

Impact Of Technology On Student's Engagement In Different Dimensions: Cognitive, Behavioral, Reflective And Social Engagement

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Abstract

This paper aims at to investigate on potential use of technology and its impact on student's different dimension of engagement. It further examines that the 24/7 availability of technology for the students makes them technological savvy, that meant that each form of technologies is in great demand and students are engaged with technology from different dimensions inside as well outside the classroom. An adopted questionnaire was used from earlier studies from the similar context with little modification. This study used quantitative research approach with non-probability convenience sampling method to collect the data from, 400, Undergraduates students from four departments, namely, Department of Education, Computer Science (BSCS), Business Administration, and Media Science (BMS) at Iqra University Karachi. The study finding reveals that there is positive and significant impact of technology on student's engagement and learning at under-graduate level. It further shows the positive influence on students behavioral, social, cognitive and reflective engagement among the students. This study also provides an exclusive perspective about students' potential use of technology and its engagement from the different dimensions, which is a subject that has not got much concentration previously in the Pakistani context. It is suggested that the due focus should be given to excessively use of technology for students' proper engagement for effective learning.

Keywords: Technology, cognitive engagement, reflective engagement, social engagement, behavioral engagement, Smart-PLS.

Literature Review

The students' different engagement of technology is an important factor for students learning and personal development (Sun & Rueda, 2012). It is considered one of the major indicators for improving the quality of academic performance, (Lutz & Culver, 2010). Research on student engagement has started many years ago via seminal work of Pace and has grown and expanded considerably (Axelson & Flick, 2011), that how much the students give efforts towards affective learning (Gebre et al., 2014) and many more environmental factors that lead the impact on students' engagement (Shernoff, et al. 2016). In the era of 21st century, the world is based on technology and its potential impact on students' engagement to utilize the technology for different purposes from an early age. (Ahmad, 2014). In this era, Students think and learn differently than they did a decade ago. (Banit, Theis, Leeuwe, 2013). It has been studied that technology makes learning fun and enjoyable for students, they're able to get interested and engaged more while learning (Raja & Nagasubramani, 2018). While Student engagement has always been seen as a significant factor for student's learning, and academic outcomes (Schindler, et al., 2017), considering student's academic achievement, persistence, retention depend on the student's engagement (Burke, 2019). For 70 years' research on student engagement has been conducted in different means with Ralph Tyler's study on how much students are spending time on course work academic activities (Axelson & Flick, 2011). Increasing attention has been paid day by day to the conceptualization and measuring student engagement by many researchers, and educators and this paradigm has shifted to student's engagement with an aspect of using many technology tools, (Bal & Bicen, 2017). There has never been time for this generation when computers, smartphones, using different social application, online gaming, and all other digitalized technology does not exist (Ahmad, 2012). Hamilton-Hankins (2017) argued that Student engagement is a wide-ranging and dynamic phenomenon with multidimensions and had been studied in the context of using technology (Korhonen et al., 2019) i.e. cognitive engagement and behavioral engagement of students while using technology (Mekewa, et al., 2014) these have been two commonly used dimensions of students engagement (Ainley & Enger, 2017) with the new additions of reflective engagement and social engagement (Gebre, et al., 2014; Bixter 2018). There is an enormous diversity of educational technology, which are provided online for teacher and students (Chen, et al., 2010) i.e. WordPress, WhatsApp, YouTube, Facebook, near pod, Zotero and lot more are the most common tools for teaching and learning, which are easily available on hand palm devices to laptops and computers. Thus it is important for students to use technology in the classroom effectively to meet goal for educators to embrace learning for 21st-century learners, (Banit et al., 2013). As Stated that technology is the ultimate source of the maintainer and meets the needs of digital natives. (Bal & Bicen, 2017), therefore it is intended to measure the impact of technology on different dimensions of engagement of undergraduate university students of Pakistan, as most of the universities in Pakistan has established and providing the technological system to engage students effectively in the learning process.

However, engagement can be applied for academic and non-academic aspects of educational experiences, and the trend of engaging students with digital technology is rapidly increasing in and out of the classroom. According to Halili (2019), learning with technology is the greatest shift in teaching and learning that we have ever seen, meanwhile, Howard, et al., (2016) recommended that without proper planning and sound pedagogy, technology could facilitate disengagement rather than helping. Most of the Researchers found that student's engagement is multi-dimensional, that are varying perspectives on

the numbers and forms of student's engagement that exist (Hamilton-Hankins, 2017; Circa & Jovanovicb, 2016). There is a growing trend toward transferring such practices into the technology-mediated environment. Thus, we built a model in this study to examine the impact of technology on a different dimension of engagement, hence our next section discussed the development of relevant hypotheses for this study.

