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Personal Technology in the Classroom: Evaluating Student Learning, Attention, and Satisfaction

Christina Long Iluzada, Baylor University, christina_iluzada@baylor.edu
Robin L. Wakefield, Baylor University
Allison M. Alford, Baylor University

Abstract: College instructors desiring classrooms free from learning distractions often enforce personal-technology-use policies to create what they think is an optimal learning environment, but students tend not to favor restrictive personal technology policies. Which type of personal technology classroom environment maximizes student satisfaction, learning, and attention? We surveyed 280 business communications students in two types of classrooms: a personal technology-restricted environment and a free-use environment. We evaluated student perceptions of cognitive learning, sustained attention, and satisfaction with the course as well as the technology policy governing their classrooms. Students believed they achieved greater cognitive learning in non-restricted personal technology classrooms and perceived no significant difference in sustained attention. Although students may be more satisfied with a free personal-technology-use policy in the classroom, overall satisfaction with the course did not significantly differ according to the classroom environment. We discuss the importance of sustained attention and policy satisfaction for enhancing student course satisfaction in classrooms with both technology policy types.

Keywords: classroom environment; cognitive learning; course satisfaction; personal-technology-use policy; sustained attention

Ask any professor about distractions in the undergraduate classroom and they will likely respond with a tale of woe related to students' personal technology use. In her book, *Reclaiming Conversation*, MIT sociologist Sherry Turkle (2015) laments the misuse of communication devices such as smart phones and asserts that due to distractions caused by students' personal technology, many professors enforce a device-free classroom policy (p. 15). Turkle believes that students appreciate restrictive personal-technology policies and admits to enforcing these policies in her classes (p. 121). Indeed, college instructors are concerned that students' use of personal technology (e.g., laptops, smart phones, and tablets) unrelated to the course content distracts them and diminishes their ability to learn. We investigate students' cognitive learning, sustained attention, and course satisfaction in restricted and unrestricted personal-technology-use

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classrooms and offer recommendations to manage the tension between students' preferences and instructors' desire for effective learning environments.

The Relationships Between Personal Technology, Attention, and Learning

Confirming instructors' anecdotal experiences, research indicates students' personal technology use may hinder focus and attention in the classroom. Multitasking often impairs sustained attention, especially during complicated tasks (Wood et al., 2012), and students who frequently text during class time have difficulty sustaining attention with in-class activities, which could impede learning (Wei et al., 2012). Texting during lectures appears to lower students' ability to recall information (Barks et al., 2011; Clayson & Haley, 2012; Rosen et al., 2011). Distracting devices may also challenge students' ability to maintain attention while studying course materials. Researchers found students study on task an average of five to six minutes before switching to a technological distraction (Rosen et al., 2013). It is likely that technology distractions contribute to attention residue (i.e., lingering cognitive activity impairing performance) when students switch between schoolwork and their devices (Leroy, 2009).

Students' lack of focus is particularly problematic because learning generally occurs when students exhibit sustained attention (Wei et al., 2012). Conversely, multi-tasking with personal technology in class hinders or, at least, slows learning (Rosen, 2010; Sana et al., 2013; Wood et al., 2012) because attention is not sustained. Grades, which are used as a measure of cognitive learning (Bloom et al., 1956), often suffer when a student is distracted. Multiple studies show student grades decline when students text, post to social media, or multi-task during schoolwork, due to the distractions inherent in these activities (Barks et al., 2011; Kuznekoff & Titsworth, 2013; Martin, 2011; Sana et al., 2013; Wood et al., 2012). Together, the research suggests personal technology use in undergraduate classrooms can be detrimental to student learning.

Students are not uniform in their beliefs about their personal technology use and distraction. Some admit to being distracted and having their learning compromised while texting or when nearby classmates text (Tindell & Bohlander, 2012), and others indicate laptop and cell phone use in class negatively affects their concentration (Attia et al., 2017). In contrast, students also believe smart phone use in class is not detrimental to their academic performance (Berry & Westfall, 2015; Braguglia, 2012; Tindell & Bohlander, 2012), and laptop use supports their learning, citing twice as many benefits as challenges (Kay & Lauricella, 2011). Indeed, mobile technology has also been found to serve educational purposes (Villena

Martinez et al., 2021) and has potential to enhance academic performance (Qi, 2019). Students can use their devices for course-related purposes such as note-taking, searching for examples or images of something discussed in class, or defining a term. For students with disabilities, personal devices can be a vital aid for learning. These devices enable students, for example, to view the professor’s presentation (Camacho et al., 2017), create audio recordings (Barbetta et al., 2021), or cope with attention disorders (Ariel & Elishar-Malka, 2019). Potentially, the differences in student perceptions and outcomes may be attributed to the goal of technology usage, be it personal or classroom oriented.

