GIS and ICT application in teaching Geography at Higher Secondary level: A closer focus on Teachers' Readiness

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Abstract

Most of the higher secondary schools in West Bengal, nowadays, have internet facility to support teaching-learning process. This has made it easy for the Geography teachers and administrators to evolve their teaching strategies for necessary integration of ICT and GIS in Higher Secondary level education which has the potential to improve students' knowledge and skills in the subject. In this study, an effort has been made to have an elementary view regarding the readiness of the Teachers of Geography in higher secondary schools in Kolkata, West Bengal to integrate ICT and GIS in regular teaching-learning processes. Keeping parity with the common perception, from this study also, it has been found (out of the dimensions studied) that younger Geography teachers of Kolkata are more ready to integrate the ICT & GIS in their teaching at the Higher Secondary level.

Keywords: Teaching-learning process, Geography teachers, integration, ICT and GIS, Higher Secondary level education.

1.1 Introduction

Information and Communication Technology popularly known by its acronym 'ICT', is a universal concept. This is so because it is seen to be in operation in most fields of study and organizations across the globe. It is a system derived from the intermingling of Information Technology (IT) and Communication Technology (CT). It is defined as the application of electronic media [Computers, telecommunication gadgets, digital media, mobile devices, Personal Digital Assistants (PDAs), etc.] in the acquisition, processing, storage, retrieving, and dissemination of Information. It consists of those software and hardware technologies that support the purposeful communication of Information. Geographic Information Systems (GIS) can be defined as a comprehensive mapping system designed for capturing, storing, analyzing, synthesizing, querying, editing, retrieving, manipulating and displaying spatial data obtained from earth's surface in the form of charts, tables, 3D images and maps based on the richness of the information entered into the GIS database. Specifically, ICT and GIS have immense potential to affect teaching and learning, and research in the education sector at every level from the Higher Secondary stage onwards. It helps to accelerate, enrich, motivate and engage

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students during teaching and learning processes thereby improving students' understanding of concepts (Falode, 2014).

The teaching profession has overtime experienced drastic changes. These changes have been reflected on the role of the teachers, the classroom activity and communication process, and the teaching methodologies. Today, the role of teachers has changed from repertoires to facilitator of knowledge. The classroom activity has now taken the form of interaction between the teacher and students rather than mere instruction as it used to be, with the communication process incorporating both the teacher and the students. The teaching methodology has not also been left out in the trend of changes. The philosophical (conventional) methods of teaching have been fortified with psychological (innovative) methods that are more contemporary. These contemporary psychological methods emphasize the use of technology, of which Information and Communication Technology (ICT) and Geographical Information System (GIS) are a part of. As such, they focus on delivering to the students the four Cs of learning (Communication, Collaboration, Critical thinking, and Creativity) even as been reflected in Geography teaching.

Application of Information and Communication Technology (ICT) and Geographical Information System (GIS) in teaching Geography in higher secondary education is a contemporary methodology in the pedagogy of Geography. It reflects a paradigm shift in Geography education. It means using technology in a brand new way to teach Geography students digital literacy, and fortifying them with the skills needed in the 21st-century technological-based labor market. It is in vein of these, that this study is saddled with the problem of discovering those areas (concepts/topics) in Geography that Information and Communication Technology (ICT) and Geographical Information System (GIS) can be best applied, unraveling those effects and challenges of applying it in teaching Geography in higher education, and then proffering possible solutions to the challenges. On this basis, this study was chosen.

1.2 Objectives of the Study:

The principal objectives of the present study were as follows:

Serial Number	Objectives of the Study
1.2.1.	To assess the ICT and GIS infrastructural capacity for teaching and learning Geography at the Higher Secondary level with special reference to Kolkata.
1.2.2.	To determine the level of teacher's ICT and GIS knowledge and skills in the application of ICT and GIS in teaching and learning Geography at the Higher Secondary level with special reference to Kolkata.
1.2.3.	To decide school administrative practices that support the use of ICT and GIS in teaching and learning geography at the Higher Secondary level with special reference to Kolkata.
1.2.4.	To make recommendations for the future to enhance ICT and GIS utilization for teaching and learning in Higher Secondary Schools.

