

Highest Education Smartphones Use and It's Relationship with Students Engagement

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Abstract: This study aims to explain the influence of smartphones on student engagement in state university students in the city of Surabaya. This study used 85 total samples. This type of research is quantitative research using survey methods with the following stages; observation of research locations, preparation of questionnaires, distribution of questionnaires, validity testing, data collection, processing of research results, analysis of research results, discussion. The results showed that the influence of smartphones on student engagement was 0.057 or 5.7% with a significance of 0.028 < 0.05. Test results t-table is greater than t-count, i.e. $t\text{-count} = 2.232 \geq (t\text{-tab}) = 1.989$. it can be proven that there is a variable influence of smartphone use on student engagement in state university students in the city of Surabaya. This can be proven from the results of the t test, namely t count 2.232 greater than table 1.989 with a significance level of 0.028. This means that there is an influence on smartphone use on student engagement. Furthermore, when reviewed from the results of the Model Summary table on the R test square scored a coefficient of determination of 0.057 or 5.7%. This means that the variable smartphone use (X1) has a contributing influence on student engagement (Y) by 5.7% and the other 94.3% is influenced by other variables outside the variable of smartphone use

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Introduction

The digital revolution has profoundly impacted human life, as evidenced by the ubiquity of mobile devices and the seamless integration of technology into common tasks such as shopping, reading and other activities (Al-Furaih & Al-Awidi, 2021). In addition, more and more people are relying on smartphones, relying only on smartphones for Internet access (Felisoni & Godoi, 2018). The idea that digital devices and the Internet have a lasting influence on how humans develop and socialize is an interesting one (Kuznekoff & Titsworth, 2013). As the time spent by young people online has doubled in the last decade and the debate about whether this shift is having a negative impact on children and youth is becoming increasingly heated (Wei et al., 2017). Most people use the internet without negative consequences and even benefit from it, but some individuals experience negative impacts (Lepp et al., 2014). Psychologists and educators are aware of the potential negative impacts of smartphone use and the associated physical and psychological problems (Grinols & Rajesh, 2014).

Integrating technology into teaching and learning is not a new challenge for universities (Bowman et al., 2010). Over the last decade, smartphones have completely penetrated into human life. Today it is not uncommon to see people moving their fingers across smartphone screens in homes, offices, parks, markets, bus stops and even in classrooms (Uğur et al., 2011). In particular, young people seem to spend more time interacting with their smartphones (Twenge & Campbell, 2019). Smartphones have become one of the most pervasive technological devices in our lives. It's a handy and fast resource for staying informed, entertained and connected (Choi et al., 2015). Smartphone use has exploded in recent years (Atarodi et al., 2020). Its use has penetrated schools, offices, restaurants and on the go (Twenge et al., 2018). The modern expansion of Internet-enabled digital devices such as smartphones has led to revolutionary transformations in many aspects of life (Yildiz Durak, 2019). their ownership extends worldwide to developing and developing countries. Such devices not only affect work and lifestyles in developed countries, but also affect less developed countries around the world (Samaha & Hawi, 2016).

Even though the use of smartphones in adolescents is already widespread studied by researchers and educators, and adolescent smartphone use patterns are influenced mainly by self-control (Reschly & Christenson, 2022). As opposed to adults who have the maturity to direct self-judgment (Sahin, 2009), adolescents have been found to be vulnerable to technology because of their lack of self-awareness (Reschly & Christenson, 2022). Smartphones can place a substantial burden on a learner's cognitive resources. As currently understood, smartphones are disruptive and very detrimental to students who are trying to learn. While smartphone use can have detrimental outcomes, such as addiction or poor academic performance, it also allows students to engage in flexible mobile learning (Tossell et al., 2015), gain access to important information about their possible future careers, and achieve their personal goals. Therefore, in order to explore the benefits students derive from using their smartphones, it is important to identify the way they use their devices and the impact these patterns have on their lives (Marciano & Camerini, 2021).

