



PEDAGOGY THROUGH ICT: FINDINGS ON CREATIVITY OF TECHNOLOGICAL STUDENTS AND PERSEPECTIVE TEACHERS OF HARYANA

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Abstract

Education may be the largest part of triumphant foundation to emerge from the industrial age. Twentieth century nations have thrived for the reason that they identified and employed effective strategies for education and employment of the general population. The world is changing. Technology makes us smarter. In today's pedagogy, technology is not only a tool, but also a resource for accessing information. Day after day, new ways have been used to amalgamate technology into learning process. This paper deals with the imperative effect on creativity with pedagogy through information and communication technology tools. Survey method of research has been used in this work, for which the computations have been performed through chi-square test in statistical package for social sciences (SPSS). The results shows the imperative effect of use of information and communication technology tools to enhance creativity of the students.

Keywords: ICT; SPSS; Creativity

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I. INTRODUCTION

Educational technology is an array of tools that might prove helpful in advancing student learning. Computer and web technology, Betty C. (1996), have revolutionized the field of education. The computers provide an interactive audio-visual media through power point presentations and animation software's. The visual effects provided by animation and presentation software, enhances the interest of the students. On the other hand, web is a huge information base. Internet is revolutionizing education, Babalobi O.O. (2010). The internet, a global network connecting millions of computers and computer users, is a new resource of educators. Globalization is a worldwide phenomena by which the world comes together to share the information. In educational globalization, internet provides upto date information of a variety of classroom related topics unavailable from other sources, Alexandru A.et.al (2007).

Technology brought a huge change in communication. Communication system has evolved from pigeons carrying messages across countries, right upto e-mails and instant messages that travel long distances in seconds. Communication plays an important role in education by transmission of knowledge and information. The availability of media, compact discs (CD's), films, charts, slides, models has supplemented to books and teachers in terms of transmitting knowledge. Communication has played an important role in educational environment, distance education, broadcasting of lecture by television media, national program on technology enhanced learning (NPTEL), use of educational satellite (EDUSAT) etc., Bhattacharya B., (2008). The basic tenets identified in national basic education scheme-Head, Heart and Hand need now, to be linked to another 'H', that is, Highways, Information highways, Websites and Internet, which are going to become common terms of usage in teacher education, Khosla D.N (1998).

II. TWENTY FIRST CENTURY SKILLS

21st century is considered to be a new world for administrators, teachers and students, Bhandari B.B, et.al (2003). This century education is a fundamental shift towards learner-centered education and creating creative thinkers. This education comprises both content knowledge and applied skills that today's students need to thrive in continually evolving workplace and society. 21st century education are woven throughout the six standards, Serim F. (2012), and performance indicators viz. creativity and achievement, communication and collaboration, research and information fluency, critical thinking, problem solving and decision making, digital citizenship and technology operations and concepts. Today's schools have a tremendous opportunity and responsibility to help students achieve academically and prepare for their futures in the 21st century, Schrum L. et.al, (2009).

We are living in an age, where creativity, achievement, knowledge and innovation are powering the world at an ever increasing pace. The genes of this revolution is information and communication technologies (ICT), achievement, creative, innovation, digital adept and adaptable people are now the major socio-economic drivers of 21st century. There is a profound gap between the knowledge and skills most students learn in school or college and the knowledge and skills they need in 21st century community and workplaces, Kendall M. (2005). Traditional studies believe three R's, that is, Reading, Writing and Arithmetic. Modern 21st century fuses the three R's with four C's, that is, Creativity and Achievement, Critical thinking and Problem Solving, Communication, Collaboration, Shames A. (2010).

Creativity and achievement emphasizes thinking creatively, that is, brainstorming techniques, creating new ideas, refining and evaluating ideas, working creatively, that is, communicating new ideas, being open to diverse perspectives, demonstrating originality, viewing failure as a part of the process and implementing innovation ,Serim F. (2012).

III. EDUCATIONAL TECHNOLOGY

Educational technology is the application of scientific knowledge, learning and the conditions of learning to improve the effectiveness and efficacy of teaching and learning.



Education, the act or process of acquiring and imparting knowledge, is critical to the development of a learner with a view to their participation in the transformation of the world for a better tomorrow. Learning and understanding are basic to the definition of education.

