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## Mediating Effect of IT Tools Usage on the Relationship between Academic Self-Efficacy, Learning Attitude and Academic Performance

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### ABSTRACT

Information technology has a powerful impact on our daily doings in all walks of life. Particularly in educational settings, the pyramid of learning attitude has been altered by the use of technological tools in the learning process and thus the performance of the students. However, comprehensive integration of information technology tools to enhance the learning is a deemed necessity of the information age where adolescents are seemed as digital natives. Therefore, this study focused on measuring the mediating effect of information technology usage on the relationship of Academic efficacy & learning attitude and academic performance of the students in secondary schools. Multistage sampling technique was used; 10% of secondary public schools were randomly selected from four randomly selected Tehsils of Sargodha as a sample; at the second stage, 20% of the 10th graders were selected from each school through stratified random sampling. Data was collected through a questionnaire by using the quantitative survey method. Path analysis was applied to study the mediating effect of IT usage on the relationship between academic self-efficacy and academic performance. Findings revealed that academic self-efficacy exert significant positive indirect effects on the academic performance mediated through IT usage. Similarly, academic attitude also found to have significant direct and indirect effect on the academic performance. Therefore, it is suggested that teachers should integrate the technology embedded activities in their teaching.

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## 1. Introduction

Technology itself is a great equalizer for humans to handle things in a proper and manipulated way (Zhu & Mok, 2020; Kaya et al., 2019). It is evident that IT gadgets have played a significant role in the improvement of learning and teaching as well. In the learning process, the effectiveness and permanence of knowledge transmission have increased due to the integration of technological tools in the education system. It has also improved the student-teacher relationship by developing a conducive learning environment in the classroom (Hulya et al. 2016). In the current technological era, students' life is influenced by many mass communication, technological tools which include smart TV, internet, laptops, tablets, smart phones, and other technological gadgets (Kalmus, 2013). It is evident that the technology tools connected with internet in the form of smart phones, tablets and laptops have a positive effect on students during lectures and thus are developing a better understanding (Byun, 2018). Cognitive gain, skills development, visualizations empowered with virtual experiences among young ones can be observed at a fast pace and in earlier years as compared to their elders (Kandalajt, 2013).

Academic self-efficacy is one's belief in his ability to perform a task or cope up with a learning situation. Therefore, it is of vital importance in defining and directing the students' learning attitude and predicting their performance in the class (Yau & Leung, 2018; Tenhet, 2013; Partin & Haney, 2012). Initially, Bandura (1977) coined the term self-efficacy and suggested that individual belief influence his learning activities, efforts and achievements. He defined it as the *person's particular set of beliefs that determine how well one can execute a plan of action in prospective situations*. More or less the same idea was presented by Moran et al. (2010) in their research study of the unified theory of acceptance and use of technology as *people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives* (p. 87). In the relationship between the academic self-efficacy and academic performance, researchers suggested that the such belief in one's self is associated with the willingness to attempt and to perform thus from his attitude towards learning (Qadoos et al., 2020; Bandura & Locke, 2003; Farnsworth et al., 2002; Shunck, 1991). Moreover, it is also evident from research that high self-efficacy infers high academic performance, which signifies tenacity challenge (Ahmad & Akbar, 2020; Tenhet, 2013; Walker & Greene, 2009).

On the other hand, the integration of technology in education today is changing traditional teaching methods and learning into modern active instructional methods. Students are becoming active learners by using technological tools during classroom lectures and activities like, calculators, laptops/tablets, smart phones and educational software, etc. thus accelerating their learning attitude (Strumsky et al., 2012). How far the availability and the usage of information technology tools accelerate the students' attitude towards learning and their academic achievement, has been the area of interest for the researchers for the past two decades. However, literature has also evident that, excessive use of these tools exerting the impatience, aggression, psychological problems and even technology and internet addiction along them too. In this case, parents and teachers can play a vital role to alter the negative effect by controlling the excessive and unwatched usage of technological tools in schools and at homes. Therefore, positive and effective use of information technology tools is the need of the time in order to make our students productive learners with sound personality (Ng et al., 2016; Andrea et al., 2011).

