

Effect of Facebook Based Instructional Design on Academic Achievement in Physics Among Secondary School Students in Relation to Parental Involvement

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Abstract: In recent years, the integration of social media platforms into educational settings has gained a lot of popularity around the world. Among these social media platforms, Facebook act as one of the most commonly used and easily accessible technological tool that can be used for communication and collaboration purposes. This paper examines the effect of utilizing Facebook based instructional design as a platform for enhancing academic achievement in physics. With the growing prevalence of social media platforms into education sector, especially Facebook, it is imperative to assess its effect on academic achievement in relation to parental involvement. This study was conducted on total number of 600 secondary school students studying in private C.B.S.E schools in class ninth from Amritsar district. In order to conduct the experiment, a total number of six schools, out of which two using conferencing tool, two using LMS and two who are ready to use Facebook platform were selected. A data was collected using achievement test in Physics and The Parental Involvement Scale (Dr. Vijaya Laxmi Chouhan and Mrs. Gunjan Ganotra Arora). A significant difference in the academic achievement gain scores in three treatment groups was found. A significant difference in the academic achievement gain scores at three levels of parental involvement was found. An interaction between instructional strategies and levels of parental involvement on the academic achievement gain scores among secondary school students was found.

Keywords: Facebook, LMS, Conferencing tool, Academic achievement, Parental involvement.

1. Introduction

Now a days, web 2.0 tools have become ubiquitous in modern society, offering unique opportunities for students to communicate, collaborate, and share vast knowledge with everyone. These tools have revolutionized the way through which information can be created, shared, and accessed on the internet. These tools hold great position in education sector too. A variety of web 2.0 tools available are social media platforms, video conferencing platforms, learning management platforms and many more. These platforms provide teacher educators a plethora of e-resources and opportunities to enhance their teaching learning situations in more effective way. These platforms enable teacher educators to make more active and interactive teaching learning environment. By integrating these platforms into their teaching repertoire, teacher educators can develop social interaction skills such as collaboration, communication and cooperation among students. It further helps to enhance their critical thinking, problem solving abilities, decision making skills and creativity.

Among variety of social media platforms available, Facebook act as one of the most popular platforms worldwide especially for connecting people socially. In the realm of education sector, Facebook provide lot of opportunities that helps to enhance collaboration, communication, cooperation and knowledge sharing among users. It helps to enhance student engagement, encourage peer-group interaction, and outspread learning beyond the classroom settings. This platform provides on-time updates, reminders and announcements related to course content. This platform keeps students informed and connected to the various upcoming events related to learning process outside of scheduled class time.

A learning management system (LMS) is a popular web 2.0 tool that helps to deliver, manage and track e-content freely and easily. This platform helps to organize courses, distribute e-resources, administering assessments and

track student's progress. There are lot of popular LMS available these days such as Moodle, Canvas and Google classroom. Another popular web 2.0 tool is video conferencing tool that helps users to conduct virtual meetings, presentations and discussions through internet. These tools offer lot of features such as screen sharing, messaging and recording. Examples of video conferencing tool are Zoom, Microsoft teams and Cisco Webex.

Overall, web 2.0 tools play very crucial role in enhancing teaching learning process. These tools help to enhance communication, access to e-resources and promote personalized e-learning. This helps students to progress at their own pace and achieve better academic results.

Parental involvement in child's education is also considered as a crucial factor that helps to enhance their academic achievement. It involves various activities such as helping child in homework, attending parent-teacher meet, volunteering or participating in school events. Maximum parental involvement helps to create a supportive and conducive home environment for effective learning. Many research studies supported that active parental involvement helps to achieve better academic scores, better attendance and better behavior. This type of active involvement helps to enhance positive attitude towards learning and reinforce children to achieve their educational goals.