Educational technology is not a simple combination of technology in education and technology of education. It is a more than the sum of their interpretations as shown in figure 1.1:

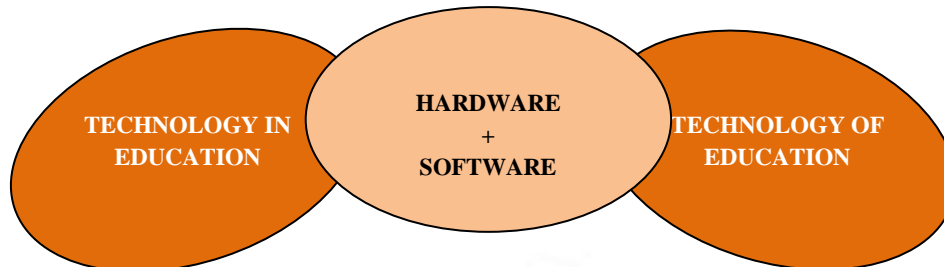


Figure 1: Educational Technologies

Few roles of technology in modern educational practices are, Jain S. (2012).

- It induces scientific, economic, technological, information and multicultural literacy and global awareness
- It promotes inventive thinking
- It develops effective communication which leads to teaming collaboration and interpersonal skills. Moreover, it includes personal, social and civic responsibility
- It leads to high productivity which given the ability to plan and manage results
- It gives a sense of using real-world tools with effective, relevant, and high quality results
- It seeks to reinforce the attack on literacy
- It improves the quality of teaching, makes learning more effective in order to achieve the teaching objectives
- It breaks the barriers of time, cost and space
- It gives the speedy results
- It deals with large number of population comfortably
- It helps in preservation, transmission and developmental of human knowledge
- It avails the resources at door step
- It provides feedback for the modification of learner and much more

Early developments referred to the role of technology in education which signifies the use of audio-visual equipment, that is, hardware in educational processes. The use of technology in education results in increasing the effectiveness of the educational process.

IV.CREATIVITY

Creativity can be developed through education. It is possible in any activity that engages intelligence. Information and communication technology (ICT) and digital technologies have enormous potential for enhancing creativity by providing tools, processes and audiences of all ages and abilities and across the curriculum. Creativity is one of the most complicated concepts in psychology. Definitions of creativity differ, but they have in common their emphasis on people's ability to produce products that are not only high but also novel.

Boden M.A. (2001) believes creativity is the ability to come up with new ideas that are surprising yet intelligible, and also valuable in some way. Five characteristics of creativity were expressed by Denning T. (2003), includes imagination, a fashioning process, pursuing purpose, being original and judging value.

Resnick M. (2007) said " Success in the future- for individuals, for communities, for companies, for nation as a whole- will be based not on what we know or how much we know, but on our ability to think and act creatively" .



Cordes et.al (2000), argue that instead of being creative and using information and communication technologies (ICT) to enhance learning opportunities in the classroom, it has been common to see students involved with mindless and passive interactions.

“Creativity and imagination are prerequisites for innovative thinking, which will never be obsolete in the workplace. Yet a heavy diet of readymade computer images and programmed toys appears to stunt imaginative thinking. Teachers report that children in our electronic society are becoming alarmingly deficient in generating their own images and ideas”.

Encouraging a creative society, Robinson K. (2006), suggested changing the traditional educational system. “Our education system has mined our minds in the way that we have strip minded the earth for a particular commodity and for the future it would not service. We need to rethink the fundamental principles on which we are educating our children”.

V. TYPES OF CREATIVITY

Creativity can be classified into three classes:

- Chance creativity: - The type of creative art or act that happens by pure luck and can rarely be duplicated.
- Spontaneous creativity: - Spontaneous creativity means bringing something new into being from a feeling of spontaneity which is designed to meet an immediate purpose.
- Conservable Creativity: - Conservable creativity refers to the process ‘where the things created does not necessarily meet an immediate purpose’. There is very little, if any feedback is present in this type of creativity. It comes through generations to generation.

