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Online versus Face-to-Face: Students' Preferences for College Course Attributes

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The objectives of this article were to determine: 1) students' preferences for college course attributes; and 2) how the amount of course attribute information impacts enrollment. Results indicate students had the highest preferences for face-to-face (F2F) courses offered late morning and early afternoon and two to three days per week. Students selected online over F2F courses depending on course makeup; for example, course topic, online course design technology, and when the F2F version was offered. Additionally, students selected online courses more frequently when additional online course attribute information was available during course selection.

Key Words: college course attributes, conditional logit model, distance learning, online course design, students' preferences, undergraduate students, web 2.0 technology, willingness to pay

JEL Classifications: A22, I23, I29

Over the past few decades the market for college credit courses has gone through a transition regarding the demand for the face-to-face (F2F) versus online course delivery options. More specifically, the enrollment trend in for-credit, online courses at many colleges and universities has increased at a faster rate than the same trend for F2F courses (Allen and Seaman, 2011).[1] This transition is the combined result of growing student demand for college courses, computer technology availability, internet access, and the increase in online course offerings at colleges and universities. To meet the growing student demand for college credit courses, many institutions now include online courses and programs as part of their regular course offerings. Allen and Seaman (2011) report this demand growth is reflected by the proportion of online course enrollment relative to total course enrollment, which was 9.6% in 2002 and grew to 31.3% in 2011.

Interestingly, this rise in demand for online courses has not just been from nontraditional students enrolled in online-only programs. Traditional, college-aged students (age 18–24 years living on or near campus) also choose to take online courses (Bejerano, 2008; Mann and Henneberry, 2012). In fact, students at some institutions today are able to easily substitute online courses for F2F versions of the same courses, especially when scheduling conflicts occur or when students perceive the

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[1] More recent research by Allen and Seaman (2013) has focused on Massively Open Online Courses (MOOCs); however, the purpose of our study is to examine for-credit, online and face-to-face courses offered to degree-seeking students at colleges and universities in the United States. Therefore, the Allen and Seaman report from 2011 is used because the data in this report are from a survey of degree-granting institutions in the United States.

online version of a course to be easier (Bejerano, 2008).[2]

In this study, two topics in the Distance Education (DE) literature are combined into a single framework to examine aspects related to undergraduate students' demand for online and F2F courses. The first topic is related to the variation in the types of online course design attributes present in college courses. Most researchers agree about the basic conceptual makeup of an effective online course (Anderson, 2004; Ausburn, 2004; Bernard et al., 2009; Campbell et al., 2008; Lou, Bernard, and Abrami, 2006; Means et al., 2009; Picciano, 2002; Swan, 2001). In short, students must be able to effectively interact with the course content, the course instructor, and other students in the course. However, the exact manner in which these conceptual features are implemented through technology is still being investigated. A common assumption in early studies that compared online and F2F courses is that the level of variation across different online course designs is similar to that of F2F course designs (Anstine and Skidmore, 2005; Bernard et al., 2009; Brown and Liedholm, 2002; Coates et al., 2004; Russell, 1999). However, Bernard et al. (2009) argues that depending on the specific technological design features implemented, online learning environments can vary more from one another relative to the variation between F2F courses. The implication is that the higher variation among online courses compared with F2F courses may be one reason some studies found that online courses were less effective than their F2F counterparts. Therefore, future studies comparing other aspects of online and F2F courses may need to account for the impact from online course attribute variation.

Second, most DE research regarding questions about the substitutability of online courses for F2F courses has been framed by course effectiveness measures such as grades or satisfaction reports. As online courses have become more acceptable in the mainstream academic environment, there is now a potential need for more direct student input regarding online course design (Koehler et al., 2004). Furthermore, the technology-savvy millennial generation is very knowledgeable about a variety of modern information and communication technologies such as web-based social networks, blogs, and streaming video commonly referred to as web 2.0 technologies (Haythornthwaite and Andrews, 2011; Jenkins et al., 2011). Because many of these technologies are identical to design features of online courses, college-aged students can potentially provide valuable insight regarding online course inputs and their effects on the learning outcome.

In place of determining course effectiveness given the variation in online course design, the focus of this study is to determine undergraduate student preferences for the attributes contributing to course variation. More specifically, this study sets out to determine students' preferences and willingness to pay (WTP) for different attributes of online and F2F college-level courses. From these results, a simulation of demand for particular courses can demonstrate how well students believe online courses can substitute for F2F courses.[3] The secondary goal of this study is to determine how the information available to students about online course attributes (no information compared with specific attribute information) impacts course selection during enrollment.

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

[2] Although we recognize that policies for student enrollment into online courses differ between institutions and within colleges or departments at the same institution, at Oklahoma State University (and some other institutions), students are able to substitute online courses for their F2F counterparts at the student's discretion.

[3] In this study, it is not our intention to equate student preferences for attributes with the impact of these attributes on course effectiveness. On the other hand, there may be similarities between the attributes that students prefer and the attributes that contribute to more effective courses in the context of student performance as measured by grades or satisfaction surveys. An examination of this possibility may provide direction for future research regarding the premise that more input from students can provide beneficial insight in the design of online courses.

preferences for course attributes is the use of a choice experiment (CE), in which 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.

