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The Relative Influence of Faculty Policies and Classroom Norms on College Students' Distracted Technology Use

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Abstract
We explored two competing explanations for what determines whether college students will engage in non-academic technology use (NATU). First, students may look to their peers to gauge the acceptable classroom technology norms. Second, students may regulate their NATU based on faculty technology policies. In this pre-registered study, a total of 259 students from 39 universities completed an online survey that included questions asking about the number of peers in their classes who typically engage in laptop and/or cell phone NATU during class, what typical faculty policies in their classes were regarding such use, and the extent to which participants used such technology themselves. Both peer use (though not beliefs about peer NATU acceptance) and lenient faculty technology policies predicted participant NATU. Results further suggest that faculty policies had significant direct effects on participant NATU and that peer NATU was a significant predictor of both laptop and cell phone NATU. We found partial mediation of faculty policies on participant NATU through peer NATU for cell phone (but not laptop) NATU. Based on our results, stricter technology policies in the classroom may be justified as they seem to reduce student NATU both for individual students directly but also via a reduction of NATU in other students, thus changing the norm surrounding its use and indirectly reducing individual student use.

While the ubiquitous nature of technology across college campuses has heightened student hands-on engagement and offered more pedagogical flexibility in the classroom (Anshari, Almunawar, Shahrill, Wicaksono, & Huda, 2017), laptop and mobile devices in the classroom pose a significant risk of distraction (Hassoun, 2015). Between half (Kay, Benzimra, & Li, 2017, using a high school sample) and three-fourths (Williams et al., 2011, using a college sample) of students say others' multitasking is distracting or interferes with their learning. Indeed, this perception seems to be accurate based on experimental research finding that the presence of multitasking peers impedes student learning (Sana et al., 2013).

The recognition that others' technology use is distracting seemingly has not slowed students' own use as it has become increasingly common (Berry & Westfall, 2015). In other contexts, there is a connection between perceived norms and individuals' behavior (Mennicke, Kennedy, Gromer, & Klem-O'Connor, 2018; Moreira, Smith, & Foxcroft, 2009), and previous research has demonstrated a connection specifically between classroom norms and student behaviors as well (Bursztyn & Jensen, 2015; Pulvers & Diekhoff, 1999; Ryan, 2000). Thus, it is possible that seeing others engage in non-academic technology use (NATU)—or even the perception that others think it is permissible—increases the likelihood of doing so oneself, essentially creating a positive feedback loop.

One way to interrupt the feedback loop might be through faculty policies regarding technology use. Given that faculty can be influential in creating classroom norms in other contexts (e.g., student collaboration or the freedom to ask a question; Turpen & Finkelstein, 2010), the tendency for faculty to move toward stricter policies seems like a logical step (Ledbetter & Finn, 2013). However, the effectiveness of such policies has not been examined in depth. While recent experimental research indicates students in a classroom with more stringent faculty policies may actually hold more favorable perceptions of instructors who do not allow them to use their cell phones during class time than do students in a classroom with more relaxed faculty policies (Lancaster, 2018), negative student perceptions of technology policies may also result in poorer rapport with faculty (Hutcheon, Lian, & Richard, 2019) and increase the likelihood of cell phone usage in the classroom as they seek to circumvent the policy (Lancaster & Goodboy, 2015). Clearly, additional research is warranted.

In the present study, we explored two competing predictors of whether students will engage in non-academic technology use. First, students may look to their peers to

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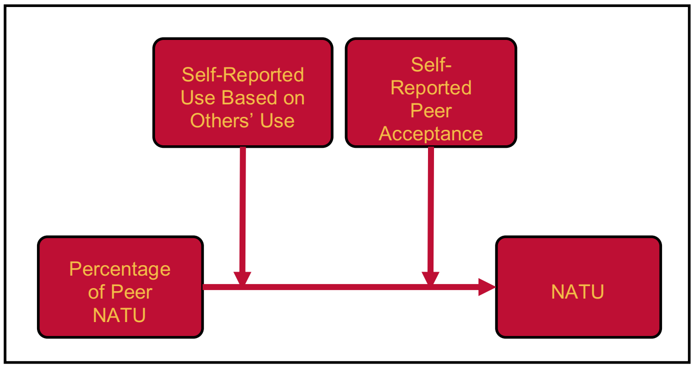