VI. DETERMINANTS OF CREATIVITY

Following are determinants of creativity, Loveless A.et.al (2005):

- The values and practice of the culture in which a person is brought up and lives
- A person’s biological constitution
- Nature of the organization or institutions
- Genetic Inheritance
- The orientation of the group
- The nature of the work the person does

VII.OBJECTIVES OF THE STUDY

This research study was conducted upon perspective teachers and students of technical education to find out the comparative impact of use of information and communication technology (ICT) on their creativity. To analyze the comparative effect of information and communication technology (ICT) on creativity questionnaire technique was adopted as the data collection instrument. In order to fulfill the requirements of the study, the main objective is split up into the following sub-objectives:

1. To study the creativity of perspective teachers and students of technical education.
2. To study the impact of information and communication technology (ICT) on their creativity level.

The following sections provide discussion on number of key questions presented to the perspective teachers and students of technical education of various institutions of Punjab, Haryana and Rajasthan states of India. This discussion summarizes the effect of the use of information and communication technology (ICT) as an educational tool on their creativity and achievement ability. This chapter incorporates the discussion on various hypotheses undertaken for the analysis of creativity and analysis of achievement ability of perspective teachers and students of technical education with and without use of information and communication technology (ICT) as an educational tool. Chi-Square analysis was used to perform the statistical Analysis using statistical package for the social sciences (SPSS) 16.0 Software.



VIII. DATA COLLECTION

The current research work deals with the analysis of creativity of perspective teachers and students of technical education. The present work deals with the various education colleges and engineering institutions of Haryana state.

Table 1: Samples for Creativity Analysis under Controlled Group

S. No.	State	Name of College	Type of Institution	Male	Female	Total
1.	Haryana	KC College of Education, Bhiwani	Education	59	37	96
2.	Haryana	Galaxy Global College of Engineering, Ambala	Engineering	29	33	62

Table 2 shows the samples collected for the analysis of creativity from various institutions observed under uncontrolled group.

Table 2: Samples for Creativity Analysis under Uncontrolled Group

S. No.	State	Name of College	Type of Institution	Male	Female	Total
4.	Haryana	Jan Naik College of Engg. & Mgmt., Sirsa	Engineering	37	15	52
5.	Haryana	Modern College of Engineering, Ambala	Engineering	39	31	70

IX. GROUP FORMATION

On the basis of marks obtain in the creativity and achievement ability analysis questionnaire the students were categorized into their ability level according to the following criterion:

High achievers	:	Marks above 70%
Medium achievers	:	Marks between 50% to 70%
Low achievers	:	Marks below 50%

X. ANALYSIS OF CREATIVITY

The following sections describe the effect of use of information and communication technology (ICT) on the creativity of students of technical education and perspective teachers.

A. Creativity analysis of perspective teachers and students of technical education of Haryana

Fluency: The analysis of fluency of the perspective teachers and students of technical education of Haryana shows that the 41% of the respondents of controlled group (n=158) come under the category of high achievers (HA), whereas only 9% of the respondents of uncontrolled group (n=122) come under the category of high achievers (HA). The 48% of the respondents of controlled group come under the category of medium achievers (MA), and 40% of the respondents of uncontrolled group come under the category of medium achievers (MA). Only 9% of the respondents of controlled group come under the category of low achievers (LA), whereas 50% of the respondents of uncontrolled group come under the category of low achievers (LA). It is inferred from the computed results that the use of information and communication



technologies (ICT) plays a key role in improving the Fluency of the perspective teachers and students of technical education of Haryana State. The calculated values of Chi-Square analysis (Chi-Square=70.73, Table Value=5.99 and df=2) has demonstrated that the use of information and communication technologies (ICT) has a significant effect on Fluency of the perspective teachers and students of technical education of Haryana State.

Table 3: Chi-Square Cross tabulation of fluency of the perspective teachers and students of technical education of Haryana

			ACHIEVEMENT			Total
			1_HIGH	2_MEDIUM	3_LOW	
GROUP	CONTROLLED	Count	66	77	15	158
		Expected Count	43.4	71.1	43.4	158.0
	UNCONTROLLED	Count	11	49	62	122
		Expected Count	33.6	54.9	33.6	122.0
Total		Count	77	126	77	280
		Expected Count	77.0	126.0	77.0	280.0

Table 4.9 shows the cross tabulation of Fluency of the perspective teachers and students of technical education of Haryana State. Table 4.10 shows the results of Chi square analysis analyzed through statistical package for the social sciences (SPSS) 16.0. Figure 4.5 shows the bar chart indicating the response of High, Medium and Low achievement groups in Fluency of the perspective teachers and students of technical education for uncontrolled and controlled group of Haryana state.