Research Hypothesis The present study has used following research hypothesis which is given as under:

Cognitive engagement: It refers the effort and time students consumes for the quality of learning programs which develop high order thinking skills to gain a deep understanding of the learner and its contents, (Fredricks, Blumenfeld & Paris, 2004; Conner, 2011). And while directly or indirectly technology has been effecting all the aspects of the student's cognitive activities (Cavanaugh, Giapponi & Golden, 2016). The benefits of using technology in the classroom for student cognitive engagement has been shown in many pieces of researches. Wallace-Spurgin in 2019, has recommended that technology has provided enough opportunities both learner and teacher to restructure and re-design the classroom learning environment and create an atmosphere that encourages higher order cognitive engagement of students. Although there are many more technology applications are being developed in the field of education for the students globally (Bellatreche, et al., 2018) such as international search engines for information (e.g. Google), visualization tools (e.g. PowerPoints, Flowcharter, video adds, blogs), those all resources can be used as an intellectual partner that can enhance the cognitive power of students, while thinking and matter of solving the problem (Lia & Bower 2019). Loes & Saichai (2016) suggested that technology plays a creative and critical role in enhancing the cognitive engagement of students, thus it supports the following hypothesis:

RH1: use of technology has a positive impact on student's cognitive engagement.

Behavioral engagement: It is the degree where students' response actively and involved themselves in learning activities/ process positively, (Kahu, 2013). behavioral engagement includes the indicators such as, attitudes of the learner, interests of learner toward learning process (Fredricks et al., 2004). Andrew et al., (2018), investigated that students who feel that they can integrate technology in their learning process with less effort, which develop a positive attitude towards the learner and learning process. On the other hand, less information about the same advancement makes learners develop a negative attitude. Moreover, Ghavifekr and Rosdy (2015) found that the technological challenges faced by various schools make it difficult to exploit unique advances in technology. Consequently, such advancements become a frustration for students, resulting in a negative attitude towards it. Nowadays, most of the students have gadgets equipped with the internet, commonly used devices are iPad, tablets, laptops, and smartphones, to make learning fun and easy (Zinan, & Sai, 2017). Moreover, Andrew et al. (2018) suggested that learners should enjoy by using the different forms of technology which helps the learner, to be more innovative and active and accept the future challenges and set new goals. Thus:

R H2: The use of technology has a positive impact on a student's behavioral engagement

Reflective engagement: Technology plays a powerful role in supporting student's engagement, it gives maximum opportunities to engaging students in reflective activities, if properly implemented in learning practices (Strampel & Oliver, 2007). One of the earliest cited quote of reflection in education by Rodgers in 2002 comes from John Dewey (1910, p.6) "according to him" "reflective engagement is the: active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends". While there is a growing trend to transfer such learning practices into a technology-mediated environment (Munir et al. 2018). The Baporikar, (2020) suggested that there are numerous digital technological tools and models and which helps to accept reflective engagement. In this regards experts demonstrated by different engagement through the video, vlog, electronic portfolios, blogs, online tutorial, discussion tools, YouTube videos short animated movies that help students to use metacognitive and self-explanation techniques in the learning process and promote reflective thinking (Schindler et al., 2017). Further McNichol et al., (2014) found that use of these technology resources enables students to monitor their performance by gaining a deep understanding to achieve an appreciation of new skills of technology developing self- learning Thus:

RH3: Use of technology has a positive impact on student's reflective engagement.

Social engagement: The introduction of social websites has changed the students' way of engagement, as it becomes part of the everyday lives of students to be used in also education purpose (Kumar & Akram 2017), therefor effect of social networking sites and their usability and impact on students' engagement concern with their learning has been started to be examined by the researchers. Ellison, & Boyd, (2013), said that these social networking sites have both positive and negative effect on various factors such as commutation, motivation, student's engagement and academic performance, depending on the purpose and form of use for learning (Cetinkaya, 2017). social media sites such as Facebook, blogs, G-mail, WhatsApp, YouTube, wikis, telegram, and so on, they are highly promising for student's engagement and collaboration with their peers because they are free of cost and every student can get access easily (Celik & Schoreels, 2014). Another worldwide used social networking site named WhatsApp, WhatsApp is one of the biggest changes in communication in recent years. Cetinkaya in 2017, to found that students formed positive views about using WhatsApp in their course work, further Coffey (2012) said that with such innovations of technologies, students can connect with learners from other schools, states and even with different nations, these online discussions had potential to create a sense of community and built meaning full and social engagement. Therefore, this leads to the following hypothesis.

