CELL (BIOLOGY)-WIKIPEDIA LEARNING PERFORMANCE IN RELATION TO COGNITIVE STYLES, LEARNING STYLES, AND SCIENCE ABILITY OF STUDENTS: A HIERARCHICAL MULTIPLE REGRESSION ANALYSIS

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Abstract: The present study assessed the effect of independent variables (*i.e.* cognitive style, science ability, learning styles, Wikipedia) on dependent variable (*i.e. learning performance*) in relationship with the independent variables (*i.e. cognitive styles, science ability, & learning styles*). For that purpose, the researchers randomly selected two English medium secondary schools in Silchar Town. Similarly, out of more than twenty-five secondary schools having five thousand students, the researcher randomly selected 10 students and assigned five students to the control group and five students to the experimental group to conduct the experiment. Non-Equivalent Pretest-Posttest Quasi Experimental Design based on Regression Analysis used and assessed the effect of independent variables. It was found that Learners' cognitive styles (e.g., extraversion, sensing, thinking and judging) were hierarchical significant relationship with Wikipedia learning performance, but learners' feeling has no significant relationship with Wikipedia learning performance.

Key words: Cell; Cognitive Styles; Learning Styles; Science Ability**;** Wikipedia Learning

Introduction

In this 1st century, classroom teaching learning process is some extent digitalized and teachers are regulating the classes with internet and other virtual Medias. The traditional classes are teacher active where teacher are the sole authority to regulate the classes but teacher sometimes neglect the students' self- reading habits, attitude, learning styles and cognitive style those are directly or indirectly influence the leaning performance. Researchers found that cognitive styles directly influence the achievement (e.g. Altun & Cakan, 2006). Researchers like Bassey, et al (1986) and Carolina, et al (2012) found that cognitive styles influence the academic achievement of university and secondary school students. Similarly, learning ability also a factor promotes achievement (Lund and Smordal

2006). Learners' science ability is the important factor encourages the learners' to learn science. Researchers like-Ayotola & Adedeji,2009 and John & Ademla, 2014 found that science ability, scientific attitude are directly related with learners' gander, age, mental ability, anxiety, self efficiency and achievement. In this virtual learning era, Wikipedia is a common and easily available learning tool to acquire more and more knowledge in the unreal classroom situation. Wikipedia is an internet facilitated online reading material helps maximum for self-reading, and high achievement. Researcher like Almekhlafi, (2006) and Wang et.al (2005) found that wave based collaborative Wikipedia learning helps maximum to the student for self-reading and group learning. Similarly, Wikipedia learning is a virtual learning medium help learner to get online learning benefit.

Cognitive style, learning style & achievement

Cognitive style is the personal feelings, emotion, and attitude towards the teaching learning process; however, cognitive styles and achievement are directly related (Kenth, 2011). Cognitive style is a personal characteristic associates with the student's profession, and selection of job (Witkin, 1973). Similarly, literature found, cognitive style is direct related with gander, academic specialization, attitude towards reading and academic performance (Ahmadzade & Shojae, 2013; Rao, 2014; Sharma, 2013). First, the term cognitive style was traditionally used more with respect to this line of research than to some of the other lines of research described in the following sections, in which other terminology (e.g., learning styles, personal styles) was more common. Cognitive style examines individual differences operating at the basic or early stages of information processing, including perception, concept formation, sorting, and categorization. Cognitive style or "thinking style" is a term used in cognitive psychology to describe the way individuals think, perceive, and remember information. Cognitive style differs from cognitive ability (or level), the latter being measured by aptitude tests or so-called intelligence tests. Goldstein and Blackman define it as "a hypothetical construct that has been developed to explain the process of mediation between stimuli and responses. The term cognitive style refers to characteristic ways in which individuals conceptually organize the environment. Some postulate that cognitive style is a bridge between cognition/intelligence measures and personality measures and it is multiple in nature, having an "either or" measure, where the absence of one characteristic implies the presence of its extreme (Ridding & Cheema, 1991). This is in opposition to personality measures that are more multifaceted (Sternberg & Grigorenko, 1997). Learning style is also sometimes synonymous with cognitive style (Pask, 1976) while others disagree stating that learning style is a preferred strategy, thereby implying that a person can change learning style, while cognitive style is an immutable characteristic of personality (Roberts & Newton, 2001).

