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Student Engagement: An Empirical Analysis of the Effects of Implementing Mandatory Web-Based Learning Systems

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ABSTRACT

Student engagement has, and will continue to be, a key desire for educators. However, some policies that are aimed at increasing engagement may actually have the opposite effect. This study of 98 students investigates one mandatory policy to use a web-based learning system and presents the level of student engagement compared to other classes where the learning system was not used. Results show that students that were required to use the web-based material had lower engagement, thus providing evidence that participation is not synonymous with engagement. Implications for practice and research are proposed.

KEYWORDS

curriculum delivery;
curriculum development;
student disengagement;
student engagement;
student participation

There appears to be a general consensus that student engagement is both necessary, and desired (Association to Advance Collegiate Business Schools [AACSB], 2013). Still, there is considerable debate on how to define student engagement (Gourlay, 2015; Steele & Fullagar, 2009; Zepke, 2014). Recent arguments call for a focus on the student's role in the engagement process (see Kahn, 2014), while others propose ways educators can increase student engagement (Bryson & Hand, 2007; Stevens, 2015; Zepke & Leach, 2010). The purpose of this study is to take a deeper look at engagement and attempt to uncover some of the “aboutness” (Burke, 2015) associated with student engagement and the educator's role in increasing student engagement. In particular, we frame our study around evaluating whether education policies that are implemented to increase participation actually affect student engagement. The adage is, “you can lead a horse to water, but you can't make it drink.” Similarly, “you can make a student participate, but that may not mean they are engaged.”

To accomplish our task we surveyed 98 students in seven different sections, taught by one instructor using the same teaching methods, but in which one of the sections had a mandated Web-based instruction component. Administrators decided to require the use of the Web-based tool based on vendor assurance that the tool would increase student engagement. Our results show that engagement may be affected by policies and practices aimed at increasing engagement. However, it is the student that determines how he or she will interact with the learning agents, such that participation may not result in actual

student engagement. We conclude our article by offering educators a framework to consider how adding human, and nonhuman, agents to the learning environment will affect student engagement. We propose that these results help fill a gap in the engagement literature on some of the “aboutness” of engagement from the student's perspective.

Student engagement

Student engagement has become a buzz phrase (Weimer, 2012) that is sought by educators, administrators, and outside agencies (Burch, Heller, et al., 2015b). The construct is obviously valuable since several studies have shown that student engagement is a key predictor of student learning, student retention, and graduation (Carini, Kuh, & Klein, 2006; Gellin, 2003; Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Pascarella, Seifert, & Blaich, 2010; Pike & Kuh, 2005; Pike, Smart, & Ethington, 2012). Yet there is still no consensus on student engagement as a construct (Gourlay, 2015; Kahn, 2014; Steele & Fullagar, 2009; Zepke, 2014). In this section, we briefly define student engagement to show that it is a measurable construct and then discuss a potential difference between participation and engagement.

Several theoretical articles have argued the conceptual basis of student engagement. We present some of these thoughts, but do not attempt to alter them in this article. Instead we take the approach that students determine what engagement is, and what actually causes them to be

engaged. First, we discuss what engagement is. Axelson and Flick (2010) attribute Alexander Astin's research in the 1980s as the start of the modern engagement era. Astin's Student Involvement Theory (Astin, 1984) defines student involvement as the quantity and quality of physical and psychological energy that students invest in the college experience. Many researchers have since considered involvement to be synonymous with engagement as evidenced by defining engagement as the contribution of time, commitment, and resources that students place on their learning (Krause & Coates, 2008). Kuh (2003) extends this idea further by stating that student engagement is the time and energy students devote to educationally sound activities inside and outside of the classroom, and the policies and practices that institutions use to induce such engagement. Most recently, Trowler (2010) defines student engagement as the interaction between the time, effort, and other relevant resources invested by students and their institutions that are intended to optimize the student experience and enhance student learning outcomes, student development, and the institution performance and reputation. Based on these more recent definitions, engagement has become both a means of institution accountability and a measure of student outcomes.

