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Impact of ICT on Creativity and Achievement Ability of Perspective Teachers and Students of Technical Education

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ABSTRACT: Information technology is the attainment, processing, storage and dissemination of spoken, symbolic, textual, numerical information by a micro-electronic based combination of computing and telecommunications. Communication, the exchange of ideas, has become faster, easier and more efficient due to advances in technology. Information technology plays a critical role in using technology to communicate. Information and communication technology (ICT) is universally acknowledged as an important catalyst for social transformation and national progress. Achievement and Creativity are the most strongly associated with Intellect intelligence. This research work is based upon the performance of technical students and perspective teachers with the use of Information and Communication technology. The study has been conducted on the controlled and uncontrolled group of upcoming engineers and perspective teachers taking two factors into consideration viz. Achievement and Creativity, with the sample size of 1087 and 1200 respectively. Creativity of the students was evaluated on the three parameters viz. Fluency, Flexibility and Originality. Achievement ability of Controlled and uncontrolled group was evaluated by scientific, verbal and non-verbal achievement. The results obtained by chi square statistics demonstrate the enhancement of student's intellect with the use of Information and Communication technology. In conclusion, it is accentuating that information and communication technologies (ICT) have shown a enormous impact in augmenting the Creativity and Achievement ability of perspective teachers and students of technical education. Further, from the Chi-Square analysis it is pragmatic that there is no relationship between creativity and achievement ability of the students and a Significant difference between creativity and achievement ability of male and female of Punjab, Haryana and Rajasthan was determined.

Keywords: Information and communication technology (ICT), Creativity and achievement ability, Social transformation and national progress, Chi-Square analysis

I. INTRODUCTION

The process of learning is not associated with inherent education but is dependent on creating a cooperative classroom environment, using cooperative learning groups and projects, and structuring cooperative instructional and recreational games as well [1]. Right to education is fundamental right and proper education to people will lead to a society that will progress leaps and bounds [2]. However, educators and researchers remain enthusiastic about the use of information and communication technologies (ICT) in teaching and learning. Researchers have maintained an interest in the effective prediction of student's academic achievement for many years. The prediction of academic achievement ability and examination of factors relating to the academic achievement ability are topics of great importance in the different educational levels [3]. Achievement ability refers to the student accomplishment level and the extent of learning that has been achieved within a learning environment [4]. Students acquire academic skills at different rates. Some students are fast learners and others may take a little longer to learn. There are expected norms that students should achieve by a certain age. Performance above the expected level may indicate superior learning ability, whereas significantly below the expected level may suggest learning disability. Information and communication technologies (ICT) favour the transfer of knowledge that can be codified and reduced to data [5].

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 [6] 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 [7] includes *imagination, a fashioning process, pursuing purpose, being original and judging value. Resnick* [8] 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* [9] 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* [10] 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".

Creativity is frequently with notions such as, talent spontaneity and coincidence, that is, factors that cannot be influenced or determined but ultimately are left to chance. The modern literature on creativity reveals that, although factors such as luck or chance certainly play a role, creativity in higher education may be enhanced by specific institutional and environmental situations as well as cultural factors. Change is a natural process. Technology changes at a rapid rate, which in turn increases the pace of change in all aspects of life.

Traditionally, education system finds hard to change with technology. But now, with creative use of information and communication technologies (ICT), the pace of change in education system is appreciable. Students are keener to know about new technologies than teachers. Juke [11] described the current generation of teenagers as living and operating in a *" …….. Multimedia, online, multitask, random access, colour graphics, video, audio, visual literacy world"*

It is responsibility of education, parents to encourage youth to be selective and creative in the way they deal with the mountains of data that are at their finger tips. Guidance, education and promotion of positive aspects of information and communication technologies (ICT) is required to encourage the youth.

The research problem is to find the comparative impact of information and communication technology (ICT) on creativity and achievement level of perspective teachers and students of technical education by using experimental method on controlled and uncontrolled groups. In order to investigate the impact of information and communication technology (ICT) on creativity and achievement level of perspective teachers and students of technical education, the following null hypothesis have been taken under consideration.

1. There is no significant effect of information and communication technology (ICT) on creativity level of perspective teachers and students of technical education.
2. There is no significant effect of information and communication technology (ICT) on achievement level of perspective teachers and students of technical education.
3. There is no relationship between creativity and achievement ability of perspective teachers and students of technical education.
4. There is no significant difference in achievement ability of male and female students.
5. Information and communication technology (ICT) has significant impact on creativity of students, perspective teachers and students of technical education.

