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Attitude towards Integrating Technology in Mathematics in relation to Learning Styles and Strategies of College Students

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Abstract

The problem of the present study is titled as "***Attitude towards Integrating Technology in Mathematics in relation to Learning Styles and Strategies of College Students***". The researcher adopted normative survey method. In the study 177 college mathematics students from 5 colleges in Salem District during the year 2020 -2021 were selected as sample by random sampling method. They were from government, government aided and private colleges. Three research tools were used to collect the required data. Quantitative data analysis was done. It was noted that gender and locality were playing a vital role in hindering the choice of attitude towards integrating technology in mathematics, learning styles and strategies. Research findings shows that there was asignificant positive correlation between the attitude towards integrating technology in mathematics and learning strategies of college students.

Key words: Attitude towards integrating technology, Learning styles, Learning strategies, Mathematics, College students.

1.0 Introduction

Technology is the most valuable medium through which the student's knowledge can be increased. Technologies are also used in the process of learning, and in effective maintenance of organization and administration of educational institutions.

"Technology is generally perceived among educators as a vital tool for effective instruction in secondary mathematics classrooms." - Franz & Hopper, (2007)

Information and Communication Technology has become one of the basic building blocks of modern society within a very short time. Many countries understand Information and Communication Technology and have mastering the basic skills and concepts of Information and Communication Technology as part of the core of mathematics education, alongside reading, writing and numeracy.

"Learning style refers to an individual characteristics and preferred way of gathering, interpreting, organizing and thinking about information." - Wang, (2008, p. 30)

Learning strategies are defined as "specific actions, behaviours, steps, or techniques such as seeking out conversation partners, or giving oneself encouragement to tackle a difficult task used by students to enhance their own learning." - Scarcella & Oxford, 1992, p.63

A learning style refers to the relationship between individual persons and their behaviour of learning whereas learning strategies refer to attitudes and behaviour that is oriented towards goals. In contrast to learning styles, learning strategies are "any set of operations, plans or routines used by learners to facilitate the obtaining, retrieval, storage and use of information" -Macaro, (2006, p. 324).

1.1 Review of Related Literature

Jai Ganesh andKrishnaraj(2016) studied the attitude towards ICT among B.Ed students in Namakkal district. The result stated that rural and urban students, Tamil and English medium students did not differ in their attitude towards ICT.

Yusuf Polat et.al (2015) studied the effect of learning styles of accounting education students on their performance: a field study. The findings of the study revealed that the success level in the pragmatist learning style was most adopted by the students.

Amber et.al (2016) inquired about who, what, and where of learning strategies. The results indicated male college student characteristics were significant predictors of their use of learning strategies. Students, who were online-learners [first-generation, female, transfers, older, Black or African American] in the bio-logical sciences, social sciences, or health professions, were more likely to use learning strategies.

1.2 Titleof the problem

The problem of the present study is selected and entitled as "**Attitude towards Integrating Technology in Mathematics in relation to Learning Styles and Strategies of College Students"**

1.3 Operational definitions of the terms

Attitude towards Integrating Technology in Mathematics

In this studyattitude towards integrating technology in mathematics included motivation, collaborative preferences, interaction and engagement with technology, confidence while learning mathematics, confidence while using computers and confidence while using technology in learning mathematics.

Learning styles

In this context learning styles include four styles; Activist, Reflector, Theorist, and Pragmatist.

Learning Strategies in Mathematics

In this study learning strategies in mathematics refer to four factors viz. cognitive, metacognitive, non - informational resources management and informational resources management.

College students

College students indicate the students who are studying final year undergraduate and postgraduate programme in mathematics in the year 2020- 2021 in select colleges in Salem district.

1.4 Objectives of the study

- To study the significant differences in the attitude towards integrating technology in mathematics by college students based on the select sub samples gender and locality
- To find the significant differences in the learning styles of college students based on the select sub samples gender and locality
- To investigate the significant differences in the learning strategies of college students in mathematics based on the select sub samples gender and locality
- To study the correlation between the attitude towards integrating technology in mathematics, learning styles and learning strategies in mathematics of college students

1.5 Hypotheses of the study

- There is no significant differences in the attitude of college students towards integrating technology in mathematics based on the select sub samples gender and locality
- There is no significant differences in the learning styles of college students based on the select sub samples gender and locality
- There is no significant differences in the learning strategies in mathematics of college students based on the select sub samples gender and locality
- There is no correlation between the attitude towards integrating technology in mathematics, learning styles and learning strategies in mathematics of college students

1.6 Population and Sample of the study

The population of the study includes college mathematics students in Salem district in the year 2020-2021. For the present study stratified random sampling method was used. In the study 177 college mathematics students from 5 select colleges during the year 2020 -2021 formed the sample. They were from government, government aided and private colleges.