2. Review of Related Literature

Studies related to instructional strategies viz., Facebook, LMS and Conferencing tool

Yang and Heh (2007) found that there was the positive impact of internet-based instructions on academic achievement scores among students. A study was conducted on total number of 150 students studying in tenth grade of school located in Taiwan. Results revealed that mean gain scores of academic achievement of experimental group was significantly higher than controlled group. Madge et al. (2009) conducted their study on first year undergraduate students studying in university. They belonged to different disciplines such as science, social science and arts. The findings showed that the students from varied disciplines considered Facebook as the better social media platform as compared to others. Moreover, the usage of Facebook for educational purposes was also seen. Oladejo et al. (2011) observed that there was significant difference in academic achievement gain scores among students who taught through various instructional material as compared to traditional method. Experimental group achieved more academic achievement score as compared to control group. Yang et al. (2011) studied that Facebook group considered as an effective educational platform that helps to promote effective teaching-learning environment. Teacher educators can perform various activities such as uploading e-content, asking polling questions, putting announcements, discussions and many more. Khan et al. (2014) conducted study on total number of 750 high school students and found that Facebook can be used as a learning platform among them. The results revealed that these platforms helps to facilitate academic achievement among students. Ravindran et al. (2014) observed that the Facebook group act as an instructional tool for undergraduate medical students. The results showed that Facebook provide a safe environment for learning and discussion among students. It helps to enhance academic achievement among students. Wiboolyasarini (2014) found that a blended problem-based instructional model via Facebook platform helps learners to learn anywhere and at any time. On this platform, students can interact and share their information with each other. Kalelioglu (2017) found that Facebook platform allowed both synchronous and asynchronous mode of communication. This platform provides lot of facilities such as sharing, uploading of e-content, instant messaging and discussions. Kelzang and Lhendup (2021) found a direct significant relationship between usage of Facebook platform and academic achievement among college students. Adeyeye et al. (2022) found that there was a positive significant impact of online platforms (ZOOM and Moodle) on academic achievement among university students.

Studies related to Parental Involvement

Lamborn et al. (1992) studied that parental involvement had direct impact on children's academic grades. Fan and Chen (2001) found that there was direct relationship between parental involvement and academic achievement. Fan (2001) found that there was a direct relationship between parental involvement and academic achievement among students. Shute et al. (2011) found that communication regarding various school activities and an authoritative parenting style had a significant correlation between parental involvement and academic achievement. Castro et al. (2015) found that there was a positive relationship between parental involvement and academic achievement among students. Durisic and Bunijevac (2017) examined that more parental involvement had positive impact on student's academic success. Boonk et al. (2018) studied a positive relationship between parental involvement and academic achievement. Tan et al. (2020) found that parental involvement in the form of support, discussion regarding child's education and participation in various activities were significantly correlated

with student’s academic achievement. Asif et al. (2021) studied that there was direct impact of parental involvement on academic achievement among students.

Delimitations of the Study

The present study is delimited to following aspects:

1. The present study has been delimited to the C.B.S.E affiliated private schools of Amritsar city of Punjab only.
2. The present study has been restricted to ninth class physics students.

Objectives of the Study

The present study is designed to achieve the following objective:

1. To study the interaction effect of instructional strategies and levels of parental involvement on the academic achievement gain scores among secondary school students.

Hypotheses of the Study

The following hypotheses have been framed to achieve the desired objectives:

1. a) There exists no significant difference in the academic achievement gain scores in three treatment groups.
- b) There exists no significant difference in the academic achievement gain scores at three levels of parental involvement.
- c) There exists no interaction between instructional strategies and levels of parental involvement on the academic achievement gain scores among secondary school students.

Research Design

In the present experimental study, a pre-test post-test non-equivalent-controlled group design and (3×3) factorial design was selected.

Tools Used

The various tools used to collect data are mentioned as below:

1. Achievement Test in Physics (Prepared by the investigator)
2. The Parental Involvement Scale (Dr. Vijaya Laxmi Chouhan and Mrs. Gunjan Ganotra Arora)
3. Development of Facebook based instructional material for teaching and learning (prepared by the investigator)

Sample

The total sample size for this study is 600 students who were studying C.B.S.E syllabus of IX class. Out of which, 200 students are selected under conferencing tool, 200 students are selected under LMS and 200 students are selected under Facebook usage.

Analysis and Interpretation

In the present study, investigator have used Mean, S.D., F-ratio, ANOVA, t-ratio for analyzing the data.

Two-Way Analysis of Variance (3×3) on the Academic Achievement Gain Scores Among Secondary School Students in Three Treatment Groups with Respect to Different Levels of Parental Involvement

The table 1 represents the means and S.Ds of the academic achievement gain scores in three treatment groups with respect to three levels of parental involvement.

