Research Article

Relationship between Attitude towards ICT and Techno-Pedagogical Skills of Rural Secondary School Teachers of West Bengal Board

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Abstract

The present study mainly investigates the relationship between Attitude towards ICT and Techno-Pedagogical Skills of rural secondary school teachers of West Bengal Board. In this study 210 rural secondary school teachers were randomly selected and research design adopted was descriptive survey. For collecting data, "Scale to Assess Techno-Pedagogical Skills" (SATPS), standardized by the researcher with content validity and reliability co-efficient of 0.56, and "Ict Attitude Scale for Secondary School Teachers", standardized by Saini, S. (2015) were used. The results revealed that the attitude towards ICT of rural secondary school teachers is positive and it doesn't differ significantly with respect to their area of discipline, but it differs significantly with respect to their teaching experiences. On the other hand, the techno-pedagogical skills of rural secondary school teachers are at moderate level and don't differ significantly with respect to their area of discipline and teaching experiences. Finally, a positive correlation between attitude towards ICT and the Techno-pedagogical skills of rural secondary school teachers has been found. So, as per the present study, it can be said that the techno-pedagogical skills positively depend upon the attitude towards ICT of rural secondary school teachers of West Bengal board.

Keywords: Attitudes towards ICT, Rural Secondary School Teachers, Techno-Pedagogical Skill, West Bengal Board.

Introduction

Now-a-days, technology is playing a pivotal role in every aspect of human life so much that even a moment of our life seems lame without technology. As the education system is an integral part of our life so at present technology is immensely unavoidable for the education system. On the other hand, present generation learners, considered as digital natives, always want to be in front of technology and they enjoy dealing with technology. So, it is the need of hour that teacher must have appropriate knowledge of an adequate use of technology in the teaching-learning process.

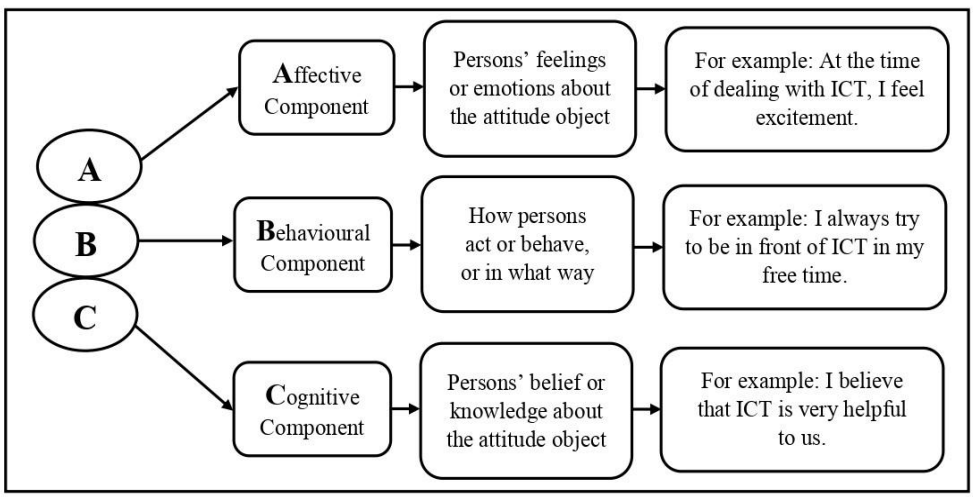
A framework was developed in 2006 by Punya Mishra and Mathew J. Koehler, known as Technological Pedagogical and Content Knowledge (TPACK) framework, which includes three broad knowledge areas, these are Technological, Pedagogical and Content. When it comes to an integrated form, it is called TPACK which is different in nature from those knowledge bases in isolated form (Mishra and Koehler,2006). Techno-pedagogical Skills has been originated from this concept of TPACK. We know that when teachers apply knowledge in a practical field, they perform skills. That's why, at the time of application of TPACK in a real classroom situation,

teachers perform techno-pedagogical skills.

According to Subasini and Jeyanthi (2019) "techno pedagogy is the art of incorporating technology in designing teaching-learning experiences so as to enrich the learning outcomes." Also, they considered it as "hybrid approach of meta-teaching." As per Rao and Jalajakshi (2021) when a teacher integrates technology and pedagogy into the classroom then "it's made him or her a techno pedagogue" and there is an extreme need of techno pedagogues as per the present scenario for an effective and enjoyable learning environment. Also, they believed that technology only can promote universal access to education.

According (Buabeng-Andoh, 2012; Thappa and Baliya, 2021; Hew and Brush, 2007), there are many factors of teachers' personal level that influence them to use ICT in the teaching-learning process, and one of those factors of personal level is teachers' attitudes towards ICT. 'Attitude' is lexically considered as "a settled way of thinking or feeling about something." That's why, Hogg and Vaughan (2005) defined attitude as "a relatively enduring organization of belief, feelings, and tendencies towards socially significant objects, groups, events or symbols." According to Saul McLeod (2009) there is an attitude structure of human beings and it has three (3) components; A, B and C. That is, 'A' for the Affective component, 'B' for the Behavioural component and 'C' for the Cognitive component and it is known as ABC model of Attitude.

Figure-1: ABC model of Attitude



On the other hand, we know that there are three (3) types of attitudes i.e., Positive Attitude, Negative Attitude and Neutral Attitude. A positive attitude is favourable to people, situations, objects or events. A negative attitude is unfavourable and people with a neutral attitude don't give so much importance to people, situations, objects or events. Here ignorance takes place.

