Factors Of Bloom Taxonomy And Academic Achievement: The Mediating Role Of Student's Self-Efficacy Using Online Platforms During COVID-19

Sayma Zia[1], Munaza Bibi[2], Ayesha Khan[3*], Ayla Wajahat[4], Insiya Abbas[5]

[1]Professor, Institute of Business Management, Karachi, Pakistan
[2]Assistant Professor, Bahria University, Karachi, Pakistan
[3*]Senior Lecturer, Bahria University, Karachi, Pakistan
[4]Research Scholar, Bahria University, Karachi, Pakistan
[5]Senior Lecturer, Bahria University, Karachi, Pakistan

*Corresponding Author: Ayesha Kha.
 Email: ayesha.khan.bukc@bahria.edu.pk

Abstract

The purpose of our study is to inspect the relationship among six factors of Bloom's taxonomy with academic achievement along with a mediating role of student self-efficacy. A quantitative approach was used. While questionnaire is employed to collect the responses from students of a University in Karachi and collected information is analyzed using Smart PLS. The results of the analysis found that students remembering Understanding and creation have a positive relationship with academic achievement. Besides, student evaluation has a negative relationship with academic achievement. Whereas student's application and analysis have no relationship with academic achievement. However, the results also showed that students' self-efficacy mediated the relationship between all factors of Bloom's Taxonomy and academic achievement except for student analysis. Therefore, the organization needs to develop strategies regarding the effective use of online platforms along with the availability of resources for students which in turn help them in academic performance.

Keywords: Academic Achievement; Bloom Taxonomy; Online Learning Platforms; Self-Efficacy

Introduction

The emergence of COVID-19 as a pandemic has affected approximately all sectors of society worldwide including the education sector. Subsequently, educators have been forced towards moving traditional classroom learning to online platforms (e.g., Zoom and MS teams) and e-learning systems like LMS to save the academic life of students (Adijaya, Widiana, Agung, & Suwela, 2023; Dhawan, 2020). Now, online learning has gained a more prominent position as a way of teaching in the higher education system (Caliskan et al., 2020). Considering this pandemic, prompt planning is needed regarding the management of higher education institutions and their faculty members in terms of conveying better education to students (Rieley, 2020). As far as faculty members are concerned, their responsibilities are far greater when using online learning platforms in terms of engaging students with limited resources and maintaining academic achievement of students (Alah, Abdeen, & Kehyayan, 2020; Lassoued, Alhendawi, & Bashitialshaaer, 2020).

Over the past two decades, the higher education sector has presented online courses as an important part of their curricula to encourage students to employ the technological aspect to learn through online learning platforms (Allen, Seaman, Poulin, & Straut, 2016; Andrade, Miller, Kunz, & Ratliff, 2020). Furthermore, online courses also allow students to learn and gain educational objectives, skills, and experience from people belonging to different professions (McAuley, Stewart, Siemens, & Cormier, 2010), while their efficiency depends on the active participation of learners. Among the researchers and educationists, academic achievement has gained more importance than before due to the utilization of online platforms (Abuhassna, Megat, Yahaya, Azlina, & Al-Rahmi, 2020; Abuhassna & Yahaya, 2018; Thompson & Lake, 2023). Therefore, academic achievement is an apprehension ahead among students as well as teachers.

Kauffman (2015) also specified that learners differ from each other based on their experience and background together with the technique they employed to learn during online platforms primarily affects their achievement. This means that in the education sector, online learning platforms are gaining popularity on the one hand, whereas this platform might not be an appropriate front for every learner on the other hand (Dan & Golan, 2013; Henry, 2020). Seeing the behavior of students during the execution of online learning platforms and academic performance, self-efficacy is viewed as a prime variable as it is related to the student's motivation and performance (Lee, 2015).

Self-efficacy is regarded as an important factor because it is a means of shaping the behavior of an individual at the end of experiences learned (Bahçekapılı & Karaman, 2020). Moreover, Bandura (1993) stated that people having a higher level of self-efficacy exhibited a strong belief in their capabilities to accomplish their responsibilities. Subsequently, the belief a person possesses to apply for the acquisition of knowledge fallouts in affecting the academic achievement of students positively in the online learning milieu (Bahçekapılı & Karaman, 2020). Accordingly, based on the above-mentioned gap, it is important to examine the link between Bloom's taxonomy factors and academic achievement along with the mediating role of student's

self-efficacy using online learning platforms during Covid 19. Subsequently, there is a need to understand how online learning platforms are affecting the academic achievement of students in Pakistan.