Background

Variation in Online Course Attributes

A number of DE studies focused on conceptual models of effective DE learning environments with the goal of comparing online and F2F learning environments. For example, there are three basic types of student interactions believed to be essential in the online learning environment: student–content (SC), student–instructor (SI), and student–student (SS) (Anderson, 2004; Bernard et al., 2009; Moore, 1989). As the availability of personal computers increased and advances were made to online course design, these conceptual interactions were able to be framed in terms of specific online technologies that could be measured (Anderson, 2004; Bernard et al., 2009). The following are a few examples of how the three student interactions may be implemented using online course design technology:

1) SC—online lecture videos, online course notes, or other digital media that support course content;
2) SI—e-mail correspondence with instructor or teaching assistant, chatrooms with instructor, or virtual office hours through video conference; and
3) SS—online group projects with other students, student-led threaded discussions, or student-directed online chatrooms.

Originally, SC interactions were believed to be the most important types of interaction in DE because they were at the core of learning (Moore, 1989). For example, in early DE courses, students only had course content (such as a textbook and written instructions). However, much of the empirical research in the early 2000s reported that SI interactions followed closely by SS interactions were equally or more important relative to SC interactions because they mitigated, to some extent, the sense of isolation students complained about in after-course surveys (Ausburn, 2004; Brown and Liedholm, 2002; Campbell et al., 2008; Lou et al., 2006; Means et al., 2009; Picciano, 2002; Summers, Waigandt, and Whittaker, 2005; Swan, 2001).

As an effort to better understand the relationship between student interactions and the variation in student performance across different online course formats, Bernard et al. (2009) conducted a meta-analysis of the DE literature that compared online and F2F students' performance. In their study, student interactions types were not categorized by specific technological attributes as described in the previous example. Instead, they were grouped together based on the conceptual definitions of SC, SI, or SS provided by Anderson (2004) and Moore (1989). For example, all interactions that occurred as SC were categorized as equal (only as SC) regardless of the technology used to encourage it. What Bernard et al. (2009) 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. The implication of these results is that some of the variation in student outcomes could be attributed to differences in course design. Additionally, these results supported early beliefs regarding the impact of SC interactions on learning outcomes. On the other hand, what this study did not clarify was whether different implementations of the same type of student interactions impacted course effectiveness differently. For example, do students watching lectures videos (an example of a SC interaction) improve the learning outcome more (or less) than students reading course lecture notes (also an example of a SC interaction)?

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 were 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 (2007) reported that 77% of the students actually watched the videos and students were willing to pay approximately $74 for access.

Boyer, Briggeman, and Norwood (2009) estimated students' WTP for seven course attributes, including three attributes similar to the features of online courses, specifically 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.

Methodology

The Choice Experiment Approach to Course Attribute Valuation

CEs have been used extensively in the marketing, transportation, environmental, and agriculture literature to determine values people place on different goods (for examples of each, respectively, see Louviere and Woodworth, 1983; Hensher and Greene, 2003; Hanley, Wright, and Adamowicz, 1998; Lusk, Roosen, and Fox, 2003). Similarly, CEs can be used to determine the value that students place on different attributes of college courses (both F2F and online). When college students enroll in classes, they make choices based on their perception of the course information provided. The general premise in this study is that students' preferences for courses are based on the importance they place on the presence or absence of particular course attributes relative to what other courses have to offer (this includes the general topic of the course). In most cases, students may simply select courses based on what they need to take to complete their degree. However, there may be other attributes of courses such as the time of day offered for a F2F course or the format of lecture videos in an online course that also attract students to particular courses. The CE in this context allows the college course enrollment process to be simulated and the students' choice process captured by their responses to tailored questions.

The results of the experiment can then be used to determine students' preferences and WTP for online and F2F course attributes. Based on these preferences, simulations of student demand using different combinations of course attributes can potentially demonstrate how changes in the presence or absences of particular course attributes impact course selection. In this way, changes in the amount of attribute information provided to students when selecting courses during enrollment can be tested. 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). The question being addressed in the simulation is whether students respond similarly when more information about online courses (i.e., more detail about the specific technology available) is presented when they enroll.

Additional analysis of results may also determine how well students' preferences for particular interaction types align with the results of studies focused on the impact of online course attributes on learning outcomes. The intent of this comparison is not to equate students' preferences with effective learning outcomes, but instead to identify similarities and differences between student preferences for attributes and other research focused on online course attribute impacts on course effectiveness. The motivation for this comparison is to provide new insight with respect to the idea of students taking a more active role in the design

