

EFFECTIVENESS OF E-CONTENT USING INTERACTIVE SOFTWARES ON TECHNICAL SKILLS IN COMPUTER SCIENCE OF STUDENTS AT HIGHER SECONDARY LEVEL

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Abstract: In this knowledge explosion era, to bring effectiveness in dissemination of information, development of creative contents and incorporation of innovative information and communication technologies plays a vital role at all level of education system. For the upcoming digital generation to create a digital teaching-learning environment, mastering ICT skills and utilising ICT is of utmost importance in every educator's profession (Molly Lee, 2005). E-content is in various forms such as m-learning, blended learning, virtual class room, augmented reality, assistive technology, web-based learning etc. E-content is a combination of text, audio, video, images, animations etc. delivered through internet or mobile technology. Any digitized content that can facilitate the learning process and/or learning outcome can be termed as e-content. Technical Skills is one of the most important skills in ICT skills. Technical Skills are the knowledge and abilities needed to accomplish mathematical, engineering, scientific or computer related duties, as well as other specific tasks relating to technology. In this paper the investigators tried to find out the effectiveness of e-content using Interactive Softwares over Activity Oriented method on Technical Skills in computer science of students at Higher Secondary level. Also the investigatorss tried to find out the effectiveness of e-content using Interactive Softwares over Activity Oriented method on retention in Technical Skills of students at Higher Secondary level. Proper statistical techniques were used for collecting, standardizing and analysing the data.

Keywords : e-content, Technical Skills in computer science, Higher Secondary School students.

I. INTRODUCTION

“We need technology in every classroom and in every student and teacher's hand, because it is the pen and paper of our time, and it is the lens through which we experience much of our world.”

– David Warlick

Education, whether as knowledge in basic skills, academics, technical, discipline or citizenship is nowadays the most fundamental issue discussed in all societies throughout the world. Education is not only the accumulation of facts but also the development of logic and reasonable thinking skills which will enable people to use their knowledge in a variety of application problems. Education prepares an individual to become a full-fledged citizen, aware of his rights and conscious of right behaviour. 21st century is the era of Information and Communication Technology. All over the world there is a trend to use ICT in teaching learning process. The teacher and learner must gain access to technology for improving learning out comes. ICT is an important instrument, which can transfer the present isolated, book-centered learning environment into a rich student centered environment. In this modern society the use of ICT is becoming more and more ubiquitous. Their use has been established in primary, secondary and tertiary levels for a number of years and their advantages have been well documented in terms of task management, improved motivation and subject knowledge among others.

II. NEED AND SIGNIFICANCE OF THE STUDY

“Today's digital kids think of Information and Communication Technology as something akin to oxygen. They expect it. It's what they breathe and it's how they live. They use ICT to meet, play, date and learn. It's an integral part of their social life. It's how they acknowledge each other and form their personal identities.”

-(Seely-Brown, 2004)

Our kids are digital natives. They are born in the midst of electronic gadgets. At the very moment they step into this world, the first thing they see is a mobile camera or a digital camera. From there they start their journey through the digital world. Most of their toys are electronic items or technology related. They learn alphabets, numbers, rhymes etc. with the help of e-content, not from grandparents. They communicate through whatsapp, imo, skype etc. Then why we, the teachers are still

following the talk and chalk method? Technology is not at all an add-on or afterthought in this digital world. We need to embrace technology for making the learning environment more interesting and engaging. Technology is the pen and paper of the hour and it's the lens through which we experience our world.

In too many schools, teachers and students still use computers only as the equivalent of expensive flash cards, electronic worksheets, or as little more than a typewriter. The productivity side of computer use in the general content area curriculum is neglected or in an underdeveloped stage. (Moursund, 1995).

In general, an educational innovation can be regarded as a shift in educational paradigm; schools assume the role of being the primary agents for preparing students to function in and became an integral part of the information society (Pelgrum et al. 1997). This paradigm shift is oriented towards lifelong learning; schools' main goal, accordingly, is to supply skills and competencies required for living and working in a continuously changing world (Fisher, 2000). ICT in schools has introduced as a tool for the modification in teachers' role, that is from instruction to guidance, assisting students in search of individual learning methods and evaluation of their learning processes and outcomes; and in students' role, e.g., becoming active learners engaged in collaborative, authentic learning within the community content (Kozma et al., 2003).