The previous studies revealed that the students who used information technology tools exhibited more interest in learning, more motivation for classroom participation and greater willingness to perform well as compare to those students who were not using these tools (Rashid &

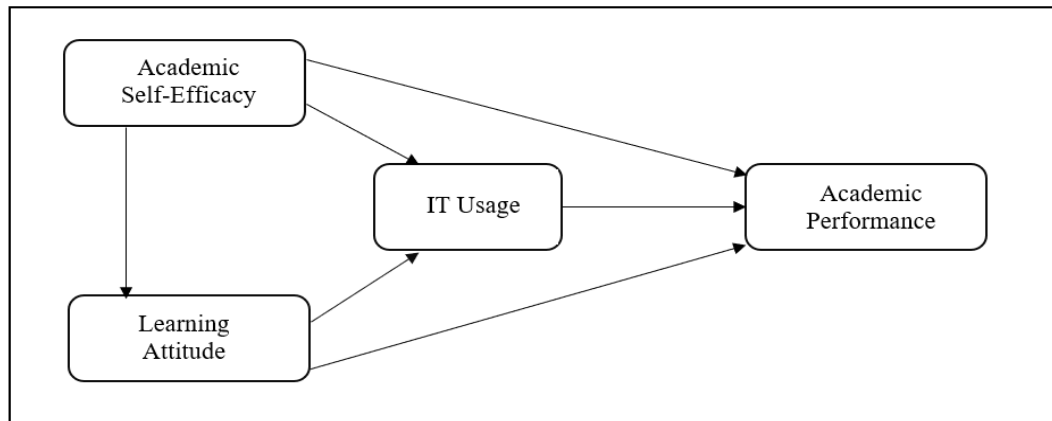
Asghar, 2016; Fonseca et al., 2014; Gulek & Demirtas, 2005; Trimmel & Bachmann, 2004). Furthermore, Drain et al. (2012) explored the “intelligent use” of information technology, which means those students who use these tools for the educational purpose most of the time, showed greater academic performance.

On the other hand, the belief of a student that he has the ability to perform educational tasks, viz, academic self-efficacy, is directly associated with his attitude towards learning (Partin et al., 2011). Attitude is a determining factor for the student’s willingness and motivation to apply what they have learned. Thus, it can be assumed that the relationship between the academic self-efficacy and attitude towards learning can determine the intensity of students’ expertise in using the information technology tools. In result, students’ inclination of using information technology tools in learning significantly affect their academic performance (Yau & Leung, 2018; Farnsworth *et al.*, 2002).

## **2. Research Framework and Hypothesis development**

Constructivist theory is referring the learning transmission through the use of technology tools because it gives diversity in the education process. When students immediately know about the new inventions around the world through technology, it helps them to develop their aims to achieve. Here the basic concern of this research is about the student’s academic attitude that how it changes when technology tools are used in their studies. Their positive attitude and behavior, increase their academic achievements, which is the best aspect of technology use in schools. Especially constructivism promotes the learning process with the use of technology because it enhances the education system in many aspects, but the possibilities are both positive and negative (Granić & Marangunić, 2019; Gilakjani, et al. 2013). The learner is active in the classroom by using the technological tools. As mentality mirror the general propensity in social correspondence innovation use over a variety of settings, including the study at home (Graham et al. 2011), consequently, it is anticipated that online correspondence disposition applies a positive direct impact on social utilization of technology apparatuses (Díaz-Posada et al., 2017; Johnson & Brown, 2017; Klein & Kleinman, 2002). Information Technology tools usage is associated with educational outcomes which depend on the academic attitude of the student that what he believes and how he uses the technology related to his educational needs (Lei, 2010). Therefore, the current study was aimed at investigating the role of information technology tools on the students’ academic performance.