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

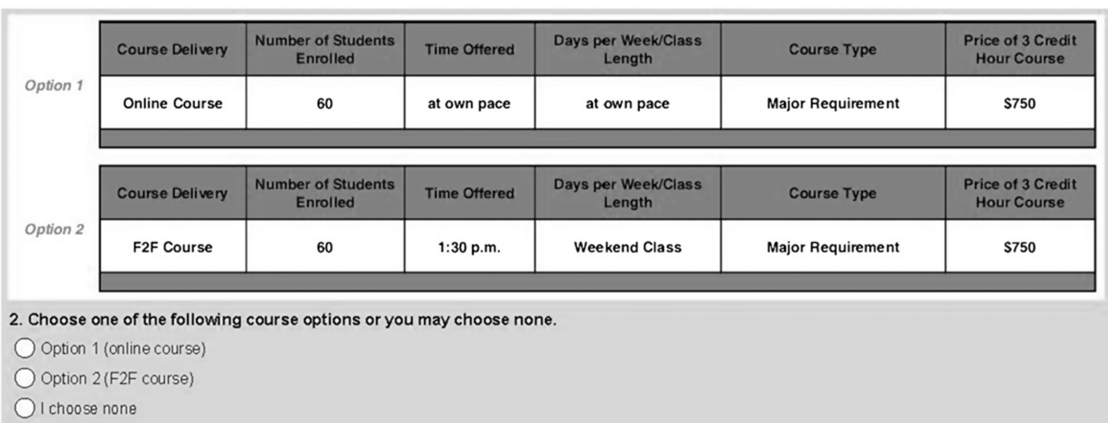
Undergraduate Course Topic of Both Formats	Technological Online Course Attributes (video)
English Composition & Oral Communication	1–10 minute topic discussion video (SC)
American History & Government	10–20 minute topic discussion video (SC)
Analytical & Quantitative Thought	20–30 minute topic discussion video (SC)
Humanities	Recorded face-to-face lecture (SC)
Natural Sciences	Other technological online course attributes
Social & Behavioral Sciences	Online course lecture notes (SC)
Diversity	Chatroom with instructor (SI)
International Dimension	Chatroom with classmates (SS)
Scientific Investigation	Threaded discussions with classmates (SS)
Time face-to-face course is offered	Take examinations and quizzes online
8:30 AM	Online dropbox for assignment
11:00 AM	Other attributes of both formats
1:30 PM	Number of students enrolled in course
4:00 PM	Price for a three-hour course
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	

SC, student–content; SI, student–instructor; SS, student–student.

of online courses. To make this comparison, the 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 that facilitate specific interactions can be identified and categorized as SC, SI, or SS (this is discussed in more detail in the next section).

Experimental Design of the Choice Questions

In this study, two different CEs were used to determine students' preferences and WTP for



	Course Delivery	Number of Students Enrolled	Time Offered	Days per Week/Class Length	Course Type	Price of 3 Credit Hour Course
Option 1	Online Course	60	at own pace	at own pace	Major Requirement	$750
Option 2	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. An Example of the College Course Choice Questions Used in the First Choice Experiment

college course attributes. The first CE was designed to simulate the information that Oklahoma State University (OSU) undergraduate students could currently access during the enrollment process.[4] The second CE was designed to simulate enrollment if additional information was available regarding specific online course attributes. The motivation for using two CEs was to test the secondary objective of this study regarding the impact of additional online course information on course selection (this is discussed more in the subsection entitled *Determining the Impact of Additional Information on Course Selection*).

The specific capabilities of OSU's Desire2Learn platform (D2L) were used to identify the technological online course attributes used in the choice experiment.[5] These attributes were then translated into one of the three student interaction types (SC, SI, and SS) based on the Anderson (2004) methodology. The other F2F and online course attributes were based on the information provided to OSU students when they self-enroll through the student information system (SIS) web page, which all registered OSU students can access. The information provided on the SIS web page includes the basic course title, class time, meeting days per week, the number of total and available seats (an indicator of class size), the meeting location, and the instructor teaching the course (for some courses, the instructor may not be known at the time of enrollment). For this experiment, the meeting location and the instructor teaching the course were not included in the course attribute list. Additionally, the price for a three-hour course was included in the list of course attributes (see Table 1).[6] The F2F course attributes in each choice included: undergraduate course topic (discrete choice that varied by nine levels); time F2F course is offered (discrete choice that varied by five levels); days per week F2F course meets (discrete choice that varied by five levels); number of students enrolled in course (continuous variable that varied by two levels); and price for a three-hour course (continuous variable that varied by two levels).[7] The online course attributes in each choice included: undergraduate course topic; number of students enrolled in course; and price for a three-hour course (all varied at the same levels as the F2F course). In the second CE, the online course attributes were increased to also include: video lecture type (discrete choice that varied by five levels); online course lecture notes; chatroom with instructor; chatroom with classmates; threaded discussions with classmates; take examinations and quizzes online; and online dropbox for assignments (the six later variables were each discrete choices that varied by two levels).[8]

[4] This was based on the available information in the fall of 2010 at Oklahoma State University (OSU). At OSU in the fall of 2010, students were not presented with online course design information at the time of enrollment; instead, they were informed only that the course was delivered online or F2F.

[5] For the purpose of this study, D2L is a web-based platform, similar to Blackboard or Canvas, designed to create a virtual learning environment. Instructors generate course content and are able to upload a variety of course-related media and conduct quizzes and examinations in the online learning environment. Students and the instructor are also able to interact through chat boards, instant messages, and e-mail. Students are able to upload (turn in) assignments and other relevant course-related materials from any computer with Internet access. The types of technology used to create the virtual learning environment for each course are at the discretion of the course instructor and based on the institution's resources. Our experience at Oklahoma State University is that there is a high amount of variation in the ways online learning environments are created given the types of available technology (e.g., video length and content format, lecture notes, availability of taking online quizzes and examinations, student activities such as group projects or participation in threaded discussions, and the methods of student–instructor and student–student communication).

[6] The price attribute was included so that the WTP for different attributes could be estimated (see the model section for more information about the calculation of the WTP).