Today, qualitative improvement of education is of great importance and it can be achieved only by improving the quality of instruction. Even though great advancements in science as well as educational technology are made in our country, the methods of teaching prevalent are not significant to meet the requirements of students at all levels. Several studies on classroom practices reveal that even though the student characteristics and societal expectations have changed, our educators still employ these traditional methods and mode of instruction. To train reflective and totally active world citizens, many of our traditional educators practice must be seriously questioned and novel approaches based on sound objective must be implemented. Hence it is necessary to refine and improve the teaching methods and instructional techniques to realize the fullest potentialities.

Effective use of relevant educational technology and identification and utilization of apt, appropriate and adequate instructional aides plays a significant role in making learning interesting, comprehensible and child centered.

Technical Skills are those abilities acquired through learning and practice. They are often job or task specific; in other words, a particular skill set or proficiency required to perform a specific job or task.(www.investopedia.com/dictionary). Technical Skills are practical and often relate to mechanical, IT, mathematical or scientific tasks. Some examples include knowledge of programming languages, mechanical equipment or tools.

In this study, the investigators prepared a Technical Skill test consulting with experts in the field of computer science. The investigators prepared 75 objective type questions from four areas of computer science: Short cut keys, Hardware Knowledge, Software Knowledge, and Social Networking Knowledge.

After reviewing the related literature the investigators found that computer related methods and e-content has high effectiveness over the traditional methods. When the investigators conducted interviews and discussions with a number of teachers and students un-officially, it's clearly understood that they are all interested to integrate technology into their teaching-learning process. The result of the need analysis report also shows the significance of e-content in the present scenario. Moreover, not many studies are conducted in this field e-content in computer science education.

Thus the investigators felt that integration of e-content will be more suitable for attaining the goals of Computer Science Education.

III. OBJECTIVES OF THE STUDY

1. To find the effectiveness of e-Content using Interactive Softwares over Activity Oriented Method on Technical Skills of students at Higher Secondary Level for total sample
2. To find the effectiveness of e-Content using Interactive Softwares over Activity Oriented Method on Technical Skills of students at Higher Secondary Level based on gender .
3. To find the effectiveness of e-Content using Interactive Softwares over Activity Oriented Method on Retention in Technical Skills of students at Higher Secondary Level.

IV. HYPOTHESES OF THE STUDY

1. There will be significant difference in the Technical Skills in Computer Science of Higher Secondary School students taught through e-content using Interactive softwares and that of those taught through Activity Oriented Method for the total sample and the subsample based on gender.
2. There will be significant difference in the Retention of Technical Skills in Computer Science of Higher Secondary School students taught through e-content using interactive softwares and that of those taught through Activity oriented method for the total sample and for the subsample based on gender.

V. METHODOLOGY

The investigators adopted experimental method for collecting the data. The tools used for collecting the data are e-content using interactive softwares and Technical Skills Test. The Investigators administered the tools among Higher Secondary school students. Then the answer sheets were collected, tabulated and suitable statistical techniques were used for analyzing the obtained data.

5.1 SAMPLE

The sample selected for the study consists of 106 Higher Secondary School students studying in standard XI from two schools of Malappuram District of Kerala State. Out of the 106 Higher Secondary school students, 49 were selected as the experimental group and 57 students as the control group.

5.2 TOOLS USED FOR THE STUDY

- E-content using interactive softwares(Prepared and validated by Shabeela,B.V.V and Jaleel,S.)
- Lesson Transcripts based on Activity Oriented Method (Prepared and validated by Shabeela,B.V.V and Jaleel,S.)
- Technical Skill Test in Computer Science (Prepared and standardized by Shabeela,B.V.V and Jaleel,S.)

5.3 STATISTICAL TECHNIQUES USED

- Descriptive Statistics
- Significance of difference between Means
- Carl Pearson Product moment Correlation

VI. ANALYSIS OF DATA AND INTERPRETATION OF RESULT

Effectiveness of e-Content using Interactive Softwares on Technical Skills of Students at Higher Secondary Level

The investigators tried to find out the effectiveness of e-Content using Interactive Softwares on Technical Skills of Students at Higher Secondary level. This was done under the following heading.