1.3. Research Questions:

To duly and effectively investigate the problem of this study, the following research questions were formulated:

Serial No.	Research Questions
1.3.1.	Which area (concepts/topics) between Information and Communication Technology (ICT) and Geographical Information System (GIS) of Geography can be best applied in teaching Geography at the Higher Secondary level with special reference to Kolkata Municipal Area?
1.3.2.	What are the potential effects of applying Information and Communication Technology (ICT) and Geographical Information System (GIS) in teaching Geography at the Higher Secondary level with special reference to Kolkata Municipal Area?
1.3.3.	What are the challenges of applying Information and Communication Technology (ICT) and Geographical Information System (GIS) in teaching Geography at the Higher Secondary level with special reference to Kolkata Municipal Area?
1.3.4.	What are the possible solutions to the challenges of applying Information and Communication Technology (ICT) and Geographical Information System (GIS) in teaching Geography at the Higher Secondary level with special reference to Kolkata Municipal Area?
1.3.5.	Is the school administrative practice supportive to the use of ICT and GIS in teaching and learning Geography at the Higher Secondary level with special reference to Kolkata Municipal Area?

1.4 Delimitations of the Study:

It is presumed that due to time constraint, certain delimitations are inevitable to influence this study. However, the delimitations of the proposed study are as follows:

Serial No.	Delimitations	Description
1.4.1.	Age Group	The present study has been restricted to a particular age group of the adolescent students (i.e. only the XI & XII grade students) as samples.
1.4.2.	Data Collection	The study is also grounded in a well-researched literature review. Data have been collected from randomly selected Higher Secondary schools within the Kolkata Municipal Area.
1.4.3.	Geographical Area	In this study, the geographical area has been delimited within the Kolkata Municipal Area.
1.4.4.	School	The study delimited itself by concentrating on the application of ICT and GIS in Higher Secondary schools.
1.4.5.	Teachers	The study has focused on teachers only and an effort has been made to understand their readyness to use ICT and GIS in teaching and learning Geography at the Higher Secondary level.

1.5 Significance of the Study:

The findings of the study would help the stakeholders in education to understand the factors that affect the use of ICT in the education system and make relevant decisions. The concerned authorities may use the findings from this study to formulate the appropriate ICT policies in line with the National ICT Policy (2006). The school administration would use the findings in making decisions on the type of ICT infrastructure to acquire as well as the technical support necessary. The teachers would understand how technology affects their instructional materials in class and may find it necessary to adopt the available ICT in their schools. The teacher training college would find the results crucial in developing educator courses to enhance pre-service ICT training on the better application of ICT in classrooms.

2.1 Methodology

The study aimed at collecting opinions from the teachers' readiness to adopt ICT and GIS in teaching and learning Geography in schools at the Higher Secondary level. Questionnaires, observation and interview schedules enabled the researchers to collect the primary data.

In the present study, population consisted of H.S grade teachers (both males and females) of Kolkata Municipal Area, West Bengal which was selected purposively.

For collection of sample, initially 40 Bengali and English medium Boys, Girls and Co-ed schools were chosen randomly using lottery method. However, the final sample constituted 75 teachers out of which 37 were Males and 38 were Females. Given that the target population is heterogeneous due to the nature of the schools in the region, stratified random sampling was used [vide Table 1 below] to allow full participation of the schools.

Table – 1 : Sample Frame

S.No.				N	Percentage
1	GENDER	I	MALE	37	49.33
		II	FEMALE	38	50.66
2	LAST UNIVERSITY ATTENDED	I	CALCUTTA UNIVERSITY	48	64
		II	BURDWAN UNIVERSITY	12	16
		III	VISVA-BHARATI	6	8
		IV	OTHERS	9	12
3	HIGHEST EDUCATIONAL QUALIFICATIONS	I	B. A.	3	4
		II	B. Sc.	2	2.66
		III	M. A.	35	46.66
		IV	M. Sc.	33	44
		V	M.Phil./Ph.D.	2	2.66
4	TEACHING EXPERIENCE	I	8 – 18 YEARS	59	78.66
		II	19 – 29 YEARS	16	21.33

A two-section survey has been shaped to evaluate the G.I.S and I.C.T application readiness of teachers in Geography at Higher Secondary level in Kolkata, West Bengal. The first section consisted of several items to collect information regarding demographic characteristics of the participants such as name of the school, higher educational qualification of the teachers, teaching experience, last university attempted of the teacher and gender (see *Annexure - 1*). The second section included 23 items to assess school teachers' self-reported readiness for GIS and ICT application in teaching Geography at Higher Secondary level. This adapted and modified Likert type questionnaire, measuring e-learning readiness has been based on Chapnick's [2000] conception of the construct.

