3% of the total enrollment (Allen and Seaman 2010). Interestingly, this rise in demand for DE has not necessarily come from DE students. Many students living on college campuses chose to take distance courses (Bejerano 2008). Additionally, undergraduates have accounted for the majority of online course enrollment and this has been especially true for large public institutions (Allen and Seaman 2010).

While popularity for the online format has exploded, the debate over online course effectiveness has been still brewing. Although a small number of studies have reported that online courses are not suitable replacements for their face-to-face (F2F) counterparts (Anstine and Skidmore 2005; Brown and Liedholm 2002), the majority found that online courses are at least as effective as the F2F versions of the courses (Campbell et al. 2008; Coates et al. 2004; Lou, Bernard, and Abrami 2006; Means et al. 2009; Russell 1999; Summers, Waigandt, and Whittaker 2005). For traditional students at many institutions today, it has become common practice to substitute online courses for F2F versions of the same courses (Bejerano 2008).

There has been a lot of research about the advantages and disadvantages associated with online courses relative to their F2F counterparts (Anderson 2004; Ausburn 2004; Bernard et al. 2009; Campbell et al. 2008; Lou, Bernard, and Abrami 2006; Picciano 2002; Swan 2001). Although most researchers agree about what constitutes an effective online course, there are some potential misconceptions about online courses. In particular, it is commonly assumed that some level of uniformity exists across online courses and formats relative to their F2F counterparts (Russell 1999). Depending on the specific course features implemented, however, online learning environments can vary considerably from one another (Bernard et at. 2009). For example, the access students have to the course instructor or other students may not be equal across all online formatted courses.

Another concern is that most of the DE research has relied heavily on studies using measures of effectiveness (grades or satisfaction reports) to determine if online courses are substitutable for F2F courses. This eliminates the possibility that students' can directly contribute to the design of online courses before they are launched. Koehler et al. (2004) argued that collaboration between faculty and students is necessary to develop effective online courses. Because physical interactions and communication in the online learning environment is limited, these types of feedback are expected to help identify ways to reduce much of the uncertainly that faculty and students experience in the online environment.

Additionally, the tech-savvy millennial generation is very knowledge and have made significant contributions to a variety of modern information and communication technologies, such as web-based social networks, blogs, and streaming video (web 2.0 technologies) (Haythornthwaite and Andrews 2011; Jenkins et al. 2011). Many of these technologies are identical to design features of online courses. Further, texting, instant messaging, and

emailing have become the primary means of communication for many young people. Therefore, college age students can provide valuable insight regarding online course inputs and their effects on the learning outcome.

Given the increase in the popularity of the online courses among both distant and on-site student population, and considering the limited published literature addressing what effect online courses have in common in terms of structure and format, the primary goal of this study is to identify student's preferences for online versus F2F course courses. More specifically, students' preferences and willingness to pay (WTP) for different attributes of online and F2F college-level courses are determined. Students' stated preferences are then used to determine how well online courses are perceived as substitutes for their F2F counterparts. As a secondary goal of this study, the impact on course selection based on the amount of online course information available to students during enrollment is determined.

In order to accomplish these objectives, a methodology allowing students to express preferences for specific course attributes is designed. One approach that can be used to evaluate student preferences for course attributes is the use of a choice experiment (CE) where college courses are considered goods with unique attributes and students are treated as the consumers of these goods. Within this framework, students can be exposed to a number of college course attributes and make choices based on their preferences.

This study is organized as follows. The background section includes a brief synopsis of the debate over the effectiveness of online versus F2F course. This is followed by an overview of the conceptual components of an effective online course including the empirical investigation of these concepts by Bernard et al. (2009). This section concludes with a brief discussion of others

efforts to identify students WTP for features of F2F courses that are similar in nature to online courses. In the methodology section, the model used to estimate students WTP based on the CE is developed. This includes the construction of a utility model based on the online course characteristics as wells at the estimation procedure of a conditional logit model. In the data section, the survey instrument used to collect students' responses is describes and the some of the data collection challenges are identified. In the results and discussion section, the estimated model parameters for online and F2F courses are compared and the major trends are highlighted. In this section, the results are also compared to the findings of Bernard et al. (2009) as well as to those of the F2F students WTP studies. This paper is concluded with a brief summary of the findings and the potential policy implications based on these results.

Background

Defining an effective online course

Russell (1999) was one of the first researchers to review studies that had compared DE courses with F2F courses. From his study he concluded that there was no indication of a quantifiable difference regarding learning effectiveness, regardless of the method used, between the two types of formats. Although his work is more of a literature review, it was a platform that elevated the discussion about comparing online and F2F courses. Although the bulk of studies following Russell's work have supported his belief, a series of studies have since focused on evaluating online course effectiveness on student learning (Coates et al. 2004; Campbell et al. 2008; Lou, Bernard, and Abrami 2006; Means et al. 2009; Summers, Waigandt, and Whittaker 2005).

The core of most of these studies have been the evaluation of types of student interaction encouraged in online and F2F courses, and the effectiveness of each of these interactions on

accomplishing the goals of the course. Moore (1989) was the first to define three types of student interactions: student-content (SC), student-instructor (SI), and student-student (SS). He believed that these interactions are necessary for the DE learning environment. Historically, SC interactions had been perceived as the most essential form of interaction as it was believed that this type of interaction was at the core of learning (Moore 1989).