[7] The discrete choices were treated as discrete variables in the estimation procedure, whereas the relationship of the continuous variables with the dependent variable was assumed to be linear.

[8] All the additional online course discrete (indicator) variables are relative to the option not being available; however, the alternative to "take examinations and quizzes online" is to take proctored examinations and quizzes at a prearranged location.

Although the goal was to capture as many student preferences for different course attributes as possible, the number of course titles needed to be significantly reduced. Therefore, the course titles provided to students in the CEs were based on the categories of general education requirements that the majority of OSU students must meet (nine in all). In the CEs, 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 web page (see Figures 1 and Figures 2 for an example of the design of choice questions). For the second CE, 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 look of the SIS web page design. In each CE, students were presented with discrete choices among three alternatives: an online course, a F2F course, and "choose none" option.[9] Each course alternative (or option) was made up of a unique set of attributes that varied between the sets of choices. Within the framework of the CE, it was assumed that students made the selection that maximized their expected utility for each choice.

To obtain the necessary data for this study, students needed to be presented with a large number of course attributes. However, the number of choice questions in the CE combined with the additional student information questions needed to be low enough that students would actually complete the survey, which posed a significant survey design challenge. Using the FACTEX and OPTEX procedures in SAS (SAS Institute, 2008; with the blocks structure feature), the choice questions were divided into blocks while maintaining an overall D-efficiency (see Kuhfeld, Tobias, and Garratt, 1994 for D-efficient experimental designs) of at least 90% (SAS Institute).[10] For the first CE, six blocks of eight questions were generated (D-efficiency of 90%), whereas the second CE consisted of six blocks of nine questions (D-efficiency of 92%).

Data

Data for this study were the undergraduate student responses to an OSU–Stillwater campus-wide survey, which was conducted in November 2010. Invitations to participate in the survey were distributed to the full student body through e-mail and included a link to SurveyMonkey where the survey had been constructed. Student e-mails in the sample population were randomly divided into 12 groups, one for each block of each choice experiment.

During that same semester, OSU implemented a new student e-mail policy, which

[9] Although the "choose none" option may not be a realistic choice in the context of students building their course schedules, including it in the choice experiment was necessary for the model to be fully identified (and is normalized relative to zero during estimation), which is necessary to determine preferences and WTP in absolute terms as opposed to relative terms.

[10] The D-efficiency is a measure of the orthogonality between columns of the attribute choices. To make comparisons between two attributes, the attributes must first be included in all combination of choice options. For example, if there are two attributes at two levels each, say course delivery (attribute 1) with levels (or choices) of F2F and online and price (attribute 2) with levels of $750 or $1000, there are four combination of choices of interest based on the formula (# attributes)$^{(\#\ \text{levels})}$ or 2^2. Because the number of combinations grows exponentially with each additional attribute and level, the full factorial (a mathematical representation of the combination of all choices) must be reduced to a manageable subset of choices when a large number of attributes and levels is considered. The FACTEX and OPTEX procedures in SAS use an algorithm to dramatically reduce the full factorial to a subset of combinations (or fractional factorial) while still allowing comparisons to be made between attributes and attribute levels. This fractional factorial can be further reduced by dividing it into blocks. For example, if the fractional factorial consists of 48 different combinations of attribute choices, these can be divided into six blocks of eight combinations. The result of blocking means that each student must answer fewer questions. It also means a larger sample population is needed to obtain estimations (relative to not blocking), and it reduces the orthogonality between the columns of attributes to less than 100%. A general rule of thumb is a D-efficiency greater than 70% (Kuhfeld, Tobias, and Garratt, 1994).

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. An Example of the College Course Choice Questions Used in the Second Choice Experiment

greatly restricted researchers' access and frequency of contact to students through campus e-mail. Per the new e-mail policy, contact was limited to a single e-mail invitation with no opportunity for follow-up. Over a six-hour window, a survey containing one of the two choice experiments was e-mailed to the sample population, which consisted of two-thirds of the full student population. This included approximately 10,900 undergraduate students.[11] The survey remained opened for two weeks. In all, there were 1291 usable surveys giving an average response rate of approximately 12%.

In an attempt to maximize the response rate, given the limited student access, an Apple iPad was used as an incentive for completing the survey and given away in a random drawing after the survey was closed. To be entered into the drawing, students had to enter their OSU-assigned student e-mail address. This was a way to ensure students were only able to respond once to the survey, and it may have acted as a deterrent for dishonest responses because a student's OSU e-mail account could be linked to their identity at the time the survey was completed.[12]

The demographic and student information of undergraduates who completed each survey is compared with the actual population (Institutional Research and Information Management, 2010) in Table 2. There are two concerns about these data that will potentially impact the results. First, the low response rate may not truly reflect the actual undergraduate population at OSU. Second, additional bias may have been introduced into the survey through delivery method (i.e., an e-mail invitation soliciting survey participation in an online survey about online education). In both cases, the self-selection bias would potentially skew results to extreme responses. In the second

[11] For this survey, two-thirds of the total OSU–Stillwater student population was randomly sampled (this included graduate and undergraduate students). However, it was not possible to distinguish between undergraduate and graduate e-mail addresses (this distinction was made based on responses to survey questions). The 10,900 approximation value is 66.67% of enrolled undergraduates in the fall of 2010 based on data provided by the Department of Institutional Research and Information Management at OSU.