Table 4: Chi-Square Analysis of fluency of the perspective teachers and students of technical education of Haryana

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	70.737a	2	.000
Likelihood Ratio	76.025	2	.000
N of Valid Cases	280		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 33.55.

Figure 4.5 shows the graphical response of information and communication technology (ICT) on Fluency of perspective teachers and students of technical education of Haryana for controlled and uncontrolled group comprising of 158 and 122 students respectively.

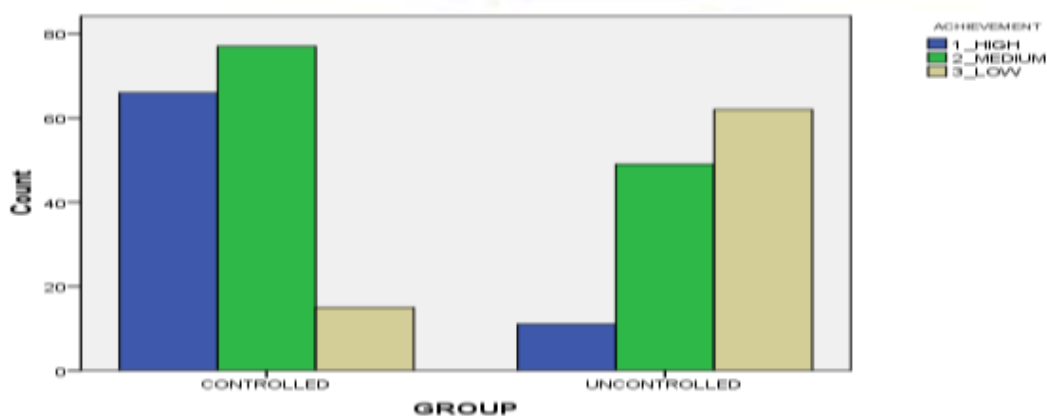


Figure 2: Bar Chart of fluency of the perspective teachers and students of technical education of Haryana



It is inferred from the bar chart that 66 students came under the category of high achievers (HA), 77 students came under the category of medium achievers (MA) and 15 students came under the category of low achievers (LA) out of 158 students of controlled group comprising of perspective teachers and students of technical education of Haryana. On the divergent side, 11 students came under the category of high achievers (HA), 49 students came under the category of medium achievers (MA) and 62 students came under the category of low achievers (LA) out of 122 students of uncontrolled group comprising of perspective teachers and students of technical education of Haryana.

Flexibility: The analysis of flexibility of the perspective teachers and students of technical education of Haryana shows that the 36% of the respondents of controlled group (n=158) come under the category of high achievers (HA), whereas only 22% of the respondents of uncontrolled group (n=122) come under the category of high achievers (HA). The 40% of the respondents of controlled group come under the category of medium achievers (MA), and 36% of the respondents of uncontrolled group come under the category of medium achievers (MA). Only 22% of the respondents of controlled group come under the category of low achievers (LA), whereas 40% of the respondents of uncontrolled group come under the category of low achievers (LA). It is inferred from the computed results that the use of information and communication technologies (ICT) play a key role in improving the Flexibility of the perspective teachers and students of technical education of Haryana State.

Table 5: Chi-Square Cross tabulation of flexibility of the perspective teachers and students of technical education of Haryana

			ACHIEVEMENT			Total
			1_HIGH	2_MEDIUM	3_LOW	
GROUP	CONTROLLED	Count	58	64	36	158
		Expected Count	48.0	61.5	48.5	158.0
	UNCONTROLLED	Count	27	45	50	122
		Expected Count	37.0	47.5	37.5	122.0
Total		Count	85	109	86	280
		Expected Count	85.0	109.0	86.0	280.0

Table 6: Chi-Square Analysis of flexibility of the perspective teachers and students of technical education of Haryana

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12.475a	2	.002
Likelihood Ratio	12.548	2	.002
N of Valid Cases	280		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 37.04.