Following the work of Moore (1989), Anderson (2004) identified student interactions, as they occur in the DE environment, in terms of specific DE technology. Base on Anderson's (2004) descriptions, the following are examples of how three student interactions (SC, SI, and SS) first defined by Moore (1989) can occur using online course design technology: 1) course lecture notes made available to students via the online delivery platform (SC); 2) communication with the course instructor via email (SI); and 3) and group projects in which students communicate via email or threaded discussions (SS). Although Moore (1989) believed that SC interactions were the most important types of interaction in DE, much of the empirical research that followed have reported SI interactions followed closely by SS interactions were more important for online course success (Ausburn 2004; Campbell et al. 2008; Lou et al. 2006; Picciano 2002; Swan 2001).

As an effort to more broadly addresses the issue of which student interactions were most important for DE success, Bernard et al. (2009) conducted a meta-analysis of the DE literature. They investigated the differences in student interaction types among online courses and the impact that these differences had on students' grades and satisfaction reports. In their study, student interactions types were not categorized by specific technological attributes such as the instructor email communication or threaded discussion lead by the instructor, both of which are examples of SI interactions. Instead, they were grouped together based on the conceptual

definitions of SC, SI, or SS provided by Moore (1989). Therefore, all interactions that occurred as SI were categorized the same regardless of the technology used to encourage it. What Bernard et al. found was that increasing SC interactions in the presence of low SI and SS interactions increased course effectiveness. However, increases in SI or SS interactions in the presence of low SC interactions did not necessarily improve course effectiveness. These results supported Moore's original conclusions about the significance of SC interactions. One major consideration not addressed in this study is how differences within a particular interaction type, such as the SI interaction used above, may impact course effectiveness based on the specific technology used to facilitate the interaction. In other words, does the use of email correspondence with the instructor impact course effectiveness differently than participating in an instructor led threaded discussion?

Students' willingness-to-pay for course attributes

Only two studies were found that estimated students WTP for design features similar to those used in online courses (Boyer, Briggeman, and Norwood 2009; Flores and Savage 2007). However, both studies used data from students enrolled in F2F courses and only considered attributes allowing SC interactions. Flores and Savage (2007) considered two teaching alternatives and estimated students' WTP for recorded lecture videos (recorded during the same semester). The teaching alternatives were based on students attending class with and without access to the recorded lecture video. Their data was from a survey of 39 undergraduate students in an intermediate microeconomics course who were asked about their use of the recorded lecture videos during the summer 2005 semester. Flores and Savage reported that 77% of the students actually watched the videos and students were willing to pay about $74 for access.

Boyer, Briggeman, and Norwood (2009) estimated students' WTP for seven course attributes, including price and three others similar to the features of online courses (web-based study guide, electronic class notes, and pod casts of the lecture videos). Their survey data included responses from 302 students in economics courses at four universities. They found students were willing to pay, on average, $62 for a web-based study guide, $45 for electronic class notes, and $18 for pod casts of lecture videos.

3. Materials and Methods

The choice experiment (CE) approach to course-attribute valuation

Choice experiments have been used extensively in marketing, transportation, environmental, and agriculture literature to determine values people place on different goods (for examples of each see Hanley, Wright, and Adamowicz 1998; Hensher and Greene 2003; Louviere and Woodworth 1983; Lusk, Roosen, and Fox 2003). Similarly, CEs can be used to determine the value that students place on different attributes of college courses (both online and F2F). When college students enroll in classes, they make choices based on the provided information as well as their perceptions about different attributes of the course selections. Students' preferences for these attributes are based on the importance they place on courses given a particular sets of attributes and relative to other courses with different sets of attributes. The use of choice experiments in this context, allows the college course enrollment process to be simulated and the students' choice process captured. The results of the experiment can then be used to determine students' preferences and WTP for online and F2F course attributes.

Based on the student preferences and WTP results, a comparison can be made to other studies within the DE literature that have used course effectiveness measures, such as grades and satisfaction reports, to determine which interaction types are most important for online course

effectiveness. In order to make these comparisons, online course attributes need to be translated in terms of one of the three student interaction types. Following the example of Anderson (2004), the design features (course attributes) of an institution's online course delivery platform [for this study Oklahoma State University's Desire-to-Learn (D2L) platform] that facilitate specific interactions can be identified and categorized as SC, SI, or SS. Based on this attribute categorization, students' preferences (and WTP) can then be compared to other research that has used effectiveness measures and conceptual student interaction definitions.

Predicting student preference based on the distance education literature

Based on the results of Bernard et al. (2009), students' preferences for SC type attributes (e.g. lecture video or online course notes) would be expected to be the highest, while preferences for SI and SS type attributes (e.g. student live chart or discussion board) would be expected to be the lowest. It is also reasonable to expect, based on the Bernard et al. results, that students would prefer attributes of a particular interaction type that allowed for higher quality or frequency of interaction compared to those of the same type that resulted in lower quality or frequency of interaction. For example, communication via live chat compared to email correspondence could allow for a student to perceive a higher frequency of an SI interaction since questions or concerns can be addressed more rapidly. Another example is the comparison between lecture videos and notes. Students may perceive a higher quality of an SC interaction to occur when watching a lecture video that explains a complicated topic compared to reading course lecture notes with the same information that was provided in the video.