The present study mainly deals with two variables i.e., attitudes towards ICT and techno-pedagogical skills of secondary school teachers. As the previous studies (Buabeng-Andoh, 2012; Thappa and Baliya, 2021; Hew and Brush, 2007) showed that attitudes towards ICT affect the teachers' use of ICT in teaching-learning

process, it can be predicted that there should be an effect of Attitudes Towards ICT on Techno-Pedagogical Skills of secondary school teachers. Therefore, a typical effort has been made by the researcher to attempt a study on the level of Techno-Pedagogical Skill in relation to Attitudes Toward ICT.

Review of Related Literatures

In teaching profession, teachers' attitude is one of the most important factors for providing quality teaching (Bhargava and Pathy, 2014; Cate and Glock, 2019; Dkhar, 2014; Nagase et al., 2020; Parvez and Shakir, 2013; Sivakumar, 2018; Singh, 2021). So, to find out whether any relation exists between Attitudes Towards ICT and Techno-Pedagogical Skills, some related literatures were reviewed. These are as follows:

Bhargava, (2021) revealed no significant difference was observed in Techno Pedagogical Competency between male and female secondary school teachers. But ICT Teaching attitudes of male and female secondary school teachers significantly differed from each other and finally, there was no significant relationship between Techno Pedagogical Competency and ICT Teaching Attitude among secondary school teachers.

Manikandan (2021) found that there was an influence of ICT awareness and attitude towards ICT on the skill of using ICT among secondary school teachers. Also, the level of attitude towards ICT among secondary school teachers was favourable and the level of ICT skill among secondary school teachers was high.

Beri and Sharma (2019) revealed the statistically significant difference in Techno-pedagogical and content knowledge (TPACK) Competencies of teacher educators were observed with respect to the locality of college i.e., rural and urban.

Guru and Beura (2019) revealed that the techno pedagogical competency level of urban higher Secondary School teachers is higher than rural higher Secondary School teachers.

Parkash and Hooda (2018) found that the techno pedagogical competency of urban Government and private Higher Secondary School teachers is better than rural school teachers because the facilities are available more in Urban schools as compared to rural schools.

Daling (2017) recognised that the teachers who are more experienced in ICT, had greater confidence, and effective performance in teaching-learning process and the level of ICT skills also influenced the teachers' attitude towards using the information and communication technology.

Yerdelen-Damar et al. (2017) found that the teachers who had more positive attitudes towards technology had higher self-efficacy beliefs about TPACK.

Avidov-Ungar & Iluz (2014) showed that attitude of teacher educators towards the use of ICT was positive and the level of their technological pedagogical knowledge was relatively high.

İPEK et al. (2014) found that the teacher candidates who have more interest in using computers have more positive attitudes than those who are not interested in using the computer.

Sethi (2014) recognised that if the teachers can develop a positive attitude towards technology and they will become friendly with the technology integrated teaching-learning environment.

Whyte (2014) organized a course on digital technologies for language teaching on 24 pre-service teachers to make them techno-pedagogically competent. After attending the course, pre-service teachers felt that they learned new ICT skills and they understood the utility of ICT clearly

for language teaching. Their attitude towards the integration of ICT into the teaching-learning process had also changed.

Rastogi and Malhotra (2013) revealed that there is a strong positive relationship between the possession of ICT skills by teachers, their attitude towards ICT and the actual implementation of ICT in classroom teaching. It means the implementation of a new curriculum with ICT strongly depends upon the attitude of teachers. So, not only the ICT knowledge and skills are sufficient but also teachers have to develop and imbibe the right attitude towards ICT.

Sathiyaraj (2013) showed that the maximum number of teachers (97.0 per cent) had a neutral attitude towards using new technology. But there was a significant and positive relationship between techno-pedagogical competency and attitude towards using new technology.

After reviewing the aforesaid related literatures, it must be undoubtedly admitted in a word that somehow attitudes towards ICT play a critical role in teachers' technology integrated teaching performances in a real classroom situation. But there was no study found so far which combined the variables Attitudes Towards ICT and Techno-Pedagogical Skills of secondary school teachers together as well as there is no study found which dealt to find out the relationship between Attitudes Towards ICT and Techno-Pedagogical Skills of Rural Secondary School Teachers.

Previous studies, like Beri and Sharma (2019), Guru and Beura (2019), Parkash and Hooda (2018), Yieng and Daud (2018) showed that rural teachers are less competent in techno-pedagogical skills than urban teachers and also, they found the less availability of ICT equipment as well as less use of ICT in education purposes in the rural institutions. So, there is a need to conduct a study to find out the attitudes toward ICT of rural secondary school teachers, and its relation to their techno-pedagogical skills.

Again, the present study differs from the rest of the previous studies in terms of population and sample.

Objectives of the Study

1. To find out the Attitude Towards ICT among Rural Secondary School Teachers with respect to the background variables; Area of Discipline (Language / Social Science / Science) and Teaching Experience (Below 5 years / 5 to 10 years / Above 10 years).
2. To find out the level of Techno-Pedagogical Skills among Rural Secondary School Teachers with respect to the background variables; Area of Discipline (Language / Social Science / Science) and Teaching Experience (Below 5 years / 5 to 10 years / Above 10 years).
3. To find out the relationship between Attitude Towards ICT and Techno-Pedagogical Skills of Rural Secondary School Teachers.