When students are directly surveyed about perceptions of their learning and attention related to their devices and prohibitive technology policies, they respond that they prefer to access their personal devices during class. Prohibitive policies are typically unacceptable to students (Gikas & Grant, 2013; Jackson, 2013; Stowell et al., 2018) and negatively affect students’ opinions about their instructors and classes. Professors enforcing prohibitive policies are regarded as less relevant (Gikas & Grant, 2013), and this attitude compromises professors’ rapport with students (Stowell et al., 2018). Although some students favor policies limiting device use to prevent distractions (McCoy, 2013), others indicate that no-technology environments are boring (Rosen, 2010). Students also value their autonomy and prefer not to turn off their devices in class (Santos et al., 2017), particularly if they are not distracting (Tindell & Bohlander, 2012), and believe their devices contribute to learning (Braguglia, 2008; Kay & Lauricella, 2011; Kuznekoff & Titsworth, 2013). While students favor policies that allow access to personal technology, their reasons may not be wholly related to learning.

Students’ reliance on mobile devices reflects a burgeoning shift in forces outside of instructors’ control. Recent research has shown that humans desire quick access to their mobile devices, even when inactive (Schaposnik & Unwin, 2018), for reasons such as maintaining immediate connection to friends and family as well as mitigating feelings of anxiety and security. Not unlike adult pacifiers, technology owners often turn to their smartphones for comfort and stress-relief (Melumad & Pham, 2020). It is no wonder, then, that students’ preference is for access to personal technology during class time.

With mixed recommendations, instructors struggle to create effective personal- technology-use policies for the classroom. Instructors may not know the best personal technology policy to implement to maximize the effectiveness of the learning environment. If they enforce a prohibitive personal-technology-use policy to create an environment more conducive to attention, they may suffer professionally from negative student evaluations, and students may miss opportunities for note-taking and other productive personal technology behaviors. We explore this tension by evaluating student perceptions of the effect of their classroom environment on their cognitive learning, sustained attention, and satisfaction. Some research questions guiding our study include the following: Which type of personal-technology classroom environment promotes attention, cognitive learning, and student satisfaction? Should instructors implement a free personal-technology-use policy to increase student attention and satisfaction? Do students believe their attention and learning suffer in classes with a free personal-technology-use policy? Are students less satisfied with a course when a restrictive technology-use policy governs the classroom?

Theory and Hypotheses

Stimulus-Organism-Response theory (SOR) (Mehrabian & Russell, 1974) proposes that an environmental stimulus elicits both affective and cognitive reactions that influence individuals’ attitudes and behaviors. That is, a stimulus prompts both emotions and beliefs, and these affect individuals’ attitudes and actions. SOR theory is applicable to our study because a personal-technology-use policy in the classroom, whether restrictive or unrestrictive, is an environmental stimulus that prompts students’ reactions specifically (i.e., toward the policy) and more broadly (i.e., toward the course). The study of students’ perceptions is important because they influence students’ evaluations of the overall learning experience. Thus, students’ feelings and beliefs about a technology use policy will influence satisfaction toward the policy as well as other aspects of the course such as learning and attention.

Researchers find learning occurs when students are focused (Wei et al., 2012), distractions are minimal, attention is engaged, and the environment is optimized for learning. However, students indicate that they experience boredom in no-technology environments (Rosen, 2010), which may trigger distracting thoughts and daydreaming to relieve boredom. Thus, if technology engages students’ attention, a classroom governed by an unrestricted personal-technology-use policy may be viewed as more interesting and stimulating. Students may perceive their cognitive engagement with personal technology during class as participation in class content or learning. If a technology-inclusive classroom is deemed more appealing, stimulating, and engaging, students are likely to believe greater cognitive learning occurs. Also, students with disabilities can use apps and browser extensions on personal devices to facilitate their learning (Ariel & Elishar-Malka, 2019; Barbetta et al., 2021; Camacho et al., 2017). Therefore, we propose the following hypothesis:

> H1: Students in a personal-technology-inclusive classroom will perceive greater cognitive learning compared to students in a personal-technology-prohibited classroom.