Identifying the preferences for specific attributes will allow for students' broader preference for the online course to be determined. Bernard et al. demonstrated that the high variance of online course effectiveness resulted from interaction type variability across online

courses. Given the level of each interaction type, an online course may be less, more, or as effective as its respective F2F counterpart. From the framework of students as consumers of college courses, students' preferences can be determined and used to estimate demand for college courses, given a specific set of course attributes (this methodology is similar to Lusk, Roosen, and Fox 2003). Using the work of Bernard et al. (2009) as a guide, estimations using different combinations of course attributes can demonstrate variations in preferences for particular courses and possibly explain variations in student performance.

Using this methodology and estimation results, predictions of online course enrollment can also be made based on the amount of information provided to students when selecting courses. It is well understood in the consumer economics literature that increasing the amount of attribute information provided to consumers can impact product selection (Arunachalam, Henneberry, Lusk, and Norwood 2009; Levin and Gaeth 1988). Therefore, it is reasonable to expect that students with more information about the available attribute bundles of online course will select online courses more frequently than F2F courses.

Experimental design and the conditional logit model

In this study, a conditional logit model was used to estimate students' preferences and WTP for college course attributes based on the data obtained from the CE. The estimated preferences were then used to: 1) determine students' for online courses compared to their F2F counterparts (the primary goal of this study); and 2) determine how course selection based on the amount of online course information available to students is impacted during enrollment (the secondary goal of this study). In the CE, students were presented with discrete choices between three alternatives: an online course, a F2F course, and an option to choose none. Each course was made up of a number of attributes that varied between the sets of choices while the

"choose none" option (which was normalized to zero in the estimation procedure) provided that the model was fully identified. Within the framework of the CE, it was assumed that students made the selection which maximized their utility for each choice

Additionally, students were separated into two groups and presented with two different information sets regarding the attributes of online courses. This allowed for a comparison between students selecting online courses with minimal online course attribute information and students with additional online course attribute information. The first group was only given information about the online course topics and the number of other students enrolled in the course. At the time of enrollment, students would not really know what the final class size is but they would know, based on the provided information, what the maximum class size could reach. The assumption in this study is that students would make their class size decisions based on the maximum class size value. The second group was proved with the same information as the first, but they were also informed about the additional attributes available for each online course. The information given to students about the F2F courses was the same for each group (see Table 1 and Figures 1-2).

Estimating students' preferences for course attributes

A random utility function specifying a student's utility was defined as follows:

(1) $$U_{ij} = V_{ij} + \varepsilon_{ij}$$

where U_{ij} is the utility of student i making choice j, for $i = 1, \dots, N$ and $j = 1, \dots, J$; V_{ij} is the deterministic component of the utility function made up of the course attributes of option j and potential student-specific characteristics (V_{ij} is equal to zero when the choose none option is made); and ε_{ij} is the stochastic component consisting of unobserved qualities. McFadden (1973) demonstrated that if the stochastic component is independently and identically distributed across

all *N* students and *J* options with Gumbel (type I extreme value) distribution, then the probability that a student selects option j is given by:

$$\text{Prob}\{\text{choose option } j\} = \frac{\exp(\lambda V_{ij})}{\sum_{k=1}^{J} \exp(\lambda V_{ik})} \quad (2)$$

where λ is a scale parameter that is not separately determined from the parameters of attributes and is inversely related to the stochastic term in the utility function. In this study, the value of λ was assumed to be constant across the sub-groups of undergraduate students.

The deterministic component of the utility function (V_{ij}) that appears in equation (2) is specified based on the scenarios presented in the choice experiment. The scenario one model is:

$$V_{ij} = \sum_{p=1}^{2} \alpha_{0p} D_{ijp} + \sum_{q=1}^{8} \alpha_{1q} FC_{ijq} + \sum_{r=1}^{8} \alpha_{2r} OC_{ijr} + \sum_{s=1}^{4} \alpha_{3s} FM_{ijs} + \sum_{t=1}^{4} \alpha_{4t} FT_{ijt} + \alpha_5 FZ_{ij} + \alpha_6 OZ_{ij} + \alpha_7 P_{ij} \quad (3)$$

where D_{ijp} is an indicator variable for the course delivery format (online or F2F); $FC_{ijq}$and OC_{ijr} are indicator variables for the undergraduate F2F and online course topics offered respectively; FM_{ijs} is an indicator variable for the number and days per week the F2F classes meet; FT_{ijt} is an indicator variable for the times of day the F2F classes meet, FZ_{ij} and OZ_{ij} are the sizes of the F2F and online classes respectively (number of students enrolled); P_{ij} is the price for a three-hour college credit course; and α_{0p}, α_{1q}, α_{2r}, α_{3s}, α_{4t}, α_5, α_6, and α_7 are the parameters to be estimated. The model for scenario two is an expanded version of the scenario one model and includes additional online course attributed as follows:

$$(4) \qquad V_{ij} = \sum_{p=1}^{2} \beta_{0p} D_{ijp} + \sum_{q=1}^{8} \beta_{1q} FC_{ijq} + \sum_{r=1}^{8} \beta_{2r} OC_{ijr} + \sum_{s=1}^{4} \beta_{3s} FM_{ijs} + \sum_{t=1}^{4} \beta_{4t} FT_{ijt}$$

$$+ \sum_{u=1}^{4} \beta_{5t} OL_{iju} + \beta_{61} ON_{ij} + \beta_{62} OI_{ij} + \beta_{63} OE_{ij} + \beta_{64} OB_{ij} + \beta_{65} OD_{ij} + \beta_{66} OS_{ij}$$

$$+ \beta_7 FZ_{ij} + \beta_8 OZ_{ij} + \beta_9 P_{ij}$$

where OL_{iju}, ON_{ij}, OI_{ij}, OE_{ij}, OB_{ij}, OD_{ij}, and OS_{ij}, are indicator variables for the online course options of lecture videos, lecture notes, instructor live chat, take exams online, discussion board, and student live chat respectively; and β_{0p}, β_{1q}, β_{2r}, β_{3s}, β_{4t}, β_{5t}, β_{61}, β_{62}, β_{63}, β_{64}, β_{65}, β_{66}, β_7, β_8, and β_9 are parameters to be estimated. The MDC procedure in SAS was used to estimate both these models but it does not automatically assign an intercept. In both equations (3) and (4), the D_{ijp} indicator variable is included in the data set and the resulting estimated parameter is the intercept for each course format.