1.7 Tools used for the present study

I)Attitude towards Integrating Technology in Mathematics Scale (AITMS)

The researcher constructed the attitude towards integrating technology in mathematics scale adapting the tools “Attitudes to technology in mathematics learning” developed by Fogarty, Cretchley, Harman, Ellerton&Konki, 2001 and “Integrating technology in mathematics learning” developed by Galbraith, Renshaw, Goos& Geiger, 1999. This background enabled the investigator in establishing six dimensions in attitude towards integrating technology in mathematics. Further, the investigator also added few more items as adding the items were felt as most appropriate suiting the Indian education system.

Validation Process of the Tool

Establishing Validity

After drafting, the tool was given to a team of eminent professors for screening and edition. They ensured the appropriateness of language, relevance of items, essentiality of the items and conciseness of the statements. Some statements were reframed and some were modified for clarity. Thus the face validity and content validity of the tool was established.

The pilot study was carefully planned and carried out. In order to validate the scale, the draft tool was administered to 30 students from the department of mathematics who were studying in a College. The researcher distributed and collected the filled in tool keeping in mind to cover the demographic variables approximately equal. The sample was derived using simple random technique. The recorded responses were scored as per the scoring key. The item wise - corrected item - total correlation was calculated with the collected data scores.To give high validity to the tool, the items with 'r' value above 0.25 was retained and the other items were rejected. Based on it 16 statements were deleted. The final tool contained 52 statements.

Reliability

Reliability of the tool was established using split half method. For computing the split half method, the entire tool was divided into two equal halves and the co – efficient of the reliability was calculated. A Cronbach α analysis was calculated for each components of this scale. The Cronbach α analysis could examine if the items were internally consistent, stable, and homogenous. In order to raise the reliability and lower the error, some unsuitable items would be deleted.The reliability coefficient (Cronbach Alpha) was calculated as 0.73 and also dimension wise reliability of the tool was also calculated, which made the scale fairly reliable values are (0.842) for motivation / confidence, (0.841) for collaborative preferences, (0.921) for interaction and engagement with technology, (0.823) for Confidence while learning mathematics, (0.799) for Confidence while using computers, (0.910) for Confidence while using technology in learning mathematics.

The final scale Attitude towards Integrating Technology in Mathematics Scale (AITMS) consisted 52 statements with six dimensions viz motivation, collaborative preferences, interaction and engagement with technology, Confidence while learning mathematics, Confidence while using computers and Confidence while using technology in learning mathematics.

III) Learning Styles Scale (LSS)

To determine students learning styles, the researcher used the Peter Honey and Alan Mumford (2006) questionnaire to find the learning style.

The researcher made the original questionnaire as a five point scale (LSS) to suit Indian scenario. This was reviewed by a group of specialists (in the field) to ensure its suitability to the Indian context. Although the tool already possesses great validity and reliability in its original format, the reliability coefficient (Cronbach Alpha) was calculated using the sample group of 30 students.

The reliability value for Learning Styles Scale (LSS) as a whole was (0.824). In addition, the reliability co-efficients for each learning style were found as follows; (0.724) for Activist style, (0.945) for Reflector style, (0.902) for Theorist style, (0.834) for Pragmatist style.

The learning styles scale consisted of 80 items on four styles Viz. Activist, Reflector, Theorist and Pragmatist. The Activist style contained 20 items, Reflector style consisted 20 items, Theorist style had 20 items and Pragmatist style obtained 20 items.

III) Learning Strategies in Mathematics Scale (LSMS)

Learning strategies in mathematics scalewas standardized by Pintrich et al., (1991). It was used to assess students learning strategies.

Re-Establishing Validity

This tool has already been standardized; standardization of the tool was redundant. However, the tool was shown to the subject experts and their approval had been obtained before administration. Some statements were reframed and some were modified for clarity. The content validity was, thus, re-established.

The pilot study was conducted with 30 students from the College. Aim of the Pilot test is to find out whether it operates properly before using it in a research study. The tool was administered and distributed among thirty respondents.