Research indicates personal technology use in class is a hindrance to students' focus and attention. Text messaging, for example, introduces stimuli that interfere with sustained attention and learning (Wei et al., 2012). Students themselves believe personal technology devices negatively affect sustained attention (Attia et al., 2017), and some students favor policies limiting device use to prevent distractions (McCoy, 2013). Additional studies find student grades suffer when they multitask with personal technology because it distracts them (Barks et al., 2011; Kuznekoff & Titsworth, 2013; Martin, 2011; Sana et al., 2013; Wood et al., 2012). Personal device use also challenges students' ability to maintain attention while studying (Rosen et al., 2013), and when students shift attention between schoolwork and technology use, cognitive ability may be impaired and hinder academic performance (Leroy, 2009). Prior research suggests free access to personal technology will impede focused, sustained attention. Thus, we hypothesize students will believe their ability to achieve sustained attention is negatively affected in permissive personal-technology classrooms:

> H2: Students in a permissive personal-technology classroom will perceive lower sustained attention compared to students in a prohibited personal-technology classroom.

In a study conducted in an online classroom setting, Bradford (2011) found cognitive load and course satisfaction were moderately correlated. As learning becomes less burdensome, students are more satisfied with the course. It is likely that personal-technology-inclusive classrooms contribute to perceptions of greater cognitive load because students' sustained attention is compromised by their technology use (Attia et al., 2017) as it interrupts their attention (Rosen et al., 2013) and contributes to multitasking behavior. Sustained attention is associated with the state of flow, or effortless attention, and is significantly related to enjoyment (Csikszentmihalyi & Nakamura, 2010). Thus, when one is easily and continuously attentive, the experience is enjoyable and likely perceived as satisfying. Teachers who facilitate students' sustained attention generally achieve greater numbers of positive student evaluations (Titus, 2008), an indication of student satisfaction. Because sustained attention is associated with content engagement, ease of learning, and enjoyment, we believe students will be less satisfied with classrooms inclusive of personal technology. Thus, we hypothesize the following:

> H3: Students in a personal-technology-inclusive classroom will indicate lower course satisfaction compared to students in a personal-technology-prohibited classroom.

Instructor-created policies governing personal technology use in the classroom are initiated to reduce student distraction and create an environment conducive to student focus and learning. Instructors generally determine what personal technologies are permissible and the allowed uses of those technologies. For example, smart phones may be allowed in class in an inactive state and laptops may be banned altogether. In general, students perceive the freedom to use their devices in class enriches and contributes to their learning (Braguglia, 2008; Kay & Lauricella, 2011; Kuznekoff & Titsworth, 2013; Qi, 2019; Villena Martinez et al., 2021). Also, studies have shown that students who need learning accommodations may benefit from access to their devices (Ariel & Elishar-Malka, 2019; Barbetta et al., 2021; Camacho et al., 2017). Therefore, students are likely more satisfied with a liberal personal-technology-use policy that provides them autonomy. In contrast, lower policy satisfaction is likely if students perceive unnecessary restrictions or bans on their freedom to use personal technology in class. Thus, we hypothesize the following:

> H4: Students in a personal-technology-inclusive classroom will indicate greater satisfaction with their technology use policy compared to the students in a personal-technology-prohibited classroom.

Methods

Participants

Business communications instructors at a large, private, southwestern university were involved in this cross-sectional field study. The study took place over two semesters in which half of the classes enforced a prohibitive personal-technology-use policy and the other half a non-prohibitive personal-technology-use policy. At the outset of each semester, students in both classroom environments participated in the same discussion regarding the potential disadvantages of personal technology use in the workplace, specifically its hindrance to interpersonal communication, concentration, and attention. Research has shown that the language used in higher education, particularly in syllabi, can impact the way students learn (Howton, et al., 2020; Kenney & Sreckovic, 2019). Therefore, the syllabus for each class stated the personal-technology-use policy governing the class, and this statement was emphasized on the first day of the course.