The questionnaires were used to collect data from the Higher Secondary teachers of Geography while the Head of the Institutions were also interviewed in case to case basis if he/she was found to be basically a teacher of Geography. Observations helped to gather crucial information that could not be obtained through interviews and questionnaires. The questionnaires were used to collect bio-data of the teachers, background information of the schools and gather information on the use of ICTs and GISs in teaching and learning Geography. It is divided into two (2) sections. The first Section A – focused on gathering information about the respondents, while the second Section B – which contains twenty three (23) items focused on gathering the respondents' responses to the research questions. The responses in Section B are weighed on a modified Likert 5-point rating scale, having Strongly Agree (SA) with 5 points, Agree (A) with 4 points, and Neutral (N) with 3 points, and Disagree (D) with 2 points, and Strongly Disagree (SD) with 1 point.

2.2 Variables:

INDEPENDENT VARIABLES	The independent variables for the present study are the gender, academic qualification, teaching experience of the surveyed teachers teaching Geography at the Higher Secondary level in the different Schools in Kolkata under the WBCHSE.
DEPENDENT VARIABLE	The dependent variable for the present study is teachers' readiness with respect to GIS and ICT application in Teaching Geography at Higher Secondary Level.

2.3 Data Collection Procedure:

After visiting the sampled schools [Figure-1 below], the questionnaires were administered and interviews were conducted. Appointments to the sampled schools were arranged prior to the visits to avoid any inconveniences to the respondents. With the help of the Head of the institutions, 91 copies of the questionnaire were distributed to 91 higher secondary school Geography teachers in Kolkata, West Bengal. Out of the 91 questionnaires distributed - 82 were collected and only 75 copies could be retrieved for this study, constituting a response rate of 82.42%. The researcher emphasized that the

information given was specifically for the study and it was private and confidential and that names were not necessary.
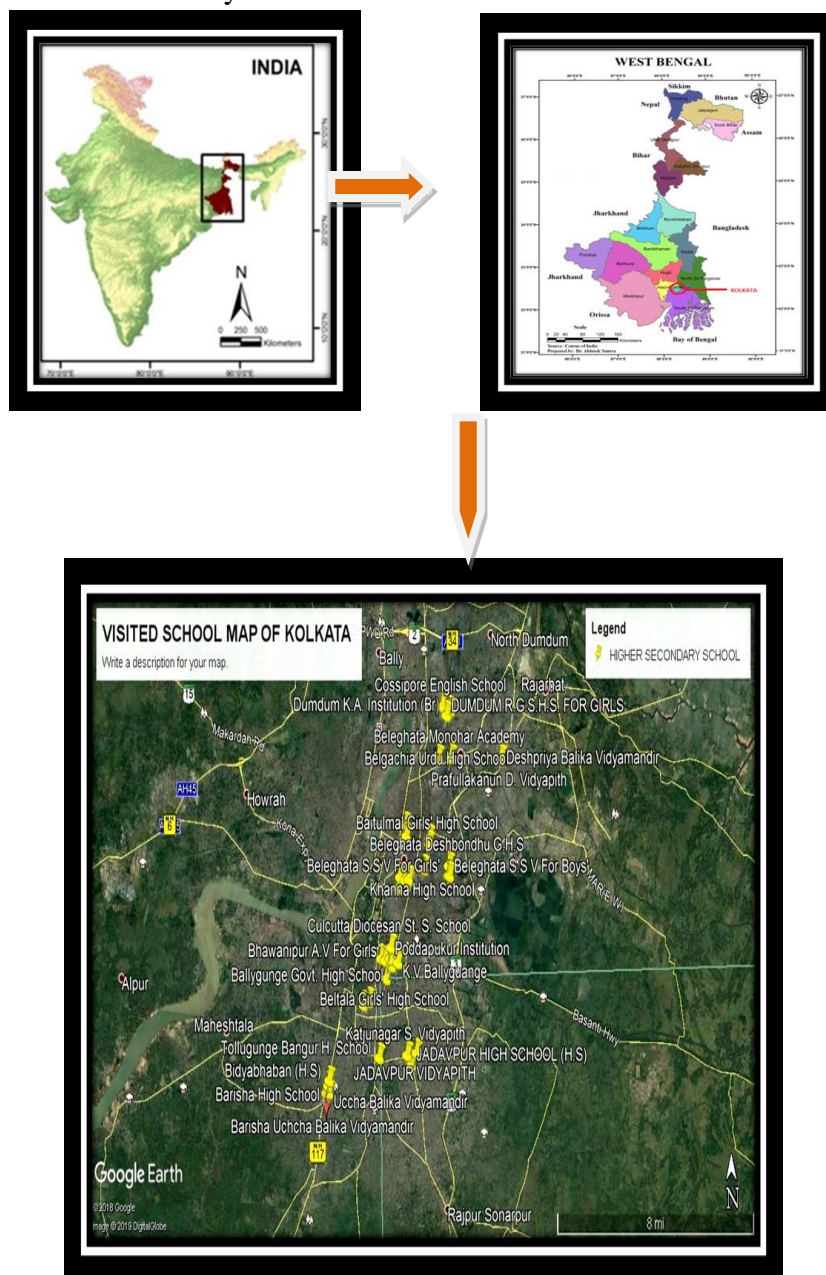