The reliability value for Learning Strategies in Mathematics Scale (LSMS) as a whole was (0.924). In addition, the reliability co-efficient for each learning strategies were found as follows; (0.890) for cognitive strategies, (0.876) for meta cognitive strategies, (0.798) for non-informational resources management, (0.919) for informational resources management.

The final scale of learning strategies in mathematics consisted of 68 statements with four strategies viz Cognitive strategies (18 items), metacognitive strategies (12 items), non-informational resources management (25) and informational resources management (13).

1.8Administration of the Tool

The researcher explained the purpose of the study to the College Principals. Then in a meeting with head of the department of mathematics, the objectives of the study and application procedure were discussed. The directions were administered in oral format by the researcher. The researcher personally administered the tool in all the selected colleges. Before giving the tool, a brief introduction about the research was provided to the respondents. The respondents were asked to read the statements carefully and indicate their response by tick marking the appropriate box. Average completion time for the attitude towards integrating technology in mathematics, learning styles and learning strategies in mathematics scale was thirty minutes respectively.

1.9 Scoring Procedure

For the 52 items in the attitude towards integrating technology in mathematics, 80 items for learning styles and 68 items for learning strategies in mathematics, the given options were "Strongly disagree, Disagree, Undecided, Agree, Strongly agree". Students were asked to show their responses by putting tick mark (√) in the appropriate column.

- The maximum possible score for integrating technology in mathematics is 260 and the minimum score is 52.
- The maximum possible score for learning styles is 400 and the minimum score is 40.
- The maximum possible score for learning strategies in mathematics is 340 and the minimum score is 68.

1.10Statistical Technique is used

The data collected from the sample are statistically analysed by using percentage analysis, t test and correlation technique

1.11Data Analysis

1.11.1 Percentage Analysis

Table – 1Level of attitude towards integrating technology in mathematics of college students

Dimensions	Low		Moderate		High	
	N	%	N	%	N	%
Motivation	32	18.10	92	52/97	53	29.94
Collaborative preferences	29	16.38	89	50.28	59	33.33
Interaction and engagement with technology	27	15.25	88	49.71	62	35.03
Confidence while learning mathematics	31	17.51	90	50.85	56	31.64
Confidence while using computers	25	14.12	101	57.06	51	28.81
Confidence while using technology in learning mathematics	37	20.90	89	50.28	52	29.38
Attitude towards integrating technology in mathematics	33	18.64	93	52.54	60	33.90

The above table it is noticed that101 (57.06%) college students are in moderate level in the confidence while using computers dimension.60(33.90%) college students have high attitude towards integrating technology in learning mathematics while 33 (18.64%) have low attitude towards integrating technology in learning mathematics.62 (35.03%) college students are in high level in the interaction and engagement with technologydimension while 37 (20.90%) college students are in low level in the Confidence while using technology in learning mathematics dimension.

Table – 2Number of students following each learning style and strategies

Learning styles (177)		
Dimensions	**Number of students**	**%**
Activist	30	20.90%
Reflector	35	19.77%
Theorist	33	18.64%
Pragmatist	42	23.72%
No learning style	107	60.45%
Learning strategies(177)		
Cognitive	35	19.77%
Metacognitive	39	22.03%
Non – Informational resource management	31	17.51%
Informational resources management	35	19.77%
No learning strategy	102	57.62%

From the above table it is found that 30 (20.90%) students follow activist style, 35 (19.77%) students adopt reflector style, 33 (18.64%) students are of theorist style, 42 (23.72%) students were pragmatist whereas 107 (60.45%) students prefer no particular learning style and also found that 35 (19.77%) students follow cognitive, 39 (22.03%) students adopt metacognitive strategies. 31 (17.51%) students are of non - informational resources management, 35 (19.77%)students are informational managers while 102 (57.62%) students practice no particular learning strategy.