The calculated values of Chi-Square analysis (Chi-Square=12, Table Value=5 and df=2) has demonstrated that the use of information and communication technologies (ICT) has a significant effect on Flexibility of the perspective teachers and students of technical education of Haryana State. Table 4.11 shows the cross tabulation of Flexibility of the perspective teachers and students of technical education of Haryana State. Table 4.12 shows the results of Chi square analysis analyzed through statistical package for the social sciences (SPSS) 16.0. Figure 4.6 shows the bar chart indicating the response of High, Medium and Low achievement groups in Flexibility of the perspective teachers and students of technical education for uncontrolled and controlled group of Haryana state. Figure 4.6 shows the graphical response of information and communication technology (ICT) on Flexibility of perspective teachers and students of technical education of Haryana for controlled and uncontrolled group comprising of 158 and 122 students respectively.

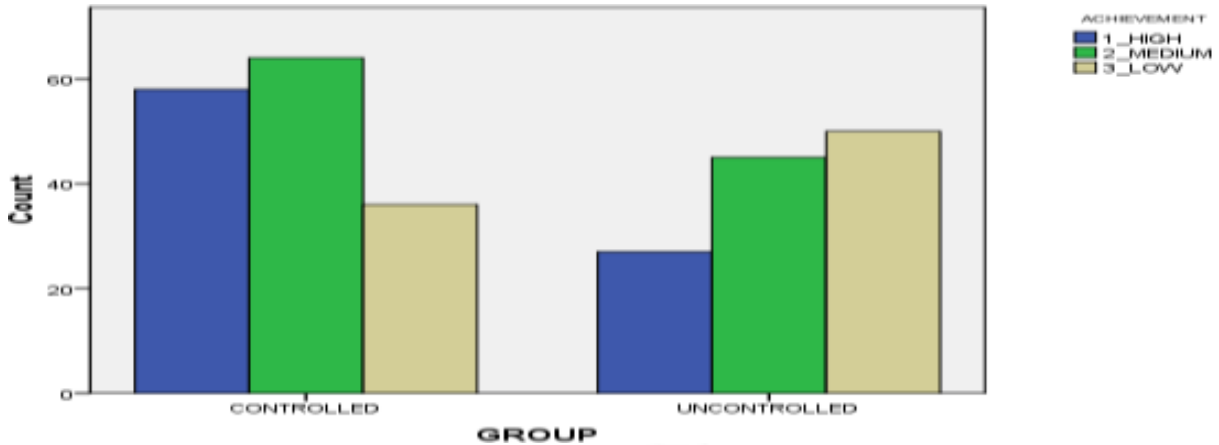


Figure 3: Bar Chart of flexibility of the perspective teachers and students of technical education of Haryana

It is inferred from the bar chart that 58 students came under the category of high achievers (HA), 64 students came under the category of medium achievers (MA) and 36 students came under the category of low achievers (LA) out of 158 students of controlled group comprising of perspective teachers and students of technical education of Haryana. On the divergent side, 27 students came under the category of high achievers (HA), 45 students came under the category of medium achievers (MA) and 50 students came under the category of low achievers (LA) out of 122 students of uncontrolled group comprising of perspective teachers and students of technical education of Haryana.

Originality: The analysis of Originality of the perspective teachers and students of technical education of Haryana shows that the 21% of the respondents of controlled group (n=158) come under the category of high achievers (HA), whereas only 28% of the respondents of uncontrolled group (n=122) come under the category of high achievers (HA). The 44% of the respondents of controlled group come under the category of medium achievers (MA), and 34% of the respondents of uncontrolled group come under the category of medium achievers (MA). The 33% of the respondents of controlled group come under the category of low achievers (LA), whereas 36% of the respondents of uncontrolled group come under the category of low achievers (LA).

Table 7: Chi-Square Cross tabulation of Originality of the perspective teachers and students of technical education of Haryana

			ACHIEVEMENT			Total
			1_HIGH	2_MEDIUM	3_LOW	
GROUP	CONTROLLED	Count	34	71	53	158
		Expected Count	38.9	63.8	55.3	158.0
	UNCONTROLLED	Count	35	42	45	122
		Expected Count	30.1	49.2	42.7	122.0
Total		Count	69	113	98	280
		Expected Count	69.0	113.0	98.0	280.0

Table 8: Chi-Square Analysis of Originality of the perspective teachers and students of technical education of Haryana

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.540a	2	.170
Likelihood Ratio	3.553	2	.169
N of Valid Cases	280		



Table 8: Chi-Square Analysis of Originality of the perspective teachers and students of technical education of Haryana

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.540a	2	.170
Likelihood Ratio	3.553	2	.169

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 30.06.