Descriptive Statistics of pre test scores of Technical Skills of Students at Higher Secondary Level for total Sample

The pre test scores of Technical Skills were tabulated and the measures of Central Tendency, measures of dispersion and measures of normality were calculated in order to get a general picture about the group. The descriptive statistics of pre test scores of Technical Skills is given in Table 1

Table 1. *Descriptive statistics of pre test scores of Technical Skills of Students at Higher Secondary Level*

Group	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Experimental	48	3.95	4.00	4.00	1.62	0.88	1.07
Control	57	3.00	3.00	2.00	1.41	1.02	1.68

The mean scores of pre test scores of Technical Skills of Students at Higher Secondary level for experimental group is 3.95 and that of control group is 3.00. The values of standard scores are respectively 1.62 and 1.41 for experimental as well as control groups. The distribution of data of pre test scores of Achievement in Computer Science for experimental as well as Control group are positively skewed. The value of kurtosis for the distribution of data of pre test scores of Problem Solving Skill for experimental as well as control group are greater than 0.263 and hence they are platykurtic.

Comparison of pre test scores of Technical Skills of Students at Higher Secondary Level for total sample

The investigators compared the pre test scores of Technical Skills of Students at Higher Secondary Level for total sample by using the test of significance of difference between means. The summary of result is given in Table 2

Table 2. *Summary of test of significance of difference between the pre test scores of Technical Skills of Students at Higher Secondary Level for experimental and control groups*

Group	N	Mean	SD	T
Experimental	48	3.95	1.62	3.18**
Control	57	3.00	1.41	

** p < .01

The obtained t ($t = 3.18, p < .01$) is significant at .01 level of significance. It implied that there exists significant difference in the mean scores of pre test scores of Technical Skills of Students at Higher Secondary level for experimental and control groups.

Descriptive Statistics of post test scores of Technical Skills of Students at Higher Secondary Level for total Sample

The post test scores of Technical Skills were tabulated and the measures of Central Tendency, measures of dispersion and measures of normality were calculated in order to get a general picture about the group. The descriptive statistics of post test scores of Technical Skills is given in Table 3

Table 3. Descriptive statistics of post test scores of Technical Skills of Students at Higher Secondary Level

Group	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Experimental	48	14.31	14.00	14.00	2.40	0.38	0.02
Control	57	11.21	11.00	13.00	2.97	-0.41	0.60

The mean scores of post test scores of Technical Skills of Students at Higher Secondary level for experimental group is 14.31 and that of control group is 11.21. The values of standard scores are respectively 2.40 and 2.97 for experimental as well as control groups. The distribution of data of pre test scores of Achievement in Computer Science for experimental is positively skewed and that of control group is negatively skewed. The value of kurtosis for the distribution of data of pre test scores of Problem Solving Skill for control group are greater than 0.263 and hence they are platykurtic and that of experimental group is less than 0.263 and hence is leptokurtic.

Comparison of post test scores of Technical Skills of Students at Higher Secondary Level for total sample

The investigators compared the post test scores of Technical Skills of Students at Higher Secondary Level for total sample by using the test of significance of difference between means. The summary of result is given in Table 4.

Table 4. Summary of test of significance of difference between the post test scores of Technical Skills of Students at Higher Secondary Level for experimental and control groups

Group	N	Mean	SD	T
Experimental	48	14.31	2.40	5.92**
Control	57	11.21	2.97	

** $p < .01$

The obtained t ($t = 5.92, p < .01$) is significant at .01 level of significance. It implied that there exists significant difference in the mean scores of post test scores of Technical Skills of Students at Higher Secondary level for experimental and control groups.

Comparison of gain scores of Technical Skills of Students at Higher Secondary Level for total sample

The investigators compared the gain scores of Technical Skills of Students at Higher Secondary Level for total sample by using the test of significance of difference between means. The summary of result is given in Table 5.

Table 5. Summary of test of significance of difference between the gain scores of Technical Skills of Students at Higher Secondary Level for experimental and control groups

Group	N	Mean	SD	T
Experimental	48	10.36	1.95	4.89**
Control	57	8.21	2.56	

** $p < .01$

The obtained t ($t = 4.89, p < .01$) is significant at .01 level of significance. It implied that there exists significant difference in the mean scores of gain scores of Technical Skills of Students at Higher Secondary level for experimental and control groups.

Comparison of post test scores of Technical Skills of Students at Higher Secondary Level for total sample for experimental and control groups using ANCOVA

The analysis of the pre test, post test and gain scores of students at Higher Secondary Level in experimental and control groups showed that there is significant difference in the Technical Skills of the two groups. Since the investigators selected non-equivalent intact class groups as it is very inconvenient to sort out students into different equated groups, so it is necessary to analyze the data by using statistical technique, Analysis of Co-variance (ANCOVA) in which the difference in the initial status is removed statistically. The pre-test and post-test scores of the experimental and control groups were subjected to Analysis of Covariance to determine the effectiveness of e – Content using interactive softwares on Technical Skills among students at Higher

Secondary level. Before proceeding to ANCOVA, ANOVA was done and the F-ratio for the pre-test and post-test scores was computed. The summary of Analysis of Variance of pre-test and post-test scores is given in Table 6.