Figure – 1 : Selected Schools in the Studied Area (Kolkata Municipality)
[Source - Edited using the Google Earth software]

3.1 Results

The data collected was analyzed using Microsoft Excel. Descriptive statistics are used to present the results of the study and the general trends which involve tabulating, graphing and describing data. For the present study, results were presented on the basis of analysis of data and its interpretation under the following headings:

(A) Item wise analyses and Interpretations:

(i) Technological Readiness:

Table – 2 : Statistics for the Items on Technological Readiness

Item No.	Overall Score		Male		Female	
	Sum	**Mean**	**Sum**	**Mean**	**Sum**	**Mean**
1	310	**4.13**	165	**4.46**	145	3.82
2	297	3.96	147	3.97	150	**3.95**
3	281	3.75	135	*3.65*	146	3.84
4	273	*3.64*	144	3.89	129	*3.39*
5	298	3.97	152	4.11	146	3.84
6	277	3.69	146	3.95	131	3.45
7	279	3.72	137	3.70	142	3.74
8	281	3.75	146	3.95	135	3.55

INTERPRETATION OF RESULTS : Figures in the Table No-2 indicated technological readiness in which maximum overall mean value was found in item no-1 and minimum in item no-4. The maximum male mean value was found to be in item no-1 and minimum in item no-3. The maximum female mean value was in item no-2 and minimum in item no-4.

(ii) Psychological Readiness :

Table -3: Statistics for the Items on Psychological Readiness

Item No.	Overall Score		Male		Female	
	Sum	**Mean**	**Sum**	**Mean**	**Sum**	**Mean**
9	315	4.20	158	**4.27**	157	4.13
10	316	**4.21**	151	4.08	165	4.34
11	314	4.19	148	4.00	166	**4.37**
12	296	3.95	145	*3.92*	151	3.97
13	294	*3.92*	147	3.97	147	*3.87*

INTERPRETATION OF RESULTS : Figures in the Table No-3 indicated psychological readiness where maximum overall mean value was found to be in item no-10 and minimum in item no-13. The male mean value was maximum in item no-9 and minimum in item no-12. The female mean value was maximum in item no-11 and minimum in item no-13.

(iii) Infrastructure Readiness :

Table -4: Statistics for the Items on Infrastructure Readiness

Item No.	Overall Score		Male		Female	
	Sum	**Mean**	**Sum**	**Mean**	**Sum**	**Mean**
14	266	3.55	138	3.73	128	3.37
15	260	*3.47*	129	*3.49*	131	3.45
16	268	3.57	135	3.65	133	3.50
17	286	**3.81**	131	3.54	155	**4.08**
18	268	3.57	141	3.81	127	*3.34*

| 19 | 276 | 3.68 | 142 | **3.84** | 134 | 3.53 |
| 20 | 271 | 3.61 | 139 | 3.76 | 132 | 3.47 |

INTERPRETATION OF RESULTS : Figures in the Table No - 4 indicated infrastructure readiness in which maximum overall mean value was in item no-17 and minimum in item no-15. The maximum male mean value was found in item no-19 and minimum in item no-15. The female mean value was maximum in item no-17 and minimum in item no-18.

