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Research Article

A Study of Effectiveness of Teaching Through E-Content On - The Educational Achievement of The Students in Chemistry Subject in The Selected Corporation Higher Secondary Schools in Greater Chennai

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ABSTRACT

Student learning skills are used to acquire new knowledge in classroom settings. The phrase "learning skills" encompasses the abilities necessary to gain new skills and information, particularly in formal learning environments. Learning skills are classified into various subcategories, including information and communication skills, which are frequently related with literacy; thinking skills and problem solving; and interpersonal skills and self-regulation. Chemistry and other science learning abilities must be separated from the aforementioned subcategories. Empirical and Analytical type of research has been used for the present study. This type of research aims to define the conditions and characteristics of the subjects' studies. The research data were examined from 350 corporation higher secondary students from Greater Chennai which were examined on their performance on chemistry test before conducting traditional teaching and after conducting e-content learning. The outcome of the research shows that chemistry learning skills of female students are significantly higher than the male students, with a higher average mark of female student is high compare to male student with their mean scores. Student from Class XII is comparatively good in chemistry learning skills compare to students from class XI. Students learning chemistry through e-Content is more satisfactory in both traditional teaching and e-Content learnings. Hence, corporation higher secondary school in Chennai city can use more of e-Content learning material for the development of student in learning chemistry subject.

Key Words: Learning, Communication, e-Content, Chemistry and Interpersonal.

INTRODUCTION

The present research emphasizes more on the current state of education in the selected corporation schools in Greater Chennai in the subject of chemistry. The years after COVID-19 have shifted the perception of teaching from conventional instruction to digital teaching. Online platform has changed the method of learning with flexibility learning methods (Echeverría et al., 2022). The pandemic has impacted the learning process and have both positive and negative effect (Jones, 2023).

Education professionals are concerned about the pandemic's influence on student-teacher relationships. The introduction of online learning causes changes in learning habits, which have a greater impact on student learning outcomes, accomplishments, and emotional well-being (Bond et al., 2021; Chakraborty et al., 2020; Cranfield et al., 2021). As a result, many students endure significant loss of learning and topic comprehension abilities (Donnelly & Patrinos, 2022; Händel et al., 2022).

The current learning is still concentrating on 21st century abilities of learning and teaching, but this has evolved considerably since post-pandemic learning with the advent of technology and the establishment of a larger learning environment (Bozgun et al., 2022). The goal of 21st century education is to create learning and innovation abilities, as well as life and job skills in information processing, media, and technology (Wetchasit

et al., 2020). However, achieving this goal will need more effort following the epidemic. Erkut (2020), Lin (2021), and Özalkan (2021) all emphasize the need of face-to-face or mixed learning.

Following the implementation of face-to-face learning in Indonesia, the curriculum underwent changes. Thus, chemistry learning for students is quite similar to the chemistry teacher's engagement with the material. According to Remillard (2005), this connection has various features. First, chemistry instructors are encouraged to use active and participatory curricular materials by interpreting, evaluating, and adapting curriculum materials. Second, chemistry instructors participate in curriculum development to encourage reform-oriented methods in the classroom. Third, instructors are oriented on their ability to lead learning through curriculum implementation, which includes methodology, content, and knowledge. The first aspect has one dimension, which covers habitual use. The second part consists of two dimensions: scientific inquiry and science, as well as technology, society, and the environment. Finally, the third part covers the teacher learning dimension, which is more closely tied to teacher interaction in training students' chemistry learning skills (Chen et al., 2019).

In the classroom, students apply their learning skills to obtain new knowledge (Sam, 2013). The phrase "learning skills" encompasses the abilities necessary to gain new skills and information, particularly in formal learning environments. Learning skills are classified into numerous subcategories, including information and communication skills, which are frequently related with literacy; thinking skills and problem-solving; and interpersonal skills and self-regulation (Higgins et al., 2007). Chemistry and other science learning abilities must be separated from the aforementioned subcategories.

Learning skills can be measured via exams, observations, or a self-assessment questionnaire (Higgins et al., 2007). To collect vast amounts of learning skills data, we may employ self-assessment with a questionnaire, which can offer information on how students learn, think, and behave (Escolà-Gascón & Gallifa, 2022).

