Quantifying Student Preferences for Spending Fees for Technology in a College of Agricultural Sciences and Natural Resources

Christopher Baker[1], Tracy Boyer[2] and Chanjin Chung[3]
Oklahoma State University
Stillwater, OK

Abstract

This study utilized Internet-based surveys to elicit preferences for student technology fee spending in the College of Agricultural Sciences and Natural Resources at Oklahoma State University. The results show that 80% of students are unaware that they pay technology fees and almost 93% had little or no knowledge of how the fees were spent. Based on students' responses the two most popular spending areas are for classroom multi-media technologies and departmental proposals using field-specific technologies such as GPS units or field specific computer software/hardware with each receiving an average of 25.2% for responses. Preferences by respondent characteristics showed that individuals' habits affect categorical spending. For example, students who use computer labs more often for classwork prefer that more money go towards department technology proposals than classroom technology; upperclassmen have a significantly negative preference for department proposals; and students who own a computer have a stronger preference toward department proposals than those who do not own a computer. The job of the administrators is to understand these differences and shape policies that provide students with the technologies they need to succeed.

Introduction

The growth of technology in the past century has drastically shifted the pedagogy of teaching and learning at universities away from using chalk and a blackboard. Simultaneously, universities have sought to increase non-tuition fees to cover increasing costs of providing technology to students (Carnevale, 2007). Despite opposition concerning increases in fees, little research has been done on how students prefer that fees be spent. Some quantitative research has aimed at examining whether the use of technology such as PowerPoint presentations and student response systems such as clickers, improves student learning (Carnevale, 2005; French, 2006; Kozma and Russell, 1997; Mayer, 2001; Murray, 1999; Nowaczyk et al., 1998; Trees and Jackson, 2007). At the forefront of media use in the classroom are newer technologies such as using mobile phones for instant messages and Twitter or similar live feedback which have been found to increase student engagement and attendance (Higdon et al., 2011). Schacter and Fagnano (1999) found that technology based on sound learning theory can significantly improve students' learning abilities and that the role of teachers, administrators and policy makers is to select and implement the technologies that best support student achievement. Another vein of the classroom technology research has shown that perceptions of the usefulness and student's willingness to pay for multi-media technologies vary by demographics and pedagogy style of the instructor (Graham et al., 2007; Boyer et al., 2009). Debate is still ongoing regarding which technologies can provide the best pedagogical improvement, but the increased technological presence has been evidenced by the increased classroom presence of computers, projectors and smart boards; the growth of computer labs and wireless capabilities across universities; and the influx of personal devices (handheld GPS units for example) for use in the field and in the lab. To fund these initiatives, many universities started charging

[1] Economist, Army Corps of Engineers, Tulsa District, 1645 101st E. Ave, Tulsa, OK 74210; Email: christopher.baker10@yahoo.com
[2] Associate Professor of Agricultural Economics, Department of Agricultural Economics, 321 Ag Hall, Stillwater, OK 74078; Tel: 405.744.6169; Email: tracy.boyer@okstate.edu (corresponding author)
[3] Professor of Agricultural Economics, Department of Agricultural Economics, 322 Ag Hall, Stillwater, OK, 74078; Tel: 405.744.6164; Email: chanjin.chung@okstate.edu

technology fees in the 1990's and have been using the revenue to construct, maintain and support the necessary information technology infrastructures (Green, 1996).

Universities have turned to technology fees as a significant alternative source of revenue to fill budget gaps (Wellman et al., 2009). Historically, students have had a voice in how the funds from fees are distributed (Meabon et al., 1985). Unfortunately, with the continued collection and dispersion of technology fees, this voice seems to have been lost. A survey conducted at Oregon State University showed that only 36.6% of students even knew they paid a technology fee (Webster and Middleton, 1999). The results of a more recent survey from the University of Minnesota- Twin Cities showed that almost no progress was made in the past decade toward increasing student awareness. In that survey, 59% of students answered that they were not aware of how much they paid in technology fees and almost 90% answered that they knew little or nothing about how the fees are spent (Walker and Jorn, 2009).

Bringing students back into the discussion of how funds are allocated could be mutually beneficial to both students and universities. Students actively engaged in budgetary decisions are more accepting of the fees and provide a measure of approval for funding decisions (Webster and Middleton, 1999). The failure to include the "tech-savvy" generation of students in the decision process may hinder rather than promote academic success and technological innovation on campuses across the country (Carlson, 2005).