It is inferred from the computed results that the use of information and communication technologies (ICT) do not play any role in improving the Originality of the perspective teachers and students of technical education of Haryana State. The calculated values of Chi-Square analysis (Chi-Square=3, Table Value=5 and df=2) has demonstrated that the use of information and communication technologies (ICT) has no significant effect on Originality of the perspective teachers and students of technical education of Haryana State. Table 4.13 shows the cross tabulation of Originality of the perspective teachers and students of technical education of Haryana State..Table 4.14 shows the results of Chi square analysis analyzed through statistical package for the social sciences (SPSS) 16.0. Figure 4.7 shows the bar chart indicating the response of High, Medium and Low achievement groups in Originality of the perspective teachers and students of technical education for uncontrolled and controlled group of Haryana state. Figure 4.7 shows the graphical response of information and communication technology (ICT) on Originality of perspective teachers and students of technical education of Haryana for controlled and uncontrolled group comprising of 158 and 122 students respectively.

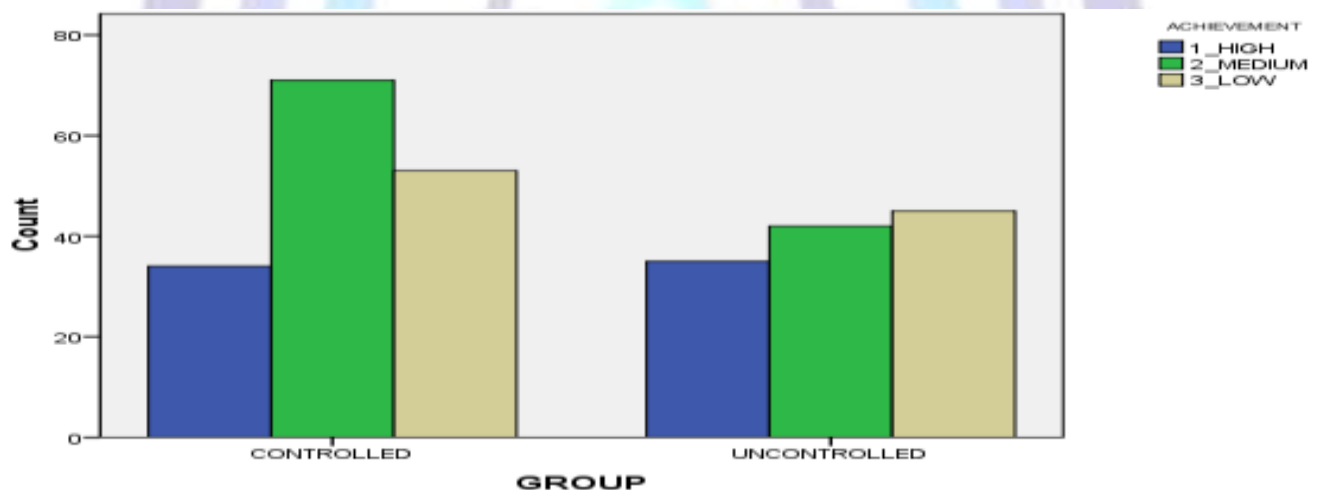


Figure 4: Bar Chart of Originality of the perspective teachers and students of technical education of Haryana

It is inferred from the bar chart that 34 students came under the category of high achievers (HA), 71 students came under the category of medium achievers (MA) and 53 students came under the category of low achievers (LA) out of 158 students of controlled group comprising of perspective teachers and students of technical education of Haryana. On the divergent side, 35 students came under the category of high achievers (HA), 42 students came under the category of medium achievers (MA) and 45 students came under the category of low achievers (LA) out of 122 students of uncontrolled group comprising of perspective teachers and students of technical education of Haryana.

XI.RESULTS AND ANALYSIS (OVERALL CREATIVITY)

The analysis of Creativity of the perspective teachers and students of technical education of Haryana shows that the 30% of the respondents of controlled group (n=158) come under the category of high achievers (HA), whereas only 8% of the respondents of uncontrolled group (n=122) come under the category of high achievers (HA).