Corporation Higher secondary school students self-evaluate their learning skills on five dimensions: responsibility, organization, independent work, participation in group work, and initiative. The five dimensions use 21st-century education abilities to deal with rapid, turbulent, and unpredictable change (Dishon & Gilead, 2021). As a result, the five characteristics of learning skills indicated above are relevant to high school pupils' cognitive abilities. More research is needed to analyze students' learning abilities, particularly in the area of chemistry. The evaluation focuses on accomplishing learning goals and implementing an independent school curriculum, despite the fact that analyzing learning skills is required to design programs that lead to the accomplishment of learning objectives.

This study is conducted with the primary objective of Chemistry learning Skills of Corporation Higher secondary schools students in Greater Chennai.

RESEARCH METHODOLOGY

Research Type

Empirical and Analytical type of research has been used for the present study. This type of research aims to define the conditions and characteristics of the subjects studies.

Research Sample

The research data were examined from 350 Corporation higher secondary students from Greater Chennai which were examined on their performance on chemistry test before conducting traditional teaching and after conducting e-content learning. The demographic profile of the sample consists of their gender, class, learning study, interests, school location and school status.

Table: Profile of the Students

Profile	Group	N	Percentage
Gender	Male	198	56.571
	Female	152	43.429
Class	Class XI	135	38.571
	Class XII	215	61.429
Learning Method	Lab class	224	64.000
	e-Content	45	12.857
	Lab class and e-Content	81	23.143
Motivation	Low	188	53.714
	Moderate	94	26.857
	High	68	19.429

Research Instruments

The present study adopted structured questionnaire that measures Chemistry learning skills which are derived from previous studies and related literature namely Organisation, Independent work, Initiative, Responsibility, Collaborative group Work. A total of 25 question were developed, consisting behavioural and learning

statements. The statements are measures with five point Likert scale of strongly agree to strongly disagree with weightage of 5,4,3,2 and 1.
The research questionnaire was first validated through penal experts in the field of Chemistry education. All the statement were identified based on their importance measured dimensions. After analysis, each dimensions had good reliability and constancy of the scale used in measurement of the knowledge of student. Organisation(five Statement, α = 0.822), Independent work(five Statement, α = 0.788), Initiative(five Statement, α = 0.792), Responsibility(five Statement, α = 0.842), Collaborative group Work(five Statement, α = 0.798).

DATA ANALYSIS TECHNIQUE

The response of the student on each dimensions were tabulated and the average has been calculated. The analysis used t-test and ANOVA with support of SPSS software (IBM SPSS 24).

DATA ANALYSIS AND INTERPRETATION

Significant difference between gender group in all dimensions of Chemistry Learning Skills. Female students reveals good average in Chemistry Learning Skills compare to male students in both traditional teaching method and e-content teaching methods. The summary of descriptive statistics with Mean and Standard deviation for both the gender group on five CLS dimensions are shown in table.

Table: Significant difference between Gender group in Dimensions of CLS

Dimensions of CLS	Gender	Traditional Learning		e-Content Learning		P value
		Mean	SD	Mean	SD	
Organisation	Male	3.030	0.817	4.090	0.949	0.000**
	Female	3.970	0.888	4.120	0.846	
Independent work	Male	3.890	0.847	3.750	0.918	0.000**
	Female	3.990	0.936	4.260	0.753	
Initiative	Male	3.720	0.959	3.760	0.888	0.000**
	Female	3.880	0.855	4.000	0.767	
Responsibility	Male	3.900	0.900	3.460	0.789	0.000**
	Female	3.980	0.868	3.990	0.692	
Collaborative group Work	Male	3.090	0.871	3.130	0.819	0.000**
	Female	3.950	0.899	3.970	0.782	

The test result shows the there is significant difference between gender group in Organisation dimensions of chemistry learning in both traditional learning and e-Content learning. Female shows higher organisational attachment in learning chemistry subject at both traditional learning and e-Content learning compare to male student. Significant difference between gender group in independent work dimensions of chemistry learning in both traditional learning and e-Content learning has been identified. Female shows higher independent work in learning chemistry subject at both traditional learning and e-Content learning compare to male student. significant difference between gender group in Initiative dimensions of chemistry learning in both traditional learning and e-Content learning has been identified. Female shows higher independent work in learning chemistry subject at both traditional learning and e-Content learning compare to male student. There is significant difference between gender group in responsibility dimensions of chemistry learning in both traditional learning and e-Content learning has been identified. Female shows higher responsibility in learning chemistry subject at both traditional learning and e-Content learning compare to male student. There is significant difference between gender group in Collaborative group Work dimensions of chemistry learning in both traditional learning and e-Content learning has been identified. Female shows higher collaborative group work in learning chemistry subject at both traditional learning and e-Content learning compare to male student.

