An Empirical Look at Business Students' Attitudes towards Laptop Computers in the Classroom

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ABSTRACT

Mobile computing technology has proliferated across university campuses with the goals of enhancing student learning outcomes and making courses more accessible. An increasing amount of research has been conducted about mobile computing's benefits in classroom settings. Yet, the research is still in its infancy. The purpose of this paper is to add to the base of knowledge related to business student attitudes and opinions about laptop technology, particularly passive versus required use in the classroom. Implications of this study's results will provide value to pedagogical policy makers, business educators, and mobile computing developers.

Attitudinal and demographic survey data was collected from a sample of business students regarding the use of laptops in the classroom. Attitudinal data were derived from questions about course design, general laptop satisfaction, and potential benefits of laptop use, in addition to demographic and categorical data. Descriptive statistics are presented in addition to some statistical comparisons across demographic and categorical segments of the sample.

INTRODUCTION

Computing technology's integration into business and education is nearly universal. Use of mobile devices and computing technology in education and business has increased in the recent past, but considered to be in a "state of infancy" (Powering Up Change, 2010; Motiwalla, 2007). The benefits of incorporating computing technology into education are thought to be many with its primary use in curricula as a pedagogical tool intended to engage students in learning and enhance the educational experience (Efaw, Hampton, and Martinez, 2004). As a result of the widespread use of computing technology, movement toward mobile computing, and expectations of enhancing the educational experience, numerous universities have embraced computer technology utilizing a variety of means for its incorporation.

A number of studies have been conducted concerning the benefits of utilizing mobile computing technology, (Hawkes and Hategekimina, 2009-2010; Efaw, Hampton, and Martinez, 2004; Turman and Shrodt, 2005; Barak, Lipson, and Sherman, 2006; Fried, 2008). However, the results have been mixed and there is no large-scale empirical data providing real proof of the impact of mobile devices on learning (Powering Up Change, 2010). In addition, there is a body of research regarding faculty perceptions and concerns related to incorporating computing technology into the curricula (Efaw, Hampton, and Martinez, 2004; Parker, Bianchi, and Cheah, 2008). Other studies have explored student perceptions of mobile computing (Rosen and Weil, 1995; Annan-Coultas, 2012). The missing piece, however, is research related to student perceptions and attitudes related to incorporating

mobile computing technology within a particular type of classroom. In particular, the evidence related to business student perceptions of mobile computing is sparse, at best. General attitudes regarding business classroom laptop use were studied and categorized in Wergin, Tracy, and Dykstra (2011). However, a rigorous statistical evaluation of business student attitudes and perceptions remains unexplored. Thus, business student attitudes and perceptions about such technology are unclear. The purpose of this study is to examine student attitudes about laptops in the business classroom and their opinions about policies requiring business students to bring laptop computers to class. The subtle difference between educational use of laptops and requiring them in class is explored. A scaled response questionnaire was used to gain an understanding of student attitudes and opinions, as well as to collect relevant demographic data.

LITERATURE REVIEW

What is mobile computing? According to Corbeil and Valdes-Corbeil (2007), it is the "application of small, portable, and wireless computing and communication devices." As the definition implies, universities desiring to implement mobile computing are faced with three main concerns. First, the institution would need to heavily invest in creating a wireless campus and require student ownership or access to some type of mobile computing device. Second, the administration should consider the benefits of incorporating the technology against the costs, which would include conversion to wireless, increased security protections, and faculty development, for example (Cossey, 2005). Third, faculty concerns include questions regarding whether student learning is enhanced and student engagement is increased (Hawkes and Hategekimina, 2009-2010). In addition, classroom management concerns include the potential loss of student focus on learning and therefore increased dishonesty, technical difficulties, using classroom time, and need for course development (Moallem, Kermani, and Chen, 2005; Shim and Shim, 2000-01; Efaw, Hampton, and Martinez, 2004). A review of the literature related to computing technology in education revealed a 1998 study about student perceptions of multimedia in undergraduate classrooms (Nowaczyk, Santos, and Partron, 1998), a 2009 study on age and gender differences related to acceptance of mobile learning (Wang, Wu, and Wang, 2009), and a 2010 German study researching factors which impact secondary student acceptance of E-learning systems which found perceived usefulness is critical to student acceptance of an E-Learning system (Friedrich and Hron, 2010).