The question remains whether embracing smartphones in learning systems facilitates or impairs learning (that is, through distraction) (Rozgonjuk et al., 2018). Only a few studies have been conducted on the impact of smartphone use on smartphone usage patterns of the subpopulation of first year students in Surabaya by analyzing self-regulation and student engagement factors. Thus, this study investigates the effect of smartphone use on their engagement in learning. Student Involvement Theory or student engagement theory published first time by Alexander W. Astin in 1984. This theory illustrates the importance of student engagement in college. that student engagement refers to the amount of physical and psychology that students devote to academic experience (Astin, 1984). Characteristics students who are involved in tertiary institutions include devoting that energy ready enough to study, spend a lot of time on campus, participate active in student organizations, and interacts frequently with faculty members and other students (Astin, 1984).

There is no standard definition of a smartphone however most people understand that a smartphone is a device that have the ability to assist in communicating that also has computer-like capabilities (Ito, 2004). smartphones have features or applications support that has a variety of functions and encourages productivity. Smartphone is a tool that has several features such as: Wireless Mobile Device (WMD) that can functions like a computer by offering features such as Personal Digital Assistant (PDA), internet access, e-mail, and Global Positioning System (GPS) (Twenge et al., 2018). Smartphones make users alienated from their world because they are busy with smartphones such as games, chatting on social

media, browsing, or watching videos on YouTube that cause you to forget the time and other important things such as studying and doing assignments (Twenge & Campbell, 2019).

Students are a phase of experiencing rapid growth and development while on campus and processing various aspects of the human experience that will affect their growth and development, including social skills formed through positive peer interaction (Anshari et al., 2016). All those experiences have a huge impact on the formation of self-esteem and a positive view of the self (Ljubin-golub et al., 2018). Furthermore, students tend to maintain social relationships by interacting with others through a variety of synchronous or asynchronous technologies, including the use of smartphones in the classroom (Schneider & Preckel, 2017). No agreement has yet been reached on the definition and measurement of student engagement, Student engagement among college students is interesting to examine (Pasquale et al., 2015). Student is the highest level after someone finishes Senior High School (SHS) education. Engagement in students towards decreased learning will have an impact on decreased academic achievement. According to Schneider & Preckel (2017) students is an individual who studies and pursues the scientific disciplines he or she takes independently. The age of students ranges from 18-25 years. Judging from the age category according to the World Health Organization (WHO), this age is included in the category late teens (Pasquale et al., 2015).

Student engagement is a construct involving three dimensions are interrelated (Anshari et al., 2016). The student engagement dimension consists of behavioral engagement, emotional engagement, and cognitive engagement (Atarodi et al., 2020). These three dimensions have an important role in influencing activities student learning. Behavioral engagement describes the motivational qualities of students who featured in both classroom and outdoor learning activities class (Pintrich & Groot, 1990). Behavioral engagement includes students having effort, intensity, perseverance, and determination in carrying out academic activities (Stockdale et al., 2018). Emotional Engagement describes students' positive emotions in the learning process as well as assignments obtained from university (Hilpert et al., 2013). Emotional behavior includes students feel enthusiastic, enjoyed, happy, and satisfied in academic activities (Gutiérrez et al., 2016). Cognitive engagement is the attachment of students to the learning process in class that shows that students are present not only in body but also in mind (Chu et al., 2020). This dimension includes students paying attention, concentration, focus, absorbing, participating, and having a willingness to strive beyond their standards (Ezoe et al., 2016).

Factors that affect student engagement consist of external factors (context) and internal factors (self) (Semerci & Goularas, 2021). External factors include a social context that will meet the psychological needs of students and thus increase their engagement. The social context will be distinguish responses from them. Students will have a comfortable feeling and have directed action through the experience both in parents, teachers, and peers (Marciano & Camerini, 2021).