[12] For privacy reasons, survey responses were immediately evaluated once the survey was closed and all information linking students to their respective responses was deleted.

Table 2. Demographics of Sample and Actual Populations

Group	Survey 1	Survey 2	Actual[a]
Student status			
Freshman	27.10%	24.40%	25.50%
Sophomore	17.30%	17.20%	22.00%
Junior	23.30%	24.60%	24.50%
Senior	32.30%	33.80%	28.00%
Gender			
Female	61.40%	57.40%	48.20%
Male	38.60%	42.60%	51.80%
Residency			
Resident[b]	78.60%	79.60%	72.10%
Out-of-state	18.70%	17.80%	20.00%
International	2.70%	2.60%	8.00%
Enrollment			
Full-time	90.90%	91.60%	89.90%
Average age (years)	20.9	21.3	21.0
Part-time	9.10%	8.40%	10.10%
Average age (years)	27.1	27.6	25.4

[a] From Fall 2010 Student Profile, Oklahoma State University Institutional Research and Information Management.
[b] Based on all Oklahoma State University campuses enrollment.

case, the self-selection bias would potentially be increased in the direction of students with preferences for technology, which may translate into higher preferences for online courses.

Another concern is the limitation of the survey delivery platform (SurveyMonkey), which did not easily allow for conjoint analysis-type surveys. The main challenge was that a comparison of multiple items with a variety of attributes, in this case comparing F2F and online courses each with a variety of course attributes, was not easily done with the available question options. To compensate for this limitation, images were created that matched the fractional factorial models of each CE with respect to the sets of specific course attributes presented at each choice. Using this strategy, survey respondents were given a series of images that included choices in which the items of primary comparison (in this case F2F versus online course delivery) were included with different combinations of attributes for each choice. Respondents then selected a specific item based on the information presented in the image. However, using this workaround meant that students could not receive the choices in a randomly generated order. As a result, there may be additional bias such that options presented first may get selected more frequently and questions presented earlier in the CE may get more attention than those presented later.

Model

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

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

where U_{ij} is the utility of student i making choice j, for $i = 1, \ldots, N$ and $j = 1, \ldots, J$; V_{ij} is the deterministic component of the utility function made up of the course attributes of option j (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

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

where λ is a scale parameter that is not separately determined from the attribute parameters and is assumed to be constant in this study.[13]

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. For the first choice experiment, the model is defined as

[13] The significance of assuming λ is constant assumes that the sample of students cannot be divided into a subgroup of students with different relative preferences compared with another subgroup of students. For example, this assumes that the preferences for specific course attributes of college freshman are identical to college seniors or that the preferences for specific course attributes of students who have taken online courses are the same as for students who have not taken online classes.

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

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 the second choice experiment is an expanded version of the first model and includes additional online course attributes as follows:

$$(4)\quad \begin{aligned} V_{ij} = {} & \sum_{p=1}^{2} \beta_{0p} D_{ijp} + \sum_{q=1}^{8} \beta_{1q} FC_{ijq} \\ & + \sum_{r=1}^{8} \beta_{2r} OC_{ijr} + \sum_{s=1}^{4} \beta_{3s} FM_{ijs} \\ & + \sum_{t=1}^{4} \beta_{4t} FT_{ijt} + \sum_{u=1}^{4} \beta_{5t} OL_{iju} \\ & + \beta_{61} ON_{ij} + \beta_{62} OI_{ij} + \beta_{63} OE_{ij} \\ & + \beta_{64} OB_{ij} + \beta_{65} OD_{ij} + \beta_{66} OS_{ij} \\ & + \beta_7 FZ_{ij} + \beta_{875} OZ_{ij} + \beta_9 P_{ij} \end{aligned}$$

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 examinations and quizzes online, online dropbox, 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 of 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:

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

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 the first choice experiment) or equation (4) (estimates the second choice experiment). Students' WTP for each course attribute (WTP_a) is given by

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

where β_a is the parameter for course attribute a and β_p is the price parameter.[14] Following Greene (2008), the variance of WTP is obtained using the delta method:

$$(7)\quad \begin{aligned} \text{var}(WTP_a) = {} & \left(\frac{-1}{\beta_p}\right)^2 \text{var}(\beta_a) + \left(\frac{\beta_a}{\beta_p^2}\right)^2 \text{var}(\beta_p) \\ & - 2\left(\frac{\beta_a}{\beta_p^3}\right) \text{cov}(\beta_a, \beta_p) \end{aligned}$$

Hole (2007) reported that the delta method outperforms other 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.

[14] This is a common method for calculating WTP in the agricultural economics literature, i.e., generating the ratio of the attribute coefficient and the price coefficient then multiplying by –1 (see Boyer, Briggeman, and Norwood, 2009; Lusk and Schroeder, 2004). However, for levels of attributes not normalized to zero (only the technological online course attributes were indicator variables relative to none or zero), the WTP will be relative to some base-level attribute, which is identified in each table of results.

