4.0 Introduction

Ultimate goal of any research is to find out solution for the existing problems. Outcome can be measured by the systematic analysis of collected information. Information can be collect in the form of qualitative or quantitative data. Data is raw information which can be analyzed by applying correct statistical technique. Data analysis is very crucial stage because researchers analyze collected data and meaningfully interpret analyzed data to infer conclusion. It is important also because we can generalize derived conclusion to large population. In this way, findings of the study need to discuss in relation to theory and prior researches in the area of Information and Communication Technology. Thus, we can correlate our study with the other studies. The present chapter deals with analysis and interpretation of the collected data during experimentation that is followed by the fruitful discussion. Selection of appropriate data analysis technique is very essential. Researcher has to select appropriate data analysis technique based on the nature of data and data analysis technique. For that researcher should have in-depth knowledge and understanding about statistical techniques in Education. Researcher has to summarize the complete information collected with the help of research tools and techniques and yield answer to the research problems and the purpose of the data interpretation is to search for broader meaning of these answers. It helps further to build proper understating and linking solution of the problem by the readers. The main purpose of the analysis and interpretation is to assess and determine the extent of attainment of objectives of the research. Analysis of the research also helps the researcher to test the hypothesis of the research study and to draw conclusion.

The present study is an experimental type following quasi-experimental design. Researcher has collected data in two phases viz. before and after intervention of the program. Pre-test and perception scale were administered before intervention of the multimedia learning package and same pre-test and perception scale was administered after the intervention on both the control and experimental group. The pre-test was used to see that the average performance of the student-teachers in both the groups is

comparable before the intervention of the program. Perception scale was used to study perception of student-teachers about ICT and ICT skills. There were total 34 and 32 student-teachers in experiment and control group respectively. Achievement test was administered on both the group but only 32 student-teachers from both the group were taken into consideration while analyzing data. Researcher collected Digital lesson plans and Power point presentation from student-teachers of experimental group to study the level of the ICT skills. Other than that Reaction scale was administered on experiment group student-teachers to mark their reactions towards developed multimedia learning package. Data collected with the help of pre and post-test were in the form of number, the quantitative data analysis techniques was adopted for analysis of the data. Sample from the population was selected purposively. So, researcher used Mann-Whitney U test, a non-parametric statistical technique to analyze data. Percentage, Frequency, Intensity index(II) as well as Wilcoxon signed rank test and Wilcoxon rank sum test for independent groups were used to analyze perception scale. Frequency of response of student-teachers for each statement was counted and analyzed. While digital lesson plan & power point were assessed with the help of rubrics. Total 25 marks were assigned for both the digital lesson plan and power-point presentation. Data analyses were carried out using SPPS Data analysis software along with manual and excel software.

4.1 Academic Achievement of Experimental and Control group

Present study has objective no 3- "to study the effectiveness of the developed multimedia learning package with respect to academic achievement in pre-test and post-test of student-teachers of experimental and control group." Researcher also intended to test null hypothesis based on objective that is "There will be no significant difference in the mean score of the student-teachers of experimental and control group in pre-test and post-test." Following Non-parametric statistics- Mann-Whitney U test formula was used

$$U = n_1 n_2 + \frac{n1\ (n1+1)}{2} - \sum R1$$

Where n1= Number in control group

N2= Number in experimental group

$\sum R1$ = Sum of Rank in one group

Following formula of Z-value was used to calculate and determine Z-value

$$Z = \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2 (n_1 + n_2 + 1)}{12}}}$$

The selection of the sample was purposive and the assumption of parametric statistics didn't match for the present study, hence it became the cause for the researcher to favor the use of Mann-Whitney U-test. Data were analyzed using Mean, Standard Deviation and Mann-Whitney U-test which is given and discussed below in table 4.1 and 4.2.

Table 4.1

Mean, Standard Deviation and Standard Error of Mean Wise Distribution of Academic Achievement of Student-teachers of Experimental and Control Group

	N	Mean	Std. Deviation	Std. Error of Mean
Control Group	32	22.63	5.2	0.92
Experimental	32	28.72	4.91	0.86

From above table 4.1, it was found that the mean academic achievement of control and experimental group student-teachers were 22.63 and 28.20 respectively out of 50 marks. Standard Deviation from the mean for the achievement test was 5.2 and 4.91 respectively for the control and experimental group with the standard error of mean 0.92 and 0.89 respectively. It can be said that both the groups were upright in academic achievement in ICT and related skills with more or less same standard deviation and equally low level of standard error of mean. Further it can be said that academic achievement of student-teachers of experimental was higher than the academic achievement of student-teachers of control group. From the standard deviation and standard error of mean it can be said that both the group were at similar level of achievement in the beginning of the experiment. To find the difference was significant or by chance and to test the null hypothesis "There will be no significant difference in the mean score of the student-teachers of experimental and control group in pre-test and post-test" Mann-Whitney U-test was used as the sample was taken purposively from the population.

Table 4.2

Summary of Mann-Whitney U-test, Sum of Ranks, U-value, z-value and

Probability

Type of Group	N	Sum of Ranks	U-value	Z-value	Probability (P)
Control	32	667	823	4.185	0.00003
Experimental	32	823			

From above table 4.2, it can be observed that sum of ranks were 667 and 823 for the control and experimental groups respectively. The U-value and Z-value were found to be 823 and 4.185, respectively null hypothesis (Ho) of z, for $z \leq 4.185$, referring the table for normal probability, the two-tailed probability was found to be 0.00003 which is lesser than the decided significant level (α) i.e. 0.05. Hence the null hypothesis was rejected and coined that there is significant difference in academic achievement of control group and experimental group student-teachers. From the table 4.1, it was also said that mean academic achievement of experimental group student-teachers calculated from post-test was more than the mean of academic achievement of control group that could attributed to academic achievement in ICT and ICT skills due to multimedia learning package. Hence it indicates that the developed multimedia learning package was effective in improving the academic achievement in ICT as compared to the traditional approach. Thus, it can be concluded that multimedia learning package was found to be significantly effective in terms academic achievement in ICT as compared to the traditional approach.

4.2 Content Analysis of Digital Lesson Plan Presentation

The present study has objective no. 4- "to study effectiveness of multimedia package in terms of the ICT based lesson plan developed by student-teachers of experimental group." Digital lesson plan and PowerPoint presentation on Science content were developed and submitted as a part of activity by student-teachers. Developed lesson plans and Digital lesson plan by student-teachers is given in CD (Attached at the back of the thesis). Researcher analyzed digital lesson plans and PowerPoint presentations with the help of Rubric (Rubric used for evaluation of lesson plans is given in appendix IV). Rubric of digital lesson plan components like unit summary, design of instructional objectives, design of instructional strategies, use of materials, organization and presentation, use of technology, way of assessment etc. Rubrics to

assess powerpoint presentation containing component like title slide, content presentation, organisation of content, use of audio and video, use of images/charts/smartArt, use of animation and slide design, references and websites referred etc. Based on rubrics, there were total 25 marks each for all the items and components of digital lesson plan and PowerPoint presentation. Digital lesson plan and PowerPoint presentation were analyzed based on rubrics and marks were given out of 25 marks for the developed lesson plan and PowerPoint presentation.