Research Method

Method of survey is quantitative research that uses questionnaire as a research instrument (Kerlinger, 1986). A questionnaire is a sheet containing a list of questions or statements with a structure determined based on existing variables (Olufadi, 2015). The type of variable used is an independent variable, namely: smartphone (X1) which has 5 research indicators, namely perseverance in learning, tenacity in facing difficulties, interest and sharpness of attention in learning, achievement in learning, independence in learning. While

the dependent variable is student engagement (Y) with 4 research indicators: the intensity of smartphone use and ownership, the negative impact of smartphone use, the positive impact of smartphone use, and the learning process of students at university. This research was conducted at Surabaya City State University: The study will be conducted from June to July 2023. The population in this study was in State University students. While the number of samples used was 85 students in the second year. Data collection techniques using questionnaires.

Result and Discussion

Result

The general description of research result data includes research variables. Serving data from each variable using the SPSS 25 program.

Student Engagement (Y)

The number of score numbers for the student engagement (Y) variable is in the range of 48 to 114. Based on the data obtained in the study, statistically processed and obtained results, namely the total number ($\sum Y$) = 7,202, the average or mean value of 85.74, with standard deviation (SDY) = 14.46, median 85, mode 80, minimum score 48, and maximum score 114. To be clearer, the following table presents a recapitulation of the numbers based on basic statistical calculations. The description can be recapitulated in the table below.

Table 1. Recapitulation of Basic Statistical Numbers of Variable Y

Variabel (Y)	n	$\sum Y$	Mean	SDY	Median	Mod us	Lowest score	Highest score
Score	85	7.202	85,74	14,46	85,5	80	48	114

Furthermore, from the distribution of these results, data and frequency were classified with the number of class 7 and the length of the interval class 10, as shown in the following table.

Table 2. Frequency Distribution Student engagement score (Y)

No	Class Interval	Absolute Frequency	Relative Frequency (%)	Cumulative Frequency (%)
1	48-57	5	6.0	6.0
2	58-67	3	3.6	9.5
3	68-77	9	10.7	20.2
4	78-87	28	33.3	53.6
5	88-97	16	19.0	72.6
6	98-107	19	22.6	95.2
7	108-118	4	4.8	100.0
Total		85	100.0	

Based on the exposure of the frequency distribution table above, it can be seen that of the 85 respondents, the most frequency is in the class interval 4 or in the range of values 78-87, with an absolute frequency of 28, a relative frequency of 33.3%, and a cumulative frequency of 53.6%. In contrast, the lowest frequency is in interval class 2 or in the range 58-67, with absolute frequency 3 and relative frequency of 3.6%, while the cumulative frequency is 9.7%.

Smartphone (X₁)

The score for the smartphone variable (X_1) is in the range of 38 to 106. Based on the data obtained in the next study, statistically processed, and obtained results, namely the total number ($\sum X_1$) = 5,782, the average value (mean) of 68.84, with standard deviation (SD_{X_1}) = 18.09, median 65.50, mode 57, minimum score 38, and maximum score 106. To be clearer, the following table presents a recapitulation of the numbers based on basic statistical calculations

Table 3. Recapitulation of Basic Statistical Numbers of Variable X

Variabel (Y)	n	$\sum Y$	Mean	SDY	Median	Modus	Lowest score	Highest score
Score	85	5.782	68,84	18,09	65,50	57	38	106

Furthermore, from the distribution of these results, data and frequency are classified with the number of class 7 and the length of interval class 10, as shown in the following table:

Table 4. Frequency Distribution Student engagement score (Y)

No	Class Interval	Absolute Frequency	Relative Frequency (%)	Cumulative Frequency (%)
1	38-47	10	11.9	11.9
2	48-57	15	17.9	29.8
3	58-67	20	23.8	53.6
4	78-77	14	16.7	70.2
5	78-87	9	10.7	81.0
6	88-97	8	9.5	90.5
7	98-108	9	9.5	100.0
Total		85	100.0	