Perhaps because of this wide range of definitions, Zepke (2014) states that student engagement research is not often investigated critically. We propose to avoid the debate over the definition of engagement and approach student engagement by what can be measured about the students and their experiences. Archer (2003) stated that people consider themselves in their environments and reflect back on their planning, prioritizing, and imagining. Students therefore reflect back on course curriculum content and delivery and determine whether the content is valuable. A similar situation is seen with the technology acceptance model, which states that technology adoption is based on the perceived usefulness of the technology and the perceived ease of use of the technology (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989). Students that do not see the usefulness of a curriculum component, or who deem the component to not be easy to use, may devote less time and energy to their studies (i.e., become less engaged). The key therefore becomes, how to measure the student's level of engagement.

One approach to measuring student engagement has come from decades of studies on how to evaluate employee engagement (see Burch, Heller, et al., 2015b). Kahn (1990) argued that engaged employees were those who were willing to invest emotional, physical, and cognitive energy in the performance of the job roles. Rich, LePine, and Crawford (2010) developed an employee engagement survey that asked employees to reflect on their level of engagement surrounding their jobs. Burch, Heller, and colleagues (2015b) altered the employee engagement survey and

psychometrically developed a student engagement scale that identified four student engagement factors: physical engagement, emotional engagement, cognitive engagement in class, and cognitive engagement out of class. We offer a brief discussion of each.

Physical engagement is measured by asking students to rate statements like these: I exert my full efforts toward this class, I devote a lot of energy toward this class, I strive as hard as I can to complete assignments for this class. Physical engagement therefore becomes a measure of physical energy and may be more closely allied with participation or motivation.

In contrast, emotional engagement is determined by asking students to rate their level of excitement about coming to class, their enthusiasm in the class, and whether they feel positive about their assignments. We propose that emotional engagement is very important for learning and that it has received very little attention, although many studies have pointed out the importance of emotions in learning. Taylor and Statler (2014) argue that neuroscience has shown that students who are emotionally engaged learn more effectively. To date most studies have tended more toward description than explanation, and there is a clear need for more analytical studies involving emotional engagement (Simpson & Marshall, 2010).

The third student engagement factor addresses the student's cognitive engagement in class. To assess this factor, students rate statements like these: When I am in the classroom for this class; my mind is focused on class discussion and activities; I pay a lot of attention to class discussion; and I am absorbed by class discussion and activities. Cognitive engagement in class is therefore more closely related to the time and energy devoted to cognitive processes, but only in the classroom.

Learning and personal development should occur both in and out of the classroom (Kuh, Douglas, Lund, & Ramin-Gyurnek, 1994). Designing curriculum that causes students to engage the subject outside of the classroom has therefore become more prevalent in recent years. Therefore, the fourth and final student engagement factors measures students' perceptions of their level of cognitive engagement out of the classroom by altering the wording of the cognitive engagement in class questions so students report their level of engagement out of class.

Now that we have defined student engagement based on what can be measured, we return to the discussion of participation. Educators have been urged to move away from traditional lecture to include activities that increase student thinking and participation (Burch, Burch, & Heller, 2015, Burrell, 2014). Similarly, book publishers have developed Web-based interactive environments where students can "engage" with the subject through various videos, activities, games, and other

learning activities. This Web-based learning approach allows educators to monitor the frequency of use, time of use, and accuracy of responses for each student. Some educational administrators have associated this ability to monitor student participation with a desire to increase student engagement. The folly therefore becomes, if the institution can require the student to participate more frequently, or for longer periods of time, the student will have higher levels of student engagement. We propose that this approach may lead to participation, but does not guarantee increased student engagement. Further, we believe that such mandated participation may affect student engagement in unexpected ways.