Graph 4.1

Student-teachers Evaluation Based on Developed Digital Lesson Plan and PowerPoint Presentation
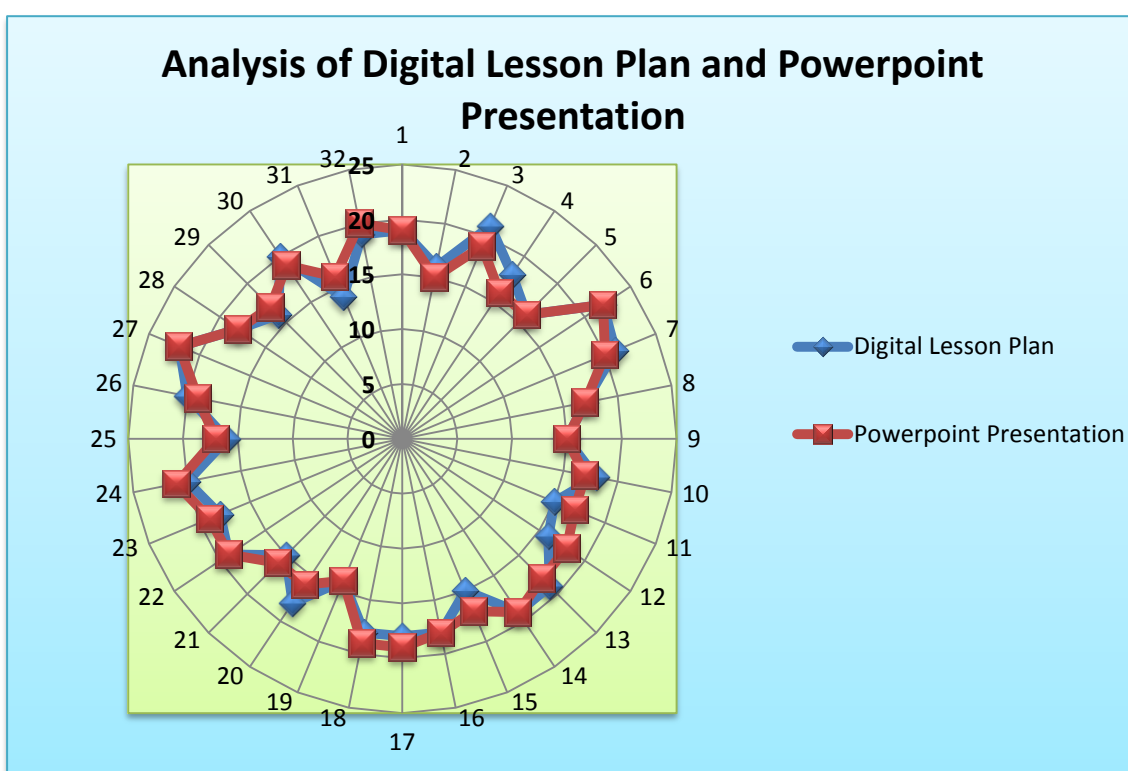
Table 4.3

Levels in ICT Skill of Student-teachers based on Score Obtained through Developed Digital Lesson Plan and PowerPoint Presentation

Range of Marks	Defined Level in ICT skills	Number of student-teachers fall under range	Percentage
Less than 5	Poor	-	-
Between 5 to 10	Below Average	-	-
Between 15 to 20	Average	1	3.125
Between 15-20	Good	27	84.375
Above 20	Very Good	4	12.5

Furthermore, based on analysis of digital lesson plan and PowerPoint presentation, the data have been presented with the help of radar chart as presented above. While assessment of the digital lesson plan, researcher keep in mind assessment criteria under rubrics viz. 1) content of the lesson plan should be precise, clear, relevance as per the level of learner. 2) Design of unit objectives as per the relevant to the topic as achievable, level of student, Instructional strategies as per the objectives. 3) Activities planned as per content, organization of teaching point and presentation planned logically, time duration, feasible technically point of view, proper combination of practical exposure with the help of technology. 4) Selection and application of technologies as per the requirement, use of technology as per the level of the students and content and context, synchronized with teaching. 5) Methods of assessment as per objectives, approaches, scope of self-evaluation etc. Similarly researcher keep in mind assessment criteria to assess powerpoint presentation under rubrics viz. 1) Presentation relevant to the topic, content covered as per the duration of period, presented information adequate and appropriate, major and minor concepts interlinked properly. 2) Contents organized logically, illustration given with the help of example, additional web links etc., use of image, charts, smart art, audio/video as per the requirement of the content, synchronized with the content, clarity should be good enough and appropriate to the content and context. 3) Design of the slides should be appropriate in terms of font size, color of the text, appropriateness of sound, graphics and animation, text and slide transaction etc., 4) Proper references should give, adequate numbers of cited references, references/websites suggested for further reading. Student-teachers were categorized in different levels of ICT skills ranging from poor to excellent in ICT skills based on level of appropriateness of the criteria of assessment viz. marks less than 5= poor, between 5 to 10= Below Average, between 10 to 15= Average, between 15 to 20= Good, above 25= Very Good. From the radar graph 4.1 and table 4.3, it can be observed that 12.5 percent student-teachers were able to prepare digital lesson plan very well which shows that they were very good in ICT skills. The lesson plan prepared by student-teachers was thoughtful, had incorporated technology meaningfully based on stated objectives and incorporated various activities for the students, evaluation criteria took care of all kind of learners. Power point presentation prepared by student-teachers was as per the digital lesson plan format and the activities planned for students were relevant and age appropriate. 84.36 percent student-teachers were good with required ICT skills, as the lesson plan

prepared by student-teachers was good and met average requirement, had incorporated technology wherever needed, the activities were planned for students but there was scope to incorporate web based activities including social networking sites. The powerpoint presentation prepared by student-teachers was as per the digital lesson plan format. 3.12 percent student-teachers were good with required ICT skills because student-teachers attempted to incorporate technology but not as per the needs and designed activities that is not as per level of students. Student-teachers planned classroom transaction process but somewhere lacking in innovativeness in planning. Powerpoint presentation developed by the student-teachers was good but organization of the contents was not appropriate, at some point, clarity of the content was missing, design of the slides, transaction, font color, size, background, media used etc. were not fully taken care of. Majority of student-teachers' developed lesson plan and PowerPoint presentation was good or very good. Thus, it can be said that the multimedia learning package was useful in guiding student-teachers in developing digital lesson plans and PowerPoint presentation in science. Probable reason may be the orientation given to student-teachers regarding development of digital lesson plan along with templates. CD-ROM was also given to student-teachers, so that they can practice at home on their own. Researcher gave practical exposure also to develop digital lesson plan and PowerPoint presentation.

4.3 Data Analysis of Perception Scale

Study has objective no 5- "to study the change in perception of student-teachers of control and experimental group with respect to ICT skills and application of ICT in Education." Perception scale was prepared by the researcher to know the perception of student-teachers regarding Information and communication technology and related skills. Perception scale contained statements comprising of skills of data processing, skills of technology integration, skills of media design, skills of communication and collaboration in education, skills of web enhanced learning environment etc. Student-teachers marked their perception on a 5 point Likert scale ranging from strongly Agree to strongly disagree. Same perception scale was administered before and after the intervention of multimedia learning package on both the groups viz. control and experimental group. Intensity index for the each statement was calculated for both the groups. For presenting analysis, responses of the student-teachers under five point

perception scale was converted to three point scale by merging Strongly Agree & Agree to Agree and similarly Strongly Disagree & Disagree to Disagree.

The null hypothesis formulated regarding testing of multimedia learning package that is "There will be no significant difference in the perception of the student-teachers regarding ICT skills and application of ICT in Education of experimental group before and after intervention." For testing the significance between the perceptions of student-teachers of experimental group, the Wilcoxon Sign Rank Test was used to know significance before and after implementation of the package among student-teachers of experimental group.

Table 4.4

Z-value & Probability of Perception of Experiment Group Student-teachers Before and After the Intervention Program

	Z-value	P Value
Perception of student-teachers regarding ICT and related skills	-4.374	0.000

It can be seen from the above table 4.4 that the p value is less than 0.05 and so null hypothesis is rejected means there is significant difference in perception of student-teachers of experimental group regarding ICT and related skills before and after the implementation of the multimedia learning package. Thus, multimedia learning package was found to be effective in terms of perception of the student-teachers of experimental group regarding ICT and related skills.