Friedrich and Hron's (2010) study focused on high school student acceptance of interactive learning modules and learning management systems. They found that perceived usefulness of the modules and systems was a significant positive predictor of pupil's acceptance while computer related attitudes were not predictors of acceptance of learning management systems. Nowaczyk, Santos, and Patron (1998) focused on student perceptions related to incorporating multimedia, specifically, text, graphics and video, into undergraduate collegiate classrooms. Interestingly, neither study focused upon college student perceptions of mobile computing and required use of laptops in the college classroom.

Other studies have focused on student intent to use mobile computing technology and perceptions about the impact of mobile computing on student learning. For example, Moran, Hawkes, and El Gayar (2010) incorporated a modified "unified theory of acceptance and use of technology" (UTAUT) to evaluate selected elements which contribute to students' behavioral intent to use Tablet PC's. UTAUT is model of information technology acceptance based upon four core determinants of IT behavior and four moderators of key relationships (Venkatesh, Morris, Davis, and Davis, 2003). Those core elements include performance expectancy, effort expectancy, social influence, and facilitating conditions, while the four moderators are gender, age, experience, and voluntariness of use. These basic elements were indirectly incorporated into the research instrument for this study.

Wang, Wu, and Wang (2009) conducted research related to age and gender differences and student acceptance of mobile learning. They found "performance expectancy, effort expectancy, social influence, perceived playfulness, & self-management of learning were all significant determinants of behavioral intention to use m[obile]-learning" (Wang, Wu, and Wang, 2009). In addition, they found that age acted as a moderator between effort expectancy and social influence and the intention to use mobile computing; however, neither age nor gender had a direct influence on the intention to use mobile computing. These findings suggest that older students' effort expectancy and social influence are stronger predictors of the intention to use mobile computing than for younger students. The findings of their study were limited to respondents from Taiwan and expectations related to use of mobile computing for learning. The study did not incorporate current actual computer usage behavior, a wide variety of demographic characteristics, or student perceptions related to requiring laptop computers to be brought to class.

Other research suggests that gender differences may influence the acceptance of mobile computing. Ong and Lai (2006) suggest that males are more influenced by their perceptions of e-learning usefulness or utility, while females are more influenced by their perceptions of com-

puter self-efficacy and ease of use. This research suggests that males tend to view computer use from an external or utilitarian view, such that they are concerned with the benefit of the computing initiative. On the other hand, females tend to hold an internal view, such that they have a greater concern regarding their ability to be proficient with the technology.

Moallem, Kermani, and Chen (2005) conducted a survey related to classroom use of personal data assistants (PDAs) for problem solving and clicker type pre- and post-tests. They found students believed the use of this type of technology influenced their learning, enhanced their involvement, and increased their motivation. Specifically, the researchers found that the class dynamics changed from a lecture based environment to a collaborative, student centered learning environment. Students also indicated the most important facet of mobile computing was the ability to receive instant feedback from classroom instruction. For example, online quizzes and exams were deemed much more relevant and useful to the students because they could receive their grades and feedback much quicker than they could in a traditional classroom setting. As such, this research found that both faculty and students had a greater appreciation for mobile computing, and preferred it to a classroom that does not facilitate mobile computing. Challenges discovered in this research included increased student frustration with Internet access, as well as security and student dishonesty where some students were able to use mobile computing technology to access information while taking quizzes and exams (Moallem, Kermani, and Chen, 2005).

The review of the literature related to computing technology in education has revealed little research about business student perceptions and attitudes related to mobile computing technology usage within the classroom. Consequently, the purpose of this study is to examine business student attitudes towards laptop use in the classroom.

METHODOLOGY

The study was conducted within an AACSB-International accredited school of business at a mid-sized Midwestern doctoral granting liberal arts residential university. Survey questionnaires were administered to undergraduate business students in required business courses. Some students were enrolled in more than one required business course. To ensure students did not complete more than one questionnaire, students were given the following instruction: "[i]f you have already completed this questionnaire, please do not complete this one and return the questionnaire." A total of 401 useable student questionnaires were received which comprises approximately 57% of the residential business student body.