In classes prohibiting personal technology use, students in violation of the policy received a written notification containing the sanctions for policy violation, which was a warning email for the first offense and a tardy on each day of each additional offense. The attendance policy counted two tardies as an absence and stipulated that students would automatically fail the course if they exceeded the maximum allowed absences. The policy also detailed the link between personal technology use and distraction in the workplace and the value of technology-free zones for strengthening interpersonal communication and relationship-building with colleagues. No sanctions existed in the free personal-technology-use policy classes, and students were merely cautioned to use their personal technology wisely.

We developed a survey in Qualtrics software and provided students with online access to it during class at the end of the semester (see Appendix A). The survey took approximately 10 minutes to complete, and participation was optional with no associated benefits for completion. The data were downloaded into SPSS software for analysis. A total of 280 students participated in the survey with 137 in the technology-restricted classes and 143 in the unrestricted classes. The descriptive statistics of the students in each classroom environment are shown in Table 1. Participants completed the "revised learning indicators scale" (Frymier & Houser, 1999) to measure cognitive learning and the sustained attention scale (Wei et al., 2012). Each of these used a 1–7 Likert type scale anchored by strongly disagree to strongly agree. The generalized satisfaction scale measurement (Crosby & Stevens, 1987) used a 1–7 polar opposite scale of adjectives such as unfavorable-favorable and dissatisfied-satisfied.

Table 1

Respondent Descriptive Statistics

Personal-Technology-Use Policy Type	Prohibitive		Non-Prohibitive	
	n	%	*n*	%
Gender				
Male	72	53%	94	66%
Female	65	47%	49	34%
Age				
19-20 years	27	20%	37	26%
21-22 years	89	65%	91	64%
>22 years	21	15%	15	10%
Classification				
Sophomores	28	21%	31	22%
Juniors	91	67%	92	64%
Seniors	18	12%	20	14%
Ethnicity				

Asian/Pacific Isle	11	8%	14	10%
African American	10	7%	9	6%
Hispanic/Latino	11	8%	14	10%
White	102	75%	101	71%
Other	3	2%	5	2%

Results

First, we evaluated the measurement items to determine the reliability and validity of the research constructs. Table 2 shows construct reliability, validity, and correlations. Construct composite reliabilities (CR) range from 0.89 to 0.98 and Cronbach's alpha (ɑ) range from 0.84 to 0.98. Each reliability measure exceeds the recommended 0.70 threshold (Nunnally & Bernstein, 1994). We evaluated convergent validity and discriminant validity using the average variance extracted (AVE) and Fornell-Larcker criterion, respectively. Each AVE exceeded the recommended 0.50 threshold (Fornell & Larcker, 1981), and each bolded element on the diagonal in the correlation table is larger than its associated off-diagonal elements. The factor loadings of each item and descriptive statistics are shown in Appendix A. Overall, the constructs demonstrate good internal consistency, reliability, and validity.

Table 2

Reliability, Validity and Construct Correlations

Variable	CR	ɑ	AVE	1	2	3	4
1. Cognitive Learning	.91	.88	.55	**0.739**			
2. Sustained Attention	.89	.84	.67	0.688	**0.818**		
3. Policy Satisfaction	.98	.98	.91	0.321	0.383	**0.955**	
4. Course Satisfaction	.97	.96	.82	0.363	0.495	0.406	**0.903**

Note: CR = Composite Reliability; ɑ = Cronbach's Alpha; AVE = Average Variance Extracted. **Bolded** numbers on the diagonal are the square root of the AVE.

We used analysis of variance (ANOVA) to evaluate the hypotheses by analyzing the differences in student responses between those in the prohibitive and non-prohibitive personal-technology-use classrooms. The results are shown in Table 3. H1 is supported in that the mean for cognitive learning in classes prohibiting personal technology ($M = 5.11$, $SD = 1.21$) is significantly lower ($F = 7.002$, $p = 0.01$) compared to non-prohibitive classes ($M = 5.46$, $SD = 0.97$). However, the data do not support H2. There is no difference in perceptions of sustained attention between students in the restricted classes ($M = 5.00$, $SD = 1.37$) compared to those in the unrestricted classes ($M = 5.08$, $SD = 1.15$). H3 was also not supported. Perceptions of course satisfaction were not statistically different ($F = 2.276$, $p = 0.13$) among students in the personal-technology-restricted ($M = 5.22$, $SD = 1.32$) and unrestricted ($M = 5.46$, $SD = 1.30$). H4 is supported in that student satisfaction with their classroom technology policy is significantly different ($F = 20.405$, $p = 0.000$). Students in the unrestricted classes viewed their technology use policy more favorably ($M = 5.24$, $SD = 1.49$) compared to students with restrictive policies ($M = 4.84$, $SD = 1.55$).