Science ability and achievement

Science ability is the effort to learn science or having positive attention towards the science. Literature found that scientific attitude could influence science achievement of senior secondary school students (John & Ademla 2014). Achievement of students could be predicted through science ability (Finn et.al 2014).

Concept of Wikipedia and its educational applications

Wikipedia is online software needs log in for edition and deletion of content regarding the teaching learning process. Wiki is a collaborative workspace in which information can be gathered, shared, evaluated, organized or used to produce something new. Wikipedia is a multilingual, web-based, free-content encyclopaedia supported by the Wikimedia foundation and based on a model of openly editable content. The name 'Wikipedia" is a portmanteau of the words Wiki (a technology for creating collaborative websites, from the Hawaiian word wiki, meaning " quick") and encyclopaedia. Wikipedia's articles provide links designed to guide the user to related pages with additional information. Largely anonymous volunteers who write without pay write Wikipedia collaboratively. Wiki is a piece of sever software that allows users to freely create and edit web page content using any web browser. It supports hyperlinks and has simple text syntax for creating new pages on the fly. It is a fully editable website whose content can be edited by anyone who has access to it. Wiki is a great tool to use in education because of its numerous features.

Wikipedia has following educational implication

- It is software, contents programmers those use for self-learning.
- Wikipedia is incomplete self-reading tool needs regular clarification, addition, deletion by experts.
- Most of the Wiki hosting platforms are free.
- It does not require HTML or other programming languages.
- Anyone can access as well as manage with an Internet connection.
- Wiki is collaborative platform for students and educators involved in a learning process.

Significance of the study

In the recent study, cognitive styles, learning styles and science abilities are the independent variables whereas achievement is a dependent variable. Similarly, Wikipedia learning was the virtual learning tool or instructional model become an independent variables. Achievement depends on learner's cognitive style, learning styles and science ability, and methods of instruction. Almekhlafi (2006) found computer assisted learning improved English performance among pre-school students. Similarly, Wang, et al (2005) & Lund (2006) found collaborative technology based wiki learning technology is naturally beneficial for learning. In fact, it was found that technology rich collaborative environment and application of media wiki recently helpful to the learners. Ganapathy et al, 2006 assessed that collaborative wiki technology based learning and found it has significant relationship with learning performance or achievement. Xiao & Lucking (2008) found students were satisfied with Wikipedia environment. Similarly, Azher et al (2014) found internet addiction and anxiety among students have positive relationship. Sahin et al. (2010) used internet in University classes and found student have positive attitude and increased achievement rate over traditional learning. Al-Salameh (2011) studied the future of e-education and found that technology in education increased the students' knowledge intact capacity. However, cognitive style directly related with students' achievement (Altun and Cakan ,2006). A path analysis revealed that learning strategies were significantly contributed to academic achievement (Carolina et al., 2012). In fact, cognitive style, secondary school students'

attitude and academic achievement in Chemistry were co-related (Bassey et al,1986). Witkin (1973) studied the role of field dependent and academic achievement found that cognitive style was highly related with academic achievement. Similarly, Science ability was directly related with science learning and students' achievement. John & Ademla (2014) found Science attitude and Science Achievement are dependent. Narmadha and Chamundeswari (2013) found science ability and attitude are related with science achievement.

From the above discussion, it was very difficult to determine whether cognitive style is related with Wikipedia learning performance or not. If so, then how cognitive style is related with Wikipedia learning performance. Based on literatures availability, the results are unclear, and therefore, it is essential to investigate its significance. That is why the present study is undertaken.

Research questions

Is it possible to assess, learners' cognitive style, and science ability, if possible, then how these cognitive style and science ability affect the learning performance? Whether virtual learning environment, and its learning performance of student affected by the cognitive style and science affect the Wikipedia learning of performance of secondary school student.

Objectives

1. To study the effect of Wikipedia learning over traditional approach.
2 To study the hierarchical relationship between cognitive styles and learning performance of traditional group students.
3: To study the hierarchical relationship among science ability, learning style and traditional learning performance of students
4 To study the hierarchical relationship between cognitive style and Wikipedia learning performance of students.
5 To study the hierarchical relationship among science ability, learning style and Wikipedia learning performance.