Review of Literature

In the current study, the theoretical framework is constructed using components of Bloom's theory. As per Bloom, Engelhart, Furst, Hill, & Krathwohl (1956), the Bloom taxonomy was constructed to assess the academic achievement of students. Accordingly, Lau (2017) also shared a view that nowadays students are continuously connected online, and using modern methods for education affects their academic performance. The first component of Bloom's taxonomy is remembering. The term remembering is explained as the act of retrieving, identifying as well as recalling knowledge from memory (Anderson & Krathwohl, 2001). In a parallel vein, Ritella, Di Maso, McLay, Annese, & Ligorio (2020) also found that numerous students have recalled the concepts and knowledge learned in online platforms which in turn improves their academic achievement. Moreover, Zimmerman and Kitsantas (2005) also specified that remembering has a meaningful link with the academic performance of students. Thus, it is hypothesized as follows:

H1: There is a relationship between students' remembering and academic achievement.

The second component of Bloom's taxonomy is understanding. Understanding is elucidated by Anderson & Krathwohl (2001) as a construction of meaning formed through verbal, written as well as graphic messages that result in considering, demonstrating, categorizing, inferring, comparing, and explaining the phenomena. Understanding the knowledge and skills learned by the students in online learning cannot only affect the student's academic achievement but also notify the efficacy of the teaching (Chan, Botelho, & Lam, 2020). Therefore, the following hypothesis is framed:

H2: There is a relationship between students' understanding and academic achievement.

The third component of bloom taxonomy is the application employed in this study. According to Anderson & Krathwohl (2001), applying encompasses the use of procedure by implementing or carrying out something. Whitmer (2013) performed a study to inspect the link between the usage of LMS and academic achievement. The fallouts of the study specify that utilization of LMS by learner's results in obtaining higher marks as compared to those who have not used it. Contrary to this Barkand (2017) showed that LMS does not have a substantial impact on the achievement of students. This means that the technology itself does not play a vital role; it is the methods used by educational institutes that eventually change the learner's achievement. This argument is supported by Aliyyah et al. (2020) that the implementation of online learning is possible with the combination of instructional facets used by the teacher such as lectures, videos, and case studies together with the usage of Zoom and MS Team results in affecting the academic performance of learners. Consequently, the succeeding hypothesis is framed:

H3: There is a relationship between students' application and academic achievement.

The fourth component of bloom taxonomy is analyzing. Anderson & Krathwohl (2001) described analyzing as breaking of concept into various parts afterward organizing and differentiating based on facts. Execution of online learning platforms is beneficial for learners as stated by Solomon & Schrum (2010) from the perspective of innovation for the development of their projects. Similarly, Cooper & Valentine (2001) also proposed that homework given to students is beneficial because it results in developing students as independent learners with the development of skills by assessing the facts and knowledge which in turn produces more positive outcomes in terms of academic performance. So, the subsequent hypothesis is framed:

H4: There is a relationship between students' analysis and academic achievement.

The fifth component of the bloom taxonomy used in our study is evaluation. So, evaluation refers to the value the students put in esteeming the lectures as well as the material they have learned to make a difference among facts and opinions (Persaud, 2018). For instance, utilizing blogs and articles to appraise the information students have learned. Besides, Efe & Efe (2011) unveiled that Bloom's taxonomy components including evaluation can help students visualize the problems and enhance their learning ability by utilizing online platforms to retrieve the material they want to appraise the knowledge that eventually amplifies the students' performance. So, the consequent hypothesis is outlined:

H5: There is a relationship between students' evaluation and academic achievement.

The last component of the bloom taxonomy used in our study is creation. The term creation refers to whatever students have learned from a particular subject perhaps helping them to create something new or resulting in the development of new concepts (Persaud, 2018). For example, students writing a report or developing new machines or software. The bloom taxonomy components including creating have given a new specification to develop and solve the problem effectually (Forehand, 2010). Thus, resulting in affecting the performance of students. Accordingly, Santosh, Ajinkya, Padmakar, and Keshav (2021) found that the performance of students improves during online learning across all levels of Bloom's taxonomy including evaluation. Subsequently, the ensuing hypothesis is delineated:

H6: There is a relationship between students' creation and academic achievement.

In the academic scenario, self-efficacy is viewed as an important aspect. Self-efficacy is regarded as a capability to perform actions to attain the anticipated goal (Tomás, Gutiérrez, Georgieva, & Hernández, 2020). The sudden transition to an online learning system increases the use of technology. Students who are facing problems regarding technology-facilitated education have a detrimental effect on their self-efficacy (Saadé & Kira, 2009; Sam, Othman, & Nordin, 2005). Besides, Fisk, Patricio, Lin, and Chang (2011) posit that a greater level of preparedness among students concerning the use of technology to apprehend knowledge may perhaps lead to a higher level of self-efficacy.