Moreover, student’s academic self-efficacy (ASE) and Learning attitude (LA) are the two concepts, that are implicitly or explicitly predicting the academic performance, have been the research interest of many educationists and psychologists since the 80’s (Bandura, 1977). In addition, with the inculcation of information technology tool usage in academic environment brought the new investigations of effects, positive or negative, on the student’s performance. Therefore, the current study aimed to investigate the path model with student’s self-efficacy, learning attitude, and their academic performance mediated through the information technology usage among secondary school students. In the light of the theoretical framework, the conceptual model for this study is given in the figure 1.



**Figure 1. Conceptual Framework of the study**

In this conceptual framework, the variable “academic performance” was the dependent variable and IT tools usage was the mediator for independent variable “academic self-efficacy” and “learning attitude”. However, multiple mediations of IT tools usage and learning attitude to the relationship between academic self-efficacy and academic performance was also investigated. From the conceptual model of the study in fig 1, following hypotheses were developed:

H<sub>1</sub>: Academic self-efficacy has a significant direct effect on the attitude of the students towards learning.

H<sub>2</sub>: Academic self-efficacy has a significant direct effect on the IT tools usage in learning.

H<sub>3</sub>: Academic self-efficacy has a significant direct effect on the academic performance.

H<sub>4</sub>: Learning attitude has a significant direct effect on the IT tools usage by students.

H<sub>5</sub>: Learning attitude has a significant direct effect on the academic performance of the students.

H<sub>6</sub>: IT tools usage in learning has significant direct effect on the academic performance of the students.

H<sub>7</sub>: Learning attitude has a significant indirect effect on the academic performance of the students mediated through IT tools usage.

H<sub>8</sub>: Learning attitude and IT tools usage significantly mediate the relationship between academic self-efficacy and academic performance.

### 3. Methodology

The main objective of this research was to investigate the mediating effect of information technology tool usage on the relationship between academic self-efficacy, learning attitude and the academic performance of the secondary school students in Sargodha district. Therefore, all the tenth graders studying in the high schools of public sector in the Sargodha district for session 2019-2020 were the targeted population. There are seven tehsils in the Sargodha district, these are, Sargodha, Shahpur, Silanwali, Bhulwal, Bhera, KotMomin & Sahiwal. To select the sample of the study, a multi stage sampling strategy was used. In the first phase of sample selection, total three/ four tehsils were selected randomly, these were, Sargodha, Sahiwal, KotMomin and Silanwali tehsil. There are total

3021 high schools in all seven tehsils, out of which 137 high schools (Boys HS=48 & Girls HS=89) were in Sargodha tehsil, which was highest among all and 28 high schools were in Kot Momin (Boys HS=17& Girls HS=11). While there were 27 high schools (Boys HS=17 & Girls HS=10) and 43 high schools (Boys HS=20 & Girls HS=23) in Sahiwal and Silanwali tehsils respectively. Therefore, only these three/four tehsils were having 207/235 high schools, which was about/above 2/3<sup>rd</sup> of the whole district's public high school population (which may be a true representative of the targeted population).

In second phase, 15% of the high schools of both genders were selected from the sampled tehsils through stratified sampling technique. There were total twenty-one high schools (Boys HS=08& Girls HS=13) from Sargodha, five high schools (Boys HS=03& Girls HS=02) from Sahiwal and seven high schools (Boys HS=03& Girls HS=04) from Silanwali were selected. From tehsil Kotmomin, total five high schools (Boys HS=03& Girls HS=02) were selected. In the last phase, 25% of the 10 grade students from science groups were selected randomly from each sampled school. This study was delimited to the secondary school students belonging to science group only, therefore students were selected from science sections only. Total 500students (Boys=310& Girls=192) from 33/38 sample high schools were selected to collect the data of the present study.