(vi) Equipment Readiness :

Table - 5: Statistics for the Items on Equipment Readiness

Item No.	Overall Score		Male		Female	
	Sum	Mean	Sum	Mean	Sum	Mean
21	237	*3.16*	124	*3.35*	113	*2.97*
22	277	3.69	136	3.68	141	3.71
23	305	**4.07**	150	**4.05**	155	**4.08**

INTERPRETATION OF RESULTS : Figures in the Table No - 5 indicated equipment readiness where the overall mean value was maximum in item no-23 and minimum in item no-21. Similarly, the male mean value was also maximum in item no-23 and minimum in item 21. Again, the maximum female mean value was also found to be in item no-23 and minimum in item no-21.

(B) Selected Variable wise analyses and Interpretations :

Table – 6 : Statistics for the total sample

Mean	87.26666667
Standard Error	1.127595438
Median	88
Mode	85
Standard Deviation	9.765262944
Sample Variance	95.36036036
Kurtosis	0.350382565
Skewness	-0.062689616
Range	46
Sum	6545
Count	75

(i) Gender wise distribution of Readiness Scores:

Table – 7 : Results of the t-Test between Male- and Female- Geography Teachers' Readiness

t-Test: Two-Sample Assuming Equal Variances		
	Total Male Score	*Total Female Score*
Mean	88.81081081	85.76315789
Variance	68.93543544	118.9423898
Observations	37	38

Pooled Variance	94.28142598	
Hypothesized Mean Difference	0	
Df	73	
t Stat	1.358984374	
P(T<=t) one-tail	0.089167771	
t Critical one-tail	1.665996224	
P(T<=t) two-tail	0.178335542	
t Critical two-tail	1.992997097	

INTERPRETATION OF RESULTS : In gender wise participants, male was 49.33 percent and female was 50.66 percent. After collecting samples, it was found that total mean score of males was 88.81 and female mean score was 85.76. The P value (P = 0.178) was found to be >0.05. So, the difference in the mean scores was found to be statistically insignificant. Thus, it can be inferred that there exists no difference in readiness for GIS and ICT application in teaching Geography at Higher Secondary level with respect to gender of the Geography teachers in the surveyed schools of Kolkata.

(ii) Distribution of Readiness Scores on the basis of Last University Attended:

Table – 8 : Results of ANOVA to determine Geography Teachers' Readiness with respect to their University Last Attended

ANOVA: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
C.U	48	4217	87.8541	88.0846		
B.U	12	1076	89.6666	107.8787		
V.B.U	6	487	81.1666	31.7666		
O.U	9	765	85	152		
ANOVA						
Source of Variation	*SS*	*Df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	355.1875	3	118.3958	1.2543	0.2966	2.7336
Within Groups	6701.4792	71	94.387			
Total	7056.6667	74				

INTERPRETATION OF RESULTS :

In Last University Attended, maximum mean value was found to be in Burdwan University 89.66 followed by Culcutta University 87.85 and Visva Bharati University 81.16. The P value among these groups was found to be P = 0.296 which is greater than 0.05 i.e., P> 0.05. So difference amongst these mean values is statistically insignificant. Thus, it can be inferred that there exists no difference in readiness for GIS and ICT

application in teaching Geography at Higher Secondary level with respect to Last University Attended by the Geography teachers in the surveyed schools of Kolkata.

(iii) Highest Educational Qualification wise distribution of Readiness Scores:

Table – 9 : Results of ANOVA to determine Geography Teachers' Readiness with respect to their Highest Educational Qualification

ANOVA: Single Factor						
Summary						
Groups	*Count*	*Sum*	*Average*	*Variance*		
B.A	3	241	80.33333	60.33333		
B.SC	2	181	90.5	12.5		
M.A	35	3002	85.77143	109.1227		
M.SC	33	2914	88.30303	75.2178		
M.PHIL./PH.D.	2	207	103.5	0.5		
ANOVA						
Source of Variation	*SS*	*Df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	805.8589	4	201.4647	2.256113	0.071694	2.502656
Within Groups	6250.808	70	89.29725			
Total	7056.667	74				

INTERPRETATION OF RESULTS :

One-way ANOVA indicated that the P value between groups was P=0.071 which is greater than 0.05 (i.e., P> 0.05). So, it indicated that the differences were statistically insignificant. Thus, it can be inferred that there exists no difference in readiness for GIS and ICT application in teaching Geography at Higher Secondary level with respect to the Highest Educational Qualification of the Geography teachers in the surveyed schools of Kolkata.