Table 6. Summary of ANOVA of pre-test and post-test scores of Technical Skills in experimental and control groups taken separately

Source of variation	df	SSx	SSy	MSx	MSy	Fx	Fy
Among means	1	32.14	344.14	32.14	344.14		
Within groups	104	362.74	1042.10	3.49	10.02	9.21**	34.34**
Total	105	394.88	1386.23				

** p < .01

x : Pre - test y : Post - test

The obtained F ratios were tested for significance. The obtained Fx (Fx = 9.21, p < .01) is significant at .01 level. The result revealed that there is significant difference in the pre – test scores of Technical Skills of students at Higher Secondary level in experimental and control groups. The obtained Fy is significant (Fy = 34.34, p < .01) as it exceeds the table values of F with degrees of freedom (1,104). So it can be concluded that there is significant difference among the post - test scores of Technical Skills between experimental and control group of students at Higher Secondary level.

The adjusted sum of squares for post - test was computed and the F-ratio was calculated. The summary of ANCOVA of post - test scores of students in experimental and control groups is given in Table 7.

Table 7. Summary of ANCOVA of post - test scores of Technical Skills of students at Higher Secondary level in Experimental and control groups

Source of variation	df	SSx	SSy	SSy.x	MSy.x	Fy.x
Among Means	1	32.14	344.14	161.51	161.51	22.91**
Within Groups	103	362.74	1042.10	726.10	7.05	

** p < .01

The obtained Fyx – ratio was tested for significance. The obtained Fyx – ratio is significant (Fyx = 22.91, p < .01) at .01 level of significance. It is clear from the result that the final means differ significantly after they have been adjusted for initial differences on pre-test.

The adjusted means of post – test scores (Y means) of secondary school students in experimental and control groups were computed. The difference between the adjusted Y – means was tested for significance. The data for adjusted means of post – test scores of the Higher Secondary School Students in the experimental and control groups are given in Table 8.

Table 8. Data for adjusted means of post – test scores of Technical Skills of experimental and control groups of Higher Secondary School Students

Groups	N	M _x	M _y	M _{y.x(Adjusted)}	SE _M	t
Experimental	48	3.95	14.31	13.98	0.38	5.77**
Control	57	3.00	11.21	11.77		

** p < .01

From Table 8, it is clear that the calculated value of t (t = 5.77, p < .01) is significant at .01 level of significance. It indicated that the Higher Secondary school students of experimental and control groups differ significantly in their post – test scores of Technical Skills as they were adjusted to pre – test scores. From table, it is also clear that the mean scores of Problem Solving Skill of experimental group (M = 13.98) is significantly higher than that of the control group (M = 11.77). It leads to the major inference that e – Content using interactive softwares is effective than Activity Oriented Method on enhancing Technical Skills of secondary school students.

The comparison of pre test, post test and gain scores of Technical Skills of Students at Higher Secondary level is graphically depicted in Figure 1

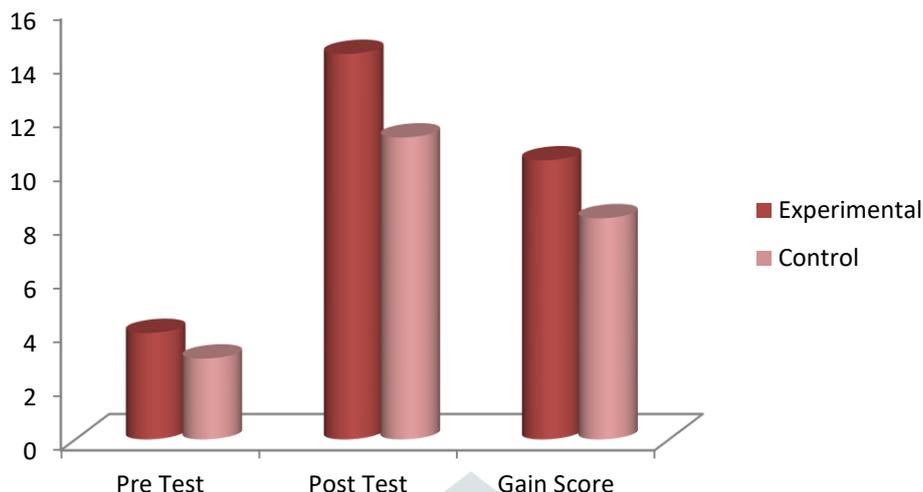


Figure 1. Graphical representation of Technical Skills of Students at Higher Secondary level

Effectiveness of e-Content using Interactive Software over Activity Oriented Method on Technical Skills of Students at Higher Secondary Level based on gender

The investigators tried to find out the effectiveness of e-Content using interactive softwares over Activity Oriented Method on Technical Skills of Students at Higher Secondary level based on gender. This was done under the following headings.