Hypotheses of the Study

H_0-1: There is no significant difference in Attitude Towards ICT among Language, Social Science and Science Rural Secondary School Teachers.

H_0-2: There is no significant difference in Attitude Towards ICT among Rural Secondary School Teachers with respect to their teaching experiences i.e., Below 5 years, 5 to 10 years and Above 10 years.

H_0-3: There is no significant difference in Techno-Pedagogical Skills among

Language, Social Science and Science Rural Secondary School Teachers.

H_0-4: There is no significant difference in Techno-Pedagogical Skills among Rural Secondary School Teachers with respect to their teaching experiences i.e., Below 5 years, 5 to 10 years and Above 10 years.

H_0-5: There is no significant relationship between Attitude Towards ICT and Techno-Pedagogical Skills with respect to the area of discipline of Rural Secondary School Teachers.

H_0-6: There is no significant relationship between Attitude Towards ICT and Techno-Pedagogical Skills with respect to the teaching experience of Rural Secondary School Teachers.

Research Design

To fulfil the objectives of the present study, the researcher adopted a Descriptive Survey Design for conducting research.

Population for the Study

All the Rural Secondary School Teachers of West Bengal Board of Secondary Education (W.B.B.S.E.) of Kharagpur Sub-Division, West Bengal were considered as the population for the present study.

Sample for the Study

In order to find out the results of this study, 210 rural secondary school teachers of W.B.B.S.E. boards from the Kharagpur sub-division, West Bengal were selected as a sample through random sampling method.

Tools Used

1. To assess the level of Techno-Pedagogical Skills of Rural Secondary School Teachers, a self-made five (5) point Likert-type scale was developed, named "Scale to Assess Techno-Pedagogical Skills" (SATPS).

   It was standardized by using content validity and using the split-half method with a reliability coefficient of 0.56. This scale contains 52 items. The maximum value of this scale is 260. The level of techno-pedagogical skills with very low, low, moderate, high and very high was calculated for those teachers who scored 52 to 93, 94 to 135, 136 to 177, 178 to 219 and 220 to 260 respectively.

2. To assess the Attitude towards ICT of Rural Secondary School Teachers, a tool titled "ICT ATTITUDE SCALE FOR SECONDARY SCHOOL TEACHERS" was used.

   It was standardized by Sunanda Saini in 2015. The items of this scale are 34 and the maximum value of this scale is 170. The score of negative, neutral and positive attitude was calculated for those teachers who scored 34 to 80, 81 to 125 and 126 to 170 respectively.

Data Analysis and Interpretation

To find out the results of Objective 1, the mean value of the attitude towards ICT of rural secondary school teachers was calculated which is mentioned in Table 1 and to find out the significant differences in attitude towards ICT among rural secondary school teachers concerning the background variables; area of discipline and teaching experience were calculated by using F-test, mentioned in Table 2 and Table 3.

Table-1: Nature of attitude towards ICT among rural secondary school teachers

Variable	Nature of Attitude	No of Teachers (N)	Percentage of Teachers	Mean value of Attitude (M)	Remarks
Attitude towards ICT	Positive (126 to 170)	168	80%	137.00	Positive Attitude towards ICT
	Neutral (81 to 125)	42	20%		
	Negative (34 to 84)	00	0%		

The results in Table 1 clearly indicate that there are 80 per cent and 20 per cent of rural secondary school teachers with positive and neutral attitude towards ICT respectively. The overall attitude of the teachers is positive with a mean value of 137. One thing that is remarkable, there is none with a negative attitude towards ICT.

Table-2: Difference in attitude towards ICT among rural secondary school teachers with respect to their area of discipline

Variables			N	Mean	SD	F-value	Remarks
Background		Dependent					
Area of Discipline	Language	Attitude towards ICT	78	134.87	13.24	1.98	$H_0$1 is accepted at a 0.05 level
	Social Science		68	137.32	13.85		
	Science		64	139.25	12.19		

The results in Table 2 clearly indicate that the calculated F-value is 1.98 which is less than the table value at a 0.05 level of significance. Thus, the null hypothesis is accepted.

It can be interpreted from the results that there is no significant difference in attitude towards ICT among language, social science and science rural secondary school teachers. So, the area of discipline is not a factor that affects the attitude towards ICT of rural secondary school teachers.

Table-3: Difference in attitude towards ICT among rural secondary school teachers with respect to their teaching experience

Variables			N	Mean	SD	F-value	Remarks
Background		Dependent					
Teaching Experience	<5 years	Attitude towards ICT	70	138.91	13.09	3.47	$H_0$2 is rejected at a 0.05 level
	5-10 years		50	139.24	13.45		
	>10 years		90	134.26	12.77		

The results in Table 3 clearly indicate that the calculated F-value is 3.47 which is higher than the table value at a 0.05 level of significance. Thus, the null hypothesis is rejected.

It can be interpreted from the results that there is a significant difference in attitude towards ICT among rural secondary school teachers with respect to their teaching experience. So, the teaching experience is a factor in the present study that affects the attitude towards ICT of rural secondary school teachers.

To find out the results of Objective 2, the mean value of the level of techno-pedagogical skills of rural secondary school teachers was calculated which is mentioned in Table 4 and to find out the significant differences in Techno-pedagogical skills among rural secondary school teachers concerning the background variables; area of discipline and teaching experience were calculated by using F-test, mentioned in Table 5 and Table 6.