Table 3

Hypotheses Results and ANOVA Tests

	Prohibitive Personal-Technology-Use Policy (N = 137)		Non-Prohibitive Personal-Technology-Use Policy (N = 143)		Significance Test	Hypothesis Support
	M	*SD*	*M*	*SD*		
H1: Cognitive Learning	5.11	1.21	5.46	0.97	F = 7.002 p = 0.01	Supported
H2: Sustained Attention	5.00	1.37	5.08	1.15	F = 0.284 p = 0.59	Not Supported
H3: Course Satisfaction	5.22	1.32	5.46	1.30	F = 2.276 p = 0.13	Not Supported
H4: Policy Satisfaction	4.84	1.55	5.24	1.49	F = 20.405 p = 0.00	Supported

Discussion

The objective of our study was to understand student perceptions to manage the tension between students' preferences to use personal technology in class and instructors' commitment to classroom environments conducive to learning.

Our first hypothesis (H1) questions whether students believe they learn better in a classroom environment where they may access their personal technology. The findings suggest this is the case. Students in classes allowing unprohibited personal technology use believe they achieved *greater* cognitive learning compared to students in the technology-restricted classrooms. As shown in Appendix A, the means for each of the eight items measuring cognitive learning are greater for students in non-restricted classrooms. Students in non-restricted classes were also asked about the use of specific technologies. On a 1–7 Likert-type scale anchored by strongly disagree to strongly agree, the mean scores for "Using a smartphone in this class facilitated my learning in class" was 4.03 and "Using a laptop in this class facilitated my learning in class" was 4.15, both above the midpoint. It appears that students' assessment of their learning was not diminished in classes with a free personal-technology-use policy.

Based on students' discernment, there is no evidence that a technology-prohibitive classroom contributed to greater cognitive learning. It may be that students' freedom to access their devices during class contributes to how well they learned. Students who used personal technology in class to look up terms, phrases, and concepts for greater clarity, for example, are likely to achieve greater learning. Additional research is necessary to determine *how* and *why* students used their personal technology in-class to determine its effect on actual learning. Nevertheless, students with in-class accessibility to their devices, whether they used them or not, are more likely to think they achieved greater learning.

It should be welcome news to instructors that students generally do not believe their sustained attention is compromised in classrooms with free access to personal technology. The results of H2 indicate no evidence to conclude that students believe their sustained attention is greater in a technology-prohibited classroom. While instructors are concerned with diminished attention caused by personal technology use in the classroom, students in a permissive-technology environment did not perceive more difficulties related to attention and focus compared to students in a restricted-technology environment.

Additionally, no support was found for differences in students' course satisfaction between the two classroom environments ($F = 2.276$, $p = 0.13$). At a liberal level of significance ($p = 0.13$), students in classes with freedom to use personal technology may tend to be more satisfied with their course ($M = 5.46$) compared to students in technology-restricted classes ($M = 5.22$). We expected students in the technology-restricted classes would be more satisfied because the absence of technology distractions would increase their focus and attention, creating a more enjoyable learning environment. However, the presence or absence of personal technology did not appear to hinder course satisfaction in our study.

Unsurprisingly, students prefer an unprohibited personal-technology-use policy governing the classroom as stated in our fourth hypothesis (H4). Students are significantly more satisfied with a policy in which they have freedom to choose to use their devices rather than a policy with sanctions for using them. It may be that students prefer having control over their in-class actions rather than restrictions and sanctions that remove control.

