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INTERACTION EFFECTS ON GENDER AND LEVELS OF ATTITUDE OF SECONDARY SCHOOL STUDENTS BY USING ICT IN LEARNING SCIENCE

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ABSTRACT

Information and communication technology (ICT) has cleared the ground for a paradigm change in the process of teaching and learning. Teachers and students have different responsibilities now, and education's purpose and philosophy have changed as well. All aspects of education benefit from the use of ICT. In recent years, research on the influence and efficacy of information and communication technologies (ICTs) in the teaching and learning of science as a secondary school topic has increased. Teachers who wish to incorporate technology into their classrooms are looking for ICT teachers. An electronic interactive whiteboard is a device that combines all of these characteristics, allowing for collaborative learning experiences for big or small groups as well as remote learning. The purpose of this study was to examine the information and communication technology (ICT) efficacy in comparing gender and attitude impacts on science learning at the secondary school level in Chikkodi city, Belagavi District, Karnataka. The researcher selected 41 students of secondary schools by purposive sampling techniques. Among them, 20 students constituted a control group and 21 students constituted an experimental group. The interaction effects of gender (male and female) and attitude level (low and high) on pre- and post-test academic achievement scores in science and its components (Physics, Chemistry, and Biology) of secondary school students in the experimental group have been determined using a 2x2 factorial design and Tukeys multiple posthoc procedures. There were four tools used in the study: the RPM test, an opinionnaire, a test of achievement, and an attitude scale. Compared to the pretest, students' results on the posttest were much better. Pre-test academic success in scientific disciplines was greater for boys and girls from high-attitude secondary schools than for boys and girls from low-attitude secondary schools. Both boys and girls from low-attitude secondary schools showed comparable pretest academic success results in science. As a result, students in secondary schools with low and high attitudes have different posttest academic achievement scores in science.

Keywords: *ICT, Science Learning, Gender and Attitude.*

Introduction

The term "Integration of Information, Communication, and Technology (ICT) in Education" refers to the incorporation of computer-based communication into the everyday teaching process in the classroom. Along with training pupils for the digital age, instructors are seen as crucial participants in integrating ICT into their regular classroom activities. This is because ICT enables the provision of a dynamic and proactive teaching-learning environment (Arnseth and Hatlevik, 2012). The purpose of education is to provide students with the skills necessary to earn a living and to contribute positively to society. Every student desires the freedom to pick his or her own method of instruction rather than being confined to more restrictive classes and rigid institutions. Every teacher wants to influence their students in some way. Modern learning theories place a premium on mastery learning and comprehension. Numerous ways of learning are offered to the pupils. Additionally, several instructional approaches are developed via study. We are moving in the direction of a learner-centered approach. ICT aided in the paradigm shift in the teaching-learning process. The roles of teacher and student have shifted, as have the purpose and philosophy of education. ICT benefits education in all of its aspects. Exposing pupils to modern technology is critical as part of their education and preparation for the future. Presenting thoughts and

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information to large or small groups of pupils has grown in appeal among instructors. ICT skills are in high demand among instructors who want to engage their pupils in technology-based learning. The electronic interactive whiteboard combines all of these characteristics, providing collaborative learning opportunities for large or small groups, as well as remote learning. Bindu (2017) states by the findings of the study it is revealed that the attitude and awareness towards class rooms by using information and communication technology case of expatriate Indian teachers in UAE both quantitative and qualitative data shows the results that the teachers gender and age had positive attitude towards using information and communication technology influences teachers gender and age with average level of awareness of information and communication technology.

The evolution of information technology reached a turning point with the development of the internet. Technologies have great potential for knowledge dissemination, effective learning, and efficient education services.

Scope of the Study

It is critical to consider the efficacy and influence of ICT in key curricular courses. In science, ICT has facilitated the development of a plethora of new applications. Simultaneously, a variety of possible advantages associated with the usage of ICT have been asserted by a variety of parties for both students and instructors (policy-makers, researchers, some teachers, employers). The study's scope is broad to improve the effectiveness of ICT in science education at the secondary school level in Chikkodi city, Belagavi district, Karnataka. Appropriate use of ICTs has been proven to stimulate the paradigmatic change in both content and pedagogy that is at the core of education reform in the twenty-first century. If ICT is developed and executed effectively, it can enhance the acquisition of knowledge and skills that prepare students for lifetime learning, as well as the usefulness of ICT in comparisons of the interaction effects of gender and attitude levels on studying science in secondary school.