The College of Agricultural Sciences and Natural Resources (CASNR) at Oklahoma State University (Stillwater, OK) has had average annual revenues of approximately $253,500 from technology fees over the past five years (Oklahoma State University, 2012). These fees have gone to support the CASNR computer labs, departmental computer labs, classroom technologies and departmental proposals (such as funding field and lab equipment) with input from only a handful of students who sit on the technology fee committee. The objective of this research is to determine student preferences for technology spending within the college. Giving faculty and administrators a better idea of which technologies students perceive as academically beneficial will fill a void in the current literature on students' campus technology preferences.

Materials and Methods

Survey Construction

An internet survey was sent by email to all CASNR students to obtain their input on the fee spending for this research. (The full survey is available upon request.) The Oklahoma State University Institutional Review Board approved the study protocol as exempt and all participants provided informed consent prior to participation in the online survey. Prior to sending an individual email solicitation, a PowerPoint slide was shown in four of the largest courses known to hold predominantly CASNR students informing students of the study. The email solicitation, containing a link to the survey, was emailed to all 2,552 students in the College of Agriculture. Participants were told two people would be chosen randomly to win $50 cash for completing the survey should they wish to enter after completing the survey. A follow-up email was sent two weeks later to all recipients as the final contact and reminders with a link were published in one CASNR career fair newsletter. A total of 262 responses were received out of the 2,552 surveys sent out for a response rate of approximately 10.2%. Responses were collected from a diverse group of students, with students responding from each of the departments. Descriptive statistics of the survey respondents are shown in Table 1. As part of the survey, students were asked to provide their knowledge of how much they paid in technology fees and how those fees were spent. The students' responses (as shown in Table 2) reflect the findings of similar surveys (Webster and Middleton, 1999; Walker and Jorn, 2009). Eighty percent of the respondents were unaware of how much they paid in fees and almost 93% had little or no knowledge of how the fees were spent.

To elicit students' preferences for technology spending, each respondent was given a hypothetical funding scenario where they were asked to allocate a percent-

Table 1. Descriptive Statistics (n=262)

Descriptive Statistics	%
Male	31
Female	69
Race	
White	85.7
Black or African-American	1.2
American Indian or Alaskan Native	5.2
Asian	4.4
Native Hawaiian or other Pacific Islander	0.4
Hispanic	4.3
From Multiple Races	3.2
Major Departments	
Agricultural Economics	17.1
Ag Education, Communication, and Leadership	14.8
Animal Science	32.3
Biochemistry and Molecular Biology	4.7
Biosystems and Agricultural Engineering	7.8
Entomology and Plant Pathology	4.3
Environmental Sciences	3.1
Horticulture and Landscape Architecture	2.7
Natural Resource Ecology and Management	7.4
Plant and Soil Sciences	5.8
College Standing	
Freshman	10.8
Sophomore	15.4
Junior	14.6
Senior	34.6
Master's	16.2
Doctoral	8.5

age share to each of five different funding categories (CASNR computer labs, departmental computer labs, classroom technologies, departmental proposals and other technologies) with the total summing to 100%. (An example of the question for percentage share of funding is included as Figure 1. The complete survey is available upon request) Based on the students' responses, the two most favored categories were classroom technologies and departmental proposals with each receiving an average of 25.2%. The shares that the other categories received are displayed in Table 3. Analysis of Variance for these results shows that the difference in assigned percentages between categories is significant at the 99% confidence level (Table 3). The students also provided feedback for other technologies that consisted of E-books, upgraded wifi, wireless printers, software package licenses, laptops and iPads for checkout, more scanners and fax machines. Surprisingly, the students did not propose any cutting edge technology such as cloud based computing, smart boards, or mobile apps. Instead most of them simply wanted better printing capabilities, free copies and more up-to-date computers and software.

Once all of the responses were collected, the data were compiled and grouped for different student characteristics and behaviors. Variables such as class standing, computer ownership and gender were used to determine whether there is any difference in preferences among various student populations. Furthermore, student's behavior may result in different preferences. For instance, students vary in the number of hours spent in a computer lab on academic work (completing homework, class projects and printing notes) versus hours spent on non-academic work (accessing email, social networking and online gaming). All of these demographic and behavioral differences may affect preferences.