Table 4.5

Wilcoxon Value, Z-value and Probability of Perception of Student-teachers of Control & Experimental Group

Wilcoxon W value	Z-value	P value
323.50	4.33	0.000

For the testing of null hypothesis "There will be no significant difference between the perception of student-teachers regarding ICT and related skills between Control and experiment group". Researcher used Wilcoxon Rank Sum Test for two independent groups. It can be seen from above table 4.5 that p value is less than 0.05. Thus, we can reject the null hypothesis. Hence, there is significant difference between the perception of student-teachers of control and experimental. It can be said from above

finding that multimedia learning package has significant impact on the perceptions of student-teachers regarding ICT and related skills.

Researcher administered perception scale on both the control and experimental group to study the change in perception of student-teachers. Researcher calculated frequency and intensity index (II) for all the statements for both the groups. Perception scale was administered before and after the implementation of the package to find out change in perceptions for student-teachers of control and experimental group. There were total twenty three statements containing perceptions in different area of Information and Communication Technology like perception regarding skill of data processing, skill related to accessibility of technology, technology integration, skills related to media design, skill of collaboration and communication, web enhanced learning environment etc. Statements were categorized in these categories under ICT skills. Researcher categorized different statements and Intensity index difference before and after the implementation were calculated for each statements for both the student-teachers of control and experimental group and that is presented below.
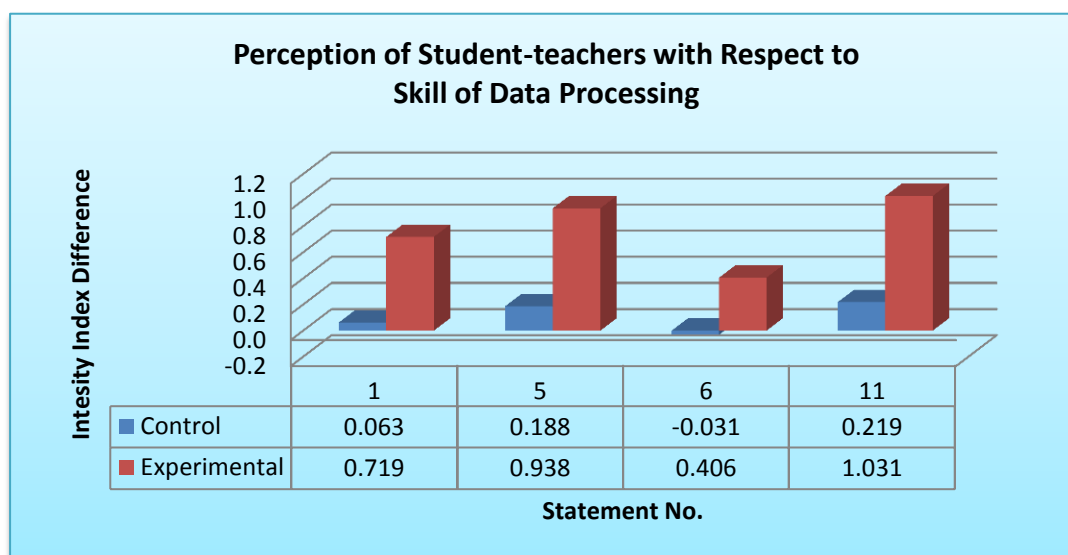
Table 4.6

Change in Perceptions with Respect to Skill of Data Processing among Student-teachers of Control and Experimental Group

Stat. No.	Statement	Intensity Index Difference	
		Control	**Exp.**
1	I use Microsoft word for the preparation of assignment.	0.063	0.719
5	I am not comfortable in using Excel for managing data.	0.188	0.938
6	Excel presents an easy way for data processing and presentation in graphical form.	-0.031	0.406
11	Microsoft Publisher provides better options for creating e-poster and e-calendar.	0.219	1.031
	Average	0.109	0.773

As mentioned in Table 4.6 and Graph 4.2, there is a change in perceptions of student-teachers towards skills of data processing among both the group but if we compare control and experimental group, there were positive as well as negative changes in perceptions. Overall change in perceptions with respect to skill of data processing among student-teachers of control group was 0.109 and 0.773 for the student-teachers

Graph 4.2

Change in Perceptions with Respect to Skill of Data Process among Student-teachers of Control and Experimental Group

Perception of Student-teachers with Respect to Skill of Data Processing

Statement No.	1	5	6	11
Control	0.063	0.188	-0.031	0.219
Experimental	0.719	0.938	0.406	1.031

of experimental group. Therefore, change in perception regarding skill of data processing was higher in student-teachers of experimental group compare to student-teachers of control group. It can be said that student-teachers of experiment group were more comfortable and convinced to use Microsoft office application viz. word, excel, publisher for the data processing as compared to control group student-teachers. Content covered, instructions given, and examples presented in Multimedia learning package were comprehensive enough to practice Microsoft office 2010 applications viz. MS Office Word, Excel, Publisher to enhance skills of data processing.
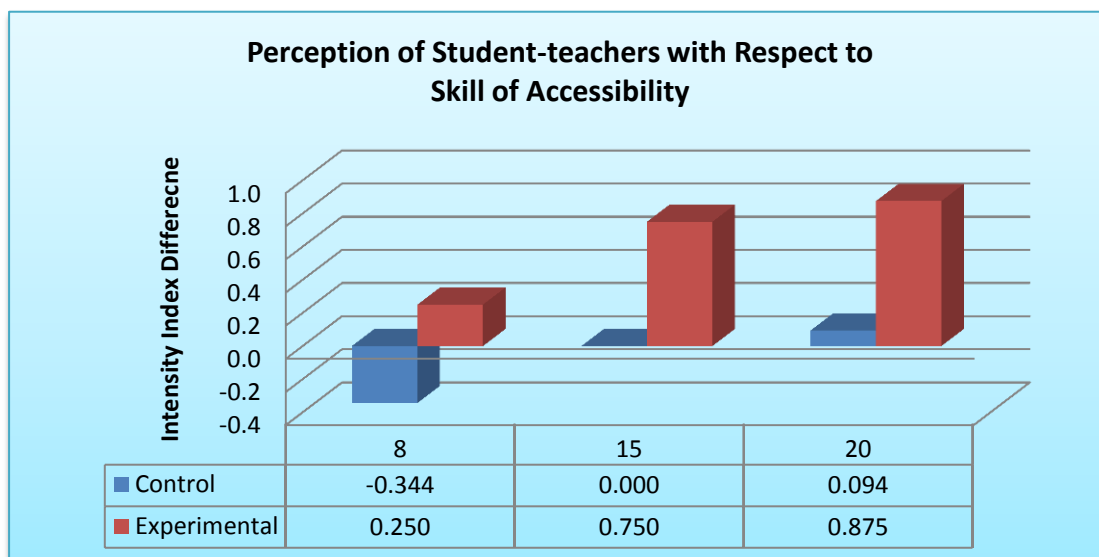
Table 4.7

Change in Perceptions with Respect to Skill of Accessibility among Student-teachers of Control and Experimental Group

Stat. No.	Statement	Intensity Index Difference	
		Control	Exp.
8	I generally use Google search engine for searching Educational information.	-0.344	0.250
15	I browse through educational sites to update my knowledge.	0.000	0.750
20	I am not aware of application of Google.	0.094	0.875
	Average	-0.083	0.625

Graph 4.3

Change in Perceptions with Respect to Skill of Accessibility among Student-teachers of Control and Experimental Group