Table –3Students following each Learning Style and Learning Strategy

	Learning Styles & Learning Strategies	**Pattern**	**Number of Students**		**%**
Learning styles	Four learning styles	A-R-T-P	7		3.95
	Three learning styles	A-R-T	3	11	6.21
		A-R-P	1		
		A- T-P	2		
		R-T-P	5		
	Two learning styles	A-R	2	20	11.30
		A-T	6		
		A-P	4		
		R-T	2		
		R-P	5		
		T-P	3		
	One learning style	A	11	32	18.08
		R	5		
		T	7		
		P	9		
	No learning style			107	60.45

Learning strategies	Four learning strategies	C-M-NI-I	10		5.64
	Three learning strategies	C-M-NI	5	12	6.78
		C-M-I	2		
		C- NI-I	3		
		M-NI-I	2		
	Two learning strategies	C-M	5	16	9.04
		C-NI	2		
		C-I	1		
		M-NI	3		
		M-I	2		
		NI-I	3		
	One learning strategy	C	12	35	19.77
		M	6		
		NI	9		
		I	8		
	No learning strategy		102		57.62%

From the above table it is found that, among the 177 students who followed learning styles; 7 (3.95%) students practiced all the four learning styles, 11 (6.21%) students adopted three learning styles, 20 (11.30%) students stuck to two learning styles, 32 (18.08%) students used only one learning style while 107 (60.45%) students have no preference to any learning style.Similarly,10 (5.64%) students followed all the four learning strategies, 12 (6.78%) students adopted three learning strategies, 16 (9.04%) students used two learning strategies, 35(19.77%) students practiced only one learning strategy while 102 (57.62%) students followed no learning strategy.

1.11.3 Inferential Analysis

- There is no significant differences in the attitude of college students towards integrating technology in mathematics based on the select sub samples gender and locality
- There is no significant differences in the learning styles of college students based on the select sub samples gender and locality
- There is no significant differences in the learning strategies in mathematics of college students based on the select sub samples gender and locality

A. Gender

Table – 4Table showing the mean differences based on gender

Groups						
Attitude towards Integrating technology in Mathematics						
Dimensions	**Male (87)**		**Female (90)**		**t Test**	**NS / S**
	M	**SD**	**M**	**SD**		
Motivation	11.05	5.42	12.91	5.43	2.28*	S
Collaborative preferences	14.48	4.82	15.19	4.44	1.02	NS
Interaction and engagement with	25.66	7.56	26.82	6.61	1.09	NS

technology						
Confidence while learning mathematics	27.43	7.35	22.87	6.44	4.38**	S
Confidence while using computers	32.21	6.31	33.36	7.14	1.14	NS
Confidence while using technology in learning mathematics	30.99	9.16	33.92	7.74	2.29*	S
Attitude towards integrating technology in mathematics	146.82	26.30	147.2	23.55	0.10	NS
Learning Styles						
Activist	75.96	16.3	71.27	15.18	1.98*	S
Reflector	72.34	17.04	71.55	16.56	0.31	NS
Theorist	71.54	15.69	70.30	15.05	0.54	NS
Pragmatist	73.99	16.63	71.95	15.66	0.84	NS
Learning Styles	285.84	48.54	288.05	48.51	0.30	NS
Learning Strategies in Mathematics						
Cognitive	66.51	11.34	64.56	11.15	1.15	NS
Metacognitive	42.87	9.10	42.32	8.92	0.41	NS
Non – Informational resource management	90.86	16.12	87.69	18.46	1.22	NS
Informational resources management	46.09	9.52	44.23	9.42	1.31	NS
Learning strategies in Mathematics	254.34	39.08	238.76	39.67	2.63**	S

****Significant at 1% level** ***Significant at 5% level** **NS- Not significant** **S – Significant**

From the above table, it is found that significant differences are not noted in thirteen cases. Hence it is concluded that the hypothesis is accepted in these cases. As there is significant difference in remaining five cases, it is concluded that the hypothesis is not accepted in these cases.

B. locality

Table – 5Table showing the mean differences based on locality

Groups						
Attitude towards Integrating technology in Mathematics						
Dimensions	**Rural(82)**		**Urban (95)**		**t Test**	**NS / S**
	M	**SD**	**M**	**SD**		
Motivation	11.22	5.42	12.93	5.42	2.09*	S
Collaborative preferences	13.94	4.26	13.90	4.71	0.06	NS
Interaction and engagement with technology	24.97	7.11	25.55	6.36	0.57	NS
Confidence while learning mathematics	29.12	6.88	29.04	6.96	0.08	NS
Confidence while using computers	31.25	7.32	34.33	7.62	2.74**	S
Confidence while using technology in learning mathematics	33.71	8.21	32.41	8.42	1.04	NS