II. 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 achievement ability and creativity. To analyze the comparative effect of information and communication technology (ICT) separately on creativity and achievement, 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.

3. To study the achievement ability of perspective teachers and students of technical education.
4. To study the impact of information and communication technology (ICT) on achievement ability of perspective teachers and students of technical education.
5. To study the relationship between creativity and achievement ability and impact of information and communication technology (ICT) on them.
6. To use the software for enhancing skills of perspective teachers and students of technical education.

III. BRIEF METHODOLOGY OF STUDY

The study analyzes the comparative impact of use of information and communication technologies (ICT) on creativity and achievement of students of technical education and perspective teachers. The sampled technological and educational institutions were divided into controlled and uncontrolled groups. The survey method was method to analyze the impact of this research study. The controlled group was administered by the model based and learning based information and communication technology (ICT) techniques. Model based information and communication technology (ICT) was used by demonstrating the students by video clippings and animations for the analysis of creativity. Model based information and communication technology (ICT) study was conducted by arranging a visit of the students, accompanied by the investigator and other faculty members of the concerned institutions for Pushpa Gujral Science City, Kapurthala in Punjab and B.M. Birla Planetarium in Jaipur for the analysis of scientific achievement. Learner based information and communication technology (ICT) was performed by facilitating the students by computers and internet for the analysis of verbal and non-verbal achievement. The uncontrolled group was administered by conventional teaching methods. A new test of creativity, made by Dr. Roma Paul was taken as survey instrument for the analysis of creativity. No instrument was found, based upon model based information and communication technology (ICT) study. For achievement analysis of the population undertaken for the study, self made questionnaire was designed. The validity and reliability of self made questionnaire was examined by experts. The relevant data from the perspective teachers and students of technical education was collected and statistically analyzed through Chi-Square Test simulated in Statistical Package for the Social Sciences (SPSS) software.

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. Perspective teachers and students of technical education from various regions of Punjab, Haryana and Rajasthan participated in the survey based research work. Abridged from the analysis and interpretations of the data collected from Perspective teachers and students of technical education from various regions of Punjab, Haryana and Rajasthan, it is inevitable that use of Information and communication technology (ICT) for educational purpose can enhance student's creativity and achievement ability. The Chi-Square statistics produce the evidence of the effective use of Information and communication technology (ICT) in enhancing the creativity and achievement ability of the perspective teachers and students of technical education. The proceeding section describes the tentativity of hypotheses undertaken for this research work. Further this paper summarizes with conclusions, future scope of this work and implications of this study.

IV. TENTATIVITY OF HYPOTHESES

Hypothesis 1: There is no significant effect of information and communication technology (ICT) on creativity level of perspective teachers and students of technical education.

The statistical analysis of creativity with the use of information and communication technology (ICT) on perspective teachers and students of technical education shows the following results.

The chi-square values for the analysis of fluency, flexibility and originality of the perspective teachers and students of technical education of Punjab are 46.965, 45.508 and 20.10 respectively. Analysis of Creativity of the perspective teachers and students of technical education of Punjab is 55.

The chi-square values for the analysis of fluency, flexibility and originality of the perspective teachers and students of technical education of Haryana are 70.73, 12.47 and 3.54 respectively. Analysis of Creativity of the perspective teachers and students of technical education of Haryana is 34.79.

The chi-square values for the analysis of fluency, flexibility and originality of the perspective teachers and students of technical education of Rajasthan are 25.11, 32.58 and 5.09 respectively. Analysis of Creativity of the perspective teachers and students of technical education of Rajasthan is 30.876.

The chi-square values for the analysis of fluency, flexibility and originality of the perspective teachers of Punjab, Haryana and Rajasthan are 4.115, 9.99 and 10.60 respectively. Analysis of Creativity of the perspective teachers of Punjab, Haryana and Rajasthan is 14.36.

The chi-square values for the analysis of fluency, flexibility and originality of the students of technical education of Punjab, Haryana and Rajasthan are 188.5, 119.0 and 7.74 respectively. Analysis of Creativity of the students of technical education of Punjab, Haryana and Rajasthan is 144.5.