Method

The purpose of this study was to determine whether using a mandated Web-based learning system increased student engagement and therefore supported the administrative decision to require the tool to be used. There are two groups to be compared: those students with whom a Web-based learning program was used and other students with whom the program was not used. To address this question, student engagement surveys were administered to 98 undergraduate business management students at a regional university and a community college in the southern United States. The sections chosen for this study represent all sections taught by a single instructor across eight sections, and all classes were required for their undergraduate business degree. Similar face-to-face teaching style, assessments, and grading policies were used in all sections. No differences between community college and university students were investigated since students from the community college fed directly into the university based on a cooperative agreement between the two schools.

In one section a mandatory computer-based learning system awarded students for logging into the system, watching videos, completing assignments, and other online activities. The decision to implement this learning system was made by department administrators based on anecdotal evidence from the learning system developer that student participation would increase student engagement and learning.

Students were asked to participate in the study and were given modest extra credit for their participation. Approximately 73% of the students chose to participate. The sample was 66.0% female, and 24.7% were minority. The average age was 32.9 years (SD 13.0 years). Several sections used for this study consisted of older students, which resulted in a higher average age.

One-way analysis of variance (SPSS Version 21) was used to determine whether there was a significant difference between means of the engagement factors for students who were required to use the mandated program as compared to students who were not in the sections where the mandated program was used. Since age and gender have also been known to affect student engagement, correlations and hierarchical regression were used to identify the role of the mandated program on student engagement above and beyond age and gender.

Measures

Engagement was measured using the 12-item Burch Engagement Survey for Students (BESS) (Burch, Heller, et al., 2015b). Questions are five-response Likert-scale questions using the anchor words *disagree* to *agree*. There are three questions for each of the four engagement dimensions (physical engagement, emotional engagement, cognitive engagement in class, and cognitive engagement out of class). Total engagement is the average of all 12 items. Cronbach alpha reliabilities for each of the subscales ranged from .75 to .92. All survey questions are provided in the appendix.

Control variables

Zepke (2014) calls for increased research on factors like age and gender. Therefore, age and gender were collected and used as controls based on their relationship with both student engagement and technology acceptance.

Results

One-way analysis of variance was used to determine whether there was a significant difference in means of engagement between subgroups. Means, standard deviations, confidence levels, and analysis of variance are presented in Table 1 for each of the four engagement factors and for total engagement.

Table 1 shows that the section with the required Web-based learning system was statistically lower for each of the engagement factors and total engagement. These results do not control for age or gender.

Table 2 shows that older students report having higher physical engagement ($r = .36$), cognitive engagement in class ($r = .31$), cognitive engagement out of class ($r = .30$), and total engagement ($r = .33$). Therefore, there is a moderate, positive correlation between engagement and age in this study.

The relationship between engagement and gender was evaluated using one-way analysis of variance of the means by gender. Table 3 shows that males (4.60) reported having higher physical engagement than females (4.32), but the

Table 1. One-way analysis of variance of means by required component.

Variable	Required component	N	Mean	SD	95% CI lower	95% CI upper	F	Significance
Physical	No	83	4.53	.64	4.39	4.67	17.7	.00**
	Yes	14	3.71	.86	3.22	4.21		
Emotional	No	83	4.19	.87	4.00	4.38	3.88	.05**
	Yes	14	3.69	.96	3.14	4.24		
Cognitive in class	No	83	4.40	.89	4.21	4.60	4.11	.05**
	Yes	14	3.88	.91	3.35	4.41		
Cognitive out of class	No	83	4.25	.98	4.04	4.47	3.20	.08*
	Yes	14	3.74	1.10	3.10	4.37		
Total engagement	No	83	4.35	.70	4.19	4.50	8.32	.01**
	Yes	14	3.76	.75	3.32	4.19		

*p significant at .05 or less. **p significant at .01 or less.

Table 2. Pearson product moment correlations.

Variable	Mean	SD	Age
Physical	4.41	.73	.36**
Emotional	4.12	.89	.13
Cognitive in class	4.32	.91	.31**
Cognitive out of class	4.18	1.01	.30**
Total	4.26	.73	.33**

*p significant at .05 or less. **p significant at .01 or less.

Table 3. One-way analysis of variance of means by gender.