Laptops are generally available at the business school surveyed. The building is completely wireless and over half of the classrooms have Ethernet ports at every seat. Most of the students have their own laptops (96%), but students may use a limited number of university-owned laptops from carts available in the classroom. Every classroom is a "smart room" equipped with a variety of computer and projection equipment, in addition to "clicker" technology and a full sound system. The overwhelming majority of the faculty utilizes the university's course management system (available in the classroom). The university has participated in a mobile computing initiative since 2009.

Table 1 shows the demographic characteristics of the survey respondents. Age was segmented at age 24 as a proxy measure for traditional versus nontraditional student status. GPA was segmented evenly in increments of 0.5. A GPA of 2.5 or higher is required for admission status to the business school surveyed. In addition a 2.0 GPA is an institutional requirement for graduation. This divided the students into proxy student categories of: excellent, good, fair, poor, and failing. ACT scores required at this school are segmented to correspond to academic potential: excellent, good, fair, and poor. Employment was segmented to correspond to: full-time, more than half time, substantial part-time, limited part-time, and not working. Other demographic characteristics were segmented on a logical basis.

The survey questionnaire, which is available in the Appendix, was originally developed by the Center for Teaching and Learning for the purpose of evaluating a mobile computing initiative deployed by the university. Several survey questions were modified to include related questions about required laptop usage in class and additional demographic items. The survey asked business students to:

- describe their attitudes about nine items related to use of laptops in the classroom (original survey questions),
- describe their opinions about five items related to use of laptops in the classroom should laptop use be required in the classroom (adapted survey questions),
- indicate their laptop ownership and laptop usage (empirical data)
- compare faculty and student digital citizenship and knowledge (attitudinal data), and
- respond to seven demographic characteristic questions.

Students were asked to indicate on a five-point Likert scale their attitudes about nine items related to laptops in the classroom and their opinions related to a course require-

Table 1
Demographic Characteristics

Characteristic	Number (%)	Characteristic	Number (%)
Gender:		**GPA:**	
Male	238 (59.4%)	< 2.0	0 (0%)
Female	163 (40.6%)	2.0-2.49	21 (5.2%)
Age:		2.5-2.99	88 (21.9%)
< 24 years	363 (90.5%)	3.0-3.49	166 (41.5%)
> 24 years	38 (9.5%)	3.5-4.0	126 (31.4%)
Ave. Age	21.2	Ave. GPA	3.19
Class:		**ACT:**	
Freshman	43 (10.7%)	0-20	50 (12.5%)
Sophomore	122 (30.4%)	21-23	97 (24.2%)
Junior	110 (27.4%)	24-26	148 (36.9%)
Senior	126 (31.4%)	27+	106 (26.4%)
Major:		Ave. ACT	24.3
Accounting	96 (23.9%)	**Employment (hrs/wk)**	
Economics	24 (6.0%)	0	178 (44.4%)
Finance	45 (11.2%)	1-10	61 (15.2%)
Health Services Administration	48 (12.0%)	11-20	95 (23.7%)
Human Resource Management	10 (2.5%)	21-30	45 (11.2%)
Management	81 (20.2%)	> 30	22 (5.5%)
Marketing	45 (11.2%)	Ave. (hrs./wk.)	10.6
Undeclared	52 (13.0%)		

ment to bring laptops to the classroom. The scale ranged from (1) strongly disagree to (5) strongly agree or from (1) never to (5) often. The laptop ownership and usage items were binomial and required a "yes" or "no" answer. The questions related to digital citizenship and knowledge were also binomial and required a "you" or "instructor" answer.