Based on the frequency distribution table of smartphone scores (X_1), it can be seen that of the 85 respondents, the highest frequency is in the interval 3 class with a value range of 58-67 with an absolute frequency of 20 and a relative frequency of 23.8%, while the cumulative frequency is 53.6. In contrast, the lowest frequencies in interval classes 6 and 7 together have an absolute frequency of 8, a relative frequency of 9.5

Table 5. Summary of Normality Test Calculation Results

No	Variable	n	Lcount	Alpha (α)	Conclusion
1	X_1	85	0,065	0,05	Normal
2	Y	85	0,067	0,05	Normal

Based on the results of the normality test data above, it can be concluded that the significance value of all variables is greater than 0.05. Thus, the data from the study derived from the population are analyzed normally distributed.

Linearity Test

The linearity test of this study uses the Analysis of Variance (ANOVA) method, which is by looking at the Fcalculate deviation value from linearity. Meanwhile, the criteria used in the linearity test is alpha 5% (0.05). Then it means that H_0 is rejected if the value of the probability deviation from linearity is less ($Sig \leq$) or equal to ($Sig =$) 0.05. Based on the results of the linearity test on the "ANOVA Table" it is known that the significance value on the linearity of the smartphone variable with the student engagement variable is 0.015. Because the significance value is $0.015 \leq$ of $\alpha = 0.05$, it can be concluded that there is a linear

relationship between the smartphone variable (X_1) and the student engagement variable (Y). Thus, the assumption of linearity is satisfied.

Research Hypothesis Testing

Regression Analysis of the Effect of Smartphones (X_1) on Student Engagement (Y)

Simple Regression Analysis is used to determine the extent of the value of the relationship or influence between the independent or independent variable (X) and the dependent or bound variable (Y) (Aliotta, 2003). It is called simple regression because there is only one independent variable (X). Testing with simple regression analysis is taken in several steps as follows:

Table 6. Smartphone Effect (X_1) Student Engagement (Y)

Model	Unstandarized Coefficients		Standardized Coefficient Beta	t	Sig
	B	Std. Error			
(Constant)	72.56	6.099		11.89	0.000
Smartphone	0.191	0.086	0.239	2.32	0.028

Simple Regression Equation

The formula used to see the simple regression equation is $Y = a + bX_1$. The calculation of regression analysis of the learning motiavation variable score data on the smartphone variable resulted in a (constant value) of 72.569 and b (regression coefficient) of 0.191. Based on these results, the effect of smartphone use (X_1) on student engagement (Y) can be formulated according to the regression equation, namely: $Y = 72, 569 + 0.191 X_1$. The Y result is 72.76. In other words, the value of 0.191 means that every additional X units (1%) of smartphone use (X), student engagement (Y) will increase by 0.191.

Hypothesis Testing

For hypothesis testing used t test. This t-test is used to determine the significant influence between knowledge variables on involvement variables. Here are the test methods and conditions. Calculate the value of t table: $\text{Alpha } (\alpha) / 2 = 0.05 / 2 = 0.025$ (2-sided test), Degree of Freedom (df) = (total data 85 – 1) = 84, With these conditions, the table t value of (ttab) = 1.989 is obtained. The magnitude of the calculated t value (t count) is 2.232 (see table). Because the calculated t value between X_1 (smartphone) and Y (student engagement) obtained is greater than the table t value, namely $t_{\text{count}} = 2,232 \geq (t_{\text{tab}}) = 1,989$, H_0 was rejected and accepted H_a . Thus, it can be stated that the regression coefficient is meaningful. This means that the use of smartphones affects student engagement. The level of significance of the influence between the variables of smartphone use and student learning motivation can be seen in the following table:

Table 7. ANOVA_a

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	993.791	1	993.791	4.981	.028 ^b
Residuals	16360.447	82	199.518		
Total	17354.238	83			

From the Anova test produced for the calculated F value is 4.981 with a significance level (probability number) of 0.028. Since the probability number (Sig.) is much smaller than

alpha (α): Sig. = 0.028 \leq of $\alpha = 0.05$, H_0 is rejected and H_a is accepted. This means that there is an influence between smartphone use (X_1) and student engagement (Y).