The chi-square values for the analysis of fluency, flexibility and originality of male and female of Punjab, Haryana and Rajasthan are 29.33, 23.88 and 11.90 respectively. Analysis of Creativity of male and female of Punjab, Haryana and Rajasthan is 19.247.

The chi-square values for the analysis of fluency, flexibility and originality of perspective teachers and students of technical education of Punjab, Haryana and Rajasthan are 209.9, 129.5 and 12.51 respectively. Analysis of Creativity of perspective teachers and students of technical education of Punjab, Haryana and Rajasthan is 171.6.

All the chi-square values are quite greater. Hence, there is enough evidence to reject the null hypothesis. Information and communication technology (ICT) plays an important role in the advancements of creativity of the students. The statistical results support the work of Devi [12] and Ansari [13]. Thus the hypothesis "***There is no significant effect of information and communication technology (ICT) on creativity level of perspective teachers and students of technical education***" is completely rejected.

Hypothesis 2: There is no significant effect of information and communication technology (ICT) on achievement level of perspective teachers and students of technical education.

The statistical results for the analysis of achievement with the use of information and communication technology (ICT) on perspective teachers and students of technical education show the following results.

The chi-square values for the analysis of scientific, verbal and non-verbal achievement of the perspective teachers and students of technical education of Punjab are 212.6, 107.6 and 49.55 respectively. Analysis of Achievement of the perspective teachers and students of technical education of Punjab is 182.6.

The chi-square values for the analysis of scientific, verbal and non-verbal achievement of the perspective teachers and students of technical education of Haryana are 22.82, 9.28 and 21.24 respectively. Analysis of Achievement of the perspective teachers and students of technical education of Haryana is 12.29.

The chi-square values for the analysis of scientific, verbal and non-verbal achievement of the perspective teachers and students of technical education of Rajasthan are 81.19, 32.83 and 7.72 respectively. Analysis of Achievement of the perspective teachers and students of technical education of Rajasthan is 90.34.

The chi-square values for the analysis of scientific, verbal and non-verbal achievement of the perspective teachers of Punjab, Haryana and Rajasthan are 117.02, 62.14 and 26.152 respectively. Analysis of achievement of the perspective teachers of Punjab, Haryana and Rajasthan is 114.4.

The chi-square values for the analysis of scientific, verbal and non-verbal achievement of the students of technical education of Punjab, Haryana and Rajasthan are 100.1, 13.30 and 3.428 respectively. Analysis of Achievement of the students of technical education of Punjab, Haryana and Rajasthan is 63.69.

The chi-square values for the analysis of scientific, verbal and non-verbal achievement of male and female of Punjab, Haryana and Rajasthan are 33.88, 6.33 and 17.39 respectively. Analysis of Achievement of male and female of Punjab, Haryana and Rajasthan is 34.50.

The chi-square values for the analysis of scientific, verbal and non-verbal achievement of perspective teachers and students of technical education of Punjab, Haryana and Rajasthan are 277.2, 81.31 and 33.42 respectively. Analysis of Achievement of perspective teachers and students of technical education of Punjab, Haryana and Rajasthan is 234.7.

All the chi-square values are quite greater. Hence, there is enough evidence to reject the null hypothesis. Information and communication technology (ICT) plays an important role in the advancements of achievement ability of the students. The results obtained supports the work of Mukherjee [14], Sree [15], Singh [16], Lincoln [17], Park [18], Qadeer [19]. Hence the hypothesis ***"There is no significant effect of information and communication technology (ICT) on achievement level of perspective teachers and students of technical education"*** is completely rejected.

Hypothesis 3: There is no relationship between creativity and achievement ability of perspective teachers and students of technical education.

The chi-square results for the analysis of creativity and achievement with the use of information and communication technology (ICT) on perspective teachers and students of technical education shows the following results.