Variable	Gender	N	Mean	SD	95% CI lower	95% CI upper	F	Significance
Physical	male	33	4.60	.67	4.36	4.83	3.11	.08
	female	64	4.32	.75	4.14	4.51		
Emotional	male	33	4.13	.90	3.81	4.45	.01	.92
	female	64	4.11	.89	3.89	4.34		
Cognitive in class	male	33	4.42	.79	4.15	4.70	.56	.46
	female	64	4.28	.96	4.04	4.52		
Cognitive out of class	male	33	4.19	1.09	3.81	4.58	.01	.93
	female	64	4.17	.97	3.93	4.41		
Total engagement	male	33	4.34	.70	4.09	4.58	.53	.47
	female	64	4.22	.75	4.03	4.41		

*p significant at .05 or less. **p significant at .01 or less.

level of significance was only .08. All other engagement factors, including total engagement, did not show statistically significant differences in student engagement. The proportion of females in the mandated tool class was 64.3% and the nonmandated tool sections had 66.2% females. Therefore, no differences were expected between groups based on gender. To ensure gender and age were appropriately controlled in the study, we used hierarchical regression to evaluate model 1 in which gender and age predict the four factors of engagement and total engagement. Model 1 was compared to model 2, in which the mandated learning component was added to help predict

student engagement. Seven students failed to report their age, so only 91 students were included in this analysis.

Table 4 shows that age and gender contribute to approximately 9% of the total variance in total engagement, but only age is statistically significant ($\beta = .33$). Adding the mandated component to model 2 shows that student total engagement decreased ($\beta = -.24$) in the class where the component was required. It was noticed that the strength of the negative effect varied based on engagement factor. The engagement factor that was most significantly affected was physical engagement ($\beta = -.37$), followed by emotional

Table 4. Results of hierarchical regression models of student engagement.

Variable	Total engagement		Physical engagement		Emotional engagement		Cognitive engagement in class		Cognitive engagement out of class	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Gender	.00	.00	-.11	-.12	.03	.03	.00	-.01	.06	.05
Age	.33**	.25*	.35**	.23*	.13	.07	.31**	.26*	.30**	.26*
Mandated component		-.24*		-.37**		-.20+		-.15		-.12
F	5.35**	5.59**	7.12**	10.44**	.78	1.62	4.70*	3.86*	4.46+	3.39*
Degrees of freedom	2, 89	3, 88	2, 89	3, 88	2, 89	3, 88	2, 89	3, 88	2, 89	3, 39
Adjusted R-squared	.09**	.13*	.12**	.24**	.02	.05+	.08*	.09*	.07	.07
Change in R-squared		.04*		.12**		.03		.01		.00

Note. Standardized coefficients reported; n = 91.

+p significant at .10 or less. *p significant at .05 or less. **p significant at .01 or less.

engagement ($\beta = -.20$), cognitive engagement in class ($\beta = -.15$), and cognitive engagement out of class ($\beta = -.12$). These results support our initial proposal. Mandating the use of a Web-based learning system does not always increase student engagement.

Discussion

The results of our study provide empirical evidence that participation is not synonymous with engagement. Implementing course elements that require participation does not guarantee increased student engagement. In fact, one-way analysis of variance of the means showed that every engagement factor was lower in the class with the mandated learning system. Hierarchical regression further showed that this change in student engagement was evident even when controlling for age and gender. Educators therefore need to be mindful that participation is not the same as engagement and that although previous research has shown that Web-based learning technology has increased student engagement in one environment (see Chen, Lambert, & Guidry, 2010), the student determines whether to engage or not.

Entwistle (1991) stated that it was the student's subjective perception of the context and process of the learning environment that matters. The teacher's task is therefore to facilitate the student in constructing his or her views about the subject and the world (Bryson & Hand, 2007) by recognizing that educational activities, supplements, and learning systems are more than tools—they are nonhuman agents in a social environment (Gourlay, 2015). Students therefore make sense of their environment and determine the usefulness and ease of use of every agent in the course, regardless of whether it is human or nonhuman. It could certainly be argued that some students find some of their instructors to not be useful in the learning process and will therefore disengage from the instructor and the course. Similarly, students may find some activities, learning supplements, or systems to be not useful or easy to use and therefore devote less physical, emotional, or cognitive energy toward the class. Based on these findings, we offer eight considerations for educators and two realizations.