RH4: Use of technology has a Positive Impact on Student's Social Engagement

Research Methodology

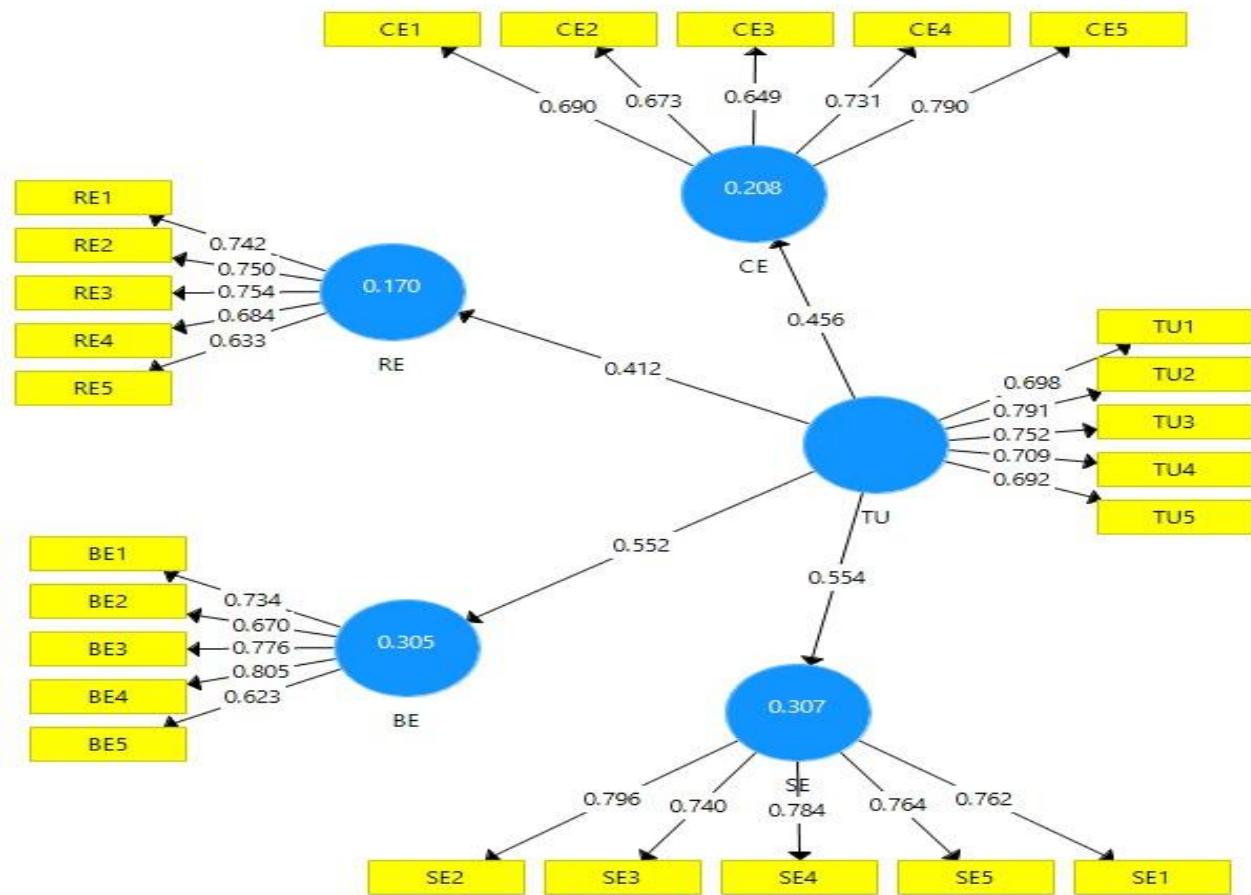
An adopted questionnaire was used from earlier studies with little modification. The questionnaire contains two sections; the first section was based on demographic information of respondents. The second section based on a questionnaire and the Likert scale was used in the instrument which divided into five