On the adjacent side, Howard, Ma, & Yang (2016) demonstrated that students with a higher level of self-efficacy concerning the processing, assessing, creating, and understanding of information results in generating positive outcomes related to technology-based education. Accordingly, Warden, Yi-Shun, Stanworth, and Chen (2020) revealed that students who are uncomfortable with using technology have a lower level of self-efficacy which in turn affects their academic performance.

Opposing this view, Bahçekapılı & Karaman (2020) confirmed that when the learner's self-efficacy increases, its fallouts in improving the student's academic achievement. The following hypotheses are projected:

H7: Students' self-efficacy mediates the relationship between student's remembering and academic achievement.
H8: Students' self-efficacy mediates the relationship between student's understanding and academic achievement.
H9: Students' self-efficacy mediates the relationship between student's application and academic achievement.
H10: Students' self-efficacy mediates the relationship between student's analyzing and academic achievement.
H11: Students' self-efficacy mediates the relationship between student evaluation and academic achievement.
H12: Students' self-efficacy mediates the relationship between student creation and academic achievement.

Methodology

To provide a comprehensive view, a quantitative approach was used in the current study. Besides, in this study, the population was comprised of Bahria University students who have been users of online learning platforms like Zoom and MS Teams via using purposive sampling technique with a sample of 152. The primary data was collected from the students through Google Forms using an adapted questionnaire. Besides, items to measure academic achievement and components of Bloom's taxonomy were adapted from the scale of Pekrun, Goetz, & Perry (2005) while student's self-efficacy was measured through items adapted from Fertman & Primack (2009) scale. Besides, for the analysis of collected data SPSS and Smart PLS have been utilized as an analysis tool.

Findings

In our study, the sample is comprised of both male and female students of which 38.2% represent the male students in our study whereas 61.8% represent the female students. In our study, 92.1 % of students are representing the BBA program while 3.9% from the BS program and 3.9% from the MBA program. Using the Smart PLS, a measurement model was run. The values of factor loadings were > 0.60 whereas a few items were eliminated due to factor loadings < 0.60 as per the recommendations of Ghozali & Latan (2015). Values for composite reliability were > 0.8 and the average variance extracted value was > 0.5. Values fall within the range which is 0.7-0.9 (Hair, Sarstedt, & Ringle, 2019) which specifies the validity of the instrument. The discriminant validity of the employed constructs is assessed by using the Fornel Larcker criteria by associating the square root of each average variance extracted for each construct (Fornell & Larcker, 1981). Therefore, the overall discriminant validity of the measurement model is acceptable.

Table 1 indicates the results of the structural model such as student remembering was associated positively with academic achievement while student understanding and creation were associated positively with academic achievement. In addition, student evaluation was associated negatively with academic achievement. Whereas the remaining two predictors including students' application and student analysis were not associated with academic achievement as the p-value is >0.05.

Table 1. Hypotheses Testing.

Hypotheses	Std Beta	t- value	p-value
1	0.292	2.645	0.008
2	0.302	2.013	0.045
3	0.137	0.809	0.419
4	0.121	0.920	0.358
5	-0.436	3.505	0.000
6	0.224	2.695	0.007

Table 2 indicates the results of the mediation. The results of the mediation analysis demonstrated that the relationship between students remembering, understanding, application, evaluation as well as creation, and academic achievement is mediated by students' self-efficacy as zero does not lie between CILL and CIUL. Whereas, the relationship between students' analysis and academic achievement is not mediated by students' self-efficacy as zero lies between the lower and upper limits of a confidence interval as per the criteria specified by Preacher & Hayes (2008).

Table 2. Mediation Analysis.