Objectives of the Study

- To find out the effectiveness of Information and Communication Technology (ICT) on the academic achievement of secondary level students in science as compared to the traditional method of learning
- To study the significant interaction effects of gender (male and female) and levels of attitude (low and high) on pretest and post test academic achievement scores in the science subject of secondary school students.

Variables of the Study

The details of variables considered in this article is as follows:

- Independent Variables:
  - (i) Conventional method of Instruction
  - (ii) ICT based learning method of Instruction
- Dependent Variables:
  - (i) Academic achievement of Science.
  - (ii) Attitude towards ICT based learning.
- Moderate Variable: Gender.

Tools Used for Active Learning

The following tools were used in the study, the RPM test, an opinion questionnaire, an achievement test, and an attitude scale. Interactive whiteboards, video projection units, microscopes linked to computers, spreadsheets designed to record and model data, and CD-ROMs were all used to study, calculate, and analyze data, thus creating a platform for student inquiry, analysis, and the creation of new knowledge.

Data Analysis and Interpretation:

The interaction effects of gender (male and female) and attitude levels (low and high) on pretest academic success scores in scientific courses and their components (Physics, Chemistry, and Biology subjects) of secondary school students in the experimental group were established in this section by using the 2x2 factorial design followed by Tukey's multiple post hoc methods, and the findings are provided in the table below.

(a) **Null Hypothesis:** No significant interaction effects of gender (male and female) and levels of attitude (low and high) on pretest academic achievement scores in the science subject of secondary school students.

To test the above null hypothesis, the 2x2 factorial design or 2-way analysis of variance was performed, and the results are presented in the following table.

Table 1. Summary of 2-way analysis of variance of interaction effects of gender (male and female) and levels of attitude (low and high) on pretest academic achievement scores in science subject of secondary school students

Sources of variation	Degrees of freedom	Sum of squares	Mean sum of squares	F-value	p-value
Main effects					
Gender	1	95.41	95.41	4.1071	0.0587,NS
Attitude	1	702.31	702.31	30.2326	0.0001,S
2-way interaction effects					
Gender x attitude	1	60.31	60.31	2.5963	0.1255,NS
Error	17	394.92	23.23		
Total	20	1252.96			

Table No. 1 shows that

- The main effect of gender (male and female) on pretest academic achievement scores in science of secondary school students is found to be significant (F=4.1071, p>0.05) at the 5% level of significance. Hence, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. It can be concluded that the male and female students of secondary schools have similar pretest academic achievement scores in science.
- The main effect of attitude (low and high) on pretest academic achievement scores in science of secondary school students is found to be significant (F=30.2326, p<0.05) at the 5% level of significance. Hence, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. It can be concluded that students studying in secondary schools with low and high attitudes have different pretest academic achievement scores in science.
- The interaction effect of gender (male and female) and attitude (low and high) on pretest academic achievement scores in science of secondary school students is found to be not significant (F=2.5963, p>0.05) at the 5% level of significance. Hence, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected.

Further, to know the pairwise comparisons of the interaction effects of gender (male and female) and attitude (low and high) on pretest academic achievement scores in science of secondary school students by applying the Tukeys multiple post hoc procedures, the results are presented in the following table.

Table 2. Pairwise comparisons of interaction effects of gender (male and female) and levels of attitude (low and high) on pretest academic achievement scores in science subject of secondary school students

Interactions	Males with low attitude	Males with high attitude	Females with low attitude	Females with high attitude
Mean	18.63	28.38	19.67	37.50
SD	4.00	2.50	3.06	14.85
Males with low attitude	-			
Males with high attitude	p=0.0043,S	-		
Females with low attitude	p=0.9884,NS	p=0.0700,NS	-	
Females with high attitude	p=0.0008.S	p=0.1161,NS	p=0.0043,S	-