	8	15	20
■ Control	-0.344	0.000	0.094
■ Experimental	0.250	0.750	0.875

The overall change in perception regarding Skill of Accessibility among student-teachers of control and experimental group were -0.083 and 0.625 respectively. It means student-teachers of the experimental group were motivated and well educated by the use of multimedia learning package to make use of e- resources. The given learning resources under multimedia learning package about how to search effectively in Google Search engine, applications of Google served proper platform to develop skill of accessibility.
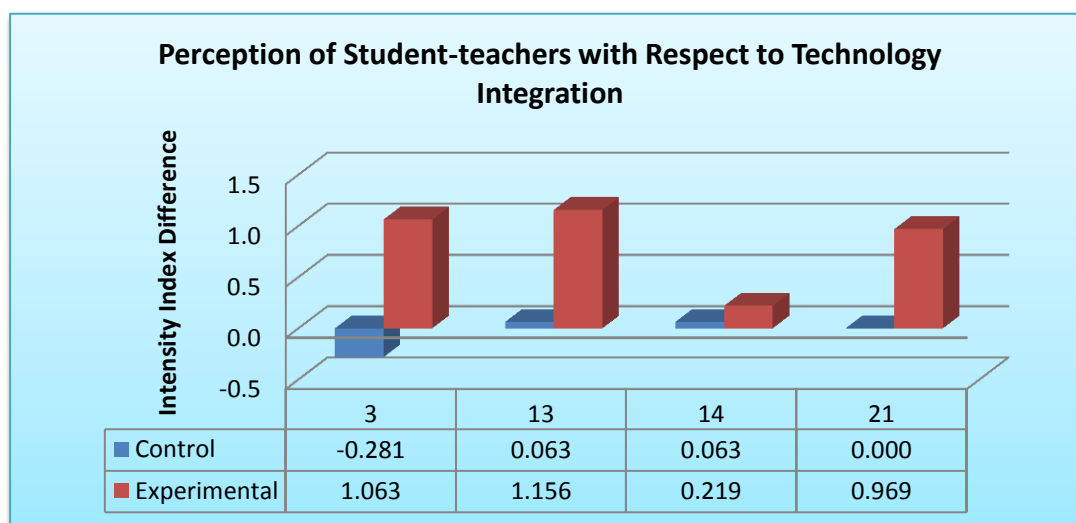
Table 4.8

Change in Perceptions with Respect to Skill of Technology Integration among Student-teachers of Control and Experimental Group

Stat. No.	Statement	Intensity Index Difference	
		Control	Exp.
3	I am not in favor of creating Blog for my class	-0.281	1.063
13	I believe that technology has significant impac on Education.	0.063	1.156
14	I recommend use of PowerPoint Presentation for strengthening classroom teaching.	0.063	0.219
21	I advocate the use of Technology in Classroom.	0.000	0.969
	Average	-0.039	0.852

Graph 4.4

Change in Perceptions with Respect to Skill of Technology Integration among Student-teachers of Control and Experimental Group

Perception of Student-teachers with Respect to Technology Integration

	3	13	14	21
Control	-0.281	0.063	0.063	0.000
Experimental	1.063	1.156	0.219	0.969

About technology integration in classroom, student-teachers of experimental group realized that technology could make positive changes in classroom. Student-teachers of experimental group showed a positive change in perception towards skill of technology integration in classroom as compared to control group. Average change in perceptions with respect to skill of technology integration was 0.851 among students teachers of experimental group, that was higher than the change in perception among student-teachers of control group that was -0.039. Thus, student-teachers of experiment group had positive impact on skill of technology integration as compared to student-teachers of control group. It means there was great impact on student-teachers learning with the help of multimedia learning package.
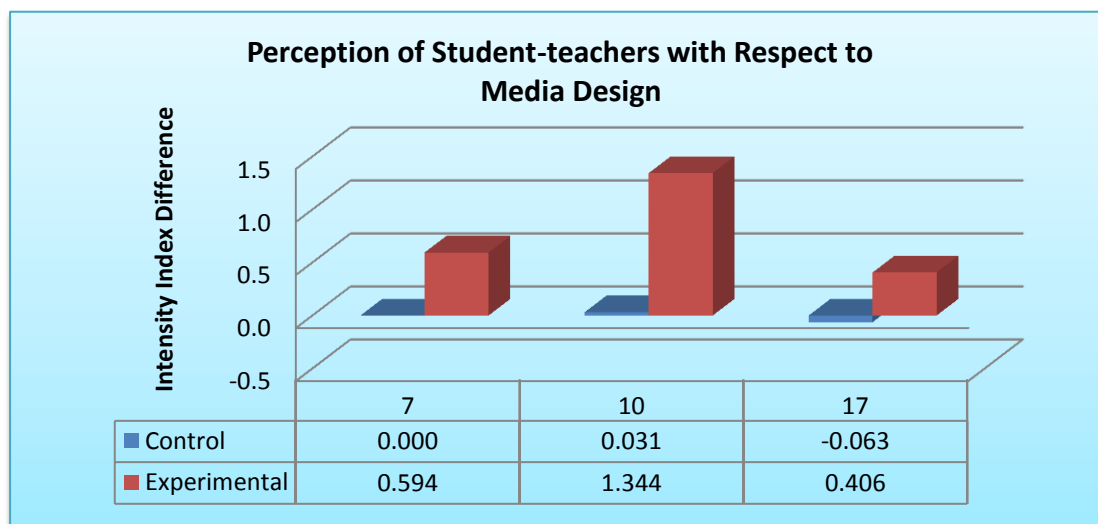
Table 4.9
Changes in Perceptions with Respect to Skill of Media Design among Student-teachers of Control and Experimental Group

Stat. No.	Statement	Intensity Index Difference	
		Control	Exp.
7	I rarely use Windows Moviemaker for developing Video.	0.000	0.594
10	I am not familiar with Picasa software for creating Videos.	0.031	1.344
17	I prefer Windows Moviemaker over Picasa Software for managing Videos.	-0.063	0.406
	Average	-0.010	0.781

Graph 4.5

Changes in Perceptions with Respect to Skill of Media Design among Student-teachers of Control and Experimental Group

Perception of Student-teachers with Respect to Media Design

	7	10	17
■ Control	0.000	0.031	-0.063
■ Experimental	0.594	1.344	0.406

There was a positive change in perception with a value of 0.785 for the student-teachers of experimental group while -0.010 for the student-teachers of control group towards the Media Design. It means media designing software like Windows Moviemaker and Picasa and their educational applications were well-demonstrated by the use of multimedia learning package.
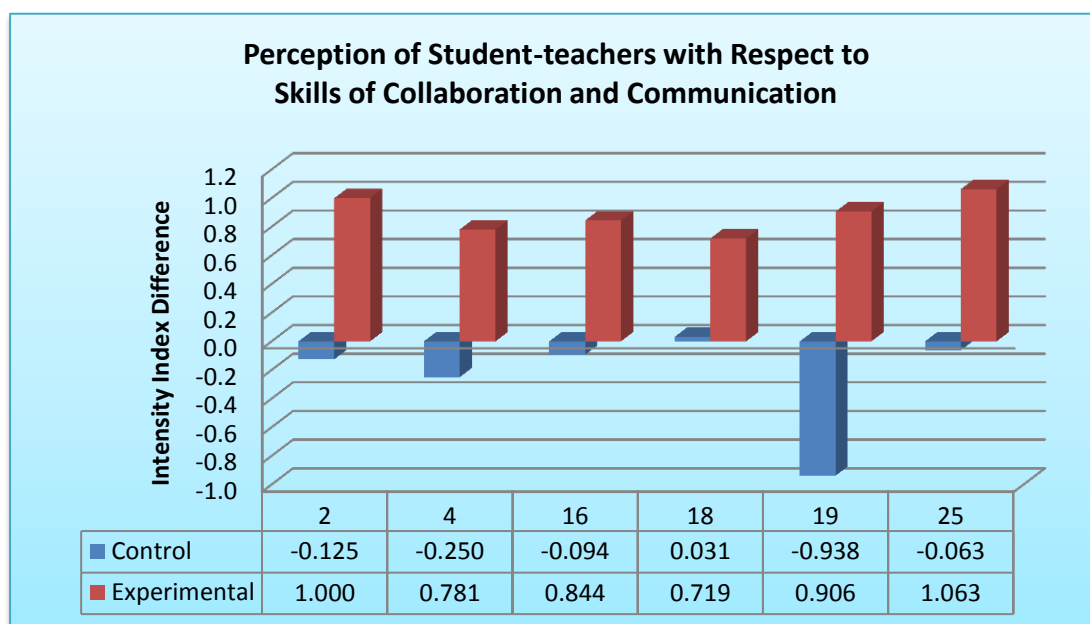
Table 4.10