sections and items were collected accordingly which representing the student's engagement such as cognitive, social, reflective, and use of technology. The 06 items were collected from Cognitive engagement an adpted from Gebre et, al. (2014). The 03 items were collected from Reflective engagement adopted from Gebre et, al (2014). The same way 05 items were collected from Behavioral engagement, the study of Makewa et. al, (2014). The 03 items were collected from Social engagement of the work of Gebre et al (2014) and 02 items were collected from behavioral engagement from the lee et al. (2014). was measured 06 items were collected from Use of technology from the work of Ghavifekr & Rosdy (2015). The convenience sampling technique adopted to collect data from 400 undergraduates' students from Department of Education, Computer Science (BSCS), Business Administration, and media science (BMS) at Iqra University Karachi. Smart-pls logarithm was used to maintain the test reliability, discriminate validity, convergent validity of the instruments. Further this research has carried out using structural equation model (SEM), using Smart-PLS bootstrapping. (Hair et al 2017). A smart- PLS model used to analyze and interpret into two phases: 1st phase is to evaluate and refine the adequacy of the estimate measurement of model while 2nd stage is based on to assess the structural model and test hypothesis.

Results

This study was intended to fine the use of technology and its impact on student different dimension of engagement, it was assessed for reliability, discriminant validity and convergent validity of the instrument. For this purpose, we have run SMART-PLS algorithm.

Assessment of measurement model:



Convergent validity: Convergent validity was assessed using reliability, composite reliability (CR) and AVE-average variance extracted values (Fornell & Lacker, 1981) as shown in the (table 1). The model of smart-PLS accomplishes the reliability and composite reliability values which are greater than 0.7, confirming that all items used for this study have demonstrated satisfactory indicators of reliability as suggested by Henseler et al., 2014, similarly as shown that all the values of AVE-average variance extracted are higher than the 0.50 threshold value which provides the support measure of the convergent validity of the measure. It shows that greater than 50% variance of the items is explained by the constructs.

Table 1: convergent validity (Cronbach’s Alpha, Composite Reliability and AVE)

Constructs/Items	Cronbach's Alpha	Composite reliability	AVE
Cognitive engagement	0.779	0.852	0.502
Behavioral engagement	0.771	0.775	0.525
Reflective engagement	0.764	0.760	0.510

Social engagement	0.828	0.833	0.592
Use of technology	0.780	0.785	0.532

Discriminant validity: For discriminant validity of all the variables, it manually calculated the square root of AVE. the study (Fornell & Larcker, 1981) criterion, based on these results all square roots of AVE exceed the off-diagonal items in their corresponding Column and row, and shows that each of AVE threshold value of the constructs is higher than its correlation with all other constructs. (Hensler et al, 2014), Hence the results conformed the formell and larkers (1981) criteria have met.

Table 2: Fornell Larcker Criterion Analysis for Checking Discriminant Validity

	BE	CE	RE	SE	TU
BE	0.725				
CE	0.409	0.708			
RE	0.343	0.416	0.714		
SE	0.486	0.427	0.436	0.769	
TU	0.552	0.456	0.412	0.554	0.730

Table 3: The Heterotrait-Monotrait ratio (HTMT)

	BE	CE	RE	SE	TU
BE					
CE	0.443				
RE	0.414	0.590			
SE	0.600	0.450	0.534		
TU	0.705	0.478	0.496	0.679	

As shown in the table 3: The Heterotrait-Monotrait (HTMT) ratio of correlation indicates that all the values were significantly different from each other under the value of 0.8. Therefore, all the results met the criteria. Meanwhile, it is concluded that the measurement model of this study has established its discriminant validity.

Predictive Relevance of the Model:

According to Hair et al, 2011 the R2 (to determine the coefficient value) is a measure of the of the model’s predictive accuracy, and R2 value ranges from 0.60, 0.33 and 0.25 respectively considered to be week, moderate and strong measure of accuracy”. In this current study as shown in the (table 4) R2 of endogenous variables met the standard value with 0.501, 0.311 0.469, 0.284, therefore, it can be predicted the high, moderate and predictive accuracy of model.

Table 4: Quality Criteria (Predictive accuracy & relevance of the model)

Predictive Variables	R2	R2 adjusted	Q2
Cognitive Engagement	0.501	0.500	0.077
Behavior Engagement	0.311	0.309	0.151
Reflective Engagement	0.284	0.282	0.075
Social Engagement	0.469	0.468	0.174

According to Hair et al, 2016 cross-validated redundancy (Q2) or Stone-Giesser Q2 is a method for measuring the predictive relevance of the inner model. The value of Q2 should greater than “Zero” for each constructs specifies the PLS-SEM path model by using blindfolding analysis. In this study as shown in the above table the threshold value of Q2 is greater than zero that indicates the strength of the model and the predictive relevance of the model was satisfied. We next assessed the outcomes of the structural equation model, and concentrating on the hypothesis testing.