Consideration 1—human and nonhuman agents affect student engagement

The social and communal nature of education certainly accounts for some degree of student engagement since students must interact with instructors and fellow students. However, Gourlay (2015, p. 407) says that Actor-

Network Theory (Latour, 2005) challenges the “assumed primacy of human agency, and instead argues that social process unfolds in networks composed of humans and non-human actors.” Our results support this claim, based on decreased student engagement with the Web-based learning system. This does not imply that the use of technology is always bad. Research has shown that there are instructional and programmatic interventions that increase students' active engagement in learning and enhance knowledge (Pascarella & Terenzini, 1991). We urge educators to be mindful of all human and nonhuman agents introduced into the learning environment since each can affect student engagement by affecting the overall social network.

Consideration 2—personal differences affect student engagement

Organizational climate and individual differences likely influence learner engagement through safety, meaningfulness, and availability (Noe, Tews, & Dachner, 2010). Noe et al. (2010) argue that interpersonal dynamics and factors that influence interpersonal dynamics play an important role in student engagement. In this study we chose to look at age and gender since researchers have advocated taking a deeper look at how personal differences affect student engagement (see Zepke, 2014). Our results show that age was significantly related to almost all engagement factors. Older students reported having higher physical engagement, cognitive engagement in class, cognitive engagement out of class, and overall engagement than their younger counterparts. This pattern was repeated even when considering the effects of the Web-based learning system on engagement. Thereby, older students reported being more engaged. Future research should consider whether these changes in engagement are based more on maturity or on intrinsic motivation. Either way, educators are encouraged to consider how individual differences may affect engagement in their classrooms while researchers continue to unravel other important individual differences that affect student engagement.

Consideration 3—using a survey may help increase student engagement

A practical implication that resulted from this study was the realization by the instructor of how much the Web-based learning system was negatively impacting student engagement. Until this survey was administered, the instructor had to rely on intuition about the effects of the Web-based system. The instructor noted

that cognitive engagement in class varied across sections, which led to considering ways to deliver the curriculum, and variance in cognitive engagement out of class caused a review of homework assignments. The result was a more refined observation of student engagement factors and which delivery techniques and activities positively affected student engagement. The survey also provided the instructor with a baseline level of student engagement for each section, to be used to evaluate any changes to curriculum activities or curriculum delivery techniques. We therefore, urge educators to consider using a student engagement survey to evaluate the student's perception of student engagement to help guide future course changes.

Consideration 4—physical engagement is important

A major contribution of this study is the identification of four distinct engagement factors and the effects caused by a Web-based learning system. The first factor we examine is physical engagement. The Burch Engagement Scale for Students (BESS) assesses student physical engagement by asking students to respond to their level of intensity, effort, and energy that they dedicate to the course. As such, there is a realization that students have many demands on their physical energy, while at the same time acknowledging that all exerted energy is not always openly evident to the instructor. Results from hierarchical regression showed that the mandated Web-based learning system affected physical engagement more than the other factors. Our study showed that an additional 12% of the variance in student physical engagement could be explained by whether the mandated component was present. This means that the policy to require students to use the Web-based learning system actually caused the students to put less effort and energy into the class. However, this is just one of the four student engagement factors measured.