Analysis of Creativity of the perspective teachers and students of technical education of Punjab is 55. Analysis of Creativity of the perspective teachers and students of technical education of Haryana is 34.79. Analysis of Creativity of the perspective teachers and students of technical education of Rajasthan is 30.876. Analysis of Creativity of the perspective teachers of Punjab, Haryana and Rajasthan is 14.36. Analysis of Creativity of the students of technical education of Punjab, Haryana and Rajasthan is 144.5. Analysis of Creativity of male and female of Punjab, Haryana

and Rajasthan is 19.247. Analysis of Creativity of perspective teachers and students of technical education of Punjab, Haryana and Rajasthan is 171.6.
Analysis of Achievement of the perspective teachers and students of technical education of Punjab is 182.6. Analysis of Achievement of the perspective teachers and students of technical education of Haryana is 12.29. Analysis of Achievement of the perspective teachers and students of technical education of Rajasthan is 90.34. Analysis of Achievement of the perspective teachers of Punjab, Haryana and Rajasthan is 114. Analysis of Achievement of the students of technical education of Punjab, Haryana and Rajasthan is 63.69. Analysis of Achievement of male and female of Punjab, Haryana and Rajasthan is 34. Analysis of Achievement of perspective teachers and students of technical education of Punjab, Haryana and Rajasthan is 234.7.
There is a huge difference between the calculated chi-square values for the different parameters. It is inferred from the results, that there is no relationship between creativity and achievement ability of the perspective teachers and students of technical education. These results give the support to *Michael* [20]. Hence the hypothesis ***"There is no relationship between creativity and achievement ability of perspective teachers and students of technical education"*** is accepted**.**

Hypothesis 4: There is no significant difference in achievement ability of male and female students.
The chi-square results for the analysis of creativity and achievement for Male and female of Punjab, Haryana and Rajasthan, with the use of information and communication technology (ICT) for perspective teachers and students of technical education, shows following results.
Analysis of Creativity of male and female of Punjab, Haryana and Rajasthan is 19.247. Analysis of Achievement of male and female of Punjab, Haryana and Rajasthan is 34.50.
All the chi-square values are quite greater. There is a significant difference between creativity and achievement ability of male and female of Punjab, Haryana and Rajasthan. The results obtained support the work *of* Ansari [13]. Hence the hypothesis ***"There is no significant difference in achievement ability of male and female students"*** is accepted**.**

Hypothesis 5: Information and communication technology (ICT) has significant impact on creativity of students, perspective teachers and students of technical education.
The above chi-square results for the analysis of creativity and achievement for perspective teachers and students of technical education of Punjab, Haryana and Rajasthan shows the significant improvement with the use of information and communication technology (ICT). The results support the work *of* Dewett [21]. The *hypothesis* ***"Information and communication technology (ICT) has significant impact on creativity of students, perspective teachers and students of technical education"*** is completely accepted.

V. RESULTS

This research work analyzes the impact of use of information and communication technologies (ICT) on creativity and achievement ability with a sample size of 1200 and 1087 respectively. The stratified sampling technique was used to select the samples from the population. The chi-square test was employed to statistically analyze the creativity and achievement ability of perspective teachers and students of technical education. Model based and learner based information and communication (ICT) based techniques were used to teach the controlled group, whereas conventional teaching methodology was adopted for uncontrolled group.
The chi-square analysis was performed to analyze the impact of use of information and communication (ICT) on creativity viz. *fluency, flexibility and originality*. The achievement ability analysis was also performed using chi-square analysis for scientific, verbal and non-verbal achievement. The study takes about three years, which includes survey of the research, conducting practical study on different students of disciplines and of diverse states for controlled and uncontrolled groups.
It is evident from the chi-square statistics that the information and communication technology (ICT) has a significant role in the improvement of creativity and achievement ability of the perspective teachers and students of technical education.

VI. CONCLUSIONS

This survey based research work lays emphasis on the use of information and communication technology (ICT) tools for the purpose of education. Perspective teachers and students of technical education participated in this survey. Model based and learner based information and communication technology (ICT) methods have been used in this research work. It is evident from the analysis and interpretations of data and the results obtained from Chi-Square analysis that information and communication technology (ICT) plays an inevitable role in the process of

education. Two variables, viz. Creativity and Achievement ability, having further dependent variables, viz. Fluency, Flexibility, Originality, and Scientific, Verbal and non-verbal have been undertaken.
In conclusion, it is emphasized that information and communication technologies (ICT) has shown a great impact in enhancing the Creativity and Achievement ability of perspective teachers and students of technical education. Further, from the Chi-Square analysis it is observed that there is no relationship between creativity and achievement ability of the perspective teachers and students of technical education. A Significant difference between creativity and achievement ability of male and female of Punjab, Haryana and Rajasthan has been determined.
Wrapping up, the results from the research work it is concluded that the information and communication technologies (ICT) and its tools are the integral part of education for better perceptive of the prospectus and for the educational growth of the Nation.