The objective function to be maximized is the log likelihood of equation (2) given the option choices of each student across the entire sample population:

$$(5) \qquad \max_{\boldsymbol{\theta}} \sum_{i}^{N} \sum_{j}^{J} C_{ij} \log \left(\frac{\exp(\lambda V_{ij})}{\sum_{k=1}^{J} \exp(\lambda V_{ik})} \right)$$

where C_{ij} is the choice of option j by student i and $\boldsymbol{\theta}$ is a vector of the parameters from equation (3) (estimates scenario one model) or equation (4) (estimates scenario two model). Students' WTP is for each course attributes (WTP_a) is given by:

$$(6) \qquad WTP_a = -\frac{\beta_a}{\beta_p}$$

where $\beta_a$is the parameter for course attribute a and β_p is the price parameter. Following Greene (2003), the variance of WTP is obtained using the delta method:

$$(7) \qquad \mathrm{var}(WTP_a) = \left(\frac{-1}{\beta_p}\right)^2 \mathrm{var}(\beta_a) + \left(\frac{\beta_a}{{\beta_p}^2}\right)^2 \mathrm{var}(\beta_p) - 2\left(\frac{\beta_a}{{\beta_p}^3}\right)\mathrm{cov}(\beta_a, \beta_p)$$

(Hole 2007 reported that the delta method out performs others procedures for estimating the variance of WTP). From equation (7), WTP confidence intervals can be calculated making testing hypotheses about students' preferences for specific design features of online courses straightforward and obvious from the results tables.

Determining the impact of additional information on course selection

The is secondary goal of this study is to determine, during the course selection process, how the amount of online course information available to students impacts the type of course, F2F or online, that is selected. In order to achieve this goal, a simulation was constructed allowing a comparison to be made between the group of students with limited online course information and those with additional online courses information. To make this comparison, two different hypothetical courses with specific course attributes were created. For each hypothetical course, an online version and F2F counterpart were created. In Table 5, the specific course attributes of the F2F and online versions of the two courses are shown.

The specific attributes for the two courses were selected in a semi-random process without replacement (so the same options could be selected twice) as follows. The course topics were selected from the nine available options. However, the F2F meeting times and days per week were selected from a pool of the three most common attributes for each category (8:30 AM, 11 AM, and 1:30 PM for the time and M, TR, MWF for the days per week). This restriction (as well as the one for the online course attributes described below) was included to provide a more realistic comparison of F2F and online courses. For example, a 6 PM weekend course would not be the most common type of F2F course. The options for the online course attributes were put into three categories: above average, average, and below average. The above average

category included all of the online course attributes, including the most popular video category. The average category included attributes that are commonly used in many of the online courses offered at OSU, which includes the F2F lecture video (Hawkins 2011). The below average category only included the F2F lecture video and course lecture notes attributes. The bundles of attributes for each of the two courses course, based on these three categories, were randomly selected.

Using equation (2) and the parameter estimates for the specific course attributes, a set of probabilities were generated based on choosing: 1) an online course; 2) a F2F course; and 3) the "none" option (note that the sum of all three choices in a given set is equal to 1). The parameter estimates for the limited information group were generated from equation (3) while those for the additional information group were generated from equation (4). Based on the two different hypothetical courses and the two groups of students with different online course attribute information, the simulation generated four sets of probabilities for comparison.

Data

Data for this study are the undergraduate student responses from two parts of three-part survey of OSU-Stillwater Students conducted in November 2010. The surveys were distributed via email and included a link to SurveyMonkey where the survey had been constructed. That same semester, OSU implemented a new student email policy which greatly restricts researchers' access and frequency of contact to students via campus email. Contact was limited to a single email invitation with no opportunity for follow-up. For the two parts of the survey used in this study, emails were sent to the full student population (graduate and undergraduate students) over a six hour window. This included the approximately 10,900 undergraduate students (the value used to estimate the response rate, 10,827, was based on the student demographic information

provided by the Department of Institutional Research and Information Management as OSU). The survey remained opened for approximately two weeks and in all, 1291 undergraduate students completed questionnaires (11.9% response rate). To maximize the response rate, given the limited student access, an Apple iPad was used an incentive for completing the survey and given away in a random drawing after the survey was closed. The basic demographic information of the undergraduates who completed the survey is presented in Table 2.

The online course design features of the OSU D2L platform were the basis for the specific online course attributes that allowed each of the three student interaction types (SC, SI, and SS) to occur. The other course attributes of F2F and online courses were based on the information provided to students at the time of enrollment. All registered OSU students have access to the Student Self-Services (SIS) webpage which allows students to enroll in courses offered at OSU. This includes F2F as well as online courses. The information provided on the SIS webpage includes the basic course title, the meeting time and days per week the class meets, the number of available seats out of the total number of seats in the course, the meeting location and the name of the instructor teaching the course. For this study, the last two items in this list were not of significance and were not included in the survey questionnaires. It is also important to point out here that information about the specific design feature included in the online course can only be obtained by contacting the instructor of the course directly.