Figure 1. The proposed conceptual moderation model for hypothesis 1.
Note: NATU = Non-Academic Technology Use

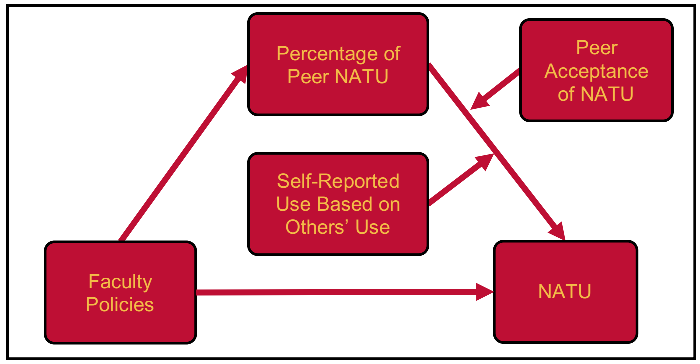

Figure 2. The proposed moderated mediation model for hypothesis 3.
Note: NATU = Non-Academic Technology Use

gauge classroom technology norms based on how many peers engage in NATU and participants' beliefs about the acceptability of such use. Second, with many instructors including various specific technology policies in the classroom, students may regulate their NATU based on faculty policies. We sought to examine whether students who perceived stricter policies would, in fact, engage in less NATU. Finally, to the extent that faculty policies banning technology are effective, such policies should affect both participants' and peers' use. Thus, we examined the relative influence of peers and faculty policies on participants' NATU and the extent to which faculty policy effectiveness of reducing NATU is mediated by concomitant reductions in NATU by peers.

Hypotheses

Based on prior research, we generated three hypotheses for the present study:

Table 1. Participant Demographic Characteristics

Age		Mean (SD)	20.5 (3.67)
Gender Identity	Female		70.1%
	Male		13.6%
	Transgender Female		.3%
	Genderqueer/Gender Nonconforming		1.3%
	Other/Not Listed		.7%
Year in School	First		15.9%
	Second		20.3%
	Third		24.3%
	Fourth		18.3%
	Fifth or More		3.0%
	Graduate Student		4.3%
GPA		Mean (SD)	3.48 (.57)
Campus Size		Median	"Fewer than 3,000"
Class Size (lower level)		Median	"25-50 students"
Class Size (upper level)		Median	"Fewer than 25 students"

H1. Given the importance of peer norms in other domains, we predicted that there would be a statistically significant correlation between participants' report of the number of peers using technology for non-academic purposes in class and participants' own NATU of both laptops (**H1.1**) and cell phones (**H1.2**). However, we predicted that this relationship would be moderated by (1) participants' ratings of how acceptable their peers think NATU in class is and (2) participants' self-reported influence of peers on their own use (see Figure 1).

H2. We predicted that faculty technology policies would be an important influence on student behavior such that college students would reduce their NATU when they report that their professors' policies are more stringent. Therefore, we expected there would be a significant positive correlation between lenient faculty policies and students' self-reports of laptop (**H2.1**) and cell phone (**H2.2**) NATU.

H3. Finally, we proposed a moderated mediation model in which faculty policies affect participant NATU both (1) directly and (2) indirectly through effects on peer use for both laptops (**H3.1**) and cell phones (**H3.2**). Consistent with **H1**, we predicted that the effect of the mediator on the primary dependent measure (NATU) would be moderated by (1) participant ratings of peer acceptance of NATU and (2) self-reported influence of peers on their own use (see Figure 2).

Method

This study was preregistered on the Open Science Framework. The methods, hypotheses, and analysis plan were all part of the preregistration, available at http://osf.io/kqha4. In addition, data and materials are available at https://osf.io/r8m3u.