Changes in Perceptions with Respect to Skill of Collaboration and Communication among Student-teachers of Control and Experimental Group

Stat. No.	Statement	Intensity Index Difference	
		Control	**Exp.**
2	I use Twitter to twit on Educational Issues.	-0.125	1.000
4	I use "ASK QUESTION" on Facebook to take opinion of others on Social Issues.	-0.250	0.781
16	I use Edublog to share information with others.	-0.094	0.844
18	I like to share information with Friends on Blog.	0.031	0.719
19	I very often use Facebook for sharing information with friends.	-0.938	0.906
25	I use Skype for video chatting.	-0.063	1.063
	Average	-0.240	0.885

Graph 4.6

Changes in Perceptions with Respect to Skill of Collaboration and Communication among Student-teachers of Control and Experimental Group

Perception of Student-teachers with Respect to Skills of Collaboration and Communication

	2	4	16	18	19	25
Control	-0.125	-0.250	-0.094	0.031	-0.938	-0.063
Experimental	1.000	0.781	0.844	0.719	0.906	1.063

Skills related to collaboration and communications are essential for the professional development of a teacher. In this regard researcher was interested to study the changes in perception towards skill of collaboration and communications. Regarding the use of social media like twitter, Facebook, blogs/ Edublogs, Skype for the collaboration and communication, there was a positive change in perception among experimental group. Overall, change in perception with respect to skill of collaboration and communication was 0.885 and -0.240 for the student-teachers of experimental and control group respectively. It could be observed here that there was positive change in perception in case of student-teachers of experimental group while negative change in perceptions for student-teachers of control group towards the use of social medias for the collaboration and communication. There was a positive impact of multimedia learning package towards use of social media for the collaboration and communication. Multimedia learning package included component of social media like Facebook, Twitter, Edublogs, blogs, Skype and educational importance of these media for communicating with students other than school hours the classroom for the educational purpose. That may be the probable reason for positive changes in perception towards the use of social media for collaboration and communication.
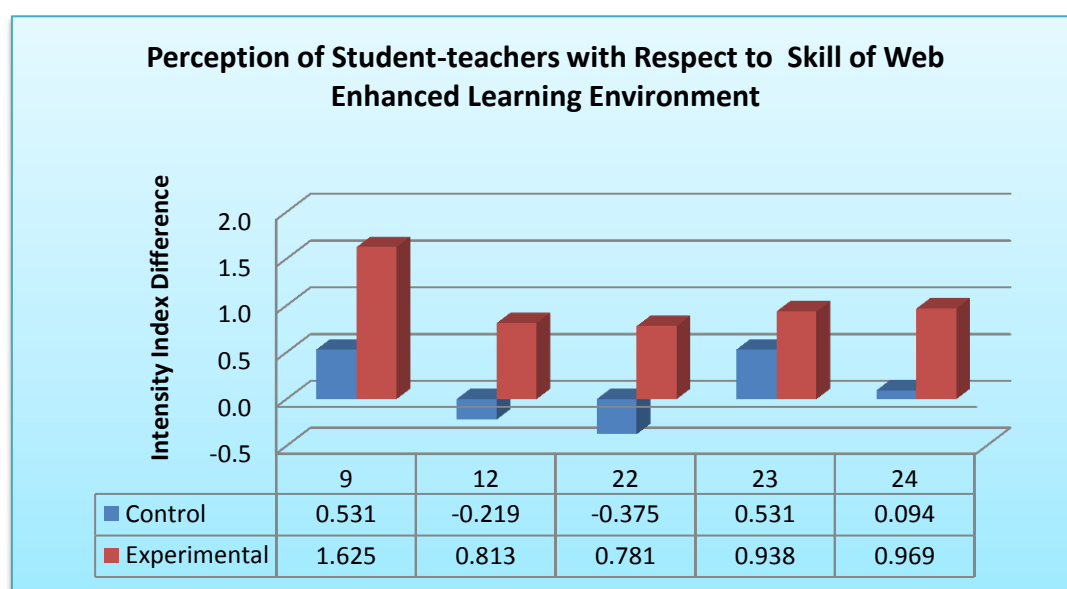
120

Table 4.11

Changes in Perceptions with Respect to Skill of Web Enhanced Learning Environment among Student-teachers of Control and Experimental Group

Stat. No.	Statement	Intensity Index Difference	
		Control	Exp.
9	I have no idea of Educational use of Twitter.	0.531	1.625
12	I like to write an article on Educational issues and share it with others online.	-0.219	0.813
22	I am actively involved in participating and sharing educational thoughts Online.	-0.375	0.781
23	I do not use Educational websites to interact with teachers.	0.531	0.938
24	I use WhatsApp for connecting with like-minded people.	0.094	0.969
	Average	0.113	1.025

Graph 4.7

Changes in Perception with Respect to Skill of Web Enhance Learning Environment among Student-teachers of Control and Experimental Group

Perception of Student-teachers with Respect to Skill of Web Enhanced Learning Environment

	9	12	22	23	24
Control	0.531	-0.219	-0.375	0.531	0.094
Experimental	1.625	0.813	0.781	0.938	0.969

Researcher studied the changes in perceptions towards skill of web enhanced learning environment. Average changes in perception were 1.025 and 0.113 with respect to skill of web enhance learning environment for student-teachers of control and experimental group respectively. Thus, it can be said that developed multimedia

learning package covers components to enrich student-teachers to develop skill of web enhanced learning environment. It also can be observed that student-teachers were motivated to develop web enhanced learning environment in future classroom to broaden learning outside classroom.

4.4 Data Analysis of Reaction scale

The objective no. 6 of the study is– "to study the reaction of the student-teachers of experimental group on developed multimedia learning package." A reaction scale was made by the researcher. Researcher received diversity of reaction on different components of Multimedia learning package that covered statements on content, aspects, feasibility, utilitarian value, application of the package. Reaction scale contained total twenty-five statements based on Likert scale ranging from strongly agree to strongly disagree. Further, reactions were converted to tree point reaction scale while analyzing data. Responses in the form of Strongly Agee and Agee were clubbed together. Likewise Strongly Disagree and Disagree were clubbed together for better understanding. Percentage, frequency and intensity index for each statement was used as data analysis technique. Analyzed data is presented in tabular form as below.