Post-Hoc Regression Analysis

Regression analyses were performed to determine the factors significantly contributing to course satisfaction among students in classes governed by the restricted and unrestricted personal-technology-use policies. Course satisfaction was input as the dependent variable and cognitive learning, sustained attention, and policy satisfaction were input as determinants of course satisfaction for each classroom environment. In the technology-restricted classes ($N = 137$), sustained attention ($t = 3.937$, $p < .001$) and policy satisfaction ($t = 3.407$, $p < .001$) were significantly related to course satisfaction, explaining 31.7 percent (adjusted R^2) of the variance in course satisfaction. In the unrestricted classes ($N = 143$), sustained attention ($t = 2.763$, $p < .01$) and policy satisfaction ($t = 2.991$, $p < .01$) were also significantly related to course satisfaction. However, these factors explained only 19.7 percent (adjusted R^2) of the variation in students' satisfaction. This indicates that in technology-restricted classrooms, students give more weight to the technology constraints and how well their attention is maintained. This may put added pressure on instructors in technology-restricted environments to develop policies acceptable to students and design courses that sustain students' attention.

Implications

The results of this study provide clear depictions of students' perceptions regarding personal technology use in the classroom. Some of the key take-aways from our study include the following:

1. Students believe they achieve greater cognitive learning in a classroom environment with unfettered access to personal technology. For students with differing abilities, access to personal devices may provide a vital learning aid.
2. In both classroom environments, students indicated similar ability to focus and sustain attention. Classrooms allowing the free use of

personal technology do not appear to compromise student attention.

3. Students in restricted and non-restricted personal-technology-use environments tend to be similarly satisfied with their course.
4. Students are more satisfied with a non-prohibitive personal-technology-use policy compared to a classroom policy restricting personal device use.
5. In both types of classroom environments, sustained attention and the technology policy are important factors in students' satisfaction with the course. However, they are more important determinants of course satisfaction in classes with restrictive policies.
6. Among the constructs we measured, the dominant driver of course satisfaction in either classroom environment is students' sustained attention.

The results show that the classroom technology environment has important consequences for instructors. Achieving balance in creating a classroom that maximizes student learning and accommodates students' need for control over personal technology use is an ongoing challenge. An important practical application tip for instructors to consider when crafting a personal technology policy and creating a course's learning environment is to shift the thinking from "getting their attention back from devices" to "keeping their attention through sustained engagement." Students desire to take classes with professors who can hold their attention and rate those courses more favorably (Titus, 2008). Attention is connected to enjoyment, and enjoyment affects students' evaluations of their learning (Titus, 2008). Learner-centered classrooms, those that place utmost importance on the needs of the students, have been shown to create a positive impact on evaluations of teaching-presence and encourage students to participate in their own learning (Stover et al., 2019). The more a teacher can design a course to engage and maintain the attention of the students, the better. Yet, our results provide no indication that students perceive one type of personal-technology environment as more attention sustaining than the other.

Other research indicates students negatively view prohibitive personal-technology-use policies and/or the teachers who enforce them (Gikas & Grant, 2013; Jackson, 2013; Stowell et al., 2018), and our findings likewise show that students are more satisfied with a free-use policy. However, a prohibitive personal-technology-use policy is not necessarily detrimental to course satisfaction if students believe their instructor is effective in maintaining their attention. An instructor's effectiveness in sustaining student attention may overcome a student's dissatisfaction with the personal-technology-use policy. Additional research is warranted to examine this relationship. However, we suggest it would be wise to accommodate students' desire for freedom and control in a classroom policy. Rather than technology bans, instructors should consider de-emphasizing restrictions on personal technology usage while maintaining effective instructor-directed, application-oriented classroom activities, which help get—and sustain—students' attention (Samson, 2010), an important contributor to students' course satisfaction.

Our analyses did not indicate that students believed they learned more in a setting with a restricted personal-technology-use policy. Pink (2009) asserts that successful management in the twenty-first century "resists the temptation to control people" and instead "reawaken[s] their deep-seated sense of autonomy" (p. 89). Trusting adult students to know their best learning style and use personal technology to their benefit creates a shared responsibility between instructor and student. Providing students with control over personal technology use in class is a superior pedagogical move if instructors optimize in-class activities to maintain and sustain student attention for enhanced learning.