Analysis of the Coefficient of Determination (R Square)

Determination analysis is used to determine the percentage of contribution of smartphone variables to learning motivation variables. The results of the determination analysis can be seen in the output of SPSS 25 Model Summary from the results of simple linear regression analysis below:

Table 8. Model Summary^b

Model	R	R square	Adjusted R Std. Square	Error of the Estimate
1	0.239 ^a	0.057	0.046	14.12507

The summary model table above shows that the R value is a symbol of the correlation coefficient value. In the table it is clear that the correlation value is 0.239 or 23.9%. These results can be interpreted that the relationship between the two research variables is in the weak category. Furthermore, based on the results of the coefficient of determination analysis (R Square) obtained a result of 0.057 or 5.7%. This means that the variable smartphone use (X_1) has an influence on the contribution to student engagement (Y) of 5.7% and the other 94.3% is influenced by other variables outside the variable of smartphone use.

Discussion

Based on the results of the hypothesis test above, it can be proven that there is a variable influence of smartphone use on student engagement in state university students in the city of Surabaya. This can be proven from the results of the t test, namely t count 2.232 greater than table 1.989 with a significance level of 0.028. This means that there is an influence on smartphone use on student engagement. Furthermore, when reviewed from the results of the Model Summary table on the R test square scored a coefficient of determination of 0.057 or 5.7%. This means that the variable smartphone use (X_1) has a contributing influence on student engagement (Y) by 5.7% and the other 94.3% is influenced by other variables outside the variable of smartphone use.

Digital learning using smartphones well can increase student engagement. Smartphones can increase student motivation if used as a digital learning medium (Grinols & Rajesh, 2014). Digital learning has a positive influence on student engagement and can also improve student learning outcomes (Persing, 2006). In the theory of motivation and its division, the use of Smartphones is one example of extrinsic motivation where things or circumstances that come from outside the individual student that encourage him to carry out learning activities (Wentworth & Middleton, 2014). Smartphone use includes factors from outside students that affect their engagement. Smartphones are a factor from students that affect their engagement.

Conclusion

Based on the results of the analysis that has been described, this study produces conclusion as follows: The use of smartphones has an influence on student engagement in state university students in the city of Surabaya, the influence is still relatively low, namely 5.7% with a significance level of 0.028. Likewise, the test result t table is greater than t count, namely t-count = 2.232 \geq (t_{tab}) = 1.989, then H_0 is rejected and accepts H_a . Thus, it can be

stated that the regression coefficient is meaningful. This means that smartphone use affects student engagement.

Recommendation

The results showed that there was a positive influence of smartphones on student engagement. Students can increase intrinsic motivation such as building awareness and developing appropriate learning strategies. Future research is expected to add independent variables, for example, in the form of lecturer support and choosing mediators with other variables which can significantly mediate the influence of these variables independent of student engagement.