Table: Significant difference between Class studying group in Dimensions of CLS

Dimensions of CLS	Class	Traditional Learning		e-Content Learning		P value
		Mean	SD	Mean	SD	
Organisation	XI	25.859	2.757	27.444	2.517	0.000**
	XII	26.500	3.055	26.303	2.954	
Independent work	XI	25.525	2.610	25.042	2.675	0.000**
	XII	25.632	2.891	25.106	2.614	
Initiative	XI	16.494	2.534	17.039	2.236	0.000**
	XII	17.279	2.143	16.595	2.121	
Responsibility	XI	16.513	2.261	17.123	2.231	0.000**

	XII	17.000	2.285	16.685	2.579	
Collaborative group Work	XI	27.346	2.785	25.456	2.635	0.000**
	XII	25.456	2.635	26.154	2.852	

The test result shows the there is significant difference between class studying group in Organisation dimensions of chemistry learning in both traditional learning and e-Content learning. Student from class XII shows higher organisational attachment in learning chemistry subject in traditional learning and compare to e-Content learning. Significant difference between class studying group in independent work dimensions of chemistry learning in both traditional learning and e-Content learning has been identified. Student from XII class shows higher independent work in learning chemistry subject at both traditional learning and e-Content learning compare to male student.

Significant difference between class studying group in initiative dimensions of chemistry learning in both traditional learning and e-Content learning has been identified. Student from XII class shows higher initiative in learning chemistry subject at traditional learning and while student from XI class shows higher initiative in learning chemistry subject at e-Content learning. Significant difference between class studying group in responsibility dimensions of chemistry learning in both traditional learning and e-Content learning has been identified. Student from XII class shows higher responsibility in learning chemistry subject at traditional learning and while student from XI class shows higher responsibility in learning chemistry subject at e-Content learning. Significant difference between class studying group in Collaborative group Work dimensions of chemistry learning in both traditional learning and e-Content learning has been identified. Student from XI class shows higher Collaborative group Work in learning chemistry subject at traditional learning and while student from XII class shows higher Collaborative group Work in learning chemistry subject at e-Content learning.

Table: Significant difference among Learning Method group in Dimensions of CLS

Dimensions of CLS	**Learning Methods**	**Traditional Learning**		**e-Content Learning**		**P value**
		Mean	**SD**	**Mean**	**SD**	
Organisation	Lab class	23.094	4.037	21.979	4.554	0.000**
	e-Content	21.929	4.619	23.163	4.146	
	Lab class and e-Content	21.888	4.625	22.167	4.780	
Independent work	Lab class	15.988	2.486	22.511	4.736	0.000**
	e-Content	15.379	3.204	19.571	4.198	
	Lab class and e-Content	15.638	2.522	22.318	4.461	
Initiative	Lab class	11.706	1.993	15.088	3.025	0.000**
	e-Content	11.507	2.144	16.364	2.921	
	Lab class and e-Content	11.413	2.036	15.640	2.635	
Responsibility	Lab class	15.577	2.139	15.936	2.665	0.000**
	e-Content	15.886	2.882	13.857	3.671	
	Lab class and e-Content	15.708	2.992	15.648	2.820	
Collaborative group Work	Lab class	15.815	1.902	15.746	2.768	0.000**
	e-Content	15.436	3.168	15.586	2.934	
	Lab class and e-Content	16.140	2.305	15.050	2.724	

The test result shows the there is significant difference among learning method group in Organisation dimensions of chemistry learning in both traditional learning and e-Content learning. Student learning chemistry in lab shows higher organisational attachment in learning chemistry subject in traditional learning while those learning chemistry through e-Content shows higher organisational attachment in learning chemistry subject in e-Content learning. There is significant difference among learning method group in independent work of chemistry learning in both traditional learning and e-Content learning. Student learning chemistry in lab shows higher Independent work in learning chemistry subject in traditional learning while those learning chemistry through e-Content shows higher Independent work in learning chemistry subject in e-Content learning.