Table 2. Student Awareness of Technology Fees (n=262)

Question	Response	%
Do you know how much you paid in technology fees to CASNR this semester?	Yes	19
	No	80
	I did not pay a technology fee	1
How much do you know about what the CASNR technology fees are spent on?	A lot	2
	Moderate	5
	A little	34
	Nothing	59

Table 3. Summary Statistics for Technology Fee Spending Preferences

Groups	Count	Sum	Average	Variance
Funding % Department Computer Labs	262	5,417	20.68	127.09
Funding % CASNR Computer Labs	262	6,072	23.18	149.70
Funding % Classroom	262	6,610	25.23	163.74
Funding % Departmental Proposals	262	6,611	25.23	192.48
Funding % Other	262	1,490	5.69	64.09

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	70,773.26	4	17,693.31	126.91	1.422E-91	2.38
Within Groups	181,940.74	1,305	139.42			
Total	252,714.00	1,309				

Empirical Model

Students' percentage share rankings of technology spending are used as the dependent variables and the student characteristics mentioned above were the independent variables. The model used is based on Zellner's (1962) seemingly unrelated regression model and is estimated in the following functional form:

$$\begin{aligned} Pref_n &= \beta_{n0} + \beta_{n1} AcademicWork + \beta_{n2} NonAcademic \\ &+ \beta_{n3} Computer + \beta_{n4} Gender + \beta_{n5} GraduateStudent \\ &+ \beta_{n6} Upperclassmen + \varepsilon_n, \end{aligned} \tag{1}$$

where the variables are defined as follows:

$Pref_n$ = percentage preference for technology n

$ß_{nk}$ = the coefficients to be estimated for the students' characteristics

n = 1,…, 5 for technology spending categories

AcademicWork = Hours spent in a computer lab on academic work

NonAcademic = Hours spent in a computer lab on non academic work

Computer = takes the value of 1 for students who own a computer, 0 otherwise

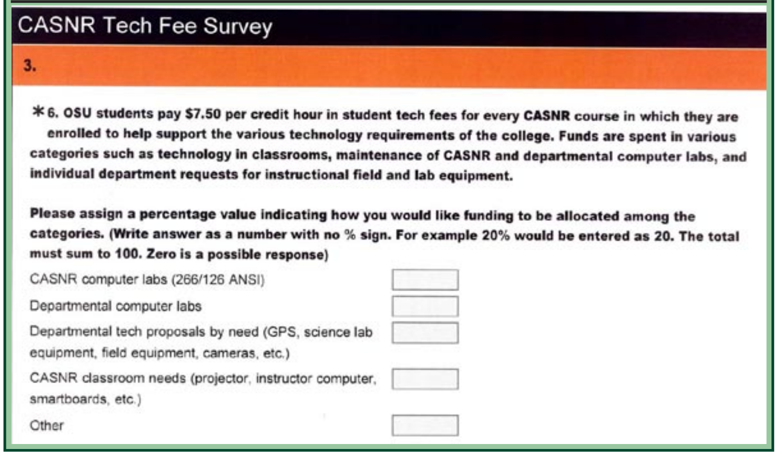
Gender = takes the value of 1 for students who are male, 0 for female

GraduateStudent = takes the value of 1 for graduate students, 0 otherwise

Upperclassmen = takes the value of 1 for upperclassmen, 0 otherwise

Since the model is defined as a system of equations, one equation has to be dropped for the model to run. The equation dropped is the percentage preference for departmental computer labs. Once the parameter estimates are obtained, the effect that different attributes have on preference can be measured by conducting hypothesis tests on the significance of the coefficients. The coefficients for *AcademicWork* and *NonAcademic* can be compared across the system of equations to rank student preferences based on the number of hours they spend on academic work and nonacademic work in computer

Figure 1. Example of Percentage Share Allocation Question (This is an example of the percentage share funding allocation question presented to the student respondents.)



CASNR Tech Fee Survey

3.

*6. OSU students pay $7.50 per credit hour in student tech fees for every CASNR course in which they are enrolled to help support the various technology requirements of the college. Funds are spent in various categories such as technology in classrooms, maintenance of CASNR and departmental computer labs, and individual department requests for instructional field and lab equipment.