Table 4.12

Reaction of Student-teachers on Clarity of Concepts Presented in Multimedia Learning Package

No.	Items	Agree	Undecided	Disagree	II
2	Concepts were clarified properly.	29 (90.62%)	2 (6.25%)	1 (3.12%)	2.87
4	Examples given in the multimedia learning package were helpful in conceptual clarity.	27 (84.37%)	3 (9.37%)	2 (6.25%)	2.78
6	Teaching points given under each unit were logically sequenced.	30 (93.74%)	2 (6.25%)	- (0 %)	2.94
8	Demonstrations shown in the multimedia learning package were clear.	30 (93.74%)	2 (6.25%)	- (0 %)	2.94
				Average	2.88

From the above table 4.12, it can be observed that the average intensity index was 2.88 for the statements related to the clarity of content presented. Thus, it shows that examples were helpful, teaching points were logically sequenced, and demonstrations shown were relevant. Student-teachers found content more comprehensive. Thus it can be said that "Multimedia learning package was helpful in clarifying the concepts presented to the students". Probable reason for that may be organization of teaching points, examples given under multimedia learning package were constructed and designed as per the level and understanding of the student-teacher. Moreover, videos given under multimedia learning package were useful in clarify concepts. Overall multimedia learning package satisfied needs of all types of students.

Table 4.13

Reaction of Student-teachers on Comprehensiveness of Multimedia Learning Package

No.	Items	Agree	Undecided	Disagree	II
1	Content covered under each unit of multimedia learning package was sufficient.	25 (78.12%)	5 (15.62%)	2 (6.25%)	2.72
3	Examples provided in the multimedia learning package were adequate for the purpose.	26 (81.25%)	5 (15.62%)	1 (3.12%)	2.78
7	Pictures given in the multimedia learning package were relevant to the topic.	30 (93.74%)	2 (6.25%)	- (0 %)	2.94
13	The multimedia learning package covered all the relevant topics.	24 (74.99%)	5 (15.62%)	2 (9.37%)	2.65
				Average	2.88

From the above table 4.13, it can be observed that the average intensity index was 2.88 for the statements related to the comprehension of multimedia learning package with reference to content covered under each unit, illustration with example, relevancy of the content. Thus, it shows that content covered was sufficient and relevant. Probable reason for that may be proper understanding of researcher about the requirement of student-teachers for effective learning with the help of technology. Also the educational utility of contemporary technology and it's applications for the

classroom. Accordingly, topics and content were selected and it provided comprehensive outlook and understating of ICT integration in teaching learning.

Table 4.14

Reaction of Student-teachers with Respect to ICT Skill Development Through Multimedia Learning Package

No.	Items	Agree	Undecided	Disagree	II
10	Learning through multimedia learning package developed ICT skills.	29 (90.62%)	1 (3.12%)	2 (6.25%)	2.84
17	Learning experience provided through multimedia learning package assisted in developing creativity.	24 (74.99%)	5 (15.62%)	3 (9.37%)	2.65
18	Learning through multimedia learning package was helpful in developing skills of information management.	27 (84.37%)	4 (12.5%)	1 (3.12%)	2.81
19	Media Exposure provided through multimedia learning package facilitated development of skills of media designing.	26 (81.25%)	6 (18.75%)	- (0 %)	2.81
20	Interaction and learning through multimedia learning package helped in developing skills of collaboration and communication.	28 (87.50%)	3 (9.37%)	1 (3.12%)	2.84
21	Learning environment provided through multimedia learning package aided in developing techno pedagogical skills.	29 (90.62%)	3 (9.37%)	- (0 %)	2.90
22	Learning exposure provided through multimedia learning package helped in developing skill for creating Web enhanced learning environment.	26 (81.24%)	5 (15.62%)	1 (3.12%)	2.78
				Average	2.81

There were different components under multimedia learning package to develop ICT skills and researcher was interested to know to what extent the multimedia learning package served purpose of skill enhancement. The perception scale related to overall ICT skill enhancement, creativity enrichment, developing skills related to information

management, skills related to media design, skills related to collaboration and communication, techno-pedagogical skills, skills related to web enhanced learning environment etc. was given to the student-teachers. Analysis of data collected from student-teachers emerges following results.

From the above table 4.14, it can be observed that the average intensity index was 2.81 for the statements related to skill development through multimedia. It indicates that the multimedia package was useful in developing ICT skills, skills of information management, skills of media designing, skills of collaboration and communication, techno-pedagogical skills, skills of creating web enhanced learning environment and developing creativity. It provided enough examples for the student-teachers to understand the use and application of the ICT in Education. The activities given to the students teachers based on the multimedia presentation gave enough scope for developing the skills for integrating technology in the classroom teaching. Researcher felt that practical exposure and understanding about ICT and its application were well taken into consideration while developing multimedia presentation that led to enhancement of ICT skills. Moreover, Multimedia also satisfied pre-requisite to develop technical skills. That led to comprehensive understanding and application of the ICT in Education.

Table 4.15

Reaction of Student-teachers with Respect to Usability of the Multimedia Learning Package

No.	Items	Agree	Undecided	Disagree	II
5	Examples provided in the package were easy to understand.	29 (28.12%)	2 (6.25%)	1 (3.12%)	2.88
14	Instructions given in the learning resources were clear.	28 (40.62%)	4 (12.5%)	- (0 %)	2.88
15	Instructional manual contained all the information about the multimedia learning package.	25 (31.25%)	6 (18.75%)	1 (3.12%)	2.75
23	Multimedia learning package was user friendly.	30 (25%)	2 (6.25%)	- (0 %)	2.94
				Average	2.86

From the above table 4.15, it can be observed that the average intensity index was 2.86 for the statements related to usability of the multimedia package, which indicates that examples provided were easy to understand, clear and students found this approach interesting. Simplicity and learning experiences provided under Multimedia learning package enhanced usability in future classroom and student-teachers may explore their learning experiences and understanding of the ICT in Education in future classroom and learning can be made interesting by the multimedia. Additionally the manual given along with multimedia learning package increased usability of multimedia learning package.

Table 4.16

Reaction of Student-teachers with Respect to Utility of the Multimedia Learning Package

No.	Items	Agree	Undecided	Disagree	II
9	The learning material provided helped in self learning.	28 (87.49%)	2 (6.25%)	2 (6.25%)	2.81
11	Teaching strategy given was useful in providing practical experience.	29 (90.62%)	1 (3.12%)	2 (6.25%)	2.84
12	Multimedia learning package helped in understanding of the concepts.	30 (93.75%)	1 (3.12%)	1 (3.12%)	2.91
16	Learning through multimedia learning package was very interesting as due to hands on experiences.	26 (81.24%)	5 (15.62%)	1 (3.12%)	2.78
24	Multimedia learning package was helpful for planning digital lesson plan.	29 (90.62%)	1 (3.12%)	2 (6.25%)	2.84
				Average	2.84

Based upon the opinion of student-teachers with respect to the statements in table 4.16, it can be said that student-teachers were in favor of utility value of multimedia package. Students- teachers showed their strong agreement with the learning materials & its utility as self-learning, strategies presented provided practical exposure, these learning experiences were helpful for planning digital lesson. Multimedia Learning package was given in form of CD-ROM that increased its utilitarian value. Adobe Acrobat software was used as Platform to develop multimedia learning package and convert it to adobe reader. The lesson plans in form of example in science subject

provided under multimedia-based approach provided utilitarian value of multimedia-based approach in science classroom. Required software to run package and other software that was essential for the practice that made learning through this approach based learning resources was flexible and easy to use which increased its value as self-learning tool. Multimedia based approach made learning flexible and self-centered that led to concrete understanding of ICT.

4.5 Major Findings of the Study

1. The U-value and Z-value were found to be 823 and 4.185, respectively null hypothesis (Ho) of z, for z ≤ 4.185, referring the table for normal probability, the two-tailed probability was found to be 0.00003 which is lesser than the decided significant level (α) i.e. 0.05. Hence the developed Multimedia learning package was found effective in terms of academic achievement in ICT compare to traditional approach.

2. Assessment of developed digital lesson plan revealed that 84.36 percent student-teachers were good with required ICT skills. Thus, it can be said that Multimedia-learning package can be useful in developing digital lesson plans and PowerPoint presentation in science.