Hypotheses

H1: There is a significant effect of Wikipedia learning over traditional approach.

H2 There is a significant hierarchical relationship between cognitive Styles and learning performance of traditional group students.
H3: There is significant hierarchical relationship among science ability, learning style and traditional learning performance of students
H4 There is a significant hierarchical relationship between cognitive style and Wikipedia learning performance of students.
H5 There is a significant hierarchical relationship among science ability, learning style and Wikipedia learning performance.

Methodology

Population

The population of the present study involves all the secondary schools of Silchar Town and all the secondary students studying in class IX.

Sample

The present study assessed the effect of independent variables (*i.e.* cognitive style, science ability, learning styles, Wikipedia, and you tube) on dependent variable (*i.e. learning performance*) in relationship with the independent variables (*i.e. cognitive styles, science ability, & learning styles*). For that purpose, the researchers randomly selected three English medium secondary schools of Silchar Town. Similarly, out of more than twenty-five secondary schools having five thousand students, the researcher randomly selected 10 students and assigned five students for the control group and 5 students for the experimental group to conduct the experiment. The population and sample design is shown in Figure No- 1.1

Figure-1.1 population and sample design
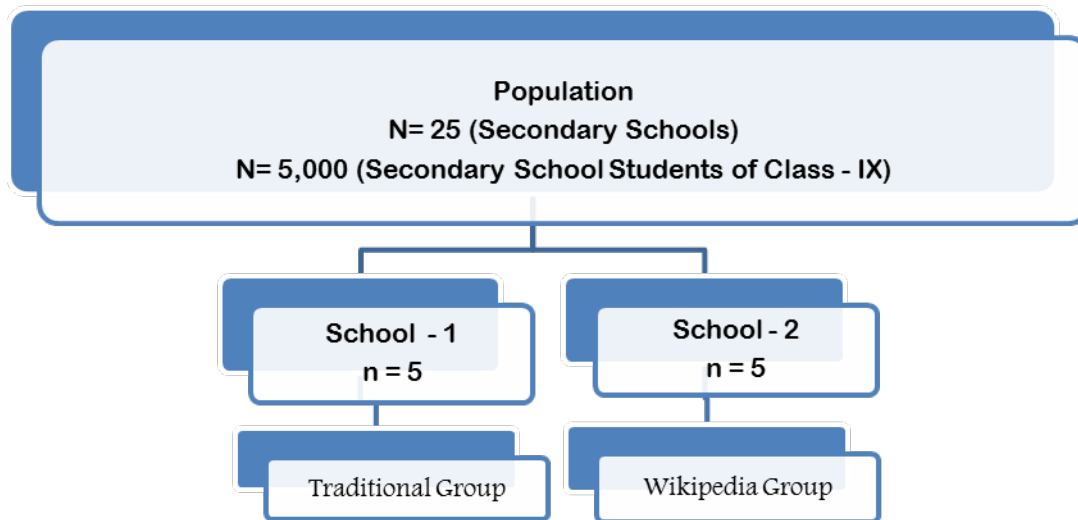
Design of the study

The present study was a ***Non-Equivalent Pretest-Posttest Quasi Experimental Design*** based on ***Regression Analysis*** assessed the effect of independent variables. The participants were randomly selected, and assigned to the control and experimental classes. A pre-test was administered to both the control and experimental group participants to know their previous knowledge and understanding on "cell". Control group was taught through traditional approach and experimental group was exposed to Wikipedia reading on "cell". During the Cell Pre-test, a Learning Style Inventory, a Science Ability Test and a Cognitive Style Questionnaire was administered to evaluate the previous knowledge, their selection learning style, ability to learn science and different cognitive styles among the participants. However, Learning Style Inventory identified participants' styles of learning. During the Wikipedia reading, the researcher facilitated the learner how to link and read the concepts to frame the propositions. In this research, achievement was the dependent variable whereas cognitive style, science ability, learning style and Wikipedia was independent variable. The researchers have tried to control the extraneous variable such as testing,

maturation, regression effect through statistical techniques and random sample techniques. The overall design of the study is shown in the Box 1.