Table-4: Level of techno-pedagogical skills among rural secondary school teachers

Variable	Level of TPS	No of Teachers (N)	Percentage of Teachers	Mean value of TPS (M)	Remarks
Techno-Pedagogical Skills (TPS)	Very High (220 to 260)	10	4.76%	147.45	Moderate level of TPS
	High (178 to 219)	62	29.52%		
	Moderate (136 to 177)	46	21.90%		
	Low (94 to 135)	52	24.76%		
	Very Low (52 to 93)	40	19.05%		

The results in Table 4 clearly indicate that there are 4.76 per cent, 29.52 per cent, 21.90 per cent, 24.76 per cent and 19.05 per cent of rural secondary school teachers with very high, high, moderate, low and very low levels of techno-pedagogical skills. The overall level of techno-pedagogical skills of rural secondary school teachers is moderate.

Table-5: Difference in techno-pedagogical skills among rural secondary school teachers with respect to their area of discipline

Variables			N	Mean	SD	F-value	Remarks
Background		Dependent					
Area of Discipline	Language	Techno-Pedagogical Skills	78	144.79	50.62	0.19	$H_0$3 is accepted at a 0.05 level
	Social Science		68	149.53	49.33		
	Science		64	148.46	45.22		

The results in Table 5 clearly indicate that the calculated F-value is 0.19 which is less than the table value at a 0.05 level of significance. Thus, the null hypothesis is accepted.

It can be interpreted from the results that there is no significant difference in techno-pedagogical skills among language, social science and science rural secondary school teachers. So,

the area of discipline is not a factor that affects the techno-pedagogical skills of rural secondary school teachers.

Table-6: Difference in techno-pedagogical skills of rural secondary school teachers with respect to their teaching experience

Variables			N	Mean	SD	F-value	Remarks
Background		Dependent					
Teaching Experience	<5 years	Techno-Pedagogical Skills	70	152.88	49.62	1.93	$H_0$3 is accepted at a 0.05 level
	5-10 years		50	153.40	48.53		
	>10 years		90	139.91	46.91		

The results in Table 6 clearly indicate that the calculated F-value is 1.93 which is less than the table value at a 0.05 level of significance. Thus, the null hypothesis is accepted.

It can be interpreted from the result that there is no significant difference in techno-pedagogical skills of rural secondary school teachers with respect to their teaching experience. So, the teaching experience is not a factor that affects the techno-pedagogical skills of rural secondary school teachers.

To find out the results of Objective 3, the correlation between attitude towards ICT and techno-pedagogical skills of rural secondary school teachers, the mean value of the attitude towards ICT and techno-pedagogical skills were calculated. Also, the correlation between the two means was calculated by using Pearson's Product Moment Method. The results are given in Table 7 and Table 8.

Table-7: Correlation between Attitude towards ICT and Techno-Pedagogical Skills of rural secondary school teachers with respect to their area of discipline

Area of Discipline	N	Variables				Co-relation (r)	Remarks
		Attitude towards ICT		Techno-Pedagogical Skills			
		Mean	SD	Mean	SD		
Language	78	134.87	13.24	144.79	50.62	0.73	Positive
Social Science	68	137.32	13.85	149.53	49.33	0.86	Positive
Science	64	139.25	12.19	148.46	45.22	0.78	Positive

In Table 7, the calculated coefficient of the correlation values between attitude towards ICT and techno-pedagogical skills of language, social science and science rural secondary school teachers are 0.73, 0.86 and 0.78 respectively.

It can be interpreted from the results that there is a highly positive correlation between attitude towards ICT and the techno-pedagogical skills of rural secondary school teachers with respect to their area of discipline.

Table-8: Correlation between Attitude Towards ICT and Techno-Pedagogical Skills of rural secondary school teachers with respect to their teaching experience

Teaching Experience	N	Variables				Co-relation (r)	Remarks
		Attitude towards ICT		Techno-Pedagogical Skills			
		Mean	SD	Mean	SD		
<5 years	70	138.91	13.09	152.88	49.62	0.84	Positive
5-10 years	50	139.24	13.45	153.40	48.53	0.86	Positive
>10 years	90	134.26	12.77	139.91	46.91	0.69	Positive

In Table 8, the calculated coefficient of the correlation values between attitude towards ICT and techno-pedagogical skills of below 5 years, 5 to 10 years and above 10 years teaching experienced rural secondary school teachers are 0.84, 0.86 and 0.69 respectively.

It can be interpreted from the result that there is a highly positive correlation between attitude towards ICT and the techno-pedagogical skills of rural secondary school teachers with respect to their teaching experience.

Thus, it can be said that the techno-pedagogical skills of rural secondary school teachers mainly depend upon their attitude towards ICT, and It can be assumed that with a positive attitude towards ICT, rural secondary school teachers perform in the teaching-learning process as more techno-pedagogically skilled persons concerning the background variables; area of discipline as well as teaching experience.