References

- Al-Furaih, S. A. A., & Al-Awidi, H. M. (2021). Fear of missing out (FoMO) among undergraduate students in relation to attention distraction and learning disengagement in lectures. *Education and Information Technologies*, 26(2), 2355–2373. <https://doi.org/10.1007/s10639-020-10361-7>
- Aliotta, S. (2003). The basics of research. In *Case Manager* (Vol. 14, Issue 4). <https://doi.org/10.1067/mcm.2003.64>
- Anshari, M., Alas, Y., Yunus, N. A. H. M., & Hamid, M. H. S. A. (2016). ONLINE LEARNING: TRENDS, ISSUES, AND CHALLENGES IN THE BIG DATA ERA. *Journal of E-Learning and Knowledge Society*, 12, 121–134.
- Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Development*, July, 251–263.
- Atarodi, A., Rajabi, M., & Atarodi, A. (2020). Cell Phone Use and Social Alienation of Young Teenagers. *Library Philosophy and Practice*, 2020.
- Bowman, L. L., Levine, L. E., Waite, B. M., & Gendron, M. (2010). Can students really multitask? An experimental study of instant messaging while reading. *Computers and Education*, 54(4), 927–931. <https://doi.org/10.1016/j.compedu.2009.09.024>
- Choi, S. W., Kim, D. J., Choi, J. S., Ahn, H., Choi, E. J., Song, W. Y., Kim, S., & Youn, H. (2015). Comparison of risk and protective factors associated with smartphone addiction and Internet addiction. *Journal of Behavioral Addictions*, 4(4), 308–314. <https://doi.org/10.1556/2006.4.2015.043>
- Chu, H. S., Tak, Y. R., & Lee, H. (2020). Exploring psychosocial factors that influence smartphone dependency among Korean adolescents. *PLoS ONE*, 15(5), 5–15. <https://doi.org/10.1371/journal.pone.0232968>
- Ezoe, S., Iida, T., Inoue, K., & Toda, M. (2016). Development of Japanese Version of Smartphone Dependence Scale. *Open Journal of Preventive Medicine*, 06(07), 179–185. <https://doi.org/10.4236/ojpm.2016.67017>
- Felisoni, D. D., & Godoi, A. S. (2018). Cell phone usage and academic performance: An experiment. *Computers and Education*, 117, 175–187. <https://doi.org/10.1016/j.compedu.2017.10.006>
- Grinols, A. B., & Rajesh, R. (2014). Multitasking With Smartphones in the College Classroom. *Business and Professional Communication Quarterly*. <https://doi.org/10.1177/2329490613515300>

- Gutiérrez, J. D. S., de Fonseca, F. R., & Rubio, G. (2016). Cell-phone addiction: A review. *Frontiers in Psychiatry*, 7(OCT). <https://doi.org/10.3389/fpsy.2016.00175>
- Hilpert, J. C., Stempien, J., Van Der Hoeven Kraft, K. J., & Husman, J. (2013). Evidence for the latent factor structure of the mslq: A new conceptualization of an established questionnaire. *SAGE Open*, 3(4). <https://doi.org/10.1177/2158244013510305>
- Ito, M. (2004). Personal Portable Pedestrian: Lessons from Japanese Mobile Phone Use. *Proceedings of the Conference 'Mobile Communication and Social Change October 1819 Seoul Korea*, 3(5), 1–6. <http://www.itofisher.com/mito/archives/ito.ppp.pdf>
- Kerlinger, F. N. (1986). *Foundation of Behavioral Research (Third)*. Holth, Rinehart and Winston Inc.
- Kuznekoff, J. H., & Titsworth, S. (2013). The Impact of Mobile Phone Usage on Student Learning. *Communication Education*, 62(3), 233–252. <https://doi.org/10.1080/03634523.2013.767917>
- Lepp, A., Barkley, J. E., & Karpinski, A. C. (2014). The relationship between cell phone use, academic performance, anxiety, and Satisfaction with Life in college students. *Computers in Human Behavior*, 31(1), 343–350. <https://doi.org/10.1016/j.chb.2013.10.049>
- Marciano, L., & Camerini, A. L. (2021). Recommendations on screen time, sleep and physical activity: associations with academic achievement in Swiss adolescents. *Public Health*, 198, 211–217. <https://doi.org/10.1016/j.puhe.2021.07.027>
- Olufadi, Y. (2015). Gravitating towards mobile phone (GoToMP) during lecture periods by students: Why are they using it? and how can it be measured? *Computers and Education*, 87, 423–436. <https://doi.org/10.1016/j.compedu.2015.08.013>
- Pasquale, C., Sciacca, F., & Hichy, Z. (2015). Smartphone Addiction and Dissociative Experience: An investigation in Italian adolescents aged between 14 and 19 years. *International Journal of Psychology & Behavior Analysis*, 1(2), 2–5. <https://doi.org/10.15344/2455-3867/2015/109>
- Pershing, A. J. (2006). *Handbook of Human Performance Technology*. In T and D (Third, Vol. 59, Issue 4). Pfeiffer. <https://doi.org/10.4018/978-1-4666-9587-0.les7>
- Pintrich, P. R., & Groot, E. V. De. (1990). Motivational and self-regulated learning components of classroom. *Journal of Educational Psychology*, 82(1), 33–40.
- Reschly, A. L., & Christenson, S. L. (2022). *Handbook of Research on Student Engagement: Second Edition*. In *Handbook of Research on Student Engagement: Second Edition* (Issue November). <https://doi.org/10.1007/978-3-031-07853-8>
- Rozgonjuk, D., Saal, K., & Täht, K. (2018). Problematic smartphone use, deep and surface approaches to learning, and social media use in lecture. *International Journal of Environmental Research and Public Health*, 15(1). <https://doi.org/10.3390/ijerph15010092>
- Sahin, M. C. (2009). Instructional design principles for 21st century learning skills. *Procedia - Social and Behavioral Sciences*, 1(1), 1464–1468. <https://doi.org/10.1016/j.sbspro.2009.01.258>
- Samaha, M., & Hawi, N. S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Computers in Human Behavior*, 57, 321–325. <https://doi.org/10.1016/j.chb.2015.12.045>
- Schneider, M., & Preckel, F. (2017). Variables associated with achievement in higher education: A systematic review of meta-analyses. *Psychological Bulletin*, 143(6), 565–600. <https://doi.org/10.1037/bul0000098>