3. Researcher used Wilcoxon Sign Rank Test to know significance of difference among student-teachers of control and experiment group. Z-value was found to be -4.374 and P value was found to be 0.0000 which is less than 0.05 and so null hypothesis is rejected means there is significant difference in perception of student-teachers of experimental group regarding ICT and related skills before and after the implementation of the multimedia learning package. Thus, multimedia learning package was found to be effective in terms of perception of the student-teachers of experimental group regarding ICT and related skills.

4. Researcher used Wilcoxon Rank Sum Test for two independent groups. Z-value was found to be 4.33 as well P value found to be 0.000 is less than 0.05. Thus the null hypothesis can be rejected. Hence, there is significant difference in perception of control and experimental student-teachers. It can be said that multimedia learning package has significant impact on the perceptions of student-teachers regarding ICT and related skills.

5. Overall change in perceptions with respect to skill of data processing among control group student-teachers was 0.109 and 0.773 for the experimental group student-teachers. Therefore, change in perception regarding skill of data processing was higher in student-teachers of experimental group compare to student-teachers of control group.

6. Average change in perceptions with respect to skill of technology integration was 0.851 among students teachers of experimental group, that was higher than the change in perception among student-teachers of control group that was -0.039.

7. There was a positive change in perception with a value of 0.785 for the student-teachers of experimental group while -0.010 for the student-teachers of control group towards the Media Design.

8. Average changes in perception were 1.025 and 0.113 with respect to skill of web enhance learning environment for student-teachers of control and experimental group respectively. It could be observed here that there was positive change in perception in case of student-teachers of experimental group while negative change in perceptions for student-teachers of control group towards the use of social medias for the collaboration and communication.

9. The average intensity index was 2.88 for the statements related to the clarity of content presented under reaction scale. It shows that examples were helpful, teaching points were logically sequenced and demonstrations shown were relevant.

10. With the average intensity index 2.77 for the statements related to the comprehension of multimedia learning package, student-teachers found content covered was sufficient and relevant with reference to content covered under each unit, illustration with example, relevancy of the content.

11. The average intensity index was 2.81 for the statements related to skill development through multimedia. It indicates that the multimedia package was useful in developing ICT skills, skills of information management, skills of media designing, skills of collaboration and communication, techno-pedagogical skills, skills of creating web enhanced learning environment and developing creativity.

12. Examples provided under multimedia learning package were easy to understand, clear and students found this approach interesting with the average intensity index 2.86.

13. Based upon the opinion of student-teachers, it can be said that student-teachers were in favor of utility value of multimedia package. The average intensity index was 2.84. Student-teachers showed their strong agreement with the learning materials and its utility as self-learning, strategies presented provided practical exposure, these learning experiences were helpful for planning digital lesson.

Major findings were further discussed in relation to the previous studies in detail.

4.6 Result and Discussion

Technology has excessive influence on all facets of learning. Twenty first century is the era of technological endeavors and innovations. Learning has changed rapidly in terms of modes, methods and approaches of teaching and learning. There is an evolution of learning with advent of technology and learning from slate to smart board, pen and pencil to fingertip and black board to smart board. With the realization of technological influence, different Government bodies and boards like the National Policy on Education (1986), National Policy on Information and Communication Technology (ICT) in School Education (2011), National Curriculum Framework for Teacher Education (2006), The UNESCO ICT Competency Framework for Teachers (2011), UNESCO (2009), National Knowledge Commission (2009), Federation of Indian Chambers of Commerce and Industry (2009) recommended to integrate ICT in classroom from primary to tertiary level. Since last two decades with the advancement of information and communication technology viz. Internet, Intranet, Educational Software, Web 2.0 tools, Social media etc. have found a place in teaching and learning. Government has also realized influence of ICT in education and hence required facilities were rendered to all the government schools as well as colleges. But there is a lacuna in the competencies in terms of ICT skills to utilize those facilities. Few studies like Swamy (2012) and Dodia (2012) have highlighted these issues. Teachers are not motivated and skilled enough to utilize facilities given by the government. Thus, there is an urgent need to train pre-service and in-service teachers and empower in effective technology integration. Government has already initiated in

the area of ICT based training for in-service teachers. But there is a necessity to train pre-service teachers to equip with ICT skills prior to enter the real classroom. Within a short span of time of one to two year of B. Ed., it is really challenging for the teachers to inculcate ICT skills. Still we are expecting them to use practical and theoretical understanding of information and communication technology in future classroom. In this regard, developed multimedia learning package would helps pre-service teacher to increase understanding about Information and Communication Technology.

Many researches are being carried out in the area of information and communication technology like utilization of different Media in education like different forms of CAI, Audio-Video, Animation, Multimedia etc. There are studies related to effectiveness of Multimedia into teaching learning including O.H.P transparencies, slide show and self-learning instruction material that have been found effective in subjects like Science, Mathematics, Geography, History etc. (Singaravelu, 2009; Nusir et al., 2012; Bhutak, 2004; Richard, 2011; Pimpale & Vadnera, 2012; Singh, 2013; Kaptan, 2014; and Irudayam, 2015). Researcher also traced studies related to technology integration in learning viz., Computer based Instruction, viz. Drill, Practice and Simulation, microcomputers, Multimedia, multimedia journal, hypermedia, Intel- Training Program 'Teach to the Future', Affable Reading Tutor, Online learning, Synchronous and Asynchronous learning, Blended learning, Web 2.0 Tools, MOODLE Module, CDROM, Macromedia Flash and learn media e-learning instructional material, distance-learning module etc. These studies revealed that technology tools can improve teaching learning; it helps not only teachers but can be effectively used to improve learning. Furthermore, it was also observed from above studies that Multimedia based learning in the form of Multimedia Learning Package can be effective tool for inculcate ICT skills among student-teachers.

The main finding of the present study was the developed multimedia learning package was found to be effective in improving academic achievement in the content of ICT as well as in enhancing ICT skills as compared to the traditional approach. Thus, it can be said that Multimedia learning package was found to be significantly effective in terms of enhancing ICT skills as compared to the traditional approach. This result was supported by the findings of George (2011) Menon (1984), Sanders (2002),

Junaidu (2008), Pimpale & Vadnera (2012), Singh (2013), Kaptan (2014) and Irudayam (2015). Apart from this, the study of Patil (2006) and Shikhare (2007) indicated significant difference between the performance of the student-teachers of control group and experimental group only on post-test. Thus, it can be noted that significant difference in the post- test establishes the fact that multimedia approach helps a teacher to teach effectively in the classroom. In the same line result of the present study were further supported by the result based on the advanced multimedia based learning. Researcher had found Multimedia Information Package more effective. Jayaraman (2006) studied the relative effectiveness of Computer based Multimedia Leaning Package (CBMMLP) on Performance and Behavior Outcomes of Students of different Age different Age of Class V, VIII and XI. Major finding of the study was the performance of the students was higher than the performance of the students who have learnt through CBMMLP. Multimedia package was proven effective to the student-teachers at the tertiary level also. Results of revealed Multimedia-enhanced lectures were more or less effective than traditional teaching methods with regard to the student-teacher comprehension. This observation is further supported by the result of Colon et al. (2000) who had used multimedia constructivist instructional design. Also the study of Piyayodilokchai et al. (2013) has indicated that 5E learning cycle supplemented with interactive multimedia has been found effective at undergraduate level. Noordin, Ahmad & Hooi (2011) have proved Multimedia courseware with 3-Dimensional model as a Teaching aid has shown significant improvement in attention, response, and recall of the content. Thus, it can be said that multimedia approach with different combinations has been found to be an effective approach to teach students particularly novice learner.