Table 9: Chi-Square Cross tabulation of Creativity of the perspective teachers and students of technical education of Haryana

			ACHIEVEMENT			Total
			1_HIGH	2_MEDIUM	3_LOW	
GROUP	CONTROLLED	Count	48	80	30	158
		Expected Count	32.7	75.6	49.7	158.0
	UNCONTROLLED	Count	10	54	58	122
		Expected Count	25.3	58.4	38.3	122.0
Total		Count	58	134	88	280
		Expected Count	58.0	134.0	88.0	280.0

Table10. Chi-Square Analysis of Creativity of the perspective teachers and students of technical education of Haryana

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	34.797a	2	.000
Likelihood Ratio	36.582	2	.000
N of Valid Cases	280		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 25.27.

The 50% of the respondents of controlled group come under the category of medium achievers (MA), and 44% of the respondents of uncontrolled group come under the category of medium achievers (MA). Only 18% of the respondents of controlled group come under the category of low achievers (LA), whereas 47% of the respondents of uncontrolled group come under the category of low achievers (LA). It is inferred from the computed results that the use of information and communication technologies (ICT) plays a key role in improving the Creativity of the perspective teachers and students of technical education of Haryana State. The calculated values of Chi-Square analysis (Chi-Square=34, Table Value=5 and df=2) has demonstrated that the use of information and communication technologies (ICT) has a significant effect on Creativity of the perspective teachers and students of technical education of Haryana State. Table 4.15 shows the crosstabulation of Creativity of the perspective teachers and students of technical education of Haryana State. Table 4.16 shows the results of Chi square analysis analyzed through statistical package for the social sciences (SPSS) 16.0. Figure 4.8 shows the bar chart indicating the response of High, Medium and Low achievement groups in Creativity of the perspective teachers and students of technical education for uncontrolled and controlled group of Haryana state. Figure 4.8 shows the graphical response of information and communication technology (ICT) on Creativity of perspective teachers and students of technical education of Haryana for controlled and uncontrolled group comprising of 158 and 122 students respectively.

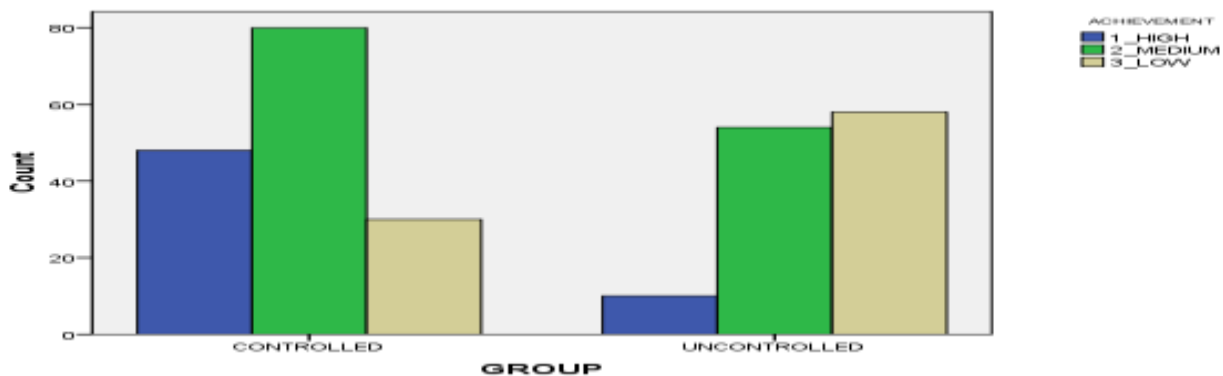


Figure 5: Bar Chart of Creativity of the perspective teachers and students of technical education of Haryana



It is inferred from the bar chart that 48 students came under the category of high achievers (HA), 80 students came under the category of medium achievers (MA) and 30 students came under the category of low achievers (LA) out of 158 students of controlled group comprising of perspective teachers and students of technical education of Haryana. On the divergent side, 10 students came under the category of high achievers (HA), 54 students came under the category of medium achievers (MA) and 58 students came under the category of low achievers (LA) out of 122 students of uncontrolled group comprising of perspective teachers and students of technical education of Haryana.

XII. CONCLUSIONS

Information and communication technology (ICT) plays an important role in enhancing the quality of life, including education. This research work is an important repercussion to provide an evidence for the effective use of Information and communication technology (ICT) tools for educational purpose.

It is inevitable that use of Information and communication technology (ICT) for educational purpose can enhance student's creativity. The Chi-Square statistics produce the evidence of the effective use of Information and communication technology (ICT) in enhancing the creativity of the perspective teachers and students of technical education.

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