General significance tests included one sample t-tests conducted for differences from neutral for the five-point Likert items. Statistical significance on these items indicates a disposition to one end of the scale. Single sample proportion tests were used for the binomial items for differences from fifty percent. Statistical significance on these items indicates a statistical majority. Four statistical tests were used for the demographic analysis. For demographic data with two values two sample t-tests were used to test for differences between means on the Likert scale questions, and two sample proportion tests were used for differences between proportions on the binomial questions. For demographic data with more than two values one-way ANOVA tests were used to determine if overall statistical differences existed, and Tukey's simultaneous confidence intervals were used to demonstrate statistical differences for specific demographic items. According to Hahn and Meeker, to "achieve the appropriate use of statistics one needs to have differences that are BOTH statistically significant and practical for decision making" (Hahn and Meeker, 1993). In large samples such as with this study statistical significance is relatively common. However, the results are only meaningful if their interpretation is of practical importance. For example, the mean for question M3 in Table 2 below is statistically different than the midpoint (3 on the 5-point Likert scale). Although the 3.18 average is statistically different from neutral it is only a marginally practical difference from a managerial or policy-making perspective.

RESULTS

Overall, 17 of 18 items tested resulted in statistical and/or practical significance. Table 2 provides the summary results of general significance, displaying the mean and p-value (α=0.05) of student responses to each questionnaire item and whether or not the item was practically significant. For the Likert scale questions a difference from the center of the scale of at least 0.30 indicates a clear practical difference for implementation of laptop use in the classroom. In other words student opinions clearly favor one direction of the tested attitude/opinion. A difference of 0.15-0.29 indicates a marginally practical difference. This can be interpreted as most business students (but not overwhelmingly) favor one direction of the tested attitude/opinion. A difference of less than 0.15 indicates no practical difference. This can be interpreted that business students generally are indifferent as a group to one direction of the tested attitude/opinion.

The statistical results indicate that business students generally believe laptops in class can be: linked to learning objectives; well integrated into a course; enjoyable to use in class. Students also generally believe that laptops are

Table 2
General Significance Tests

Survey Item		Mean (p-value)	Practical Significant?
M1	Laptop use in class linked to learning objectives.	3.39 (0.000)	Yes
M2	Laptop use enhances classroom experience.	3.27 (0.000)	Marginally
M3	Laptop use = more effective/efficient learning.	3.18 (0.001)	Marginally
M4	Laptop use can be well integrated into a course.	3.75 (0.000)	Yes
M5	I will enjoy using a laptop in class.	3.59 (0.000)	Yes
M6	Outside class I enjoy a laptop to help me learn.	4.20 (0.000)	Yes
M7	How often do you use laptops during class?	2.14 (0.000)	Yes
M8	Should laptops be used in class more, less, same?	3.30 (0.000)	Yes
M9	How often do you use laptops in class for outside activity?	3.32 (0.000)	Yes
M10	Do you own a laptop?	0.96 (0.000)	Yes
M11	Do you regularly bring it to class?	0.20 (0.000)	Yes
M12	Requiring a laptop in class increases participation.	2.61 (0.000)	Yes
M13	Requiring a laptop in class will prepare me for a career.	3.09 (0.126)	No
M14	Requiring a laptop in class will help creativity.	2.76 (0.000)	Marginally
M15	Requiring a laptop in class will improve my grade.	2.64 (0.000)	Yes
M16	Requiring a laptop in class will be a distraction.	3.91 (0.000)	Yes
M17	Who is a better digital citizen, your instructor or you?	0.76 (0.000)	Yes
M18	Who knows more about technology in your field?	0.68 (0.000)	Yes

helpful in learning outside of class. Students generally do not use laptops in their current classes, but think that they should be used more often. Students also believe that although they use laptops in class for outside activities, laptops would only marginally enhance the classroom experience and learning effectiveness/efficiency. These results seem to at least partially validate previous results (Efaw, Hampton, and Martinez, 2004) with respect to the benefists of incorporating mobile technology into the business classroom.

The survey revealed that 95.8% of students own a laptop. However, only 19.7% regularly brought a laptop to class. The question of requiring a laptop in class yielded some interesting results. While business students felt generally positively about using laptops in class, requiring one generally made the students feel that it would not increase participation/engagement, would not impact their career preparation, would not increase their creativity, and would not improve their grade in the course. While business students use laptops for outside activities inside the classroom, they felt requiring laptops in class would be a distraction. These results seem to indicate that requiring laptops does not consistently lead to the positive student learning outcomes, confirming the findings from Fried (2008). The results also support the finding that perceived usefulness is critical to student acceptance (Friedrich and Hron, 2010).