Table 1 Mean Scores of the Academic Achievement Gain Scores among Secondary School Students in Three Treatment Groups with Respect to Three Levels of Parental Involvement

Levels of Parental Involvement	Instructional Strategies			
	Facebook	LMS	Conferencing Tool	Total
High	N= 48 M= 15.458 S.D.= 4.9075	N=51 M=13.020 S.D.= 4.0025	N=59 M=8.593 S.D.= 2.4853	N=158 M=12.108 S.D.= 4.7893
Average	N=76 M=17.329 S.D.= 5.5000	N=50 M=11.900 S.D.= 3.7047	N=60 M=9.133 S.D.= 2.3897	N=186 M=13.226 S.D.= 5.5266
Low	N=76	N=99	N=81	N=256

	M=16.092 S.D.= 4.8749	M=10.576 S.D.= 3.4614	M=8.543 S.D.= 2.3241	M=11.570 S.D.= 4.7621
Total	N=200 M=16.410 S.D.= 5.1599	N=200 M=11.530 S.D.= 3.7896	N=200 M=8.735 S.D.= 2.3945	N=600 M=12.225 S.D.= 5.0594

In order to find out the variance, F-values have been calculated and are presented in the table 2 below:

Table 2 Summary of Analysis of Variance (3x3) Factorial Design

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6374.645 ^a	8	796.831	52.571	.000
Intercept	85718.063	1	85718.063	5655.223	.000
Instructional Strategies	5541.494	2	2770.747	182.799**	.000
Levels Parental Involvement	120.063	2	60.031	3.961**	.020
Instructional Strategies *Levels Parental Involvement	196.166	4	49.042	3.236*	.012
Error	8957.980	591	15.157		
Total	105003.000	600			
Corrected Total	15332.625	599			

a. R Squared = .416 (Adjusted R Squared = .408)

**Significant at the 0.01 level of the confidence

*Significant at the 0.05 level of the confidence

Main Effects

Instructional Strategies (A)

It may be observed from the table 2 that the F-ratio (182.799) for the gain scores in academic achievement among secondary school students taught through three instructional strategies namely; Facebook, LMS and Conferencing tool is found to be significant at the 0.01 level of confidence. Thus, the data provides sufficient evidence to reject the hypothesis (H_{1a}), “There exists no significant difference in the academic achievement gain scores in three treatment groups”.

In order to probe deeper, F-ratio is followed by t-test. The values of t-ratios are presented below in the table 3:

Table 3 t-Ratio for the Difference in the Academic Achievement Gain Scores in Three Treatment Groups Namely; Facebook, LMS and Conferencing Tool

Facebook	LMS	t-value	Facebook	Conferenci	t-value	LMS	Conferenci	t-value
M=16.410 S.D.= 5.1599 N=200 S.E _D = 0.3649	M=11.530 S.D.= 3.7896 N=200 S.E _D = 0.2680	10.780*	M=16.410 S.D.= 5.1599 N=200 S.E _D = 0.3649	M=8.735 S.D.= 2.3945 N=200 S.E _D = 0.1693	19.081*	M=11.530 S.D.= 3.7896 N=200 S.E _D = 0.2680	M=8.735 S.D.= 2.3945 N=200 S.E _D = 0.1693	8.818*

*Significant at the 0.05 level of confidence

**Significant at the 0.01 level of confidence

The table 3 indicated that t-values are found to be significant at the 0.01 level of the confidence.

It can be thus concluded that the students taught through Facebook instructional strategy exhibited better academic achievement mean gain scores as compared to the ones taught through LMS and Conferencing tool instructional strategies.

Levels of Parental Involvement (B)

It is clear from the table 2 that the F-ratio (3.961) for the difference in the academic achievement gain scores at three levels of enactive learning style is found to be significant at the 0.01 level of confidence. Thus, the data provides sufficient evidence to reject the hypothesis (H_{1b}), “There exists no significant difference in the academic achievement gain scores at three levels of parental involvement”.