Hypothesis testing (SMART-PLS bootstrapping)

In this study the path model was developed which was analyzed using statistical software SMARTPLS 3.0. This current study used Semi structural equation model (SEM) to examine the impact of technology on student's different dimensions of engagement.

Table: 5 (Hypotheses, Beta, T Statistics and P values)

Hyp	Constructs	mean	B-value	T-value	Pvalue	Decision
1	Use of technology > cognitive engagement	0.478	0.456	12.128	0.000	supported
2	Use of technology > behavior engagement	0.617	0.552	15.906	0.000	Supported
3	Use of technology > reflective engagement	0.451	0.421	9.121	0.000	Supported

4	Use of technology > social engagement	0.482	0.554	9.583	0.000	Supported
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To find the hypothesized relationships among the variables the pls – bootstrapping occurred and the results showed that use of technology has significantly positive impact on students’ cognitive engagement at (B = 0.456, mean = 0.748, t-value = 12.128, P = 0.000) thus the H1 was supported. Moreover, the use of technology has significantly positive impact on students’ Behavioral engagement (B = 0.552, Mean = 0.617, t-value = 15.906, P = 0.000) therefore H2 was supported. Also Use of technology has significantly positive impact on student’s Reflective engagement (B = 0.421, Mean = 0.451, t-value = 9.121, P = 0.000) Thus the H3 is also supported. Finally Use of technology has significantly positive impact on students’ Social engagement (B = 0.554, Mean = 0.482, t-value = 9.583, P = 0.000), hence H4 was supported.

Discussion

This research intended to find out the potential impact of technology on learners’ different dimensions of engagement. Literature review was carried out for this study to determine the multiple dimension of student engagement which can be influenced by the using technology. The four latent variables emerged from the literature review such as cognitive engagement, behavioral engagement, reflective engagement and social engagement of the learners. Furthermore, this research has used the structural equation model (SEM), using Smart-PLS to test the Hypothesis and other statistical analyses for this study. The findings of the study supported all four proposed hypotheses and prove that use of technology has positive effect on students’ engagement.

In general, it appeared that students are favorably disposed towards working with various forms of technology, which can help students to engage in analyzing information, comparing and contrasting ideas using computers/laptops/smartphones also (Gebre et al., 2014). The reflective engagement has to do with awareness of what we are supposed to do and it a part of metacognitive awareness (Korucu-Kis & Demir, 2019), there are many forms of technologies that support reflective engagement. Such as vlog blogs, online tutorial, discussion tools, YouTube videos short animated movies that help students to use metacognitive and self-explanation techniques in the learning process and promote reflective thinking (Schindler et al., 2017). Certainly, the use of technology tools influence student behavioral engagement, this study showed the positive and significant relationship between the use of technology and students behavioral engagement that that technology makes the learner more actively involved in the learning activities (Hartnett, 2015), reduces teacher dominations and that became more students centered rather than the teacher-centered, Provide students independence participation in more self-regulating learning activities, therefore, it helps to develop student’s self-reliance (Zinan & Sai, 2017).

Moreover, this research shows a positive relationship between a student’s social engagement and using technology. (Munir et al., 2018) Students interact with classmates and teachers in the course using emails, WebCT, WhatsApp, and other social websites. (Athukorala, 2018) However, it also suggested by the students to promote social applications as a supporting tool in the teaching and learning process.

(Cetinkaya, 2017). This study can help out to creating learning environment with the integration of advanced technologies and their effectiveness on students understanding while using technology, can provide meaning information to educators, instructors, for the curriculum development to a fusion of technology in curriculum in terms of engaging students effectively and that helps to retain students and results in good learning outcomes.

Recommendations

1. This study recommended that proper work and focus should be given on training about technology use and overcome its related hurdles technology should be introducing at school level.
2. This study also recommended that there are many skills could develop through the use of technology. In our society, the application of technologies become a tool to achieve the desired levels of student engagement.
3. It is also recommended that the impact of technology on student engagement in the classroom as well as out of the classroom, the character of social websites, such as WhatsApp, Facebook, telegram, etc., and their usage by the teacher for the teaching purpose were quite ignored. Still, it may be important to explore how a teacher can use social media websites to facilitate learning and student engagement.
4. Despite the rich research on student engagement using technology, the more researches are needed on the factors that influence the student's engagement from the cross-sectional perspectives.
5. This study is limited only seeks to measure student engagement in a technology-rich environment but did not provide any intervention that signified the academic achievement through the student's effective engagement and level of engagement through the time

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