Participants

A snowball sample of 259 college students (see Table 1 for participant characteristics) completed a survey that the research team distributed through social media and via email to shared contacts at various institutions. In the recruitment flyer/email and at the conclusion of the survey, we asked participants to share the survey with college students they knew both at their current university and at other schools. In all, students from 39 colleges and universities participated in the study, although a majority of participants were from two schools, a small, private liberal

Table 2. Correlations among all predictor variables and outcome variables. (Ns = 238-258 due to missing data)

	2	3	4	5	6	7
1. For a typical class, would you bring a laptop with you to use during class?	$.36^{***}$	-.02	.04	.10	$.54^{***}$	-.08
2. What percentage of your peers would you estimate use technology for non-academic purposes during class?		$.18^{**}$	$.29^{***}$	$.13^{*}$	$.43^{***}$	$.19^{**}$
3. In general, how do your classmates view the use of non-academic technology during class by other students?			-.01	.06	.05	.09
4. If your classmates are using technology for non-academic purposes during class, how does that affect your likelihood of using technology for non-academic purposes during class?				-.01	$.13^{*}$	.09
5. Your professors' policies regarding non-academic technology use in the classroom likely differ. However, what would you say is the most typical policy is regarding non-academic technology use during class? (Higher = more lenient)					$.22^{***}$	$.28^{***}$
6. How frequently do you use a laptop for non-academic purposes during a class?						$.20^{**}$
7. How frequently do you use a cell phone for non-academic purposes during a class?						

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

arts university in southwestern PA and a small, state-system university in south-central PA.

Survey

As part of a larger study on academic technology use, participants completed several items that are relevant to the present study. We assessed the primary dependent measures using two items: "How frequently do you use a laptop (cell phone) for non-academic purposes during a class?" Response options to this Likert-type scale included never (1), rarely, in less than 10% of the class time (2), occasionally, in about 30% of the class time (3), sometimes, in about 50% of the class time (4), frequently, in about 70% of the class time (5), usually, in about 90% of the class time (6), and the entire time (7). We also asked, "For a typical class, would you bring a laptop with you to use during class?" Responses ranged from never (1) to every time (5).

We included three items to assess peer influence of participants' technology use. First, we assessed peer NATU via a single item: "What percentage of your peers would you estimate use technology for non-academic purposes during class?" Participants responded using a slider that ranged from 0-100%. Second, we assessed perceived classroom norms by asking, "In general, how do your classmates view the use of non-academic technology during class by other students?" Responses to this Likert-type scale ranged from totally unacceptable (1) to totally acceptable (7) with an additional option for "I'm unsure what their views are." Third, we assessed self-reported influence by peers by asking, "If your classmates are using technology for non-academic purposes during class, how does that affect your likelihood of using technology for non-academic purposes during class?" Responses to this Likert-type scale ranged from much less likely (1) to much more likely (5).

Finally, we assessed participants' perceptions of faculty policies with a single, Likert-type item: "Your professors' policies regarding non-academic technology use in the classroom likely differ. However, what would you say is the most typical policy regarding non-academic technology use during class?" Responses ranged from totally unacceptable (1) to totally acceptable (7).

Results

Correlations among the variables in the present study are presented in Table 2.

To test the prediction that participant NATU is predicted by peer NATU (**H1.1** and **H1.2** for laptops and cell phones, respectively), we examined the correlations among these variables. In support of our predictions, peer NATU was positively correlated with both participants' laptop and cell phone NATU (*p*s < .01; see Table 2). Next, to test the second part of our prediction, namely whether self-reported influence by peers and peer acceptance of NATU moderate this relationship, we used the SPSS PROCESS macro (Hayes, 2018) Model 2 with (1) laptop and then (2) cell phone NATU as the dependent measures.[1] In both cases, neither self-reported use based on others' use nor

Table 3. Results from regression analysis of moderation effect of peer influence on the relationship between peer NATU and participant NATU.

	Laptop NATU		Cell Phone NATU	
	B (SE)	95% CI for b	b	95% CI for b
Percentage of Peer NATU	.02*** (.09)	.01, .03	.01** (.00)	.00, .02
Self-Reported Peer Influence	.08 (.00)	-.10, .03	.07 (.09)	-.12, .25
Peer Acceptance of NATU	.00 (.05)	-.10, .01	.03 (.07)	-.10, .15
Peer NATU × Peer Influence	-.00 (.00)	-.01, .01	.00 (.00)	-.01, .01
Peer NATU × Peer Acceptance	.00 (.00)	-.00, .01	.00 (.00)	-.01, .00
R^2	.17		.06	
F (df)	6.92*** (5, 173)		2.49* (5, 203)	
N	179		209	