Results and Discussion

Undergraduate students' preferences and WTP for course attributes are presented in Tables 3, 4, 5, and 6. With the exception of the additional online course attributes, the WTP values presented in these tables should be interpreted as the premiums students are willing to pay (when positive), discounts needed (when negative), or not significant (when zero) relative to the base-level comparison. The base-level comparison for course topic, time offered, and number of meetings per week is scientific investigation, 11 AM, and Tuesdays and Thursdays, respectively. In each case, the values for each of these attribute levels are mutually exclusive and relative only to other levels within the attribute category. On the other hand, the additional technological online course attributes were indicator variables relative to "none" or zero (including the video category that included a "none: option), and each of these values can be compared with other technological online course attributes. It is also important to point out that the lecture video attribute should be considered as only one of the five choices that can be included in a course as opposed to all four video types present in one course.

There are a number of general trends regarding students' preferences for course attributes observable from these results. Regarding F2F attributes, undergraduate students have the highest preference for classes 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. Additionally, the course topic scientific investigation is most preferred in a F2F versus an online environment.

Table 3. Conditional Logit Parameter Estimates for College Course Attributes (choice experiment 1)

	Online		Face-to-Face	
Parameter Name	Estimate	Standard Error	Estimate	Standard Error
Undergraduate course topic				
English Comp. & Oral Comm.	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	–0.0010	–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 three-credit hour class	–0.0032***	–0.0003	–0.0032***	–0.0003
Intercept	4.4544***	–0.2957	5.3392***	–0.2962
Log likelihood	–4503			

Note: 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 4. Estimated WTP and 95% CI for College Course Attributes (choice experiment 1)

	Online		Face-to-Face	
Parameter Name	WTP[a]	95% CI	WTP	95% CI
Undergraduate course topic				
English Comp. & Oral Comm.	$32.39	0	–$52.35	0
American History & Government	$179.65	($94.87–264.44)	–$60.14	0
Analytical & Quantitative Thought	$4.19	0	–$98.58	(–$178.70 to –$18.46)
Humanities	$127.01	($46.31–207.72)	–$4.49	0
Natural Sciences	$140.01	($54.77–225.24)	–$23.79	0
Social & Behavioral Sciences	$103.62	($22.36–184.88)	–$75.09	0
Diversity	$153.83	($71.60–36.05)	$6.80	0
International Dimension	$103.20	($24.10–182.30)	–$104.90	(–$187.60 to –$22.19)
Class size	–$0.32	0	–$0.55	0
Time face-to-face course is offered				
8:30 AM			–$149.46	0
1:30 PM			–$55.04	0
4:00 PM			–$124.32	(–$187.11 to –$61.53)
6:30 PM			–$215.21	(–$287.36 to –$143.05)
Days per week face-to-face course meets				
M/150-minute class			–$135.89	(–$197.28 to –$74.51)
MWF/50-minute classes			–$46.32	(–$102.58–9.95)
MTWRF/30-minute classes			–$159.19	(–$224.92 to –$93.46)
Weekend class			–$396.90	(–$499.22 to –$294.57)

Note: 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).
WTP, willingness to pay; CI, confidence interval.

Regarding online course attributes, undergraduates have the highest preference for short- and medium-length videos (ten- to 20- and 20- to 30-minute topic discussions). On average, they are willing to pay approximately $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 in this study have a higher preference for video (all types) than for course notes and were willing to pay approximately $90 for course notes. Boyer, Briggeman, and Norwood (2009) reported that F2F students were willing to pay approximately $45 for course notes.

One explanation for these differences is that the F2F students would have the opportunity to see the lectures in real time, whereas students taking online courses would only be able to access lectures through recordings. Additionally, the course lecture notes may help F2F students reduce study time for examinations by highlighting specific information that students were given in class compared with the same F2F students rewatching lectures and trying to discern the most important information for examinations. On the other hand, students in online courses may need to understand the content first by watching lecture videos and then consider course lecture notes for summarization. Another explanation is that students in online courses may have a higher preference for learning through technology compared with those in F2F courses. This later possibility is one discussed by Haythornthwaite and Andrews (2011) and Jenkins et al. (2011) who have proposed that the use and familiarity with Web 2.0 technologies by millennials is also part of what is driving their increased interest in online courses.

In the context of student interactions, the results in this study indicate that SC interactions (facilitated by lecture videos and online course lecture notes) are the most preferred interaction

Table 5. Conditional Logit Parameter Estimates for College Course Attributes (choice experiment 2)

	Online		Face-to-Face	
Parameter Name	Estimate	Standard Error	Estimate	Standard Error
Undergraduate course topic				
English Comp. & Oral Comm.	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
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				
One- to ten-minute topic discussion video (SC)	0.3889***	–0.0944		
Ten- to 20-minute topic discussion video (SC)	0.4481***	–0.0939		
20 to 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		
Chatroom with instructor (SI)	0.2021***	–0.0571		
Chatroom with classmates (SS)	0.1423**	–0.0589		
Threaded discussions with classmates (SS)	0.1871***	–0.0581		
Take examinations and quizzes online	0.1423**	–0.0596		
Online dropbox 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 three-credit hour class	–0.0029***	–0.0003	–0.0029***	–0.0003
Intercept	3.2332***	–0.2946	4.8091***	–0.3040
Log likelihood	–4813			

Note: 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), four video options relative to none, take examinations and quizzes relative to take proctored examinations and quizzes, and other online course attributes relative to attribute not available.
* $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$.
SC, student–content; SI, student–instructor; SS, student–student.