Students also felt strongly that they were better "digital citizens" and knew more about technology in the business field than their instructors. Taken at face value this finding is difficult to interpret. While today's students are certainly in general more savvy than faculty with consumer technology and mobile computing, business technology and computing applications (other than presentation and word processing) are not students' strengths. Anecdotally, many faculty believe students are ill-prepared to use spreadsheets, databases, and statistical packages prior to exposure in business courses.

In general, it appears that business students like the idea of using laptops in class and/or for educational purposes. However, they do not see the value of or want to be compelled to bring laptops to class. It would seem to indicate that the elements of the UTAUT model (Moran, Hawkes,

and El Gayar, 2010) are not independent, at least with respect to laptop technology in the business classroom.

Some differences were found when tests were performed using demographic segmentation. The differences are discussed below by demographic category. There were no significant differences based on hours worked per week.

Results by Gender

Approximately 95.8% percent of all students own a laptop. However, females were more likely than males to own a laptop. In fact, 98.8% of the females owned a laptop (p-value = 0.005). Females were more likely than males to believe requiring computers in the classroom would be a distraction (p-value = 0.044).

Results by Class

There were ten items with significant differences based on ANOVA tests with Tukey's simultaneous 95% confidence intervals. Sophomores are more likely than Juniors to agree that laptop use in the classroom can be directly linked to course learning objectives (p-value = 0.008), that it will enhance the student's classroom experience (p-value = 0.016), and that it will allow more effective/efficient learning (p-value = 0.009). Sophomores also more strongly enjoyed using laptops outside of class to help them learn than Juniors (p-value = 0.045). Sophomores felt more strongly than Juniors and Seniors that laptops can be well integrated into a course (p-value = 0.000). Freshmen and Sophomores were more likely to enjoy using a laptop in class than Juniors and Seniors (p-value = 0.013). It is not surprising then that Juniors and Seniors are more likely to disagree that requiring laptops in the classroom will increase class participation and engagement (p-value = 0.005) and prepare them for a future career (p-value = 0.003) as opposed to Sophomores. Freshmen are more likely than Juniors and Seniors, while Sophomores are more likely than Seniors to believe requiring laptops in the classroom will help with the student's creativity and creative thinking (p-value = 0.002). These results partially support the finding of Hawkes and Hategekimina (2009-2010) with respect to Freshman. Finally, there were decreasing means from Freshmen to Seniors with regard to laptop ownership. One hundred percent of Freshmen respondents indicated they owned a laptop while only 92% of Seniors indicated they owned a laptop (p-value = 0.042).

Results by Major

There were nine items with significant differences based on ANOVA tests with Tukey's simultaneous 95% confidence intervals. Undeclared students are more likely than Finance students to believe laptops could be well integrated into a course (p-value = 0.046). Accounting students were less likely to enjoy using a laptop in class than undeclared students (p-value = 0.041). Health Services Administration, Management, Marketing, and Undeclared students generally enjoy using computers outside of class for learning than Human Resource Management students (p-value = 0.008). Accounting students were less likely to bring laptops to class compared to Marketing students. (p-value = 0.039) Accounting, Management, and Economics majors were less likely to use laptops in class compared to Marketing students (p-value = 0.000). Accounting students were less likely than Finance students to use laptops in class for non-class activities (p-value = 0.049). Accounting students were less likely than Undeclared students to think required laptops in the classroom will 1) improve their grade (p-value = 0.015) and 2) help their creativity and creative thinking (p-value = 0.021). Accounting, Finance, Health Services Administration, and Economics students were less likely to think requiring a laptop would increase class participation/engagement (p-value = 0.012). Lastly, Marketing students are less likely to bring their laptops to class than Human Resource Management students (p-value = 0.0369).

Results by Age

Traditional students (younger than 24 years of age) were more likely to use computers for non-classroom related activities while non-traditional students (24 years old or older) were more likely to seldom or never use computers for non-classroom related activities (p-value = 0.026). This is consistent with the results from Wang, Wu, and Wang (2009). Traditional students believed they would know more than the instructor about technology use in their filed at the end of the semester while non-traditional students were neutral (p-value = 0.022).