Major Findings

- A positive attitude towards ICT of rural secondary school teachers of West Bengal Board has been found.
- Attitude towards ICT among language, social science and science rural secondary school teachers of West Bengal Board doesn't differ significantly.
- Attitude towards ICT among language, social science and science rural secondary school teachers of West Bengal Board differs significantly with respect to their teaching experience.
- Techno-pedagogical skills of rural secondary school teachers of West Bengal Board is at moderate level.
- Techno-pedagogical skills among language, social science and science rural secondary school teachers of West Bengal Board doesn't differ significantly.
- Techno-pedagogical skills of rural secondary school teachers of West Bengal Board doesn't differ significantly with respect to their teaching experience.
- A positive correlation between attitude towards ICT and the techno-pedagogical skills of rural secondary school teachers of West Bengal Board has been found with respect to their area of discipline.
- A positive correlation between attitude towards ICT and the techno-pedagogical skills of rural secondary school teachers of West Bengal Board has been found with respect to their teaching experience.

Educational Implications

As per the recommendations of NEP 2020 and the needs of the modern digital era, technology integrated quality teaching-learning process is required for quality education. So, for quality in learning outcomes at the school level, techno-pedagogical skills are an important measure to the secondary school teachers as well as to all those stake holders who are related to the present education system. Even, though the attitude towards ICT is playing a vital role in the technology integrated teaching-learning process, a favourable attitude of secondary school teachers is also required at present.

- While implementing various educational policies related to ICT integration in education, all the stakeholders should focus on the appropriate and quality implementation of technology in education for quality in learning outcomes.
- The different orientation programs must be organised to maintain the positive attitude towards ICT of secondary school teachers on a regular interval.
- At the time of developing curriculum, the curriculum planner must plan and develop the updated technology integrated lessons and activities keeping in mind the opportunities for ICT accessibility by the teachers and learners.
- At the time of implementing the curriculum in a real classroom situation, teachers must plan the appropriate and updated technology-oriented lessons and activities as per the individual differences of the learners.
- Conduction of different training programs related to ICT integration in education for school teachers should be made mandatory for enhancing their techno-pedagogical skills.
- The adequate opportunity to use the ICT must be provided to the students to clear the concept about their lessons, anytime and anywhere.
- Technology mediated teaching-learning process should be provided to the students on a regular basis to involve them as active participants in the present teaching-learning process.
- As a professional, a teacher shapes the learners through his/her instruction. By the use of modern technological tools, resources and devices teachers make the learners aware of the use of technology along with its advantages and disadvantages. So, there is a need to teachers to improve their techno-pedagogical skills as they are the role model to the learners in this context.

Conclusion

The present study mainly aimed to find out the attitude towards ICT and the level of techno-pedagogical skills as well as to find out the relationship between attitude towards ICT and techno-pedagogical skills of rural secondary school teachers. It was an important survey in the rural context. The findings of this study indicate that rural secondary school teachers need to be more techno-pedagogically skilled for being competent teachers. Also, attitude towards ICT should be made more positive, as the relationship between attitude towards ICT and techno-pedagogical skills is positive. Thus, it can be said that with an appropriate attitude and adequate techno-pedagogical skills, rural secondary school teachers will become able to provide sound teaching-learning situations as per the present scenario.

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Research Article

GIS in School: Geography Teachers' Perceptions towards Geographic Information System

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Abstract

The use of Information Technology and Communication in general and GIS in particular is an important tool that is used to understand today's complex world and help to solve the problems related to spatial interaction. Today GIS has penetrated different aspects of life and it is the result of extensive acquisition of digital computers by business, trades, schools, institutions, universities, researchers, teachers, teacher educators, policy makers and households. The use of GIS as a pedagogic tool in geography classroom enables students to better understand the spatial interaction and relationship that exist on the surface of the earth by using technology. A sample of 20 Post Graduate Teachers (PGTs) teaching geography at senior secondary level was purposively selected through questionnaire and interview schedule.

The result shows that majority of the teachers were interested to get trained in GIS, so that they could be able to incorporate GIS in their teaching learning process with proper command. The paper highlights that time to time in-service training programmes need to be organized in GIS for the teachers to enhance their learning and also up to date with latest technology in the field of GIS.

Keywords: Geography, Geography Education, GIS, Pedagogic Tool, Perceptions, Spatial Interaction

Introduction

"This is a call for geography and environmental educators to think critically about the value of GIS." (Bednarz, 2004, p.192)

Geographic Information System (GIS) is a computer based medium through which geographic information in a map is stored, visualized, manipulated and analyzed. It is a means of assembling and analysing various kinds of spatial data that is available on the surface of the earth. 'Many systems have been evolved for natural- resource management and land-use planning at the different levels such as, regional, urban, state and national levels of government agencies. 'Most of the systems rely on data that comes from existing maps or on data that is mapped readily' (Shelton & Estes, 1981). The function of GIS is one of the most important contributions of the latest technology used by the teachers to create, manage, analyze and display natural as well human phenomenon or geographic data on the map. One of the important exciting uses of GIS in classroom occurs when teacher collect, create and manage their own geographic data with their students. The collected data then compiled and use with the help of GIS to analyse and display the results. GIS is used in geography classroom and it enables students to