type followed by SI interactions (facilitated by a chatroom with instructor) and SS interactions (facilitated by a chatroom with students and threaded discussions). Within interactions types, all forms of videos are preferred over online course lecture notes, and the chatroom with classmates is preferred over threaded discussions with classmates. The results are very similar to

Table 6. Estimated WTP and 95% CI for College Course Attributes (choice experiment 2)

	Online		Face-to-Face	
Parameter Name	WTP	95% CI	WTP	95% CI
Undergraduate course topic				
English Comp. & Oral Comm.	$48.02	0	$18.29	0
American History & Government	$18.75	0	$62.72	0
Analytical & Quantitative Thought	$42.80	0	$46.94	0
Humanities	$111.58	($20.10–203.06)	–$13.11	0
Natural Sciences	$74.61	0	$18.62	0
Social & Behavioral Sciences	$58.85	0	–$8.54	0
Diversity	$39.08	0	–$15.67	0
International Dimension	$37.47	0	–$39.35	0
Class size	$0.26	0	–$0.68	0
Additional online course attributes				
One- to ten-minute topic discussion video (SC)	$132.32	($65.53–199.11)		
Ten- to 20-minute topic discussion video (SC)	$152.45	($83.99–220.91)		
20- to 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)		
Chatroom with instructor (SI)	$68.77	($27.76–109.78)		
Chatroom with classmates (SS)	$48.42	($7.65–89.18)		
Threaded discussions with classmates (SS)	$63.65	($22.68–104.62)		
Take examinations and quizzes online	$48.42	($6.66–90.18)		
Online dropbox for assignment	$69.22	($27.84–110.61)		
Time face-to-face course is offered				
8:30 AM			–$110.75	(–$175.69 to –$45.81)
1:30 PM			–$1.20	0
4:00 PM			–$100.01	(–$160.25 to –$39.78)
6:30 PM			–$175.63	(–$244.66 to –$106.60)
Days per week face-to-face course meets				
M/150-minute class			–$106.90	(–$171.57 to –$42.23)
MWF/50-minute classes			–$35.80	0
MTWRF/30-minute classes			–$123.03	(–$192.34 to –$53.72)
Weekend class			–$397.78	(–$503.15 to –$292.41)

Note: 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), four video options relative to none, take examinations and quizzes relative to take proctored examinations and quizzes, and other online course attributes relative to attribute not available.
WTP, willingness to pay; CI, confidence interval; SC, student–content; SI, student–instructor; SS, student–student.

the findings of Bernard et al. (2009) and original conclusion of Moore (1989) regarding the impact of attributes on course effectiveness. Although it is not our intention to equate student preferences for particular attributes with the impact of the attributes on effective learning outcomes, it may be that students' experiences and preferences for particular attributes are based on their performance in online courses.

Impact of Attribute Details on Course Selection

The secondary goal of this study was to determine how providing additional information about online course attributes impacts course selection during enrollment. To achieve this goal, a course demand simulation was designed to compare two groups of students: 1) a group given information similar to what is available with the current system; and 2) a group given more information about the availability of specific technological, online course attributes. The simulation was constructed using the preference parameters estimated from the two CEs described in the *Experimental Design of the Choice Questions* subsection (see Tables 3 and 5).

To make this comparison, two sets of four hypothetical courses with specific course attributes were created. For each hypothetical course, a F2F version and online counterpart were created. Additionally, the F2F courses were identical given the two CEs, but the online courses differed only by the amount of technological attributes available. Recall that in the first CE, the only online attribute information that students had was about the course topic, class size, and cost. In the second CE, students were given additional information regarding the technological online course attributes. The idea was to construct a set of hypothetical courses in which a F2F course with an online counterpart were created equally between the two groups of CE results and that the only change was the amount of online course attribute information.

The specific attributes for the two course versions were selected in a semirandom process as follows (see Table 7). First, the course topics were selected from the nine available options (see Table 1). To create the F2F and online counterparts, the course topic needed to be the same for each set of four hypothetical courses. Next, 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).[15] The options for the online course attributes were put into three categories and two of these categories were selected at random for the simulation. The categories included: premium, standard, and minimum. The premium category included all of the technological online course attributes, including the most popular video category (10- to 20-minute topic discussions) based on the results in Table 5. The standard category included attributes that were commonly used in many of the online courses offered at OSU, which included the recorded F2F lecture (Hawkins, 2011). The minimum category included only the most basic technological attributes of a typical online course at OSU, recorded F2F lecture, and course lecture notes. A bundle of the additional online course attributes for each hypothetical course was randomly selected.

Using equation (2) and the parameter estimates for the specific course attributes, a set of probabilities was generated that simulated the share that each of the three options (F2F, online, "none") received given the design of the hypothetical courses (note that the sum of all three shares is equal to 100%). The parameter estimates for the limited information group, which was based on the first CE, were taken from Table 3, whereas those for the additional information group, which was based on the second CE, were taken from Table 5. The results of this simulation are shown in Table 8.

Under the "no information about additional online course attributes" group for course one, the probabilities (or shares) are very close between students selecting the online and F2F courses, approximately 45% versus 42%, respectively. For this same course under the "specific information about additional online course attributes" group, the gap between selecting online and F2F courses is much larger and favors students selecting the online course over the F2F course (61% versus 31%). For course two and under the "no information about additional online course attributes" group, the gap between the online and F2F course is large and favors the F2F course (27% for online and 64% F2F). Similar to the course one experiment, when additional information is provided to students about the technological online course attributes, students are more likely to select an online course than the no information group (the gap

[15] The restrictions on attribute selection were included to provide a more realistic comparison of courses.