Consideration 5—emotional engagement matters

Simpson and Marshall (2010) stated that one area of interest that has received little attention was the connection between emotion and learning. This is especially true since organizational scholars and neuroscientists have suggested that people learn more effectively when they are emotionally engaged (Taylor & Statler, 2014). Zull (2006) even goes so far as to say that emotion is the foundation of learning since chemicals of emotion modify the learning cycle. Research has shown that learning activities activate student

feelings, and thereby students create a level of emotional engagement based on their assessment of the activity (Harper & Quaye, 2009). Student (co-)reflexivity is therefore important and should be considered when developing activities (see Kahn, 2014). The question therefore becomes, "Which activities affect emotional engagement?" Wolfe (2006) said that one means of changing the emotional stakes for students was to use simulations, role-plays, and real-life problems. In our study student age and gender accounted for 2% of the variance in emotional engagement. Adding the mandated Web-based learning component increased the explained variance by another 3%. Based on our study, the mandated Web-based program affected physical engagement ($\Delta r^2 = .12$) more than emotional engagement ($\Delta r^2 = .03$).

Consideration 6—cognitive engagement in class should be deliberately managed

Many of the recent recommendations on how to improve student engagement are aimed at increasing cognitive engagement in the classroom. In this study we were able to parse out this student engagement factor to demonstrate that it is conceptually different than emotional engagement and physical engagement. In fact, hierarchical regression demonstrated that cognitive engagement in class was less affected by the learning system than physical or emotional engagement. Age was significantly more important than the Web-based learning program at predicting student cognitive engagement in the class. This finding indicates that older students may be more resilient in adding nonhuman agents than younger students. Educators could possibly leverage these findings by focusing on adding activities aimed at younger students, since the older students may maintain their levels of cognitive engagement in class regardless of the nonhuman agents.

Consideration 7—cognitive engagement out of class should be deliberately managed

Our findings on cognitive engagement out of class are very similar to those on cognitive engagement in class. Age affects cognitive engagement out of class more than the added nonhuman agents do, at least in this study. We believe that identifying cognitive engagement out of class as an important factor supports the belief that there are many student engagement behaviors that are private, silent, unobserved, and solitary (Gourlay, 2015). One observation by the instructor in this study was that the choice of exercises and homework assignments created a situation where student

engagement out of class was always lower than engagement in class. Students were perhaps more entertained in class, but were not encouraged to go as far with their studies when the instructor was not present. The instructor is already making changes to curriculum based on this observation. A second observation is that the Web-based learning system was supposed to significantly increase student learning activities out of the classroom. Educators are urged to evaluate the claims of educational supplement vendors to ensure that empirical results focus on student engagement rather than student participation. The results of our study would have been significantly different if we had evaluated the number of hours the student participated with the Web-based learning system instead of asking them to evaluate their level of engagement.

Consideration 8—activities may affect all four engagement factors differently

This study was aimed at determining whether adding a Web-based learning system would increase student engagement. Our results showed that this nonhuman agent actually caused physical and emotional engagement to decrease. Cognitive engagement in class and out of class were more closely associated with student age. These findings are therefore valuable to educators since they demonstrate how student personal differences influence their perception of nonhuman agents, and therefore all four factors of student engagement. We urge educators to consider these findings when implementing new activities. We also encourage administrators to consider these findings when developing new policies designed around mandated curriculum content or delivery. Students are the ultimate consumers of this curriculum and they will be the ones that determine their level of engagement. A final urge is made to researchers to consider all four student engagement factors in future research and to not mistake participation for engagement.

Realization 1—faculty members matter in student engagement

Educators clearly have a large role to play in fostering student engagement (Axelson & Flick, 2010; Zepke & Leach, 2010) since they have complete control over the ease of interaction, emphasis of interaction, and classroom dynamics (Arbaugh, 2000). Our findings do not support the belief that learning is principally the responsibility of the instructor, who becomes less an imparter of knowledge and more a designer and facilitator of learning experiences and opportunities (Smith,

Sheppard, Johnson, & Johnson, 2005). Umbrach and Wawrzynski (2005) empirically found that faculty interactions with students increased student engagement. Educators have a tremendous burden to evaluate student engagement and make curriculum content and delivery changes to increase all four factors of student engagement. Educators should maintain a balanced realization that even the best pedagogical innovations do not always make students do their best, because some students are not responsive to such interventions (Honkimaki, Tynjala, & Valkonen, 2004).