VII. FUTURE SCOPE OF THE RESEARCH WORK

On the basis of present findings, the further research work can be furnished in the following few areas:
The present study was focused on various parameters considered for, analysis of creativity viz. Fluency, Flexibility and Originality, and various parameters considered for, Achievement analysis viz. Scientific, Verbal and non-verbal achievement.
In future work, the other parameters for the analysis of creativity and achievement ability like quantitative ability, reasoning ability, problem sensitivity, logical thinking, and communication ability can be considered to conduct the further research.
In this work, model based learning and learner based information and communication technology (ICT) techniques were used to analyze the creativity and achievement ability. In future research work, the other information and communication technology (ICT) techniques like computer assisted learning, e-learning, virtual classroom learning may be considered. Future research work can be done in the following areas of research:
(i) Similar study can be conducted with larger population taken into concern.
(ii) Similar study can be undertaken on different states, taking rural and urban population in concern.
(iii) A study of impact of information and communication technology (ICT) on achievement of learning languages at primary level of different schools of different mediums (English or Hindi) can be undertaken.
(iv) A study of impact of information and communication technology (ICT) on achievement of science and environmental studies at secondary level students of different education board of states can be undertaken.
(v) A study of impact of information and communication technology (ICT) to increase the efficiency of perspective teachers pursuing Basic School Teachers Certificate (BSTC), Nursery Teacher Training (NTT), and Elementary Teacher Training (ETT), Bachelor of Education (B.Ed.) in different states can be undertaken.
(vi) A study of creativity and achievement level of students of different technical courses, for example, home sciences, Bachelor of computer applications (BCA), Bachelor of Science (B.Sc.) in different states can be considered.
(vii) A study of creative thinking and achievement level of students pursuing management courses, for example, Bachelor of Business Administration (BBA), Masters of Business Administration (MBA) can be considered.
(viii) A study of delimitations of information and communication technology (ICT) in teaching different subjects, for example, languages, history, sciences, and social sciences at secondary levels can be considered.
(ix) A study of teaching efficiency of teachers with and without use of information and communication technology (ICT) related gadgets can be undertaken.
(x) A study of use of information and communication technology (ICT) in evaluation of different abilities of students, for example, answer writing ability, explanation abilities and problem solving abilities can be considered.
(xi) Use of information and communication technology (ICT) in evaluation of learning of different learning problems of secondary level students in rural and urban areas.

VIII. IMPLICATIONS OF THE STUDY

Even on the eve of 21st Century, the integration of information and communication technologies (ICT) is kept aloof in education. The present research work analyzes the impact of information and communication technologies (ICT) on Creativity and Achievement ability of Perspective teachers and students of Technical Education. So, the present study can be considered as the research report about the impact of integration of information and communication technologies (ICT) on Creativity and Achievement ability of Perspective teachers and students of Technical Education.
This research work reveals the effect of model based and learner based information and communication technology (ICT) techniques on creativity and achievement ability of Perspective teachers and students of Technical Education. The present study gives the implication to the following:

(i) This study will have to access the level of students, to find learning problems in different subjects, so that the information and communication technology (ICT) can be used to enhance their abilities and improve their learning.
(ii) It is helpful for students pursuing different subjects at senior secondary level and in higher studies by testing their abilities and aptitude.
(iii) This study will also be helpful to improve an individual creativity in drawing, painting, music, home science.
(iv) This study will also be helpful for managers, doctors, engineers, teachers to improve their efficiency and efficacy in their profession with the use of information and communication technology (ICT).
The computed results of the research work help to understand the effect of the use of model based and learner based information and communication technologies (ICT) on Perspective teachers and students of Technical Education with the help of various parameters considered for, analysis of creativity viz. Fluency, Flexibility and Originality, and various parameters considered for, Achievement analysis viz. Scientific, Verbal and non-verbal achievement. The statistical analysis of the collected data gives the evidence that the information and communication technologies (ICT) can enhance the learner's creativity and achievement ability.
The study clearly shows the need for the implementation of various information and communication technology (ICT) tools for the enrichment of environment in order to achieve the sustainable and prolonged creativity and achievement ability among the students to keep pace with the technological needs of the developing countries like India.
Abridged, the results obtained can help in formulating the policy for implementation of various information and communication technology (ICT) tools in education at various levels of the study.

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