(iv) Teaching Experience wise distribution of Readiness Scores :
Table – 10: Results of the t-Test between the two groups of Geography Teachers' Readiness on the basis of their Teaching Experience

t-Test: Two-Sample Assuming Equal Variances		
	(8 to 18) years	*(19 to 29) years*
Mean	86.06779661	91.6875
Variance	84.23670368	118.2291667
Observations	59	16

Pooled Variance	91.22145635	
Hypothesized Mean Difference	0	
Df	73	
t Stat	-2.087470076	
P(T<=t) one-tail	0.020168163	
t Critical one-tail	1.665996224	
P(T<=t) two-tail	0.040336326	
t Critical two-tail	1.992997097	

INTERPRETATION OF RESULTS : In teaching experience, experience between 8 to 18 years was 78.66 percent and between 19 to 29 years was 21.33 percent. T-test analysis of both samples indicated that P value was 0.04 i.e., P< 0.05. Thus, it can be inferred that there exists a difference in readiness for GIS and ICT application in teaching Geography at Higher Secondary level with respect to the span of Teaching Experience of the Geography teachers in the surveyed schools of Kolkata and the younger teachers appeared to be more ready in this respect.

4.1 Major Findings:

Sl. No.	Major Findings
4.1.1.	Uses of G.I.S & I.C.T are very important in teaching education at higher secondary level for better understanding and gaining of knowledge in a better way. The different tools like use of technology, infrastructure, equipment, and psychological awareness are very helpful in teaching education.
4.1.2.	In chapter wise analysis and interpretation, the survey was done to check the readiness towards the technology of the teachers. It was observed that all total eight items were to have aggregates of agree 68.83%. the neutral was 22.57% and disagree was 8.88% respectively. So, it is said that closeness towards the use of technology in G.I.S & I.C.T. application was high.
4.1.3.	The psychological readiness of the teachers was also checked and was observed that the aggregates of agree was 79.73%. The aggregate of neutral was 15.73% and disagree was 4.53%. Here, agree of readiness towards psychology of the teacher was also higher than the disagree.
4.1.4.	The infrastructure of the school is the big challenge to maintain the school's environment. The readiness of the teachers toward the infrastructure was also analyzed and it showed that the aggregates of the agree of all total items was 61.33%. The aggregate of neutral was 22.09% and aggregates of disagree was 16.57% which was less than agree. So, it was found that readiness towards infrastructure was also higher.
4.1.5.	The equipment which is the most valuable things helping the teachers to properly convey the knowledge to the students. The aggregates of agree

	to use the equipment was 63.9% and disagree was 18.22%. The aggregate of total neutral was 17.78%. So, the use of equipment was more.
4.1.6.	In variable wise analysis & interpretations, table 1 indicated the readiness of the teacher towards the use of technology and it was observed that maximum overall mean value was found in item no-1 & minimum in 4. The male mean value was maximum in item no-1 and minimum in 3. The male mean value was found to be maximum in item no-2 and minimum in 4.
4.1.7.	The overall mean value in psychological readiness of the teachers was found to be maximum in item no-10 and minimum in item no 13. The mean value of was found to be maximum in item no-9 and minimum in 12. The mean value of female was in item no-11 and minimum in 13.
4.1.8.	The infrastructural readiness has been shown in table no 3 and it was found that overall mean value was maximum in item no-19 and minimum in 15. The male mean value was maximum in item no-19 and minimum in 15. The mean value of female was found to be maximum in item no-17 and minimum in 21.
4.1.9.	The mean value of overall, male and female in equipment readiness were found to be maximum in item no 23 and minimum in item no-21.
4.1.10.	In gender wise participants female was higher (50.66%) than the male (49.33%). but the mean score in male was found to be higher (88.81) than the female (85.76). The P value was 0.178 which is greater than 0.05 i.e., P>0.05. So, data were insignificant and null hypothesis was accepted.
4.1.11.	In last university attended, the mean value was found to be in maximum in Burdwan University (89.66) followed by Culcutta University (87.85) and Visva Bharati University (81.16). The P value among these groups was found to be P=0.296 which is greater than 0.05 i.e., P> 0.05. So, difference amongst these mean values was statistically insignificant. Therefore, the null hypothesis was accepted.
4.1.12.	Table No-19 and Table No-20 showed highest education qualification in which highest education qualification participants was M.A. followed by M.Sc, B.Sc, M.Phil/Ph.D and B.A. One-way ANOVA showed that the P value between groups was P=0.071 which is greater than 0.05 (P> 0.05). So, it indicated that data were insignificant and null hypothesis was accepted.
4.1.13.	In teaching experience, experience between 8 to 18 years was found to be 78.66% and between 19 to 29 years was 21.33%. The t-test analysis of both samples showed that P value was0.04 i.e., P< 0.05. It indicated that data were significant. So, alternate hypothesis was accepted.