Perhaps one means of increasing responsiveness is to tie grades to the actual desired learning outcome. Bradley and his colleagues found that students put more time and energy into learning concepts when the grade was based more on conceptual understanding (Bradley, Burch, & Burch, 2015). In this study, participation may have increased since the grade was somewhat tied to participation. The educator's role in education should start with defining the learning objectives and rewarding students for achieving those goals through feedback/grades. The true question for implementation of Web-based learning programs may reside in how programs are used and how the student is rewarded for using them.

Another recommendation for educators is that the level of support shown by the educator for a Web-based program may significantly affect the student's level of engagement. We did not consider this in our study, but have recognized the role of the educator more fully since completing the study. Future studies should evaluate whether the educator's level of support affects student engagement in mandated programs.

Realization 2—students matter the most in student engagement

Bryson and Hand (2007) argue that student engagement is a result of the student's perception and their experience. True student engagement may therefore come from activating the learner's personal stance so that learner takes on the role of active agent in society, and in his or her learning (Mann, 2001). Therefore, a key component of higher levels of student engagement is based on self-sufficiency of the student and less dependent on the teacher (Ramsden, 2003).

This may be exceptionally true for Millennial learners. This new generation of learners has been characterized as technologically competent, optimistic, and group oriented, with a propensity for multitasking, a reliance on electronics, and a need for immediate feedback (Beard & Dale, 2008; Pardue & Morgan, 2008). Millennial learners will undoubtedly perceive

educational human and nonhuman agents differently than their older counterparts. This may require educators to move toward greater integration of the student in the learning project (Conklin, 2012), to make learning more student driven and less instructor driven.

The real answer for student engagement may actually come from the student's perceived usefulness of the Web-based system. It is possible that student engagement may have similar connections with the technology acceptance model whereby adoption of the technology is based on perceived usefulness. Future research should therefore consider the student's perceived usefulness of such learning technology.

Conclusion

This study was designed to take a look at whether the decision to mandate a Web-based learning system would increase student engagement. Our results fill an important gap in the engagement literature by demonstrating that participation does not equate to engagement. In this case the learning system caused students to be less emotionally engaged and less physically engaged. Our results also provided empirical evidence that individual differences affect student engagement and that student perception of nonhuman agents is affected by age. Based on these findings we offered eight considerations for educators, administrators, and researchers. We specifically developed five of these considerations to illustrate that student engagement is composed of physical engagement, emotional engagement, cognitive engagement in class, and cognitive engagement out of class. We are aware that our study only used one instructor and the implementation of one nonhuman agent. Our results are therefore most valuable to the students in the classroom where the Web-based learning system was mandated. We propose that a major contribution of this study is the revelation that measuring student engagement at the class level is easily accomplished and provides valuable insight for educators. Using this approach will allow educators to make deliberate changes to curriculum content and delivery and then empirically determine whether they have increased student engagement or simply increased student participation.

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Appendix

Abbreviated Burch Engagement Scale for Students (A-BESS) (Burch, Heller, Burch, Freed, & Steed, 2015):

All questions were 5-point Likert scaled with *agree* and *disagree* as the anchors.

Physical engagement

- I exert my full effort towards this class/course.
- I devote a lot of energy towards this class/course.
- I try my hardest to perform well for this class/course.

Emotional engagement

- I feel energetic when I am in this class/course.
- I feel positive about the assignments I complete in this class/course.
- I am excited about coming to this class/course.

Cognitive engagement in class

- When I am in the classroom for this class/course, my mind is focused on class discussion and activities.
- When I am in the classroom for this class/course, I pay a lot of attention to class discussion and activities.
- When I am in the classroom for this class/course, I concentrate on class discussion and activities.

Cognitive engagement out of class

- When I am reading or studying material related to this class/course, my mind is focused on class discussion and activities.
- When I am reading or studying material related to this class/course, I pay a lot of attention to class discussion and activities.
- When I am reading or studying material related to this class/course, I concentrate on class discussion and activities.