Descriptive Statistics of pre test scores of Technical Skills of Students at Higher Secondary Level based on gender

Before starting the experiment, Test of Technical Skills was administered as pre test and the obtained scores were tabulated and the measures of Central Tendency, measures of dispersion and measures of normality were calculated in order to get a general picture about the group. The descriptive statistics of pre test scores of Technical Skills is given in Table 9

Table 9. Descriptive statistics of pre test scores of Technical Skills of Students at Higher Secondary Level

Sub Sample	Group	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Boys	Experimental	24	4.47	4.00	4.00	1.75	0.69	1.15
	Control	28	2.93	3.00	2.00	1.65	1.23	2.00
Girls	Experimental	24	3.49	3.00	4.00	1.36	0.91	0.37
	Control	29	3.07	3.00	2.00	1.16	0.59	0.00

The mean scores of pre test scores of Technical Skills of Boys are 4.47 for Experimental group and 2.93 for control group. The mean scores of pre test scores of Technical Skills of Girls are 3.49 for Experimental group and 3.07 for control group. The standard deviation obtained for the pre test scores of Technical Skills of Boys is 1.75 for Experimental group and 1.65 for Control group. The standard deviation obtained for the pre test scores of Technical Skills of Girls is 1.36 for Experimental group and 1.16 for Control group. All the distributions are positively skewed. Since the obtained kurtosis values are greater than the normal value (0.263), the distributions are platykurtic for all the distributions of pre test scores of Technical Skills of Students at Higher Secondary level based on gender of students except for control group of girls at Higher Secondary level.

Comparison of pre test scores of Technical Skills of Students at Higher Secondary Level based on gender

The investigators compared the pre test scores of Technical Skills of Students at Higher Secondary Level based on gender by using the test of significance of difference between means. The summary of result is given in Table 10.

Table 10. Summary of test of significance of difference between the pre test scores of Technical Skills of Students at Higher Secondary Level for experimental and control groups

Gender	Group	N	Mean	SD	T
Boys	Experimental	24	4.47	1.75	3.25**
	Control	28	2.93	1.65	
Girls	Experimental	24	3.49	1.36	1.20

Control	29	3.07	1.16
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* $p < .05$

The obtained t are $t = 3.25$, $p < .01$ for Boys and $t = 1.20$, $p > .05$ for Girls. It indicates that there exists significant difference in the pre test scores of Technical Skills of Boys and is not significant for Girls.

Descriptive Statistics of post test scores of Technical Skills of Students at Higher Secondary Level based on gender

After the treatment, Test of Technical Skills was administered as post test and the obtained scores were tabulated and the measures of Central Tendency, measures of dispersion and measures of normality were calculated in order to get a general picture about the group. The descriptive statistics of post test scores of Technical Skills is given in Table 11

Table 11. Descriptive statistics of post test scores of Technical Skills of Students at Higher Secondary Level

Gender	Group	N	Mean	Median	Mode	SD	Skewness	Kurtosis
Boys	Experimental	24	15.16	15.00	14.00	2.57	0.31	0.27
	Control	28	10.71	11.00	14.00	3.40	-0.39	1.38
Girls	Experimental	24	13.57	14.00	14.00	1.99	-0.07	0.97
	Control	29	11.69	12.00	10.00	2.45	0.06	0.11

The mean scores of post test scores of Technical Skills of Boys are 15.16 for Experimental group and 10.71 for control group. The mean scores of post test scores of Technical Skills of Girls are 13.57 for Experimental group and 11.69 for control group. The standard deviation obtained for the post test scores of Technical Skills of Boys is 2.57 for Experimental group and 3.40 for Control group. The standard deviation obtained for the post test scores of Technical Skills of Girls is 1.99 for Experimental group and 2.45 for Control group. the distribution of post test scores of Technical Skills of Boys at Higher Secondary level for experimental group is positively skewed and for control group is negatively skewed. The distribution of post test scores of Technical Skills of Boys at Higher Secondary level for Experimental group is negatively skewed and that of control group is positively skewed. Since the obtained kurtosis values are greater than the normal value (0.263), the distributions are platykurtic for all the distributions of pre test scores of Technical Skills of Students at Higher Secondary level based on gender of students except for control group of girls at Higher Secondary level.