Note: NATU = Non-academic technology use; Regression coefficients are unstandardized; *$p < .05$, **$p < .01$, ***$p < .001$

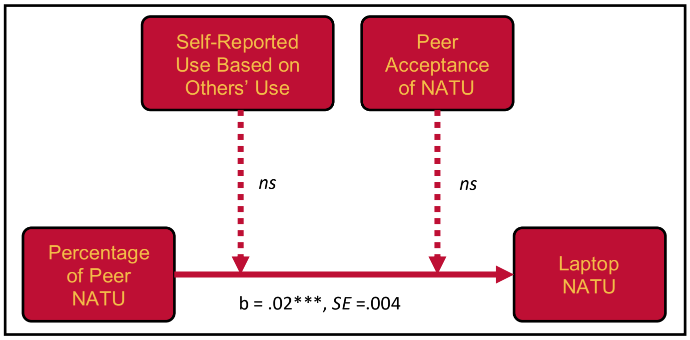

Figure 3. Path coefficients for moderated analysis of laptop non-academic technology use (NATU; N = 179). *Note*: Dotted lines represent non-significant paths. Significant path is an unstandardized regression coefficient. ***$p < .001$

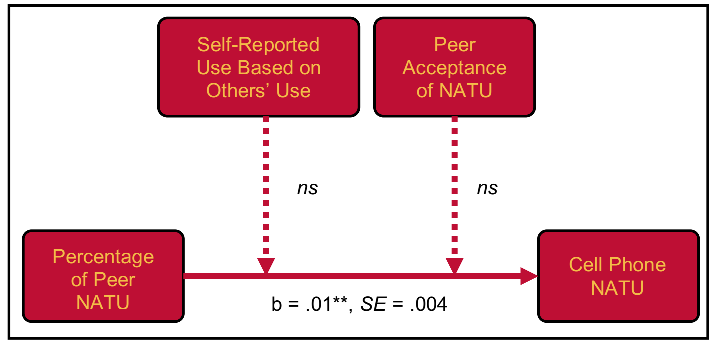

Figure 4. Path coefficients for moderated analysis of cell phone non-academic technology use (NATU; N = 209). *Note*: Dotted lines represent non-significant paths. Significant path is an unstandardized regression coefficient. ***$p < .001$

participant beliefs about peers' NATU acceptance significantly moderated the relationship, though peer NATU remained significant in both models (see Table 3 and Figures 3 and 4).

To test our prediction that participants would engage in less laptop (**H2.1**) and cell phone (**H2.2**) NATU when faculty technology policies were strict, we analyzed correlations between participant perceptions of faculty policies and both laptop and cell phone NATU. In support of the hypotheses, both of these correlations were significant (*r*s = .22 and .28, respectively, both *p*s < .001). Because of the scoring method, students who reported that faculty had more lenient technology policies reported using their laptops and cell phones more in class.

To test **H3** (see Figure 2) that the relationship between faculty policies and participant NATU is partially due to peer NATU (and that peer acceptance of NATU and self-reported peer influence affect the relationship between peer use and participant NATU), we used the SPSS PROCESS macro (Hayes, 2018) Model 16. In this model, peer NATU is included as a mediator of the relationship between faculty policies and participant laptop and cell phone NATU (see Note 1). In addition, both peer acceptance of NATU and self-reported peer influence were included as moderators of the peer NATU/participant NATU relationship. We calculated regression estimates separately for laptop (**H3.1**) and cell phone (**H3.2**) NATU. As with the analyses testing **H1.1** and **H1.2**, the proposed moderators were not significant (*p*s > .05; see Figures 3 and 4). Because inclusion of the moderators resulted in elimination of participants with missing data for those variables, we removed the proposed moderators and reran the regression analyses using SPSS PROCESS macro Model 4 using both laptop and cell phone NATU as dependent measures.

Using faculty policies and peer NATU to simultaneously predict first laptop and then cell phone NATU, we found

Table 4. Results from regression analysis of mediation effect of peer NATU on the relationship between faculty policies and participant NATU.