Results by Grade Point Average (GPA)

There were four items with significant differences. Fair students (2.5-2.99 GPA) were more likely to believe laptops should be used more often in the classroom while Good and Excellent students 3.0 GPA or higher) thought classroom laptop usage should be about the same as current (p-value = 0.004). Fair students were more likely to believe requiring laptops in class would sometimes increase class participation/engagement while Excellent students (3.5 GPA or higher) were less likely (p-value = 0.022). Fair students were also more likely to believe requiring laptops in class would sometimes increase their creativity/creative thinking while Excellent students were less likely (p-value = 0.004). Finally, Fair students were more likely to believe

requiring laptops in class would sometimes increase their class grade while Good and Excellent students were less likely (p-value = 0.006).

Results by ACT

The lower the student's ACT score, the more likely the student is to agree that laptop use in class can be directly linked to course learning objectives (p-value = 0.046).

DISCUSSION AND CONCLUSION

Statistically significant and practical differences occurred for 13 of 18 items, and for all demographic categories except hours worked per week. Nearly all students own a laptop while all Freshmen owned one. Business students enjoy using laptops outside of class to assist with their learning and Sophomores have the most positive attitudes toward laptop use.

There are several challenges related to using laptops as an effective implementation tool for mobile computing. Of most importance, students do not always bring their laptops to class. In fact, less than 20% of the respondents regularly bring their laptops to class. Students believe laptops in the classroom will fairly often be a distraction and, overall, they rarely think laptops in class will increase their class participation, engagement, and grade. Finally, Accounting majors are least likely to bring laptops to class, think it would aide with their thinking, or improve their grade.

In conclusion, laptop technology is ubiquitous and business students enjoy using them for learning. However, because students do not believe requiring laptops in the classroom will benefit the student, laptops in the classroom will be a distraction, and they do not regularly bring their laptops to the classroom, instructors would be wise to design their courses to integrate mobile computing into their courses at selected points or by expanding out-of-classroom laptop experiences.

FUTURE RESEARCH

The results of this study are not truly generalizable across disciplines. Therefore, further research is required to acquire a profile of student perceptions of laptop use in education and the classroom. The authors will be collecting data from students across academic units and majors with a goal of determining differences among the academic units and majors. Additional research is needed to determine whether there are similarities between universities with differing characteristics, such as student enrollment, student diversity, etc., and in other geographic areas.

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Appendix

Please circle the number that best describes your attitudes about laptops in the classroom.

M1 Laptop use in class can be directly linked to the course learning objectives.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M2 Laptop use in class will enhance the classroom experience.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M3 Laptop use in class will allow me to learn more effectively or more efficiently.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M4 Laptop use can be well integrated into a course.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M5 I will enjoy using a laptop in class.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M6 Generally (outside of class), I enjoy using computers to help me learn.

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M7 How often do you use laptops in your current classes (during class)?

1	2	3	4	5
Never		Sometimes		Often

M8 Should laptops be used more in class, less in class, or about the same as now?

1	2	3	4	5
Use less often		Same use as now		Use more often

M9 How often did you use your laptops in class for non-classroom related activities?

1	2	3	4	5
Never		Sometimes		Often

M10 Do you own a laptop? Yes No

M11 Do you regularly bring it to class? Yes No

Please circle the number which best describes your opinion if you were required to bring a laptop computer to class.

M12 Requiring a laptop in class increase class participation/engagement?

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M13 Requiring a laptop in class will help me prepare for my future career?

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M14 Requiring a laptop in class will help your creativity/creative thinking?

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M15 Requiring a laptop in class will improve your grade in class?

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M16 Requiring a laptop in class would be a distraction?

1	2	3	4	5
Strongly disagree		Neutral		Strongly agree

M17 Who is a better digital citizen, you or your instructor? You Instructor

M18 Who will know more about technology use in your field at the end of the semester, you or your instructor? You Instructor

Demographic Information

1 Gender (M or F): M F

2 Current Class Level (check one): Fr. Soph. Jr. Sr.

3. Major _____

4 Hrs. Employed/Week: _____

5 Age: _____

6 GPA (4 pt scale): _____

7 ACT Score