Comparison of post test scores of Technical Skills of Students at Higher Secondary Level based on gender

The investigators compared the post test scores of Technical Skills of Students at Higher Secondary Level based on gender by using the test of significance of difference between means. The summary of result is given in Table 12.

Table 12. Summary of test of significance of difference between the post test scores of Technical Skills of Students at Higher Secondary Level for experimental and control groups

Gender	Group	N	Mean	SD	T
Boys	Experimental	24	15.16	2.57	5.37**
	Control	28	10.71	3.40	
Girls	Experimental	24	13.57	1.99	3.08**
	Control	29	11.69	2.45	

** $p < .01$

From Table 12, the obtained t ($t = 5.37$, $p < .01$ for Boys; $t = 3.08$, $p < .01$ for Girls) are significant at .01 level of significance. It implies that there exists significant difference in the mean scores of post test scores of Technical Skills of Students at Higher Secondary level based on their gender.

Comparison of gain scores of Technical Skills of Students at Higher Secondary Level based on gender

The investigators compared the gain scores of Technical Skills of Students at Higher Secondary Level based on gender by using the test of significance of difference between means. The summary of result is given in Table 13.

Table 13. Summary of test of significance of difference between the gain scores of Technical Skills of Students at Higher Secondary Level for experimental and control groups

Gender	Group	N	Mean	SD	T
Boys	Experimental	24	10.69	2.18	4.10*
	Control	28	7.79	2.91	
Girls	Experimental	24	10.08	1.68	2.78**

Control	29	8.62	2.14
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** p < .01

From Table 13, the obtained t ($t = 4.10$, $p < .01$ for Boys; $t = 2.78$, $p < .01$ for Girls) are significant at .01 level of significance. It implies that there exists significant difference in the mean scores of gain scores of Technical Skills of Students at Higher Secondary level based on their gender.

Comparison of post test scores of Technical Skills of Students at Higher Secondary Level based on gender for experimental and control groups using ANCOVA

The analysis of the pre test, post test and gain scores of boys at Higher Secondary Level in experimental and control groups showed that there is significant difference in the mean scores of Technical Skills at Higher Secondary Level. The analysis of the pre test scores of girls showed that there exists no significant difference. But the comparison of post test and gain scores of girls at Higher Secondary Level in experimental and control groups showed that there is significant difference in the Technical Skills of the two groups. Since the investigators selected non-equivalent intact class groups as it is very inconvenient to sort out students into different equated groups, so it is necessary to analyze the data by using statistical technique, Analysis of Co-variance (ANCOVA) in which the difference in the initial status is removed statistically. The pre-test and post-test scores of the experimental and control groups were subjected to Analysis of Covariance to determine the effectiveness of e – Content using interactive softwares on Technical Skills among students at Higher Secondary level based on gender. Before proceeding to ANCOVA, ANOVA was done and the F-ratio for the pre-test and post-test scores was computed. The summary of Analysis of Variance of pre-test and post-test scores is given in Table 14.

Table 14. Summary of ANOVA of pre-test and post-test scores of Technical Skills in experimental and control groups taken separately

Gender	Source of variation	df	SSx	SSy	MSx	MSy	Fx	Fy
Boys	Among means	1	40.83	340.46	40.83	340.46	9.96**	28.85**
	Within groups	51	209.06	601.62	4.10	11.80		
Girls	Among means	1	3.28	65.27	3.28	65.27	1.31	9.26**
	Within groups	52	130.61	366.72	2.51	7.05		

** p < .01

x : Pre - test y : Post - test

The obtained F ratios were tested for significance. The obtained Fx are $F_x = 9.96$, $p < .01$ for boys and $F_x = 1.31$, $p > .05$ for girls. The result revealed that there is significant difference in the pre – test scores of Technical Skills of boys at Higher Secondary level in experimental and control groups. Also, there is no significant difference in the pre test scores of Technical Skills of girls at Higher Secondary Level in experimental and control groups. The obtained Fy values are significant ($F_y = 28.85$, $p < .01$ for Boys; $F_y = 9.26$, $p < .01$ for Girls). So it can be concluded that there is significant difference among the post - test scores of Technical Skills between experimental and control group of students at Higher Secondary level based on gender.