The results of table No.2 clearly show that

- The male students of secondary schools with low attitudes and the male students of secondary schools with high attitudes differ significantly with respect to pretest academic achievement scores in science at a 5% level of significance. It can be concluded that the male students of secondary schools with a high attitude have significantly higher pretest academic achievement scores in science as compared to the male students of secondary schools with a low attitude.
- The male students of secondary schools with low attitudes and female students of secondary schools with low attitudes do not differ significantly with respect to pretest academic achievement scores in science at the 5% level of significance. It can be concluded that, the male students of secondary schools with low attitudes and the female students of secondary schools with low attitudes have similar pretest academic achievement scores in science.
- At a 5% level of significance, male secondary school students with low attitudes and female secondary school students with high attitudes differ significantly in terms of pretest academic achievement scores in science.It can be concluded that female students of secondary schools with a high attitude have significantly higher pretest academic achievement scores in science as compared to male students of secondary schools with a low attitude.
- The male students of secondary schools with a high attitude and female students of secondary schools with a low attitude do not differ significantly with respect to pretest academic achievement scores in science at a 5% level of significance. It can be concluded that the male students of secondary schools with a high attitude and the female students of secondary schools with a low attitude have similar pretest academic achievement scores in science.
- The male students of secondary schools with a high attitude and female students of secondary schools with a high attitude do not differ significantly with respect to pretest academic achievement scores in science at a 5% level of significance. It can be concluded that the male students of secondary schools with a high attitude and the female students of secondary schools with a high attitude have similar pretest academic achievement scores in science.
- Female secondary school students with low attitudes and female secondary school students with high attitudes differ significantly in pretest academic achievement scores in science at the 5% level of significance. It can be concluded that male and female secondary school students with a positive attitude have significantly higher pretest academic achievement scores in science than female secondary school students with a negative attitude.

(b) Null Hypothesis: There were no significant interaction effects of gender (male and female) and levels of attitude (low and high) on posttest academic achievement scores in the science subject of secondary school students. To test the above null hypothesis, the 2x2 factorial design or 2-way analysis of variance was performed, and the results are presented in the following table.

Table 3. Summary of 2-way analysis of variance of interaction effects of gender (male and female) and levels of attitude (low and high) on posttest academic achievement scores in science subject of secondary school students

Sources of variation	Degrees of freedom	Sum of squares	Mean sum of squares	F-value	p-value
Main effects					
Gender	1	29.64	29.64	2.5049	0.1319,NS
Attitude	1	381.64	381.64	32.2514	0.0001,S
2-way interaction effects					
Gender x attitude	1	10.26	10.26	0.8667	0.3649,NS
Error	17	201.17	11.83		
Total	20	622.71			

The findings of table No.3 demonstrate unequivocally that:

- The main effect of gender (male and female) on posttest academic achievement scores in science of secondary school students is found to be significant ($F=2.5049$, $p>0.05$) at the 5% level of significance. Hence, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected. It can be concluded that the male and female students of secondary schools have similar posttest academic achievement scores in science.
- The main effect of attitude (low and high) on posttest academic achievement scores in science of secondary school students is found to be significant ($F=32.2514$, $p<0.05$) at the 5% level of significance. Hence, the null hypothesis (H_0) is rejected and the alternative hypothesis (H_1) is accepted. It can be concluded that students studying in secondary schools with low and high attitudes have different posttest academic achievement scores in science.
- The interaction effect of gender (male and female) and attitude (low and high) on posttest academic achievement scores in science of secondary school students is found to be not significant ($F=0.8667$, $p>0.05$) at the 5% level of significance. Hence, the null hypothesis (H_0) is accepted and the alternative hypothesis (H_1) is rejected.

Findings from the study

- Male students of secondary schools with a high attitude have significantly higher pretest academic achievement scores in science as compared to male students of secondary schools with a low attitude.
- Male students of secondary schools with low attitudes and female students of secondary schools with low attitudes have similar pretest academic achievement scores in science.
- Female students of secondary schools with a high attitude have significantly higher pretest academic achievement scores in science as compared to male students of secondary schools with a low attitude.
- Male students of secondary schools with a high attitude and female students of secondary schools with a low attitude have similar pretest academic achievement scores in science.
- Male students of secondary schools with a high attitude and female students of secondary schools with a high attitude have similar pretest academic achievement scores in science.
- Female students of secondary schools with a high attitude have significantly higher pretest academic achievement scores in science as compared to female students of secondary schools with a low attitude.
- Male and female students of secondary schools have similar posttest academic achievement scores in science.
- Students studying in secondary schools with low and high attitudes have different post-test academic achievement scores in science.

Discussion and Conclusion

Students had shown high scores in the post-test compared to the pre-test. Boys and girls from secondary schools with a high attitude showed higher pretest academic achievement in science subjects than boys from secondary schools with a low attitude. Both boys and girls from secondary schools with low attitudes had similar pretest academic achievement scores in science. Hence, one can state that students studying in secondary schools with low and high attitudes have different posttest academic achievement scores in science. Students who used ICT to study science subjects in secondary schools were extremely enthusiastic about the possibilities of the technology, and a lot of them were inspired in their lessons and had gained confidence from the fact that the concept clarity was reliable and easy to understand. Observations also indicate that designing lessons around ICT can help educators streamline their preparations and be more efficient in ICT integration, thereby enhancing their overall productivity.

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