### 3.1 Tool Development

A quantitative survey research design was adopted in this study. For this purpose, a questionnaire consisted of the demographic profile and scales was developed. There were four variables of the study, academic self-efficacy, learning attitude, IT usage and academic performance for which the scales were developed, whereas the dependent variable "Academic performance" was measured in terms of the students' average marks obtained in their third term examination in schools. The scale for the variable "Academic self-efficacy" based on 8 items was adopted from the reliable and valid scale of the Motivated Strategies for Learning Questionnaire (MSLQ) (Duncan & McKeachie, 2005). Similarly, to measure the variable "IT usage", items were taken from the "Peer learning" and "Help seeking" scales from MSLQ and modified with respect to the information technology used to take the help in the learning. While, the "Learning attitude" was measured with 4 item scale adopted from an attitude towards learning scale (Topală, 2014). All the scales were measured on the 7-points Likert scale moving from "not at all true of me" to "very true of me". Along with these scales, a part of demographic profiles of the students were also included in the questionnaire, based on "gender", "tehsil", "schools area" and "average marks".

In order to ensure the reliability of the research tool, a pilot test was conducted on the 48 students selected from two schools randomly selected from Silanwali tehsil. The reliability of the scales of this study was measured through Chronbach Alpha in table 1.

**Table 1. Items of the scales and their Alpha coefficients**

No.	Items	Alpha ( $\alpha$ )
	<b><i>Academic Self-efficacy Scale</i></b>	<b>0.779</b>
1	I believe I will receive an excellent grade in this class.	0.750
2	I'm certain I can understand the most difficult material presented in the readings in the class.	0.754
3	I'm confident I can learn the basic concepts taught in the class.	0.753
4	I'm confident I can understand the most complex material presented	0.737

1 [https://schoolportal.punjab.gov.pk/sed\\_census/new\\_emis\\_details.aspx?distId=384--Sargodha](https://schoolportal.punjab.gov.pk/sed_census/new_emis_details.aspx?distId=384--Sargodha)

	by the teacher in the class.	
5	I'm confident I can do an excellent job on the assignments and tests.	0.734
6	I expect to do well in this class.	0.779
7	I'm certain I can master the skills being taught in this class.	0.765
8	Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	0.749
	<b>Learning Attitude</b>	<b>0.697</b>
1	I believe that learning is essential to me.	0.619
2	When I'm learning, I feel that I'm doing something important.	0.642
3	I'm looking for opportunities to learn something new.	0.635
4	When I want to learn something, I get totally involved.	0.644
	<b>IT Usage</b>	<b>0.774</b>
1	I try to work with IT devices to complete the course assignments.	0.760
2	Even if I have trouble learning the material in this class, I try to do the work on my own, without help of IT devices. (REVERSED)	0.755
3	I search the internet and use IT tools/devices to clarify concepts I don't understand well.	0.764
4	When I can't understand the material in this class, I use IT tools to help.	0.757
5	I try to identify the web contents and software which I can consult for help if necessary.	0.747

Data of the pilot test was examined for measuring Internal consistency by Cronbach's alpha correlation coefficient in SPSS v.22. The value of alpha varies from 0.7 to 0.8 is considered a good level of alpha coefficient. The internal consistency of all eight items of the "Academic Self-efficacy" scale was measured at  $\alpha = 0.779$  which is considered as good level. Similarly, for the scale of "IT usage", the coefficient alpha was found at  $\alpha = 0.774$ , however, the coefficient alpha value for the variable "Learning attitude" was found at  $\alpha = 0.697$ . Alpha value of 'Learning attitude' scale is approximately 0.7 after round off, therefore this can also be considered at acceptable level. After the construction of the final questionnaire, data were collected from the students of the selected sample schools.

#### 4. Results

Data from the total 512 students were collected, however, during editing and refining the data, 12 students were removed due to incomplete data. The table 2 presents the demographic characteristics of the 500 high school students selected as the sample of the current study. In the descriptive statistics, frequencies and percentages of demographic variables were computed.