comprehend the spatial relationship that exist on the surface of the earth. Spatial interaction and analysis such as selection of location in terms of site and situation change over time and influence and impact the environment that play an integral part in GIS use in geography classroom.GIS was first time introduced in Indian school curriculum as a part of geography at senior secondary stage under the flagship of National Curriculum Framework for School Education-2000 (NCFSE-2000). Existing NCERT Syllabus for secondary and senior secondary classes' volume-II (NCF-2005) on geography education at senior secondary stage suggests that there seems to be a lesser focus on GIS as a core objective and it needs to get more coverage in the coming days. GIS applications play an important role and may help teachers how to implement constructivist and inquiry-based learning environment in the classroom. Despite its potentials, most of the schools still lack of the essential infrastructure and resources and teachers fail to use GIS effectively in their class with proper command and effective skills. Nevertheless, it is very difficult to process of geographical data and GIS is difficult to use without proper understanding and skills of the computer and at the same time it also needs sound understanding about different packages of the GIS like ERDAS, Arc View etc. The interest in the incorporation of GIS into senior secondary school is mushrooming as teachers can learn multiple benefits and use of GIS in school education. "Its display of spatial data helps students to recognize and comprehend spatial patterns, while the variety of data and subject matter demonstrate real world complexities (Kerski 2003)". GIS is a very useful pedagogic tool for the teachers willing to use more student-centred approach for teaching students who play pivotal role in the teaching-learning process, inspiring and motivating students so that they can think critically (Fitzpatrick & Maguire 2000). Due to its interactive nature, GIS makes geography and other subjects interesting and informative for the students. GIS keeps students motivated for asking questions, creating, managing, analyzing, displaying and interpreting map on the basis of information available to them.

Review of Literature

Siljeg, S., Milanovic, A. and Maric, I. (2022) aimed to explore teachers and students attitudes towards the possibilities to implement GIS in secondary schools in Croatia. 96 teachers who taught geography and 611 students who opted geography were chosen for the study from Croatia. The results of the study highlight that both students and teachers showed positive attitudes towards implementation of GIS in their geography classes while teachers perceived higher importance of introducing GIS in their classes as compared to the students.

Incekara, S. (2012) conducted a study entitled "Do Geographic Information Systems (GIS) Move High School Geography Education Forward in Turkey? A Teacher's Perspective". 183 geography teachers were chosen for the study from 50 different provinces in Turkey. The result reveals that most of the respondents know about GIS but they did not have sound understanding how to use GIS as a pedagogic tool in their geography classes.

Pandey, A. (2011) explored the role of GIS in geography teaching in schools. She explained that there was lack of connectivity between schools and university level related to GIS and without these linkage most of the teachers of geography failed to understand how to adopt GIS effectively as a pedagogic tool in their classes. She suggested that for the effective implementation of GIS in schools, there is an urgent need to have

a proper connection and coordination between schools and universities.

Demirci, A. (2009) examined geography teachers' attitudes towards GIS and how these teachers approach new technology in their teaching learning process in 200 private secondary schools in Turkey. He found that geography teachers had positive attitudes towards GIS. Study revealed that understanding of GIS and its used by the geography teachers in the classroom was minimal which shows that there is an urgent need to train their geography teachers, so they can integrate GIS in their geography classes in Turkey in the future.

Lam, C.C., Lai, E. & Wong, J. (2009) explored the use of GIS in geography curriculum at secondary level in the schools of Hong Kong. They had conducted 28 geography teachers' interviews from different secondary schools in Hong Kong. Despite the fact that GIS was found to be an important geographical skill for the teachers, the study also reveals that in Hong Kong the use of GIS in geography teaching was very low.

Significance of the Study

There is even more compelling reason for concern with regards due to the lack of understanding and skills of computers among teachers. Due to this the teachers are not in the position to make teaching-learning process interesting, informative and innovative as such there is no meaningful learning to get to know more about GIS. It is generally observed that some of the geography teachers of government schools do not have working knowledge of computer with proper command. In the absence of adequate knowledge of computer, it's a matter to reflect how can teacher deals/teaches GIS that is completely based on the system i.e., computer. Due to ignorance and reluctance towards modern technology, indifferent attitudes of the geography teachers and lack of required physical infrastructure the geography teaching-learning process becomes a boring activity of the classroom and generally not getting attention from the side of the learners. The Kothari Commission (1964-66) emphasized the professional training of teachers for the qualitative improvement of education but very few concrete steps have been taken till date in this regard (NFG-Teacher Education, NCF-2005). NCERT has been taking great initiative towards imparting in-service education programmes for the teachers in all subject areas in general and geography in particular through face to face mode and also through distance education mode with the help of EDUSAT. In this backdrop, it is essential that geography teachers need to have sound understanding to deal with GIS with a fundamental skill of computer. The present research work, therefore, intends to study In-service geography teachers' perceptions, knowledge and skills of GIS in the light of curriculum of geography at senior secondary stage being offered in the schools of Directorate of Education, Government of National Territory of Delhi.

Objectives of the Study

1. To study the perceptions of geography teachers towards GIS
2. To study geography teachers' understanding and skills to incorporate GIS in their teaching learning process

Methodology

The study has used the mixed method approach. The responses obtained through questionnaire were scored while the responses gathered through

interview schedule were analyzed qualitatively keeping in mind the objectives of the study.

Population and Sample

The population of the study consists of all the geography teachers teaching geography at senior secondary stage in the schools of Directorate of Education in Delhi. A purposive sampling technique was used to collect the relevant data from geography teachers. Therefore, the sample of the study comprised 20 PGTs teaching at senior secondary stage in the schools of Directorate of Education situated in South-East zone of Delhi.

Tools

The investigator used interview schedule and questionnaire to collect the relevant data. Interview schedule was aimed to ascertain the perceptions of geography teachers' towards GIS while questionnaire was employed to study the level of understanding and skills of geography teachers' to incorporate GIS in their teaching- learning process.