Box 1 Design of the study

Sl. no	Group	Pre Intervention Test	Treatment	Post Intervention test
1	Traditional(n=5)	Achievement Test Cognitive Style Questionnaire Science Ability Test Learning Style Inventory	Traditional	Achievement Test
2	Wikipedia (n=5)	Achievement Test Cognitive Style Questionnaire Science Ability Test Learning Style Inventory	Online Wikipedia	Achievement Test

Tools

In the present study, the researcher has used four tools, which were self-developed and standardized.

Cell Test

Cell test was an achievement test developed by following the steps of standardization of the tool. At the planning and preparation stage of the test, 30 items were prepared by using table of specification. A group of experts of life science, education and measurement and evaluation reviewed the items and finally 15 multiple choice type items were accepted through primary, secondary are final tryout. The content validity ratio was (CVR=.60) and Cronbach α reliability test found .75. To access the students' previous knowledge, and understanding on CELL, this test was administered as a pre-test and post test. The test contains 15 items having a correct answer and two powerful destructors.

Science Ability Test

Science ability test was a self-developed tool having 10 statement form items. It is a Likert type test having 5 responses, like strongly agree (SA), agree (A), undecided (UN), disagree (D), strongly disagree (SD) like options. All the items were based on individual's thinking, belief, analogy, skill and practice of science. During the development of the tool, the research has followed the standardized procedure of Likert test. The average content validity ratio (CVR=.60) and Split- Half reliabity co-efficient was 0.75.To assess the students' science ability, the researcher has administer the test as a pre-test. One's the tools were administer before instruction to access the relationship between science ability and effect of Wikipedia and YouTube learning over traditional approach.

Cognitive Style Questionnaires

The researcher developed the cognitive style questionnaire by following all the standardized steps. The test was set of question, design to access, individual cognitive style. They are 30 items in the tool and each has two responses but both responses have two rates by the individual out of 5 points. The items are total 8 categories, such as extraversion (2b+ 5b+8a+15a+19a+20b), introversion(2a+5a+8b+15b+11a+12B+17b+25a+29a+30b), intuitive

(4a+9b+11b+12a+17a+25b+29b+30a),   thinking   (1b+7b+13b+16a+22b+24a+26a+27b),   feeling (1a+7a+13a+16b+22a+24b+26a+27a),   Judging   (3a+6b+10a+14b+18a+20b+23a),   perceiving (3b=6a+10b=14a+18b+20a+23b). If 1 is more than 4 point larger than other ,i.e., a type of cognitive style for example if an individual score 25 on extroversion and 15 on introversion then these individuals are extrovert. Similarly, if the scores are less than 5 points apart then the individual are in between extrovert and introvert. The content valid ratio was found (CVR 0.60) and KR[20] Reliability found 0.70.

Learning Style Inventory

A self-developed learning style questionnaire was developed having 24 items and three options each (i.e. often, sometimes and seldom). The researcher has identified four basic learning styles among the students. These are deep learning styles, surface learning styles, strategic learning styles, and apathetic learning styles. Factor Analysis Technique used during the preparation of the items. The content valid ratio was found (CVR 0.62) and Split half Reliability found 0.72.

Procedure of experiment

The procedure of experiment has 4 basic components, such as
 i. Participants for the 2 groups (i.e., Traditional group, and Wiki group).
 ii. Activities for each group.
 iii. Administration of cognitive style and science ability test.

For the present study, the researcher has randomly selected a school from the population for the experiment. Out f three sections of 9th class of that school, the researcher has assign the section A five students for traditional learning, and five students for Wikipedia learning from section B. Those participants where willingly attended the course.

Activity I

A traditional group having 5 students learn Cell Concept, structure & function of cell, component of the cell of cell organelles through the traditional lecture method. The researcher has pre-planned all the teaching points and completed these within 7 contact hours. Before these instructions, cognitive styles, learning styles and science ability questionnaire were administered among the students.

Activity II How to read Wikipedia

School 2 was assigned Wikipedia learning to five students. The learners used cell (Biology) Wikipedia through online (https://en.wikipedia.org/wiki/Cell_(biology). Students searched and read the concepts like cell structure and functions of the cell organs through online Wikipedia (*see* figure 1). For that purpose, the researcher facilitated them and helped the students to operate Wikipedia, and trained how to enter different concept in search engines to find these in the Wikipedia.   However, learners used their self-pace in reading. They himself and herself read and prepared their learning note for long retention.