**Table 2: Respondents' demographic characteristics**

Variables	Frequency	Percentage
<b>Gender</b>		
Male	310	62%
Female	192	38%
<b>Tehsils</b>		
Sargodha	195	39%

Silanwali	115	23%
Sahiwal	93	18.6%
Kot Momin	97	19.4%
<b>Where do you live?</b>		
Urban	305	61%
Rural	195	39%

In this table 2, the information about gender revealed that 62% of the boys and 38% of the girls' students participated in the study. The distribution of the total sample among four tehsils indicated that 39% students were from tehsil Sargodha, 23% of the total sample were belonged to tehsil Silanwali. Whereas, 18.6% and 19.4% of the total sample students were from tehsil Sahiwal were and Kotmomin respectively. The third variable was the locality where the school was situated. Total 305 students which 61% of whole sample, were belonged to the urban areas and 195 high school students, which is 39% of the sample, were belonged to the rural areas.

**Table 3. Mean, standard deviation and bivariate correlations between the variables**

Variables	Mean	SD	1	2	3
Academic Self-Efficacy	4.96	1.253	1		
Learning Attitude	4.88	1.452	0.422**	1	
IT Usage	4.84	1.302	0.539**	0.380**	1

\*\* p < 0.01

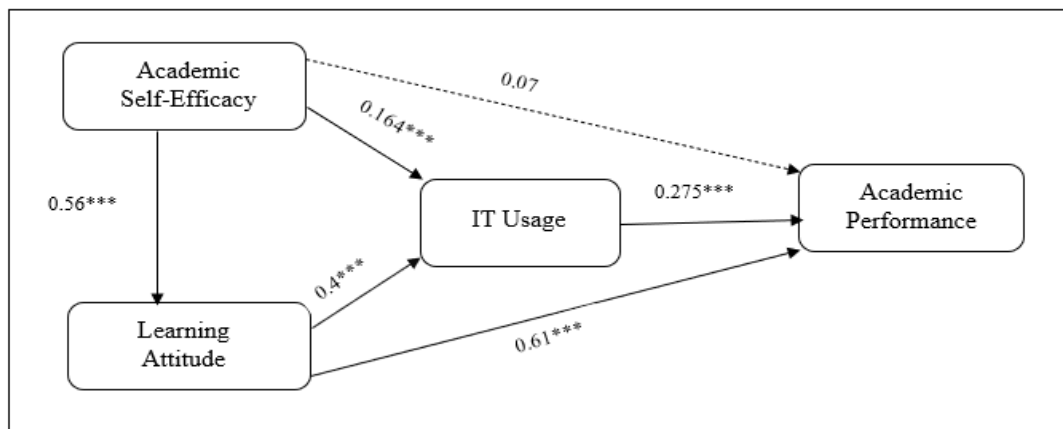
The results of Mean scores in the table 3 showed the average level of agreement for each variable. The scales were measured on 7-points Likert scale, in which neutral level was at point 4. The mean level for all three variables is greater than 4, which demonstrated that overall students possessed positive academic self-efficacy, learning attitude and use IT to take help in their studies. Further, correlation coefficients showed that, academic self-efficacy found to have significant positive correlation with learning attitude ( $r = 0.422$ ,  $p < 0.01$ ) and IT usage ( $r = 0.539$ ,  $p < 0.01$ ). Similarly, the learning attitude and IT usage were found to have significant positive correlation between them ( $r = 0.539$ ,  $p < 0.01$ ).