Please assign a percentage value indicating how you would like funding to be allocated among the categories. (Write answer as a number with no % sign. For example 20% would be entered as 20. The total must sum to 100. Zero is a possible response)

CASNR computer labs (266/126 ANSI)

Departmental computer labs

Departmental tech proposals by need (GPS, science lab equipment, field equipment, cameras, etc.)

CASNR classroom needs (projector, instructor computer, smartboards, etc.)

Other

labs. The number of hours spent in a computer lab for academic use can be used as a measure of student effort. Student effort has been shown to play a significant role in predicting student success (Carbonaro, 2005) and is used to see if students who expend more effort on school prefer different technologies. If so, these areas of spending may be a good place to start when trying to determine which campus technologies students think will help them succeed academically.

Results and Discussion

Descriptive statistics of survey respondents are shown in Table 1. A disproportionate number of female students (69%) responded to the survey. In fall 2012, the only available timely accounting of student makeup, female students made up 52% of the CASNR student body (Oklahoma State, 2012). The majority of student respondents were Caucasian (85.7%), a higher percentage than those enrolled in fall semester 2012 (76.7%) (Oklahoma State, 2012). The greatest percentages of respondents were from the two largest student majors, Animal Science (32.3%) and Agricultural Economics (17.1%). The greatest percentage of respondents was made up of students with Senior standing (34.6%). In descending order, Seniors were followed by Masters (16.2%), Sophomores (15.4%), Juniors (14.6%), Freshmen (10.8%), and Doctoral Students (8.5%). As stated previously and shown in Table 2, students either do not examine their tuition and fee statements or do not pay it personally, as 80% report that they were unaware technology fees were assessed.

The model is run in SAS 9.2 using the GMM procedure to correct for potential heteroskedasticity (SAS, 2007). Results for the seemingly unrelated regression model are shown in Table 4 showing the ranking within funding category by group. All of the constant terms, which represent the estimated preference for the base group of undergraduate females who do not own a computer, are significant at the 5% level. Upperclassmen show a strong positive and significant preference for allocating funds to CASNR computer labs when compared to graduate students and underclassmen. The reason for this may be because the CASNR labs are larger and better support students working on group projects and have more updated computers and the software required for some higher level course homework assignments. Graduate students also have separate computer labs available to them, which possibly limits their preference for CASNR computer labs. Most of the coefficients for departmental proposals are significant indicating that students tend to

Table 4. Seemingly Unrelated Regression Results for Students Preferences for Technology Fee Spending

Parameter	Label	Estimate	
CASNR Labs			
B20	Constant	26.073*** [1]	(4.329) [2]
B21	Academic Lab Use	-0.016	(0.012)
B22	Non-Academic Lab Use	-0.018	(0.016)
B23	Own Computer	-3.907	(3.858)
B24	Gender	-3.264*	(1.621)
B25	Graduate Student	1.823	(2.161)
B26	Upperclassmen	6.086***	(1.761)
Classroom Technology			
B30	Constant	26.922***	(5.981)
B31	Academic Lab Use	-0.044*	(0.019)
B32	Non-Academic Lab Use	0.055	(0.049)
B33	Own Computer	-0.620	(5.533)
B34	Gender	-0.123	(1.707)
B35	Graduate Student	2.087	(2.274)
B36	Upperclassmen	-1.647	(1.693)
Departmental Proposals			
B40	Constant	20.169***	(3.662)
B41	Academic Lab Use	0.046**	(0.017)
B42	Non-Academic Lab Use	-0.049**	(0.017)
B43	Own Computer	5.967*	(3.026)
B44	Gender	2.970	(1.928)
B45	Graduate Student	-2.209	(2.613)
B46	Upperclassmen	-5.095**	(1.809)
Other Technology			
B50	Constant	6.706*	(2.647)
B51	Academic Lab Use	0.002	(0.009)
B52	Non-Academic Lab Use	0.013	(0.016)
B53	Own Computer	0.235	(2.391)
B54	Gender	0.006	(0.967)
B55	Graduate Student	-4.202**	(1.271)
B56	Upperclassmen	-1.299	(1.252)

either have a strong positive or negative preference for departmental proposals. Upperclassmen have a significantly negative preference for departmental proposals (Table 4), meaning they may not want to pay for a significant investment in things like field equipment if they will graduate before being able to use it. Students who own a computer also have a strong preference for departmental proposals, potentially because they do not have as strong a preference for computer labs, although that cannot be concluded from the model results. For the other technology category, the only significant finding was that graduate students have a strong negative preference toward it. Since "other technology" as a category included things such as E-books, wireless printers and laptops and iPads for check out, graduate students may not see any benefit from these technologies since graduate classes tend to be taught as traditional lectures and labs.