Result and Discussion

Perceptions of Geography Teachers towards GIS

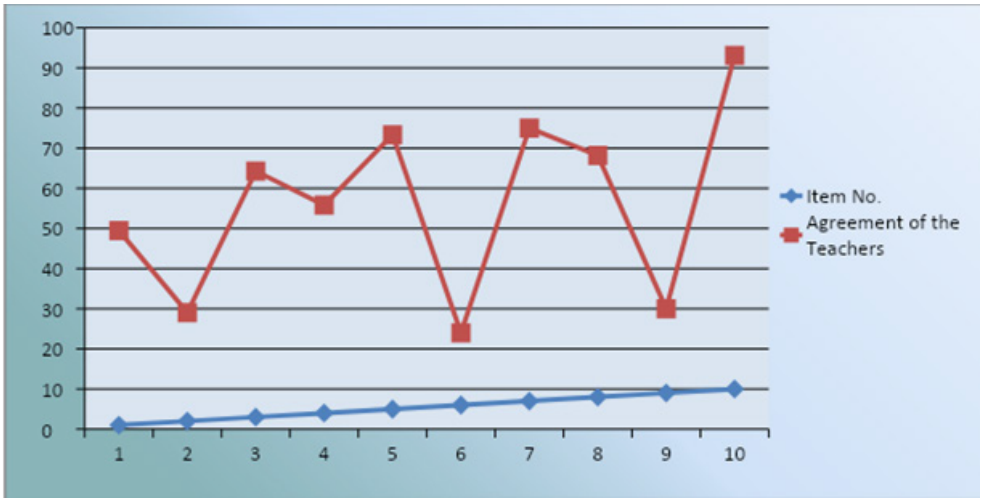
In order to get to know about how to assess the skills of geography teachers to incorporate GIS in their teaching. It was observed that 85 per cent respondents did not have sound understanding of how to use GIS software but they knew something about the concept of GIS as it was an important component of practical geography in class XII. Majority of the teachers responded that although their school have computers still, they did not have GIS software. 30 per cent teachers expressed their views that even if school provide GIS software but we will not be in position to develop a GIS course activity. As we did not learn GIS with the help of computer during our college days due to shortage of system or at that time computers were not easily available. Department and any other Government organization did not organize any training program on GIS, although they had attended some seminars and workshops on geography as conducted by NCERT and SCERT. All teachers expressed their views that GIS should be incorporated and implemented properly in the classroom as it is important component of the geography curriculum in this globalized world. They said that it should be the responsibility of the government to provide in-service training programmes from time to time for geography teachers to learn develop and enhance their geo-literacy with the integration of computer in general and GIS in particular. Three-fourth respondents revealed that due to their own lack of understanding their students would not be able to use GIS successfully in their assignments and projects. However, 70 per cent of respondents stated that they wanted to go for GIS training and more than 85 per cent of them expressed that they were keen to attend any training program based on GIS by the government. From the discussion it can be concluded that all the teachers were interested to get trained in GIS, so that they could be able to incorporate GIS in their teaching learning process with proper command.

Table-1: The geography teachers' understanding and skills for the incorporation of GIS in their teaching

Sr. No.	Statement	Agreement of the Teachers
1.	GIS is a very important tool/method for integrating pedagogy-technological interface	49.47
2.	NCF-2005 emphasizes use of GIS in teaching geography at senior secondary stage	29.03
3.	Do you adopt GIS as a teaching method more in your class as given in NCF-2005?	64.28
4.	Do you have sound understanding about how to incorporate GIS into your teaching/	55.81
5.	Do you incorporate technology (GIS) while teaching/ dealing with diverse concepts of geography in the classroom?	73.33
6.	Do you have enough time to learn and teach various concepts of geography with the help of GIS?	24
7.	The limited facilities provided by the school prevent you for using GIS sufficiently in your class	75
8.	Do you face any problem dealing with the data, images and maps to develop activities in your class related to GIS?	68.18
9.	Do you think that without GIS geography is incomplete in this globalized world?	30
10.	Time to time in-service training programs are organized on GIS for the geography teachers to enhance their learning and also up to date with latest technology	93.10

In the light of above result as depicted in table no. 1it can be safely said that the current application of GIS as a pedagogic tool in geography classroom could not be effectively adopted by the teachers due to their own lack of understanding and skills. Due to this they faced several challenges like how to incorporate GIS with their pedagogy and their motivation may dwindle because of inadequate command over it. All the respondents perceived that GIS is an ideal pedagogic tool for the teachers who wanted to use more student-centric approach in which students play pivotal and active role in the learning process. Instead of these challenges, it should be the responsibility of the teachers to provide space to the students to think critically and rationally but due to lack of understanding of GIS skills they just focussed to complete the syllabus or GIS by using non technophobic approach.

Figure-1: Percentage of the geography teachers' understanding and skills to incorporate GIS in their teaching has been shown graphically



Items of the table have been further analyzed separately keeping in mind the objectives of the study in the following manner: -

Item No.1 'GIS is an important tool/ method for integrating pedagogy-technological interface'

In order to find out the importance and utility of GIS as a pedagogic tool/method for integrating pedagogy-technological interface. 49.47 per cent of the teachers' extent their agreement, 42.10 per cent of the teachers were confused while 18.42 per cent of the teachers disagreed with the statement that GIS is an important tool/method for integrating pedagogy-technological interface. This finding matches with the findings of Green (2001b) "A GIS is a beneficial tool for integrated education because it focuses on geography while pulling together other relevant subjects".