#### 4.1 Model Testing

Model testing is the procedure to determine how well the data fit the model (Pacurar & Abbas, 2015). The hypothesized relationships are tested by investigating the standardized regression coefficients of  $\beta$  values and the total explained variances or  $R^2$  values (also called the coefficient of determination). In Path analysis, there are other measures which are highly recommended, these are called absolute measures or indices, incremental fit measures and parsimony measures. Absolute measures include the Chi-square, Normed Chi square and Root Mean square error of approximation (RMSEA). The accepted range of normed chi-square is between 1 and 5 (Abbas, 2011). The value for the normed chi square less than 1 indicates the poor model fit, while the value greater than 5 indicates the need for improvement in the model (Schumacker & Lomax, 2010; Hair et al., 2009). Moreover, the value of the root mean square error of approximation 'RMSEA' ( $RMSEA = \sqrt{\frac{d}{df}}$ , where  $d = \frac{\chi^2 - df}{N - 1}$ ) less than 0.06 is considered as the good measure (Loehlin, 2004; p.69 cited in Abbas, 2011). Whereas, the most influential incremental fit measures are comparative fit index (CFI) and normed fit index (NFI). The standard range of the values for the incremental fit indices is "0 to 1",

the value closer to 1 is considered as a good fit (Byrne, 2006). Lastly, the Parsimony normed fit index, which is denoted by PNFI, its range is also between 0 and 1, value closer to 1 is a good fit. In the large sample size (e.g., here N=500), the value of chi-square does not remain consistent measure for model testing (Abbas, 2011), therefore, the normed chi-square, which ranges from 1 to 5, is used as an alternative.

In this paper, AMOS v. 20 was used to test the conceptual model and to test the hypothesized relationships in the model. The path analysis under the structural equation modeling was run by taking the ‘Academic self-efficacy’ as the independent variable and Academic performance as the dependent variable. Figure 2 presents the structural model with path coefficients.



**Figure 2. The path model of mediating effect of IT usage on Academic self-efficacy and Academic performance**

In figure 2, path coefficients of each relationship are estimated. As it is demonstrated in fig 2, the path showing the direct effect of academic self-efficacy on the academic performance was found non-significant, therefore, by removing this path, the path model rerun again. The fit indices of the model were analyzed. The normed chi-square, which was calculated as CMIN/df, was found within the range ( $\chi^2_{(normed)} = 1.440, p = 0.231$ ). The incremental fit indices, CFI was found 0.999 and the value of NFI was found 0.998. These values indicated the good fit which means the variables were having high average correlations between them. Further, the value of RMSEA was found at 0.03. The measured value of RMSEA less than 0.06 indicated good measure in the model of the study. Moreover, the value of parsimony measure PNFI was calculated at 0.1667 which was found greater than zero. On the base of these fit indices, it was concluded that model was the best fit. Moving further to test the hypotheses H<sub>1</sub> to H<sub>6</sub>, the estimates of the paths of the model in figure 2 were measured in the table 4.

**Table 4. Path estimates of measured model.**

Parameter	Unstandardized (β)	SE	t-value	Standardized (b)
H <sub>1</sub> : ASE → LA	.561***	.043	12.953	.502
H <sub>2</sub> : ASE → IT	.164***	.037	4.479	.183
H <sub>3</sub> : ASE → AP	.074	.061	1.201	.051
H <sub>4</sub> : LA → IT	.398***	.033	12.182	.499
H <sub>5</sub> : LA → AP	.612***	.058	10.632	.475
H <sub>6</sub> : IT → AP	.275***	.072	3.813	.170



\*\*\* p < 0.001

The path coefficients for the hypotheses H<sub>1</sub> and H<sub>2</sub>, affirmed that academic self-efficacy has a significant direct effect on learning attitude and IT usage for learning purpose. Also, this independent variable (ASE) produced 25% (R<sup>2</sup> = .252) of the total variance on the learning attitude. Further, the results for H<sub>4</sub> and H<sub>5</sub> showed that learning attitude was found to have a significant direct effect on IT usage and academic performance of the students. The coefficient of determining value (R<sup>2</sup> = 0.374) showed that 37% of the variance in IT usage was explained by the learning attitude and academic self-efficacy. Moreover, testing H<sub>6</sub>, it was found that the variable IT usage also had the significant direct effect on the academic performance of the students (β = .275, p < 0.001). In the proposed measured path model in fig 2, the coefficient of determination of academic performance was found 0.351, which indicated that 35% of the variance in academic performance was explained by the academic self-efficacy, learning attitude and IT usage. However, academic self-efficacy of the students did not appear to have a significant direct effect on the students' academic performance (β = 0.074, t = 1.201; p = .231), thus H<sub>3</sub> was not accepted.