There is significant difference among learning method group in Initiative of chemistry learning in both traditional learning and e-Content learning. Student learning chemistry in lab class shows higher Initiative in learning chemistry subject in traditional learning while those learning chemistry through e-Content shows higher Initiative in learning chemistry subject in e-Content learning. There is significant difference among learning method group in Responsibility of chemistry learning in both traditional learning and e-Content learning. Student learning chemistry in e-Content class shows higher responsibility in learning chemistry subject in traditional learning while those learning chemistry through e-Content shows higher responsibility in learning chemistry subject in e-Content learning.

RESULTS AND DISCUSSION

Several studies have shown the effect of gender on academic achievement. Cognitive, psychomotor, and affective domains are registered to be affected by gender differences. A survey conducted by Lowrie and Jorgensen (2011) shows that gender differences make a difference in learning attitude, which correlates with learning achievement. In the learning process, female students' motivation is higher than that of male students, which also connects with learning skills (Chang & Chung, 2017; Schatt, 2011) . In contrast, Naz et al. (2020) research shows male students are more extrinsically motivated than female students.

Research on the learning abilities of female and male students, particularly while studying chemistry, has yet to be widely published. Gender has been shown to influence various learning skills, such as social and numerical abilities. In accordance with our findings, female students reported better study abilities than male students (Räsänen et al., 2021). This disparity is most likely due to female students' tastes, which differ from male students. Male students often dominate creative thinking and social skills, whilst female students excel in analytical and technical skills. Characteristics of learning chemistry that require more analytical skills and technical skills, such as in carrying out investigative processes or laboratory work. In addition, it is known that female students' interest in learning chemistry is higher than that of male students. Students with a high interest in learning tend to use their learning skills to make academic achievements (Karpudewan & Heng, 2015).

Female shows higher organisational attachment in learning chemistry subject at both traditional learning and e-Content learning compare to male student.. Female shows higher independent work in learning chemistry subject at both traditional learning and e-Content learning compare to male student. Female shows higher independent work in learning chemistry subject at both traditional learning and e-Content learning compare to male student. Female shows higher responsibility in learning chemistry subject at both traditional learning and e-Content learning compare to male student. Female shows higher collaborative group work in learning chemistry subject at both traditional learning and e-Content learning compare to male student.

Student from class XII shows higher organisational attachment in learning chemistry subject in traditional learning and compare to e-Content learning. Student from XII class shows higher independent work in learning chemistry subject at both traditional learning and e-Content learning compare to male student. Student from XII class shows higher initiative in learning chemistry subject at traditional learning and while student from XI class shows higher initiative in learning chemistry subject at e-Content learning. Student from XII class shows higher responsibility in learning chemistry subject at traditional learning and while student from XI class shows higher responsibility in learning chemistry subject at e-Content learning. Student from XI class shows higher Collaborative group Work in learning chemistry subject at traditional learning and while student from XII class shows higher Collaborative group Work in learning chemistry subject at e-Content learning.

Student learning chemistry in lab shows higher organisational attachment in learning chemistry subject in traditional learning while those learning chemistry through e-Content shows higher organisational attachment in learning chemistry subject in e-Content learning. Student learning chemistry in lab shows higher Independent work in learning chemistry subject in traditional learning while those learning chemistry through e-Content shows higher Independent work in learning chemistry subject in e-Content learning. Student learning chemistry in lab class shows higher Initiative in learning chemistry subject in traditional learning while those learning chemistry through e-Content shows higher Initiative in learning chemistry subject in e-Content learning. Student learning chemistry in e-Content class shows higher responsibility in learning chemistry subject in traditional learning while those learning chemistry through e-Content shows higher responsibility in learning chemistry subject in e-Content learning.

CONCLUSION

The outcome of the research shows that chemistry learning skills of female students are significantly higher than the male students, with a higher average mark of female student is high compare to male student with their mean scores. Student from Class XII is comparatively good in chemistry learning skills compare to students from class XI. Students learning chemistry through e-Content is more satisfactory in both traditional teaching and e-Content learnings. Hence, corporation higher secondary school in Chennai city can use more of e-Content learning material for the development of student in learning chemistry subject.

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