- Semerci, Y. C., & Goularas, D. (2021). Evaluation of Students' Flow State in an E-learning Environment Through Activity and Performance Using Deep Learning Techniques. *Journal of Educational Computing Research*, 59(5), 960–987. <https://doi.org/10.1177/0735633120979836>
- Stockdale, L. A., Coyne, S. M., & Padilla-Walker, L. M. (2018). Parent and Child Technoference and socioemotional behavioral outcomes: A nationally representative study of 10- to 20-year-Old adolescents. *Computers in Human Behavior*, 88, 219–226. <https://doi.org/10.1016/j.chb.2018.06.034>
- Tossell, C., Kortum, P., Shepard, C., Rahmati, A., & Zhong, L. (2015). Exploring smartphone addiction: Insights from long-term telemetric behavioral measures. *International Journal of Interactive Mobile Technologies*, 9(2), 37–43. <https://doi.org/10.3991/ijim.v9i2.4300>
- Twenge, J. M., & Campbell, W. K. (2019). Media Use Is Linked to Lower Psychological Well-Being: Evidence from Three Datasets. *Psychiatric Quarterly*. <https://doi.org/10.1007/s11126-019-09630-7>
- Twenge, J. M., Joiner, T. E., Rogers, M. L., & Martin, G. N. (2018). Increases in Depressive Symptoms, Suicide-Related Outcomes, and Suicide Rates Among U.S. Adolescents After 2010 and Links to Increased New Media Screen Time. *Clinical Psychological Science*, 6(1), 3–17. <https://doi.org/10.1177/2167702617723376>
- Uğur, B., Akkoyunlu, B., & Kurbanoglu, S. (2011). Students' opinions on blended learning and its implementation in terms of their learning styles. In *Education and Information Technologies* (Vol. 16, Issue 1, pp. 5–23). <https://doi.org/10.1007/s10639-009-9109-9>
- Wei, F. F., Wang, Y. K., Klausner, M., Wei, F. F., Wang, Y. K., Rethinking, M. K., Wei, F. F., Wang, Y. K., & Klausner, M. (2017). Rethinking College Students' Self-Regulation and Sustained Attention: Does Text Messaging During Class Influence Cognitive Learning? Rethinking College Students' Self-Regulation and Sustained Attention: Does Text Messaging During Class Influence Cog. 4523(April).
- Wentworth, D. K., & Middleton, J. H. (2014). Technology use and academic performance. *Computers and Education*, 78, 306–311. <https://doi.org/10.1016/j.compedu.2014.06.012>