Concerning the indirect effects, hypothesized in the H<sub>7</sub>, H<sub>8</sub>, and H<sub>9</sub>, the direct, indirect and total effects were measured in AMOS as shown in table 5.

**Table 5. Direct, indirect and total effects**

Variables	Causal variables					
	Academic Self-Efficacy		Learning Attitude		IT Usage	
	Unst.	St.	Unst.	St.	Unst.	St.
Learning Attitude						
Direct Effect	0.561**	0.502				
Indirect Effect	0.000	0.000				
Total Effect	0.561**	0.502				
IT Usage						
Direct Effect	0.164**	0.183	0.398**	0.499		
Indirect Effect	0.224**	0.250	0.000	0.000		
Total Effect	0.388**	0.434	0.398**	0.499		
Academic Performance						
Direct Effect	0.000 <sup>1</sup>	0.000	0.612**	0.475	0.275*	0.170
Indirect Effect	0.450**	0.312	0.110**	0.085	0.000	0.000
Total Effect	0.450**	0.312	0.722**	0.560	0.275*	0.170

\*\*p < 0.01; \*p < 0.05. ⊃>1 model was rerun after removing non-sig path.

To begin with mediated effects, the hypothesis H<sub>7</sub> was to measure the indirect effect of learning attitude on the academic performance mediated through the IT usage. The value, in table 5, of indirect effect turned up significant (0.085), which affirmed that positive learning attitude of the student with the inclusion of information technology in studies turned into better academic performance. In order to test the H<sub>8</sub>, the indirect effect of academic self-efficacy on the academic performance mediated through the learning attitude and IT Usage, the indirect effect was measured and found significant (0.312), though direct effect of Academic self-efficacy was found non-significant but the total effect was significant. It indicates that academic self-efficacy if mediated through positive learning attitude and integration of IT create a significant positive effect on academic performance of the students. As an illustration, it was observed that the academic self-efficacy measured the significant direct and indirect effect on the IT usage and further the significant direct effect of learning attitude on IT usage was also observed.

## 5. Conclusion and Discussion

Usage of Technology tools is rapidly and continually progressing. It is an unending process and demands a recurrent integrated learning. Using technology tools/devices are affecting the students' lifestyle in different ways, it has engaged the students from real to virtual supporting tools for their learning. The findings of this study show that academic self-efficacy develops a significant indirect effect on the students' performance in terms of their achievements mediated through academic attitude and IT usage as well. These results are aligned with the previous research studies. However, the direct effect of self-efficacy on the academic performance was not found significant which is contrary to the research findings of Tenhet (2013) and Walker & Greene (2009). The possible reason of this finding may be that self-efficacy of the student alone cannot produce the learning benefits or positive educational outcomes unless it is mediated through the academic attitude which seems logical as self-efficacy is the determinant of the interest and motivation towards learning (for example Putin, 2016; the theory of Planned behavior by Bandura).

The result of current study showed that information of academic attitudes, these technology tools had great impact on student' learning attitude and hence develop into the source for students' intrinsic motivation. Though, one point of view in research claims that excessive use of IT tools may be harmful for the mental activity, like lack of concentration, however, at the same time, these IT devices produce a beneficial impact if used for educational purposes and creative activities. These technology tools may engage the student in purposefully in order to become them active learner, which may ultimately affect their academic attitude and thus achievement level.

Further, the results of this study also confirm the use of technology tools/devices, if used under the guided programmed supervision of teachers, can predict and accelerate the academic attitude of the students at primary schools. It is reasonable that guardians should set the timetable for their children for utilizing distinctive technology devices to protect them from negative influence. It is necessary that students should be provided healthy and conducive learning environment in schools by integrating information technology in the learning process. On parallel, parents should also be aware of their children's habits in using IT devices.

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