Limitations and Recommendations for Further Research

The present study had notable limitations due to its scope. These data were based solely on multiple sections of a business communications course and students' perceptions of satisfaction, sustained attention, and cognitive learning. Though an established scale was used to measure cognitive learning, students' actual grades were not included in the analyses. Past research indicates that when students multitasked using personal devices, their exam grades were lower, though their perceptions of their learning did not reflect that reality (Ravizza et al., 2014), a phenomenon we were not able to capture. Future studies could include grades in the evaluation of cognitive learning in conjunction with students' perceptions. Additionally, future research might compare grades between classes prohibiting the use of personal technology and classes with lenient personal-technology policies. If greater internet usage in class is associated with poorer scores (Ravizza et al., 2014), it would be useful to know if a prohibitive personal-technology-use policy positively affects students' grades.

Additional research could also clarify effective boundaries for in-class technology use that contributes to student learning. Implementing restrictive policies may not actually prevent students from using their devices but will remove opportunities to incorporate these devices into teaching methodologies (Santos et al., 2017) and reduce autonomy that empowers students to choose learning over distraction. Presumably, students will use personal technology regardless of policy. For example, Clayson and Haley (2012) found 49 percent of students texted in a class despite a prohibitive technology policy.

Further research is also necessary to determine the types of courses in which prohibitive personal-technology-use policies support learning. While the hands-on, activity-based business communications classroom may benefit from a lenient personal-technology-use policy, this result is not generalizable to all types of classroom environment and curricula. Depending on a course's structure, the ability to use personal technology in the classroom may influence students' satisfaction with the course.

Conclusion

As college instructors consider how to create the best classroom environment to facilitate learning and student satisfaction, we suggest they de-emphasize personal technology restrictions. Instead, instructors should devote their energies to vying for students' sustained attention by encouraging student participation, creating engaging classroom activities, and providing students with meaningful opportunities to learn while balancing their need for autonomy related to personal technology use.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

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Appendix A

Survey Items, Descriptive Statistics, and Factor Loadings

Survey item	Prohibitive Personal-Technology-Use Policy (N = 137)		Non-Prohibitive Personal-Technology-Use Policy (N = 143)		Factor Loading
	M	*SD*	*M*	*SD*	
Factor 1: Cognitive Learning					
1. I actively participated in class discussions.	5.50	1.51	5.91	1.15	.691
2. I talked with my family and/or friends about what I was doing in the class.	4.72	1.79	5.08	1.68	.732
3. I explained course content from the class to other students.	4.63	1.67	5.03	1.54	.751
4. I volunteered my opinion in class.	5.43	1.58	5.59	1.42	.632
5. I thought about the course content outside of class.	5.12	1.70	5.50	1.31	.809
6. I see connections between the course content and my career goals.	5.54	1.55	5.84	1.16	.797
7. I review the course content for the class.	4.63	1.56	4.98	1.55	.679
8. I compare the information from this class with other things I have learned.	5.30	1.39	5.71	1.27	.804
Factor 2: Sustained Attention					
1. I feel I have learned a lot in this class.	5.35	1.59	5.59	1.29	.831
2. I never shifted my attention to other non-task oriented activities during the class.	4.26	1.77	4.10	1.75	.734
3. I could sustain my attention to learning activities during this class.	5.17	1.59	5.28	1.46	.833
4. I paid full attention to class discussions.	5.24	1.54	5.36	1.27	.871
Factor 3: Class impressions					
1. Dissatisfied…Satisfied	5.34	1.38	5.63	1.40	.899
2. Displeased…Pleased	5.23	1.44	5.55	1.35	.904

3. Unfavorable…Favorable	5.31	1.62	5.55	1.43	.933
4. Unpleasant…Pleasant	5.12	1.48	5.54	1.45	.904
5. I didn’t like it at all…I liked it very much	5.12	1.52	5.24	1.46	.905
6. Frustrated…Contented	5.12	1.57	5.38	1.62	.890
7. Terrible…Delighted	5.07	1.31	5.31	1.31	.889
Factor 4: Policy impressions					
1. Dissatisfied…Satisfied	4.98	1.63	5.61	1.41	.955
2. Displeased…Pleased	4.80	1.63	5.66	1.38	.972
3. Unfavorable…Favorable	4.83	1.66	5.61	1.44	.958
4. Unpleasant…Pleasant	4.83	1.67	5.70	1.41	.957
5. I didn’t like it at all…I liked it very much	4.71	1.71	5.51	1.41	.943
6. Frustrated…Contented	4.98	1.58	5.67	1.35	.944
7. Terrible…Delighted	4.74	1.54	5.56	1.39	.956