4.6.1 Result and Discussion on Change in Perceptions through Multimedia Learning Package

Perception and readiness of student-teachers in ICT integration is very essential because if teachers have favorable attitude towards ICT then they can effectively utilize ICT in teaching learning. The researchers have carried different studies across globe to measure attitude of the teachers in ICT integration. Change in perception toward the use of ICT can change perspectives of education. Present study revealed that developed multimedia learning package can be more or less effective tool to

develop ICT skills, development of creativity, development of skills of information management, skills of media design, skills of collaboration and communication, development of techno pedagogic skills, skills of web enhanced learning environment. If we encompass analysis of perception of student-teachers towards ICT and related skills, present study also reveals that there is positive impact on perception of student-teachers of experimental group regarding ICT and related skills before and after the implementation of the multimedia learning package. There were also significant difference between perception of student-teachers of control and experimental group. This is supported by findings of Krishnan (1983) But the finding of present study is in contrast with Sanders (2002)'s findings. Thus, It can be observed from the result that Multimedia based teaching and Multimedia Learning Package has significant impact on changes in perceptions of teachers as well student-teachers.

Present study also revealed that student-teachers of experiment group are more comfortable and convinced to use Microsoft office application viz. Word, Excel, Publisher for data processing as compared to control group student-teachers this is supported by the findings of Crary (2010). Student-teachers of experiment group also had positive impact on skill of technology integration as compared to the student-teachers of control group.

Study also highlights that student-teachers liked self-based learning and multimedia learning package was helpful to them for the self-learning. Student-teachers were more confident and skilled while searching online resources on internet and Google search engine as compared to control group student-teachers. Davies et al. (2005) also observed that Online resources increase flexibility for learners through the provision of 'anytime, any place learning', reaching non-traditional learners and learners outside formal education. Another result found that developed multimedia learning package provided ample scope for self-learning, practical exposure, tool to understand the concept and proper execution to prepare effective lesson plan in science. Results were in the same line with that of Phoolwala (1997), Sritaratorn & Sombunsukho (2011), Valentine et al. (2005) where computer instructed multimedia program was found effective enough to be used for self-study. In the same line on Self-regulated learning, Moos (2010), Beder (2001) and Mandic et al. (2007) reported flexibility in learning using computer-based learning package available on CDROM (PDF, HTML) and

electronic material in the form of DEMO, CD and VIDEO material were useful for university teachers too. Thus, it can be said that multimedia and multimedia learning package can used effectively by the student-teachers as well as by students to study at their own place and pace.

Present study also highlights that multimedia-based learning and developed multimedia learning package can be helpful to students to understand concept easily. Study of Piyayodilokchai et al. (2013) found project management concepts presented as multimedia were easy to understand than the print based version and it took less time to work through than the printed version. Thus, Learning can be made easy and better with the help of multimedia learning package. Present study also revealed that students were more convinced to develop and use classroom website, this is supported by the result of Hughes et al. (2004) as well as Mostefaoui et al. (2012). Thus, student-teachers can explore website or web portal in classroom to expand learning outside classroom. Similarly, Ferry & Brown (1995) proved that multimedia journals were useful for the professional development of the teachers. Moreover, Joshi (2013) also recommended that web 2.0 tools can be integrated in teaching-learning on a large scale in higher education. Similarly, Davies et al. (2005) and Carrington et al. (2011) promoted online classroom simulation. In a way learning can be enhanced with professionalism of teachers and student-teachers. Moreover, web 2.0 tools and online learning through website can be boon for the future classroom.

Studying the change in perception through Multimedia learning package regarding skill of media design, it was found to be more among student-teachers of experimental group as compared to the student-teachers of control group. This is congruence with the result of Hu (2005). Hu (2005) which reported that using multimedia learning packages during pre-service training and self-reported practices of multimedia design was useful or somewhat useful to learn to create multimedia learning materials. Study of Toth (2002) found that development of multimedia is a potentially powerful tool as relevant to the educational setting. Multimedia and multimedia learning package can enhance student-teachers' skills to create multimedia. So they can teach students effectively by multimedia integration in the classroom.

There was a positive impact of multimedia learning package towards the use of social media for collaboration and communication. Web 2.0 tools, blogs and social

networking sites, Asynchronous Computer-Mediated Communication have proven fruitful to the students to engage at different levels of interaction and participation in social activities and can be useful in educational settings too (Hawkes & Romiszowski, 2001; Cuneo & Harnish, 2002; Carrington et al., 2011; Fu, Chu, & Kang, 2013; Heo & Lee, 2013; Joshi, 2013). Similar results of Lan (2013) in the area of English language class indicated that the use of co-sharing with web tools helped students to improve vocabulary at school level. Present study has revealed that student-teachers were in favor of using web 2.0 tools and social media to collaborate with student in their classroom. Result were in contrast with study of Swamy (2012) where it was reported that there was lack of interaction among teachers, students using email in teacher education institutes.

Present study has evidenced a positive changes in perception towards use of web enhanced learning environment as compared to the control group. Eilon & Kliachko (2004) also stated that students encountered difficulties in implementing independent (self-directed) learning required in the web-based course, they emphasized their preference for the role of a teacher as an information provider. Web based learning is the future of education and student-teachers can be trained and molded in a way that they can expand interaction with students and teachers as well as parents. It also can be observed here that web 2.0 tools like Wiki, blogs, social networking sites should be integrated in formal classroom and student-teachers also agreed to promote web 2.0 tools to increase interaction amongst students, teachers and parents.

Beliefs, relevance, relatedness and personal value were identified as important factors that motivated these teachers to integrate technology and multimedia within the educational setting (Toth, 2002). This is proven true in present study. Multimedia learning package can be useful in terms of concept presented and clarity of concept. Present study also found that student-teachers agreed that Package contains all relevant topics with sufficient content under each unit with adequate and relevant examples.

Regarding attitude and skills of student-teachers in ICT integration and required measures, previous studies have highlighted measurement of attitude, potentiality, motivation level, level of application, readiness of teachers, feasibility requirement etc. With regard to the reaction of the subjects in the study towards multimedia-based

approach, it was found that they had a very positive opinion. Patil (2006), Shikare (2007), Singh (2013), Kaptan (2014) and Irudayam (2015) have also reported similar finding. Thus, it can be stated that the subjects of the study liked the comprehensiveness of multimedia package because it helped them to learn better.

Present study also found that multimedia based learning and developed multimedia learning package can be used effectively to create digital lesson plan in the area of science and concept be presented effectively with the help of power point presentation. Present study also reveals that student-teachers of experiment group have ICT skills, which can help them to teach Science subject with the help of technology. This is supported by the study of Deshmukh et al. (2012) on online science education revealed that the science education can help them with their ICT skills. Furthermore, this is partially supported by the Pingle (2011). Multimedia learning package also be helpful to increase Math skill, Communication skills, Scientific inquiry, skill of problem solving, and e-learning skills (Bajcetic et al., 2007; Nusir et al., 2012; Pimpale & Vadnera, 2012; Sanders, 2002; and Neo & Neo, 2001; Joshi, 2013). Thus, it can be said that multimedia learning can enhance math skills, problem solving skills, e-learning skills of the student-teacher apart from ICT skills. It is observed here that multimedia-oriented learning, like many other technology based teaching learning, were used alternatively as an innovative and effective tool in a future classroom. Other than ICT skills, multimedia learning package helpful to increase Math skill, scientific inquiry, skill of problem solving, and e-learning skills.

From the above discussion, it can be observed here that the use of multimedia approach and developed multimedia learning package not only helps the student-teachers to teach effectively but also helps the students to learn better. Therefore, in today's classroom multimedia should find a place in teachers teaching repertoire and more encouragement is needed to create this awareness among other teachers.