4.2. Limitations of the Study :

The limitations of the present research work were as follows:

- The first and foremost limitation was time constraints which was one of the major cause to delimit the study.
- Being a full time and regular student of M.Ed. course under the WBUTTEPA, the academic commitments other than the dissertation hindered the present researcher to undertake the study in its full-fledged form.

4.3 Suggestions for further study:

The present study for dissertation work of M.Ed. course was confined to so many limitations like time constraints, selection of sample, incorporation of other desired variables, lack of space for using sophisticated statistical techniques.

The researcher thinks it is appropriate to make the study a full-fledged one and also to generalize and findings the following steps may be taken which are:

Sl. No.	Suggestions
4.3.1	The sample may be collected from a wider range of population.
4.3.2	Involvement of different strata of the greater society like urban vs. rural etc.
4.3.3	A study can be carried out to determine the cost- benefit analysis of using ICTs and GIS in Higher Secondary Schools Teachers.
4.3.4	Sophisticated statistical techniques may also be used.

Above all, to depict a lively view of the study, a pilot project may be taken with a spirited heart full of enthusiasm and that might lead to the *summum bonum*.

Acknowledgements:

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Annexure – 1

Questionnaire to determine the Readiness of the Teachers regarding GIS and ICT application in teaching Geography at Higher Secondary level

Name of the Teacher :…………………………………….....................................

Gender :………………..

Name of the University/College last attended for P.G./Hons. Degree : ...………….

Name of the School : …..………..………………….............….……………….

Highest Educational Qualification :…..…..

Teaching Experience [in years] :…………...

S.N.	ITEMS
F-1	Technological Readiness
1	I have enough technical skills to use ICT and GIS in Teaching Geography at Higher Secondary school.
2	Accessing the Internet is not a problem to me.
3	I have the basic technical knowledge to fix technical e-learning problems.
4	I have enough technical competencies to prepare ICT and GIS materials in Teaching Geography at Higher Secondary school.
5	I know ICT and GIS.
6	I clearly understand the components of ICT and GIS to use it for teaching.
7	It is easy to acquire the skills to use ICT and GIS.
8	I am ready to integrate ICT and GIS in Teaching Geography at Higher Secondary school in my teaching.
F-2	Psychological Readiness
9	Using ICT and GIS for teaching Geography at Higher Secondary level is a good idea.
10	I think ICT and GIS can help students to be more active.
11	I think ICT and GIS are helpful to improve teaching and learning Geography at Higher Secondary level.
12	I think ICT and GIS are easy to use for teaching Geography at Higher Secondary level.
13	It is easy to gain knowledge from the use of ICT and GIS to teach.
F-3	Infrastructure Readiness
14	I have the facilities to conduct teaching in my classroom using ICT and GIS.
15	The school conducts ICT and GIS workshops to equip teachers with the required technical skills.
16	My school can provide the technical staff to support e-learning at the Higher Secondary level using ICT and GIS.
17	The school's Internet connection is good.
18	My school's infrastructure can support e-learning using ICT and GIS at the Higher Secondary level.
19	My school has enough computer labs to support e-learning of Geography using ICT and GIS at the Higher Secondary level.
20	The school's computer labs have up-to-date facilities to implement e-learning using ICT and GIS.
F-4	Equipment Readiness
21	The school has different GIS CD-ROM drives that work well for teaching Geography at the Higher Secondary level.
22	The school has printers that work well.
23	The school has computer projectors and screens that work well.