Attitude towards integrating technology in mathematics	147.22	27.92	145.21	21.83	0.53	NS
Learning Styles						
Activist	70.44	15.84	72.67	16.51	0.92	NS
Reflector	71.08	16.16	72.78	16.46	0.69	NS
Theorist	70.22	15.11	71.50	15.80	0.55	NS
Pragmatist	71.43	16.08	72.51	16.24	0.44	NS
Learning Styles	286.18	50.08	292.46	47.80	0.85	NS
Learning Strategies in Mathematics						
Cognitive	62.01	12.28	63.10	11.42	0.61	NS
Metacognitive	41.71	8.21	42.48	8.92	0.60	NS
Non – Informational resource management	86.54	18.08	89.97	15.67	1.34	NS
Informational resources management	46.09	8.72	48.49	9.95	1.71	NS
Learning strategies in Mathematics	245.07	42.79	248.02	39.06	0.48	NS

****Significant at 1% level *Significant at 5% level NS- Not significant S – Significant**

From the above table, it is found that significant differences are not noted in sixteen cases. Hence it is concluded that the hypothesis is accepted in these cases. As there is significant difference in remaining two cases, it is concluded that the hypothesis is not accepted in these cases.

1.11.4 Correlational Analysis

There is no correlation between the attitude towards integrating technology in mathematics, learning styles and learning strategies in mathematics of college students

Table – 6Correlation between Attitude towards Integrating Technology in Mathematics, Learning Styles and Learning Strategies in Mathematics

Variables	Attitude towards Integrating Technology in Mathematics	Learning Styles	Learning Strategies n Mathematics
Learning Styles	0.03 (NS)	1	
Learning Strategies in Mathematics	0.243^{**} (Significant at 0.01 level)	0.07 (NS)	1

* * Table value of r for df 177 at 0.01 level is 0.193.

There is significant positive correlation between the Attitude towards Integrating Technology in Mathematics and learning strategies of college students.

1.12 Discussion on the findings

Jai Ganesh and Krishnaraj (2016) stated that rural and urban students, Tamil and English medium students do not differ in their attitude towards ICT. These findings are in the same line as

the present study as this study has also found that rural and urban students, Tamil and English medium college students do not differ in their attitude towards integrating technology.

Yusuf Polat et.al (2015) showed that most preferred learning style was pragmatist. The present study findings are that pragmatist is the most preferred learning style.

Amber et.al (2016)reported female students were more likely to use learning strategies. The findings of the above studies did not confirm to the present study.Since the present study has found that male students were more likely to use learning strategies.

1.13 Major Findings of the study

- 101 (57.06%) college students are in moderate level in the confidence while using computers dimension of attitude towards integrating technology in learning mathematics.
- 30 (20.90%) students follow activist style, 35 (19.77%) students adopt reflector style, 33 (18.64%) students are of theorist style, 42 (23.72%) students were pragmatist whereas 107 (60.45%) students prefer no particular learning style and also found that 35 (19.77%) students follow cognitive, 39 (22.03%) students adopt metacognitive strategies. 31 (17.51%) students are of non - informational resources management, 35 (19.77%) students are informational managers while 102 (57.62%) students practice no particular learning strategy.
- 7 (3.95%) students practiced all the four learning styles, 11 (6.21%) students adopted three learning styles, 20 (11.30%) students stuck to two learning styles, 32 (18.08%) students used only one learning style while 107 (60.45%) students have no preference to any learning style.
- 10 (5.64%) students followed all the four learning strategies, 12 (6.78%) students adopted three learning strategies, 16 (9.04%) students used two learning strategies, 35(19.77%) students practiced only one learning strategy while 102 (57.62%) students followed no learning strategy.
- Male and female college students differ in dimensions motivation, Confidence while learning mathematics, confidence while using technology in learning mathematics of attitude towards integrating technology in mathematics.
- Male and female college students differ in dimensions activist of learning styles.
- Male and female college students differ in the in the total scores of learning strategies in mathematics.
- Rural and urban college students differ in dimensions motivation, Confidence while using computers of attitude towards integrating technology in mathematics.
- There is significant positive correlation between the Attitude towards Integrating Technology in Mathematics and learning strategies of college students.

1.14 Conclusion

The problem of the present study is titled as “Attitude towards Integrating Technology in Mathematics in relation to Learning Styles and Strategies of College Students”. The finding of this study indicates that the moderate level of Attitude towards Integrating Technology in Mathematics,

pragmatist style as the most preferred learning style and information cognitive strategy was the most followed learning strategy.

1.15 References

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