In order to rank students' preferences across the funding category equations, the variable in question must be continuous so that meaningful conclusions can be drawn from the comparison. *AcademicWork* is the only individual demographic variable with enough variation to have a significant effect among the funding category equations. A one-tailed t-test at the 10 % significance level results in the highest ranking for departmental proposals, followed by equal ranks between the three categories of CASNR computer labs, departmental computer labs and other technologies for second, and the lowest ranking for classroom technologies. These were calculated for each of the variables across each equation. For example, students reporting more hours spent on academic work, the null hypothesis is null hypothesis is that the $\beta_{Dept\ Proposal} - \beta_{OtherTech} = 0$ and the alternative hypothesis is that this difference would be greater than zero. (Calculations were as follows: $t= ((ß_{Dept\ Proposal}-ß_{OtherTech})-0)/sq.rt.(var(ß_{DeptProposal})+var(ß_{OtherTech})-2(cov(ß_{DeptProposal},ß_{OtherTech})))$. It was found that t=1.7755 > 1.29 t(0.90,262); therefore, we conclude: B41>B51 at the 90% confidence level.)

The more effort that students put into school work creates a stronger preference for departmental proposals, potentially because they view field and lab equipment as providing hands on learning and a real world experience and a weak preference for classroom technology, because they may view PowerPoint technology as just a nice perk that does not increase learning or academic success.

Although many of the results from the regression model in Table 4, proved inconclusive, evidence is found that different student populations have varying preferences for technology spending. Administrators and policy makers may want to consider this when deciding how to allocate technology budgets. Based on the results for upperclassmen in particular, schools may find it beneficial to students to consolidate some of the departmental computer labs so that they are larger and then use excess funds to upgrade the computers and software for them. Another idea may also be to treat technology fees differently based on the class level of the course being taught. Fees collected for upper level and graduate courses could be used to support technologies that promote more academic achievement in the groups taking those courses.

Summary

The use of technology on campuses across the country has the potential to revolutionize the way that today's students experience college. If universities plan to continue to assess technology fees, they need to educate students about how these fees are spent and provide the opportunity for input into the decision-making process. Simply surveying students about their preferences such as done in this study may serve to educate many students about the levels of fees and the potential to participate in the process of spending allocations. Students in college today are more technologically savvy than any generation before them and understanding what they want for the classrooms of the future is important (Carlson, 2005). Understanding students preferences for technology on campus will help ensure that universities are investing in programs that students feel improve their education experience and prepare them to compete in a global work force.

The results of this research show that students have differences in how they think their technology fees should be spent. Students of different class standing prefer different allocations for fees for technology according to the varying demands of their classwork. Students who use labs more often for classwork prefer that more money go toward departmental technology proposals than classroom technology, potentially because they find field and lab equipment enhances the learning experience and the creation of job skills more than PowerPoint technology. Students who own computers have a significantly higher preference for proposals enhancing departmental or major-specific needs than those students who do not own a computer. This preference is especially important since more students are bringing their own technology to college (Crews et al., 2007). The job of the administrators is provide avenues for student involvement in decision making, to understand these differences, and to shape policies that provide students with the technologies they need to succeed. They also must ensure that students' fees are not being used to subsidize the technology use of specific subgroups of students. Ultimately administration must also find ways to support faculty who effectively use media and technology to improve learning by investing and rewarding innovation in teaching as well.

Inevitably students must actively begin to participate in the allocation process to determine which campus technologies add value to their education and are worthy of being funded. This research simply provides the groundwork for understanding how students would like to see their technology fees spent. These results may also be isolated to the specific university where the data were collected, so it is necessary for future studies to look at multiple universities to compare findings. Future research also needs to focus on using different surveying techniques, such as conjoint choice, that better elicit ranked preferences. Researchers can estimate students' willingness to pay technology fees so that policy makers can implement an optimal fee structure. Although the adoption of technology on college campuses has been slower than most of the rest of society, assuming that we know what technology students want on campus and what they are willing to pay for it is unwise.

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