The adjusted sum of squares for post - test was computed and the F-ratio was calculated. The summary of ANCOVA of post - test scores of students in experimental and control groups is given in Table 15.

Table 15. Summary of ANCOVA of post - test scores of Technical Skills of students at Higher Secondary level in Experimental and control groups based on gender

Gender	Source of variation	Df	SSx	SSy	SSy.x	MSy.x	Fy.x
Boys	Among means	1	40.83	340.46	136.24	136.24	15.62**
	Within groups	50	209.06	601.62	435.85	8.71	
Girls	Among means	1	3.28	65.27	41.30	41.30	7.85**
	Within groups	51	130.61	366.72	268.25	5.26	

** p < .01

The obtained Fyx – ratio was tested for significance. The obtained Fyx – ratios are significant ($F_{yx} = 15.62$, $p < .01$ for Boys; $F_{yx} = 7.85$, $p < .01$ for Girls) at .01 level of significance. It is clear from the result that the final means differ significantly after they have been adjusted for initial differences on pre-test.

The adjusted means of post – test scores (Y means) of students at Higher Secondary level in experimental and control groups based on gender were computed. The difference between the adjusted Y – means was tested for significance. The data for adjusted means of post – test scores of students at Higher Secondary Level in the experimental and control groups based on gender are given in Table 16.

Table 16. Data for adjusted means of post – test scores of Technical Skills of experimental and control groups of students at Higher Secondary level based on gender

Gender	Groups	N	M _x	M _y	M _{y,x(Adjusted)}	SE _M	t
Boys	Experimental	24	4.47	15.16	14.63	0.66	4.67**
	Control	28	2.93	10.71	11.56		
Girls	Experimental	24	3.49	13.57	13.44	0.44	3.44**
	Control	29	3.07	11.69	11.92		

** p < .01

From Table 16, it is clear that the calculated values of t (t = 4.67, p < .01 for Boys; t = 3.44, p < .01 for Girls) is significant at .01 level of significance. It indicated that the Higher Secondary school students of experimental and control groups based on gender differ significantly in their post – test scores of Technical Skills as they were adjusted to pre – test scores. From table, it is also clear that the mean scores of Technical Skills of experimental group (M = 14.63 for Boys; M = 13.44 for Girls) are significantly higher than that of the control group (M = 11.56 for Boys; M = 11.92 for Girls). It leads to the major inference that e – Content using interactive softwares is effective than Activity Oriented Method on enhancing Technical Skills of students at Higher Secondary Level based on gender.

The comparison of pre test, post test and gain scores of Technical Skills of Students at Higher Secondary level is graphically depicted in Figure 2

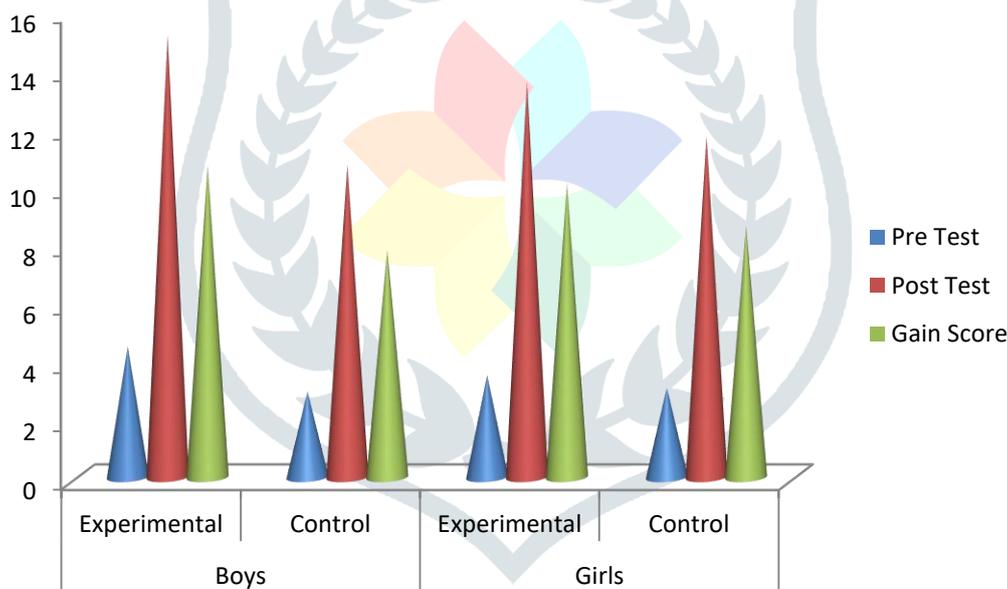


Figure 2 . Graphical representation of Technical Skills of Students at Higher Secondary level based on gender

The effectiveness of e-Content using Interactive Softwares over Activity Oriented Method on Technical Skills is compared based on gender of students using Two-way ANOVA. The summary of result of the analysis are presented in Table 17.