Although the goal was to capture as much real world attribute information as possible, a method to significantly reduce the large number of course titles available to undergraduate students was needed. Therefore, the course titles provided to students in the survey were based on the categories of general education requirements that the majority of OSU students must meet (nine in all). In the survey, the general education categories were referred to as the course topic.

Additionally, the design style of the choice questions including the type of information provided about online and F2F courses was based on the look of the SIS webpage (see Figures 1-2). For the second survey, the additional online course attribute information, based on the technological capabilities of the OSU D2L platform to provide SC, SI, and SS interactions, was presented to students in a way that was consistent with the SIS webpage design style.

To tests the hypotheses proposed in this study, students needed to be presented with a large number of course attributes. However, the number of choice questions combined with the additional student information questions needed to be low enough that students would actually complete the survey. This posed a significant survey design challenge. Using the FACTEX and OPTEX procedures in SAS (with the blocks structure feature), the choice questions were divided into blocks while maintaining an overall D-efficiency (see Kuhfeld, Tobias, and Garratt1994 for D-efficient experimental designs) of at least 90% (SAS Institute). For the first survey, six blocks of eight questions were generated and had a D-efficiency of 90%. For the second survey, six blocks of nine questions were generated with a D-efficiency of 92%.

One limitation of the delivery platform used (SurveyMonkey) was that it did not allow for a conjoint analysis type survey with the variety of courses attributes being presented to students in this study. To compensate for this limitation, images of the course choice questions were created that matched the factional factorial models of each survey with respect to the specific course attributes used. However, this also meant that students would not receive the choice questions in a randomly generated order.

Results and Discussion

Students Preferences and WTP for Courses and Course Attributes

Undergraduate students' preferences and WTP for course attributes are presented in Tables 3(a), 3(b), 4(a) and 4(b). The WTP values presented in these tables should be interpreted as the premiums students are willing to pay (when positive) or discounts needed (when negative) for college courses with these particular attributes relative to the base course (a scientific investigation course offered at 11 A.M. on Tuesdays and Thursdays). Since the individual attributes are part of the total course package, it is possible to see from the results tables how different combinations of course attributes will impact student demand for various courses.

There are a number of general trends regarding students' preferences for course attributes observable from these results. Regarding class time and the number of days per week for F2F courses, undergraduate students have the highest preference for those that meet late morning (11 AM) or early afternoon (1:30 PM) and meet two (Tuesday and Thursday) or three (Monday, Wednesday, and Friday) days per week. Regarding the subject of the courses, courses categorized as scientific investigation are most preferred in a F2F versus an online environment. Regarding course delivery methods, undergraduates also have the highest preference for short and medium videos (10-20 minutes and 20-30 minutes). Regarding WTP, on average, they are willing to pay about $120-$150 for videos depending on type. This differs from the results of the undergraduate F2F students' WTP values of $18 and $74 reported by Boyer, Briggeman, and Norwood (2009) and Flores and Savage (2007) respectively. The other difference is that undergraduate students' average WTP for course lecture notes in this study is about $90 while Boyer, Briggeman, and Norwood (2009) reported WTP values of about $45.

In the context of student interactions, the results in this study indicate that SC interactions (lecture videos and course notes) are the most preferred interaction type followed by SS (student live chat room and threaded discussion) and SI (instructor live chat) interactions. Within

interactions types, all forms of videos are preferred over online course lecture notes, and the student live chat room attribute is preferred over the student-led threaded discussion attribute. For the most part, these results match up with the findings of Bernard et al. (2009) and the original conclusion of Moore 1989. However, Bernard et al. (2009) reported that SI interactions are more important than SS interactions from the course effectiveness framework, but the differences in this study between preferences for SS and SI interactions are small.

Impact of Information on Selecting Online Courses

The simulated demand for online courses based on specific courses attributes (see Table 5) and using the estimated preferences from Tables 3(a) and 4(a) are presented in Table 6. For each course, the simulation generated a limited-information set of probabilities and an expanded-information set of probabilities. Given a specific course (either course one or course two), comparisons can be made between delivery methods (F2F or Online) with in a probability set and between probability sets under the same delivery method.

Under the limited-information group for course one the probabilities are very close between students selecting the online and F2F courses. However, this particular comparison narrowly favors students selecting the online course. For this same course under the expanded-information group, the gap is much larger and still favors student selecting the online course over the F2F course. For course two and under the limited-information group, the gap between the online and F2F course is large and favors the F2F course. Under the expanded-information group for this same course, the gap is closer but still favors the F2F course.

The results of this simulation indicate that when students receive more information about specific course attributes during the course-selection process, their likelihood of choosing an online course compared to the F2F version increases. However, this result is also conditional on

the presence of specific online course attributes that students value most. These results also suggests that depending on the specific course attributes present, including the course topic, students may actually prefer some courses in online versus F2F formats. The presence of specific course attributes may also shed some light on the causes of the amount of variation in effectiveness across online courses detected by Bernard et al. (2009). If students' preferences are any indication of course effectiveness, then the absence or presence of specific course attributes given students preferences for them, may be the cause of some of this variation.