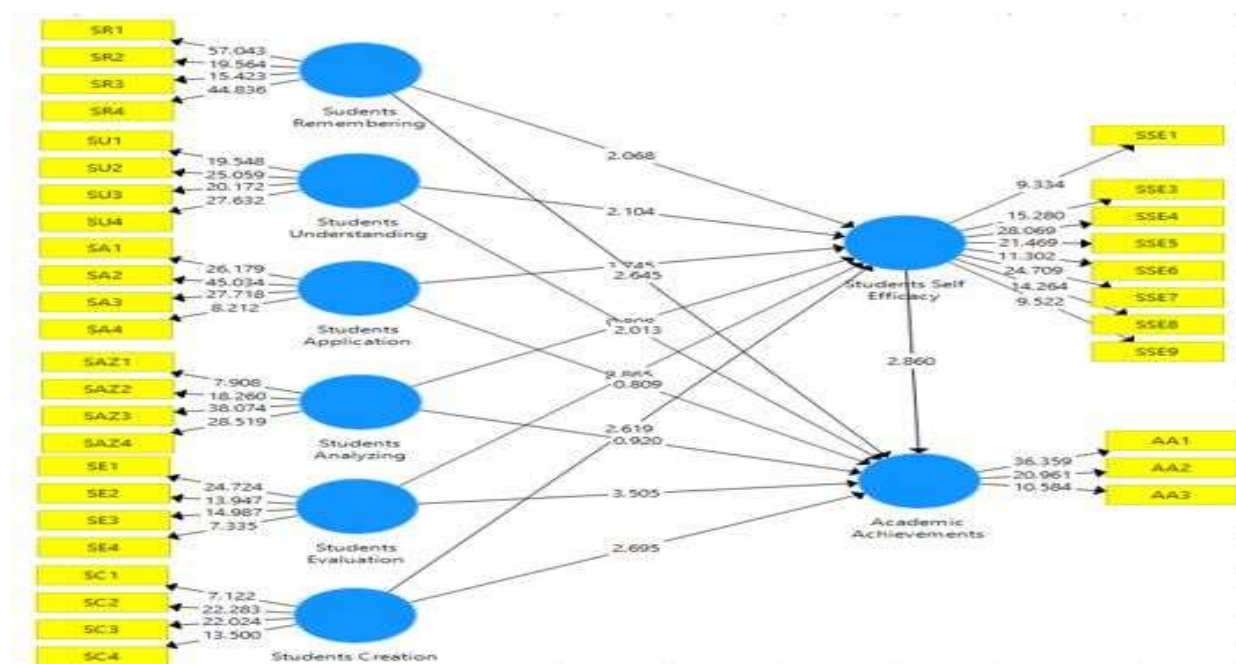| Hypotheses	Std Beta	t- value	95% CILL	95% CIUL
7	0.058	1.603	0.011	0.164
8	-0.068	1.793	-0.176	-0.012
9	0.061	1.474	0.002	0.158
10	0.026	0.747	-0.031	0.097
11	0.098	2.183	0.035	0.228
12	0.078	1.761	0.017	0.176

Figure 1. Theoretical Model Results

Discussion

We have investigated in our study the main facets of Bloom's taxonomy and its relationship with student's academic achievement along with mediating effect of student's self-efficacy. Referring to the hypothesis that students' remembering has a positive relationship with academic achievement whereas this relationship is mediated by student's self-efficacy. Hence, this means that our study findings are in line with the outcomes of studies conducted by (Howard et al., 2016; Ritella et al., 2020; Zimmerman & Kitsantas, 2005).

Students' understanding has a positive relationship with academic achievement during online learning platforms and it is also mediated by student's self-efficacy. The results of our study are in line with the outcomes of Chan et al. (2020) and Howard et al. (2016). Besides, students' application has no relationship with academic achievement and this relationship is mediated by student's self-efficacy. The results of this study are consistent with the outcomes of Barkand (2017) whereas the results are not in line with the outcome of Whitmer (2013). Students who are uncomfortable with using technology have a low level of self-efficacy which in turn affects their academic performance (Warden et al., 2020).

Students' analyzing has no relationship with academic achievement and this relationship is not mediated by students' self-efficacy. The results are not in accord with the fallouts of Cooper & Valentine (2001) study. Students' evaluation has a negative relationship with academic achievement and this relationship is mediated by student's self-efficacy. The results of Efe & Efe (2011) study are not consistent with the results of our study. Students' creation has a positive relationship with academic achievement and this relationship is mediated by student's self-efficacy. Furthermore, Bahçekapılı & Karaman (2020) confirmed that when the learner's self-efficacy increases, its fallouts in improving the student's academic achievement, results are in line with our study results. Accordingly, Santosh et al. (2021) study outcomes are in line with the results of our study except for the student's application and analysis.

Conclusion and Recommendations

The Bloom Taxonomy theory was adopted as an underlying theory for hypothesizing the relationship between six predictors and academic achievement. Our study has made a major contribution to the extant literature as our study examined the relationship between the factors of Bloom's taxonomy and academic achievement of students especially when the online platforms have been utilized for learning. Furthermore, the student's self-efficacy has been checked as a mediator between bloom taxonomy factors and the academic achievement of students.

The organization needs to develop strategies regarding the effective use of online platforms among students as well as teachers along with the availability of resources for students which in turn help them in academic performance. The provision of an LMS system by the university might perhaps play a vital role in providing lectures, course material, and supporting articles related to the subjects to facilitate those students who have missed their classes due to internet as well as electricity issues which in turn facilitating the positive outcomes for students in terms of academic achievement.

This study also has a few limitations. Firstly, this study was conducted on a small sample size. Future studies must examine this model on a larger sample size. Secondly, this study was conducted among business students. Future investigators can conduct this study in other programs as well. Future researchers must examine the bloom taxonomy in the blended learning environment to further expand the prospects.

Disclosure statement

No conflict of interest.

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