Table 7. Course Attributes Used to Simulate Online and F2F Course Demand

Course Attributes	Course 1	Course 2
Basic attributes		
Course topic	English Composition & Oral Communication	Scientific Investigation
Class size	70	35
Price for three-hour course	$1,000	$1,000
Face-to-face time	8:30 AM	11:00 AM
Face-to-face days per week	MWF	TR
Additional online attributes		
20- to 30-minute topic videos	Yes	No
Face-to-face lecture videos	No	Yes
Course notes	Yes	Yes
Online exams	Yes	Yes
Chatroom with instructor	Yes	No
Dropbox	Yes	No
Threaded discussion	Yes	Yes
Chatroom with student	Yes	No

F2F, face-to-face.

narrows slightly to 34% for online and 57% for F2F).

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 with the F2F version of a course increases. However, it is important to point out that this result is conditional on the presence of specific online course attributes including the course topic. The results also demonstrate that depending on the specific course attributes present, students may actually prefer some courses in the online versus F2F formats (and vice versa). The presence of specific course attributes may also shed some light on the causes regarding the amount of variation in effectiveness across online courses, which was detected by Bernard et al. (2009). If students' preferences for course attributes are related to the impact of these attributes on course effectiveness, then the absence or presence of specific course attributes facilitating the general interaction types (for example SC interactions facilitated by lecture videos versus course lecture notes) may account for even more of the variation reported in online course effectiveness.

Summary and Conclusion

The primary objective of this study was to determine students' preferences and WTP for online and F2F college course attributes. The secondary objective was to determine how the amount of information that students have about

Table 8. Simulation of Impact of Additional Attribute Information on Student Demand

	Online (share)	F2F (share)	None (share)
	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%

Note: Based on parameters estimates from Tables 3 and 5.

[a] See Table 7 for course attributes information.

F2F, face-to-face.

online course attributes during enrollment impacts their selection of college-level courses. The motivation for the first objective was to present a complementary study to those focusing on online course effectiveness by determining how well students perceive online courses to substitute for F2F 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 from a 2010 campus-wide survey of OSU undergraduate students were used. The survey contained two CEs that were evenly and randomly divided between the sample student population (approximately 10,900 students), and in all, 1291 students responded to the survey. One concern with these data are that OSU communications policy restricted the contact with students, which limited the response rate to approximately 12%. To compensate, efforts were taken to increase survey participation; however, these efforts may have also impacted the amount of bias in the results, and the sample population may not reflect the true population. On the other hand, these results provide an important platform for discussion and a number of areas for further investigation.

There are four trends with respect to students' preferences for college credit courses 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 to three days during the week) that students prefer to take F2F courses. 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. Third, students demonstrated the highest preferences for online course attributes that facilitated SC interactions. In fact, the online course attribute that was valued the most by students was shorter (10 to 20 minutes) customized topic videos. Fourth, students selected online courses more frequently when additional information about online course attributes is available during course selection and when the attributes students value most are included.

Based on these results, there are some potential policy and course design implications that maybe helpful for faculty and administrators wishing to improve or expand their current online programs and course offerings. First, increasing the number of courses that students identified as most popular in the online format might be appropriate. For some universities, this may also include considering an alternative fee schedule that better reflects student demand for specific courses. Second, as demonstrated by the simulation, the probability that students would select an online version of a course increased as the number of technological attributes included in online courses were increased. This was also affected by the course topic. This suggests that institutional efforts to use online courses to help meet on-site student demand would be more accepted by students if a broader array of online course attributes, especially those desired most by students, were included (e.g., short topic discussions, course lecture notes, opportunity to correspond with instructor in real time, ability to take examinations and quizzes online, and an online dropbox for assignments). Third, for institutions wishing to differentiate their online courses and programs from those of other colleges and universities, customizing content such as lecture videos and other content-related materials may be an important consideration. Fourth, students' preferences for online course attributes were very similar to the results of studies focused on attribute impacts on course effectiveness. Although this similarity does not imply that student preferences for attributes are equal to attributes contributing to course effectiveness, it does support the premise that students may provide helpful insight regarding the design process of online courses. At a minimum, this particular result highlights a potential direction for further research.

The student preferences determined in this study were based on design features of the OSU

D2L platform; however, the model presented here has the flexibility to accommodate other kinds of F2F and online course attributes as well as potentially relevant student characteristics. Additionally, this study provides a number of areas for future research. For example, there are a few general course topics that students indicated they preferred in the F2F versus online format and vice versa. A more thorough and detailed investigation of this idea may be helpful in determining more precisely what topics of courses are most appropriate in the online learning environment. Related to this idea are the potential effects on course delivery preferences from students' choice of academic major.

An additional area to expand research that is highlighted by the results presented in this summary is the potential contribution that students could make in the design of online courses. Much of the culture of the millennial generation is driven by technology use, and there is a growing body of research focused on this phenomenon. Furthermore, millennials have made significant contributions to the development of new information and communication technologies, many of which are very similar to the technologies used to design online learning environments. 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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