Summary and Conclusions

The primary objective of this study was to determine students' preferences and WTP for online and F2F college-level course attributes. The secondary objective was to determine how the amount of information that students have about online course attributes during enrollment impact their selection of college-level courses. The motivation for the first objective was to present an alternative strategy, based on students' preferences, to determine how well online courses can substitute for F2F courses. The majority of DE studies have depended heavily on after-the-fact feedback, such as students' grades and satisfaction reports, to make this determination. Additionally, students have considerable experience with information and communication technology and, based on their experiences, can potentially make valuable contributions to the design process of online courses. The motivation for the secondary objective comes from the practical experiences that the researchers involved in this study have with regard to the amount online course attribute information available to students during enrollment.

To accomplish the objectives of this study, data consisting of undergraduate students responses to a survey that included a CE were used. Although OSU Communication policy restricted the contact with students which limited the response rate to about 12%, nearly 1300

students completed the surveys. Additionally, the demographic make-up of respondent population was similar to that of the full undergraduate population.

Based on the results of this study, there are four trends with respect to students' preferences for college credit course that may provide insight to higher education faculty and administrators. First, there is an apparent premium time-period (between late morning and early afternoon) and number of days-per-week (two-three days during the week) that students prefer to take F2F courses. As demonstrated by the simulation, however, the probability that students would select an online version of a course increased as the number of technological attributes included in online course increased. This suggests that institutional efforts to use online courses to help meet on-site student demand would be more accepted by students when the online courses attributes students desire most are included.

Second, it appears that students prefer some courses in the F2F format and others in the online format. For example, the scientific investigation course topic was one of the most popular in the F2F format and the least popular in the online course format. On the other hand, humanities and natural sciences were two of the more popular course topics in the online format. For institutions wishing to develop and expand their online course offerings, increases the number of courses that students identified as most popular in the online format might be appropriate. Another consideration is the pricing strategy. For some universities, considering adjusting fees that reflect student demand for particular types of courses instead of being based on the college offering the course may be appropriate.

Third, students demonstrated the highest preferences for online course attributes that facilitated SC-type interaction. In fact, the online course attribute that was valued the most by students was shorter (10-20 minute) customized topic-videos. For many institutions wishing to

differentiate their online courses and programs from other universities, customizing video as well as other online course attributes may be an important consideration.

Fourth, students selected online courses more frequently when additional information about online course attributes is available during courses selection, and when the attributes students value most are included. This last result also implies that, depending on the specific courses attributes included in the course, online courses may be more popular, considered about the same, or less popular than their F2F counterparts. This is an important consideration for institutions wishing to encourage enrollment in online courses.

In light of the fact that many higher education institutions have a strong incentive to develop and expand their online programs and offerings (Allen and Seaman 2010), using students input to help develop online course formats may be a necessary consideration. Although the students preferences determined in this study were based on design features of the OSU D2L platform, the model presented here has the flexibility to accommodate other kinds of online and F2F course attributes. Further, as the technology available to designers of online courses continues to change, re-evaluating students' preferences for college course attributes is a worthy endeavor.

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Table 1. Online and Face-to-Face Course Attribute Options in Choice Questions

Undergraduate course topic	*Additional online course attributes*
English Composition & Oral Communication	1-10 minute topic discussion video (SC)
American History & Government	10-20 minute topic discussion video (SC)
Analytical & Quantitative Thought	20-30 minute topic discussion video (SC)
Humanities	Recorded face-to-face lecture (SC)
Natural Sciences	Online course lecture notes (SC)
Social & Behavioral Sciences	Chat-room with instructor (SI)
Diversity	Chat-room with classmates (SS)
International Dimension	Threaded discussions with classmates (SS)
Scientific Investigation	Take exams and quizzes online
Time face-to-face course is offered	Online drop box for assignment
8:30 AM	*Other attributes of both courses*
11:00 AM	Number of students enrolled in course
1:30 PM	Price for a three hour course
4:00 PM	
6:30 PM	
Days per week face-to-face course meets	
M/150 minute class	
TR/75 minute classes	
MWF/50 minute classes	
MTWRF/30 minute classes	
Weekend class	

Table 2. Demographics of Students Completing the Surveys

Group	Survey	Actual[a]
Freshman	18.41%	20.51%
Sophomore	12.33%	17.69%
Junior	17.08%	19.71%
Senior	23.55%	22.51%
Female	56.22%	48.22%
Male	43.78%	51.78%
Resident[b]	70.81%	72.06%
Out-of-state	20.01%	19.99%
International	9.18%	7.95%

[a] From OSU student profile fall 2010.

[b] Based on all OSU campuses enrollment.

Table 3(a). Conditional Logit Parameter Estimates for College Course Attributes (Survey 1)

Parameter Name	Online		Face-to-face	
	Estimate	Standard Error	Estimate	Standard Error
Undergraduate course topic				
English Composition & Oral Communication	0.1045	(0.1319)	-0.1690	(0.1223)
American History & Government	0.5799***	(0.1302)	-0.1941	(0.1250)
Analytical & Quantitative Thought	0.0135	(0.1222)	-0.3182**	(0.1252)
Humanities	0.4099***	(0.1276)	-0.0145	(0.1255)
Natural Sciences	0.4519***	(0.1343)	-0.0768	(0.1287)
Social & Behavioral Sciences	0.3344**	(0.1321)	-0.2424***	(0.1294)
Diversity	0.4965***	(0.1273)	0.0219	(0.1346)
International Dimension	0.3331***	(0.1258)	-0.3386***	(0.1313)
Class size	-0.001	(0.0015)	-0.0018	(0.0015)
Time face-to-face course is offered				
8:30 AM			-0.4824***	(0.0949)
1:30 PM			-0.1777*	(0.0964)
4:00 PM			-0.4013***	(0.0950)
6:30 PM			-0.6946***	(0.0950)
Days per week face-to-face course meets				
M/150 minute class			-0.4386***	(0.0909)
MWF/50 minute classes			-0.1495*	(0.0911)
MTWRF/30 minute classes			-0.5138*	(0.0926)
Weekend class			-1.2810*	(0.1024)
Price for a 3 credit hour class	-0.0032***	(0.0003)	-0.0032***	(0.0003)
Intercept	4.4544***	(0.2957)	5.3392***	(0.2962)
Log Likelihood	-4503			