Item No. 2 'NCF-2005 emphasizes use of GIS in teaching geography at senior secondary stage'

Regarding this item 38.70 per cent of the teachers expressed their disagreement and 29.03 per cent of the teachers expressed their agreement while 32.25 per cent of the teachers were confused with the statement. Most of them assumed that NCF-2005 was only provides guidelines about more use of technology which is not used without proper infrastructure and necessary resources.

Item No. 3 'Do you adopt GIS as a teaching method more in your class as given in NCF-2005'?

As far of this item is concerned 64.28 per cent of the teachers show their agreement and stated that for dealing with diverse range of issues, they had tried their best to explain the concept in a simple and lucid way by using geographic information with and without computer. 19.04 per cent of the teachers were confused while remaining teachers were disagreed with this statement.

Item No. 4 'Do you have sound understanding about how to incorporate GIS into your teaching'.

Regarding this item more than one half (55.81 per cent) of the teachers agreed with the statement and another 32.55 per cent teachers were confused. While remaining 11.62 per cent of teachers

expressed their disagreement with the statement indicating that they were unable to incorporate GIS in their teaching due to lack of computer skills and understanding.

Item No. 5 'Do you incorporate technology (GIS) while teaching/dealing with diverse concepts of geography in the classroom'?

As far of this item is concerned almost three fourth (73.33 per cent) of the teachers expressed their agreement with the statement, which might be effective to incorporate GIS while teaching/dealing with diverse concepts of geography in the classroom. While 13.13 per cent of the teachers had shown their disagreement and equal number of teachers were also confused in this regard.

Item No.6 'Do you have enough time to learn and teach various concepts of geography with the help of GIS'?

Regarding this item 68 per cent of the teachers expressed their disagreement with the statement and also expressed their desperation for not providing enough time and facilities by the school authorities to learn and teach various concepts of geography with the help of GIS. This indicates that these teachers were eager to learn but unfortunately not get an opportunity due to lack of time and facilities and other pressure on the part of school. About one fourth (24 per cent) of the teachers agreed while remaining (8 per cent) teachers confused with the statement.

Item No. 7 'The limited facilities provided by the school prevent you for using GIS sufficiently in your classes'.

As far of this item is concerned three fourth of the teachers expressed their agreement with the statement. This indicates that limited facilities were the reason not to incorporate GIS sufficiently in their classes. 16.6 per cent of the teachers had been confused while remaining teachers disagreed with the statement.

Item No. 8 'Do you face any problem dealing with data, images and maps to develop activities in your class related to GIS'?

68.18 per cent of the teachers expressed their agreement with the statement. This reveals that they faced problem in dealing with data, images and maps to develop activities in their classes related to GIS. 18.18 per cent of the teachers were confused while remaining (13.63 per cent) of the teachers shown their disagreement with the statement.

Item No. 9 'Do you think that without GIS geography is incomplete in this globalized world'?

As far of this item is concerned 43.33 per cent and 30 per cent of the teachers shown their disagreement and agreement with the statement respectively while remaining slightly more than one fourth percentage (26.66 per cent) of the teachers were confused in this regard.

Item No. 10 'Time to time in-service training programs are organized in GIS for the geography teachers to enhance their learning and also up to date with latest technology'.

As far as this item is concerned majority (93.10 per cent) of the teachers expressed their agreement with the statement. This indicates that majority of these teachers were interested to attain in-service training programs on GIS to enhance their own learning about it. 6.89 per cent of the teachers were confused while there was no single teacher who did not want to attain training program on GIS.

Conclusion

Teachers recognize the importance and benefits of GIS as a pedagogic tool to deal with the diverse range of phenomenon

with the help of system i.e., computer. But they face several challenges like how to incorporate GIS with their pedagogy and their motivation may dwindle. Due to lack of understanding of GIS most of the teachers wanted more time to learn and incorporate GIS as a pedagogic tool in their classroom. In most of the schools' teachers do not have sufficient time to learn latest software packages and become proficient user of GIS. It is software based system which requires active learning beyond whatever they had learnt in order to gain proper command and proficiency as per the need of the digital world. GIS use technology extensively in various sectors which use spatial data including planning, urbanization, engineering, environmental protection, transportation, forestry, agriculture, remote sensing and at all levels of education. As far the education is concerned the adaptation and implementation of GIS as a pedagogic tool into geography classroom was even slower as compared to other sectors. The reason behind this may be limited facilities provided by the school prevent teachers for not to use GIS sufficiently in the class and they also have lack of functional skills of computer and good command over GIS. Because of lack of understanding these teachers were not be able to create images and maps by using raster and vector data properly. Limited time, curriculum problems, teachers' problem, issues of physical conditions and its access both hardware and software, lack of GIS training and exposures are some of the major factors. Because of these factors GIS technology is very slowly integrated into the senior secondary curriculum by the geography teachers. The speedy integration of GIS in geography curriculum needs to be re-thought and redesigned by curriculum planners, policy makers and teacher educators by adopting and offering latest technology along with the recent software packages of GIS. More recent books, modules and time to time arrangement of the training on GIS need to be made available to the teachers in their school by the appropriate authorities so that it could become easy for the teachers to integrate GIS in their classes effectively.

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