The values of t-ratios are presented below in the table 4:

TABLE 4 t-Ratio for the Difference in the Academic Achievement Gain Scores at Three Levels of Parental Involvement

High level of parental involvement	Average level of parental involvement	t-value	High level of parental involvement	Low level of parental involvement	t-value	Average level of parental involvement	Low level of parental involvement	t-value
N=158 M=12.108 S.D.=4.7893 S.E _D =.3810	N=186 M=13.226 S.D.=5.5266 S.E _D =.4052	1.987*	N=158 M=12.108 S.D.=4.7893 S.E _D =.3810	N=256 M=11.570 S.D.=4.7621 S.E _D =.2976	1.113	N=186 M=13.226 S.D.=5.5266 S.E _D =.4052	N=256 M=11.570 S.D.=4.7621 S.E _D =.2976	3.371*

*Significant at the 0.05 level of confidence

**Significant at the 0.01 level of confidence

The table 4 indicated that there exists significant difference in academic achievement gain scores at three levels of parental involvement namely; High, Average and Low. Meaning thereby, Average level of parental involvement exhibited more academic achievement mean gain scores as compared to high and low level of parental involvement. Whereas, high level and low level of parental involvement exhibited similar academic achievement mean gain scores.

Two Order Interaction

Instructional Strategies X Levels of Parental involvement (A X B)

It is obvious from the table 2 that the F-ratio (3.236) for the interaction between instructional strategies and levels of parental involvement on the academic achievement gain scores is found to be significant at the 0.05 level of the confidence. Thus, the data provide sufficient evidence to reject the hypothesis (H_{1c}), “There exists no significant interaction effect of instructional strategies and levels of parental involvement on the academic achievement gain scores among secondary school students”.

In order to probe deeper, F-ratio is followed by t-test and are presented below in the table 5:

TABLE 5 t-Ratio for the Difference in the Academic Achievement Gain Scores in the Interaction between Instructional Strategies (Facebook, LMS and Conferencing Tool) and Levels of Parental Involvement

Variables	Facebook			LMS			Conferencing tool		
	High Parental involvement	Average Parental involvement	Low Parental involvement	High Parental involvement	Average Parental involvement	Low Parental involvement	High Parental involvement	Average Parental involvement	Low Parental involvement
High Parental involvement				2.717*	4.062*	6.961*	9.375*	8.774*	10.818**
Average Parental involvement	1.922			4.804*	6.122*	9.926*	11.328**	10.762**	13.179**

	involve ment									
	Low Parenta l involve ment	.703	1.467		3.734* *	5.174* *	8.750* *	10.773 **	10.132 **	12.506 **
LMS	High Parenta l involve ment							7.066* *	6.315* *	8.131* *
	Averag e Parenta l involve ment				1.458			5.543* *	4.726* *	6.378* *
	Low Parenta l involve ment				3.881* *	2.153* *		3.846* *	2.842* *	4.516* *
Conferencing tool	High Parenta l involve ment									
	Averag e Parenta l involve ment							1.209		
	Low Parenta l involve ment							0.122	1.473	

*Significant at the 0.05 level of confidence

**Significant at the 0.01 level of confidence

The table 5 indicated that in some cases, t-values for (Facebook-Low Parental Involvement and Facebook-Average Parental Involvement; Facebook-Low Parental Involvement and Facebook-High Parental Involvement; Facebook-Average Parental Involvement and Facebook-High Parental Involvement; LMS-Average Parental Involvement and LMS-High Parental Involvement; Conferencing tool-Low Parental Involvement and Conferencing tool-Average Parental Involvement; Conferencing tool-Low Parental Involvement and Conferencing tool-High Parental Involvement; Conferencing tool-Average Parental Involvement and Conferencing tool-High Parental Involvement) are found not to be significant at the 0.01 or 0.05 level of the confidence. Whereas, in rest of the cases, t-values are found to be significant at the 0.01 level of the confidence. Hence, there is a significant interaction effect of instructional strategies and levels of parental involvement on the academic achievement gain scores among secondary school students.

3. Discussion on Results

The results from the present study revealed that the interaction between instructional strategies and levels of parental involvement significantly differ on the academic achievement gain scores among secondary school

students. Moreover, it is found that there exists significant difference in the academic achievement gain scores in three treatment groups namely, Facebook, LMS and Conferencing tool. The results suggest that the students taught through Facebook mode of instruction exhibited better in the academic achievement mean gain scores as compared to other mode of instructional strategies namely; LMS and Conferencing tool. It is also observed that the students taught through LMS exhibited better in the academic achievement mean gain scores as compared to Conferencing tool.

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