Results are relative to: social and behavioral science (course topic), 11:00 AM (face-to-face time), Tuesday and Thursday (face-to-face days/week).

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

Table 3(b). Estimated WTP and 95% CI for College Course Attributes (Survey 1)

Parameter Name	Online		Face-to-face	
	WTP[a]	95% CI	WTP	95% CI
Undergraduate course topic				
English Composition & Oral Communication	$32.39	(-$47.67,$112.44)	-$52.35	(-$128.03,$23.33)
American History & Government	$179.65	($94.87,$264.44)	-$60.14	(-$137.05,$16.77)
Analytical & Quantitative Thought	$4.19	(-$69.97,$78.35)	-$98.58	(-$178.70,-$18.46)
Humanities	$127.01	($46.31,$207.72)	-$4.49	(-$80.72,$71.75)
Natural Sciences	$140.01	($54.77,$225.24)	-$23.79	(-$102.34,$54.77)
Social & Behavioral Sciences	$103.62	($22.36,$184.88)	-$75.09	(-$155.28,$5.09)
Diversity	$153.83	($71.60,$236.05)	$6.80	(-$74.91,$88.50)
International Dimension	$103.20	($24.10,$182.30)	-$104.90	(-$187.60,-$22.19)
Class size	-$0.32	(-$1.21,$0.58)	-$0.55	(-$1.50,$0.39)
Time face-to-face course is offered				
8:30 AM			-$149.46	(-$214.26,-$84.65)
1:30 PM			-$55.04	(-$115.06,$4.98)
4:00 PM			-$124.32	(-$187.11,-$61.53)
6:30 PM			-$215.21	(-$287.36,-$143.05)
Days per week face-to-face course meets				
M/150 minute class			-$135.89	(-$197.28,-$74.51)
MWF/50 minute classes			-$46.32	(-$102.58,$9.95)
MTWRF/30 minute classes			-$159.19	(-$224.92,-$93.46)
Weekend class			-$396.90	(-$499.22,-$294.57)

Table 4(a). Conditional Logit Parameter Estimates for College Course Attributes (Survey 2)

Parameter Name	Online		Face-to-face	
	Estimate	Standard Error	Estimate	Standard Error
Undergraduate course topic				
English Composition & Oral Communication	0.1411	(0.1303)	0.0538	(0.1257)
American History & Government	0.0551	(0.1299)	0.1844	(0.1236)
Analytical & Quantitative Thought	0.1258	(0.1248)	0.1380	(0.1277)
Humanities	0.3280**	(0.1338)	-0.0385	(0.1255)
Natural Sciences	0.2193*	(0.1255)	0.0547	(0.1251)
Social & Behavioral Sciences	0.1730	(0.1256)	-0.0251	(0.1257)
Diversity	0.1149	(0.1291)	-0.0461	(0.1250)
International Dimension	0.1101	(0.1241)	-0.1157	(0.1263)
Class size	0.0008	(0.0015)	-0.0020	(0.0015)
Additional online course attributes				
1-10 minute topic discussion video (SC)	0.3889***	(0.0944)		
10-20 minute topic discussion video (SC)	0.4481***	(0.0939)		
20-30 minute topic discussion video (SC)	0.4087***	(0.0936)		
Recorded face-to-face lecture (SC)	0.3549***	(0.0954)		
Online course lecture notes (SC)	0.2638***	(0.0587)		
Chat-room with instructor (SI)	0.2021***	(0.0571)		
Chat-room with classmates (SS)	0.1423**	(0.0589)		
Threaded discussions with classmates (SS)	0.1871***	(0.0581)		
Take exams and quizzes online	0.1423**	(0.0596)		
Online drop box for assignment	0.2035***	(0.0577)		
Time face-to-face course is offered				
8:30 AM			-0.3255***	(0.0934)
1:30 PM			-0.0035	(0.0906)
4:00 PM			-0.2940***	(0.0891)
6:30 PM			-0.5162***	(0.0924)
Days per week face-to-face course meets				
M/150 minute class			-0.3142***	(0.0900)
MWF/50 minute classes			-0.1052	(0.0941)
MTWRF/30 minute classes			-0.3616***	(0.0951)
Weekend class			-1.1692***	(0.0953)
Price for a 3 credit hour class	-0.0029***	(0.0003)	-0.0029***	(0.0003)
Intercept	3.2332***	(0.2946)	4.8091***	(0.3040)
Log Likelihood	-4813			

Results are relative to: social and behavioral science (course topic), 11:00 AM (face-to-face time), Tuesday and Thursday (face-to-face days/week), and absence of any additional online course attributes.

* $p < 0.1$.