	Laptop NATU		Cell Phone NATU	
	b (SE)	95% CI	b	95% CI
Faculty Policies[a]	.17*** (.06)	.04, .29	.25*** (.00)	.13, .36
Percentage of Peer NATU	.02*** (.00)	.01, .03	.01* (.00)	.00, .01
Indirect Effect of Faculty Policies on Participant NATU	.04 (.03)	-.00, .10	.02 (.01)	.00, .05
R^2	.18		.10	
F (df)	19.82*** (2, 179)		13.29*** (2, 237)	
N	159		180	

Note: NATU = Non-Academic Technology Use; Regression coefficients are unstandardized; *$p < .05$, **$p < .01$, ***$p < .001$

[a] Higher values are associated with more lenient policies

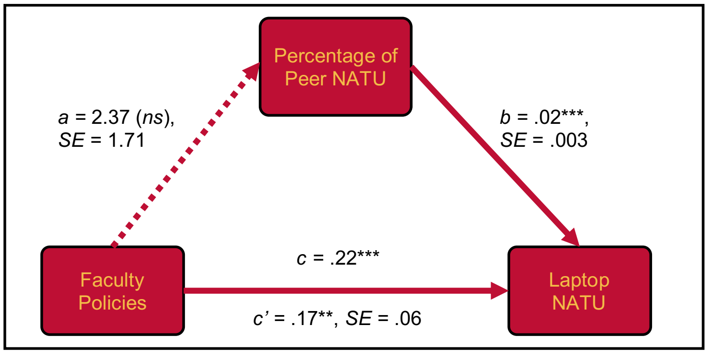

Figure 5. Path coefficients for simple mediation analysis of laptop non-academic technology use (NATU; N = 182). *Note*: Dotted line represents non-significant path. Significant paths b and c' are unstandardized regression coefficients. Path c is the bivariate correlation between faculty policies and laptop NATU.
***p* < .01; ****p* < .001

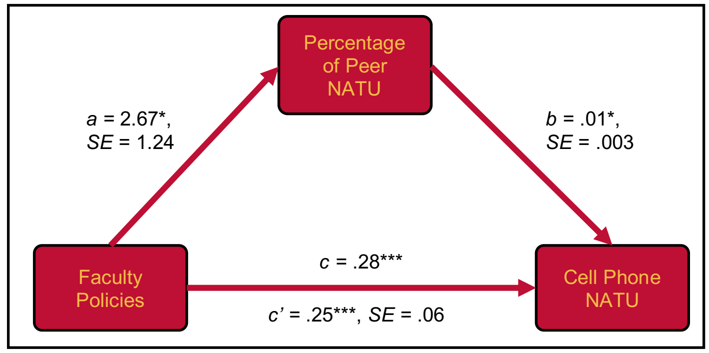

Figure 6. Path coefficients for simple mediation analysis of cell phone non-academic technology use (NATU; N = 240). *Note*: Significant paths a, b, and c' are unstandardized regression coefficients. Path c is the bivariate correlation between faculty policies and laptop NATU.
**p* < .05; ****p* < .001

that the overall regressions were significant (*p*s < .001) and faculty policies had significant direct effects on participant NATU (*p*s < .001, see Table 4), supporting **H3.1** and **H3.2**. Further, peer NATU was a significant predictor of both laptop and cell phone NATU (*p*s < .001; see Figures 5 and 6). To test the significance of the indirect effect of faculty policies on participant NATU through peer NATU, we used 5,000 bootstrap samples to compute 95% bootstrap confidence intervals (CI). Evidence of partial mediation of faculty policies on participant NATU through peer NATU was significant only for cell phone use, as the CI for laptop NATU included .00.

Discussion

In the present study, we concurrently examined faculty technology policies and peer influence on college students' non-academic technology use. Importantly, we demonstrated that peer NATU is a significant predictor of both laptop and cell phone use in college students. This finding is consistent with other research that has determined that classroom norms are important drivers of student behavior (Bursztyn & Jensen, 2015; Pulvers & Diekhoff, 1999; Ryan, 2000), though to our knowledge, it is the first demonstration of the relationship between peer and participant technology use.