Table 17. Summary of Two-way ANOVA for the comparison of post test scores of Technical Skills among Higher Secondary School Students based on gender

	Sum of Squares	df	Mean Square	F
Gender	3.34	1	3.34	0.36
Treatment	356.57	1	356.57	38.30**
Interaction	13.45	1	13.45	1.44
Error	968.34	104	9.31	

** p < .01

From Table 17, the obtained F ratio of post test scores of Technical Skills among Higher Secondary School Students is not significant ($F = 0.36$, $df (1,104)$, $p > .05$) based on gender. This means that gender does not reveal significant difference in the post test scores of Technical Skills among Higher Secondary School Students in Experimental and Control groups.

The obtained F ratio of different treatments ($F = 38.30$, $df (1,104)$, $p < .01$) is significant at .01 level of significance. This means that the difference in post test scores of Technical Skills among Higher Secondary School Students in Experimental and Control groups irrespective of gender of students.

The calculated F – ratio of post test scores of Technical Skills for interaction of Gender of Students and each treatment is not significant ($F = 1.44$, $df (1, 1.04)$ $p > .05$). This means that the effectiveness of e-Content using Interactive Softwares over Activity Oriented Method on Technical Skills among Higher Secondary School Students do not differ significantly in accordance with the Gender of students. This substantiates the obtained result that e-Content using Interactive Softwares are effective than Activity Oriented Method on Technical Skills among students at Higher Secondary Level based on gender.

Effectiveness of e-Content using Interactive Softwares over Activity Oriented Method on Retention in Technical Skills of students at Higher Secondary Level

The investigators analyzed the retention of Technical Skills among Students at Higher Secondary Level by comparing the retention scores using test of significance of difference between means and the summary of result is given in Table 18

Table 18. Summary of result of the comparison of Retention of Technical Skills of Students at Higher Secondary Level

Group	N	Mean	SD	T
Experimental	48	90.81	8.33	3.01**
Control	57	84.25	13.70	

Table 18 shows that the obtained t ($t = 3.01$, $p < .01$) is significant at .01 level of significance. This implies that there exists significant difference in the mean scores of retention of Technical Skills of Students at Higher Secondary Level in Experimental and Control groups. Table 18 also shows that the mean scores of retention of Technical Skills for experimental group ($M = 90.81$) is comparatively higher than that for control group ($M = 84.25$). Hence this can be concluded that e-Content using Interactive Softwares is effective than Activity Oriented Method on Retention of Technical Skills of Students at Higher Secondary Level.

VII. MAJOR FINDINGS OF THE STUDY

1. Learning through e – Content using Interactive Softwares is more effective than Activity Oriented Method on enhancing Technical Skills of Computer Science students at Higher Secondary level.
2. Learning through E-Content using Interactive Softwares is more effective than Activity Oriented Method on Retention of Technical Skills in Computer Science of Students at Higher Secondary level.

VIII. CONCLUSION

Technical Skills are the knowledge and abilities needed to accomplish mathematical, engineering, scientific or computer related duties, as well as other specific tasks relating to technology. Those with Technical Skills are often referred to as technicians.

Technical Skills can refer to the ability to perform tasks that require the use of certain tools, whether tangible or intangible and technology to complete them. In this regard, the knowledge in a Technical Skills area is seen as practical in nature as it allows a person to complete a designated task in a real, not theoretical way. The acquisition of Technical Skills requires specific education or training, often with a hands-on-learning component

Technical Skills are practical and often relate to mechanical, IT, mathematical or scientific tasks. Some examples include knowledge of programming languages, mechanical equipment or tools.

Learning with the assistance of e-content helps to improve the Technical Skills of students. Our kids are digital natives. They are born in the midst of electronic gadgets. At the very moment they step into this world, the first thing they see is a mobile camera or a digital camera. From there they start their journey through the digital world. For this journey, Technical Skills is a very important skill.

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