** $p < 0.05$.

*** $p < 0.01$.

Table 4(b). Estimated WTP and 95% CI for College Course Attributes (Survey 2)

Parameter Name	Online		Face-to-face	
	WTP	95% CI	WTP	95% CI
Undergraduate course topic				
English Composition & Oral Communication	$48.02	(-$38.56,$134.59)	$18.29	(-$65.56,$102.14)
American History & Government	$18.75	(-$68.00,$105.49)	$62.72	(-$19.85,$145.29)
Analytical & Quantitative Thought	$42.80	(-$40.90,$126.49)	$46.94	(-$39.08,$132.96)
Humanities	$111.58	($20.10,$203.06)	-$13.11	(-$96.83,$70.61)
Natural Sciences	$74.61	(-$10.35,$159.57)	$18.62	(-$65.00,$102.23)
Social & Behavioral Sciences	$58.85	(-$25.74,$143.43)	-$8.54	(-$92.32,$75.25)
Diversity	$39.08	(-$47.33,$125.50)	-$15.67	(-$99.03,$67.69)
International Dimension	$37.47	(-$45.91,$120.85)	-$39.35	(-$124.42,$45.72)
Class size	$0.26	(-$0.72,$1.24)	-$0.68	(-$1.67,$0.31)
Additional online course attributes				
1-10 minute topic discussion video (SC)	$132.32	($65.53,$199.11)		
10-20 minute topic discussion video (SC)	$152.45	($83.99,$220.91)		
20-30 minute topic discussion video (SC)	$139.05	($69.28,$208.82)		
Recorded face-to-face lecture (SC)	$120.74	($53.64,$187.85)		
Online course lecture notes (SC)	$89.75	($46.67,$132.84)		
Chat-room with instructor (SI)	$68.77	($27.76,$109.78)		
Chat-room with classmates (SS)	$48.42	($7.65,$89.18)		
Threaded discussions with classmates (SS)	$63.65	($22.68,$104.62)		
Take exams and quizzes online	$48.42	($6.66,$90.18)		
Online drop box for assignment	$69.22	($27.84,$110.61)		
Time face-to-face course is offered				
8:30 AM			-$110.75	(-$175.69,-$45.81)
1:30 PM			-$1.20	(-$61.58,$59.19)
4:00 PM			-$100.01	(-$160.25,-$39.78)
6:30 PM			-$175.63	(-$244.66,-$106.60)
Days per week face-to-face course meets				
M/150 minute class			-$106.90	(-$171.57,-$42.23)
MWF/50 minute classes			-$35.80	(-$99.55,$27.95)
MTWRF/30 minute classes			-$123.03	(-$192.34,-$53.72)
Weekend class			-$397.78	(-$503.15,-$292.41)

Table 5. Course Attributes Used to Simulate Online and F2F Course Demand

Course Attributes	Course 1	Course 2
Basic Attributes		
Topic	English composition & oral communication	Scientific investigation
Class Size	70	35
Price	$1,000	$1,000
Face-to-face time	8:30 AM	11:00 AM
Face-to-face days per week	MWF	TR
Expanded Online Attributes		
20-30 minute topic videos	Yes	No
Face-to-Face Lecture videos	No	Yes
Course notes	Yes	Yes
Online exams	Yes	Yes
Chat-room with Instructor	Yes	No
Drop box	Yes	No
Threaded Discussion	Yes	Yes
Chat-room with Student	Yes	No

Table 6. Simulation of Impact of Additional Attribute Information on Student Demand

	Online	F2F	None
	No information about additional online course attributes		
Course 1[a]	45.19%	41.99%	12.83%
Course 2	27.30%	64.40%	8.30%
	Specific information about additional online course attributes		
Course 1	61.20%	30.83%	7.97%
Course 2	33.87%	56.74%	9.38%

Based on parameters estimates from Tables 3(a) and 4(a).

[a] See Table 5 for course attributes information.

Option 1

Course Delivery	Number of Students Enrolled	Time Offered	Days per Week/Class Length	Course Type	Price of 3 Credit Hour Course
Online Course	60	at own pace	at own pace	Major Requirement	$750

Option 2

Course Delivery	Number of Students Enrolled	Time Offered	Days per Week/Class Length	Course Type	Price of 3 Credit Hour Course
F2F Course	60	1:30 p.m.	Weekend Class	Major Requirement	$750

2. Choose one of the following course options or you may choose none.

- ◯ Option 1 (online course)
- ◯ Option 2 (F2F course)
- ◯ I choose none

Figure 1. Example of Course Choice Questions in Survey 1

Option 1

Course Delivery	Number of Students Enrolled	Time Offered	Days per Week/Class Length	General Course Topic	Price of 3 Credit Hour Course
Online	20	at own pace	at own pace	Major Requirement	$750

Additional Online Course Information	Availability
Video lecture type	1-10 minute topic discussion
Course lecture notes	Available
Taking exams and quizzes	Take at prearranged time/location
Drop box for assignments	Not available
Chat-room with instructor	Not available
Threaded discussion with classmates	Not available
Chat-room with classmates	Not available

Option 2

Course Delivery	Number of Students Enrolled	Time Offered	Days per Week/Class Length	General Course Topic	Price of 3 Credit Hour Course
F2F	60	4:00 p.m.	MWF/50 minute classes	Major Elective	$875

2. Choose one of the following course options or you may choose none.

- ◯ Option 1 (online course)
- ◯ Option 2 (F2F course)
- ◯ I choose none

Figure 2. Example of Course Choice Questions in Survey 2