In contrast to research in other domains that has found that perceived acceptance of behaviors by others drives engagement in those behaviors (e.g., Mennicke et al., 2018; Moreira et al., 2009) we found not only that perceived acceptance does not moderate the relationship between peer NATU and participant NATU, but, indeed, there is no correlation between beliefs regarding how classmates view NATU during class and participants' own NATU (cell phone, $r = .06$; laptop, $r = .05$; both $ps > .05$). This finding suggests that our participants engaged (or did not engage) in NATU regardless of what they believe their peers think about the behavior. That is, *perceived* norms (peer acceptance of NATU) are less important than *actual* norms (based on peer use). We anticipated that these variables would be strongly correlated, but post hoc analysis demonstrated only a moderate ($r = .18$, $p < .01$) correlation between perceived peer acceptance and peer NATU, suggesting that these concepts are somewhat distinct. Presumably, noticing one's classmates engaging in NATU would be associated with beliefs about whether they accept that this behavior is acceptable, though perhaps students "know" that it is unacceptable to be off-task (and attribute a similar belief to their peers) but nonetheless mimic the behavior anyway. Alternately, students may simply misjudge acceptance of NATU by their peers. Whether this is a unique feature of the particular participants in our sample or, instead, represents something fundamentally different about perceived versus actual norms of technology use (or, indeed, changing norms reflected by different cohorts) should be examined in future studies.

While some studies have examined the effect of faculty policies in a single class on NATU in that class (Lancaster, 2018; Ledbetter & Finn, 2013), we asked participants broadly speaking how strict or lenient their faculty policies were and in general how frequently participants engage in NATU. Overall, participants reporting stricter policies engaged in less NATU. This finding has important implications for faculty who are hoping to reduce distracted technology use in their classes. However, faculty should also be mindful that enforcing the policy via power, aggressiveness, and control risks harming faculty-student rapport and alienating students, resulting in circumvention of the policy (Hutcheon et al., 2019; Lancaster, 2018; Lancaster & Goodboy, 2015).

Additionally, we found that when considered concurrently, both faculty policies and peer NATU independently predict participants' NATU (for both laptops and cell phones). Further, peer use was a partial mediator for participant NATU of cell phones, so part of the reason that stricter faculty policies were effective seems to be because of their reduction of peer NATU, which in turn reduced participant NATU. If faculty are interested in reducing the amount of NATU in their classes, implementing stricter policies may reduce NATU two ways. First, stricter policies may be justified as they seem to reduce student NATU directly. As a benefit, at least for cell phones, the stricter policy may reduce NATU not only for individual students but also in other students, changing the norm surrounding its use and indirectly reducing individual student use. Why this same, mediated relationship does not seem to be the case for laptops is unclear. Perhaps this discrepancy is due to the characteristics of the students who bring laptops to class (who were less frequent in our sample than the number of students who brought cell phones to class). Alternately, while faculty may perceive these two technologies as similar, the frequency of cell phone use among current college students—in and out of the classroom—likely dwarfs the use of laptops. Thus, students may think of these devices as being quite different from one another.

Finally, as discussed above, it is important to note that our sample was disproportionately represented by students from two universities. Notably, one of these schools, accounting for approximately 40% of our participants, has a policy whereby all students receive laptops and tablets, making technology ubiquitous on the campus. Further, it is a small, private, liberal arts institution, making generalization to large, state institutions difficult. Future research should explore the relationships described in this study with broader samples.

Note

1. Because we were only interested in laptop NATU by participants who may possibly have engaged in this behavior, we conducted this analysis for all participants who responded that they bring a laptop to class "occasionally," "almost every time," or "every time." We excluded participants who "never" or "almost never" do so. Because 98.6% of college students own a smartphone (Kim, 2017), our assumption was that participants would have a cell phone available (and with) to them, so we did not ask whether they were brought to class. Thus, the number of participants in the laptop and cell phone NATU analyses differ markedly.

Open Practices

All data and materials have been made publicly available via the Open Science Framework and can be accessed at https://osf.io/r8m3u. The design and analysis plan were also preregistered and can also be found at https://osf.io/kqha4/. This poster therefore qualifies for the badges for Open Data, Open Materials, and Preregistration. More information about the Open Practices badges can be found at https://osf.io/tvyxz/.

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