Fig-1 cell biology Wikipedia page
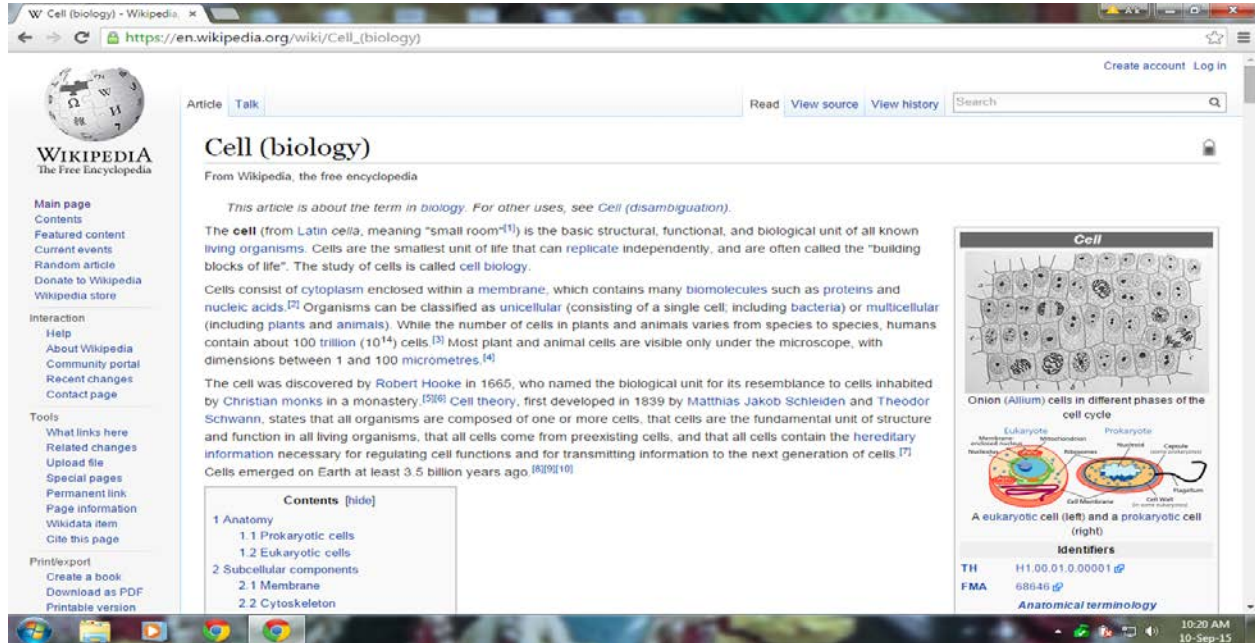
Stage1 Read "Cell" concept in Wikipedia and identify other linked concepts

In the first page of the cell Wikipedia, students found different linked concepts like; living organisms; replicate cell biology; cytoplasm membrane; biomolecules proteins; nucleic acids; unicellular bacteria; multicellular plants animals; Robert Hooke Cell theory; Matthias Jakob Schleiden and Theodor Schwann, and hereditary information which were hyperlinked to search and read more information in their respected web address.

Stage1I Read more by clicking the hyperlinks

To get more information regarding linked concepts, students went through the hyperlinks those were mentioned in the primary cell Wikipedia page. These were :https:// en.wikipedia .org/ wiki/living;https://en.wikipedia.org/wiki/organism;https://en.wikipedia.org/wiki/biology;https://en.wikipedia.org/wiki/replication;https://en.wikipedia.org/wiki/cytoplasm;https://en.wikipedia.org/wiki/membren;https://en.wikipedia.org/wiki/biomolecules;https://en.wikipedia.org/wiki/protein;https://en.wikipedia.org/wiki/nucleicacids;https://en.wikipedia.org/wiki/unicellular;https://en.wikipedia.org/wiki/bacteria;https://en.wikipedia.org/wiki/multicellular;https://en.wikipedia.org/wiki/Robert_Hooke (see figure 2).

Fig-2 cytoplasm Wikipedia page
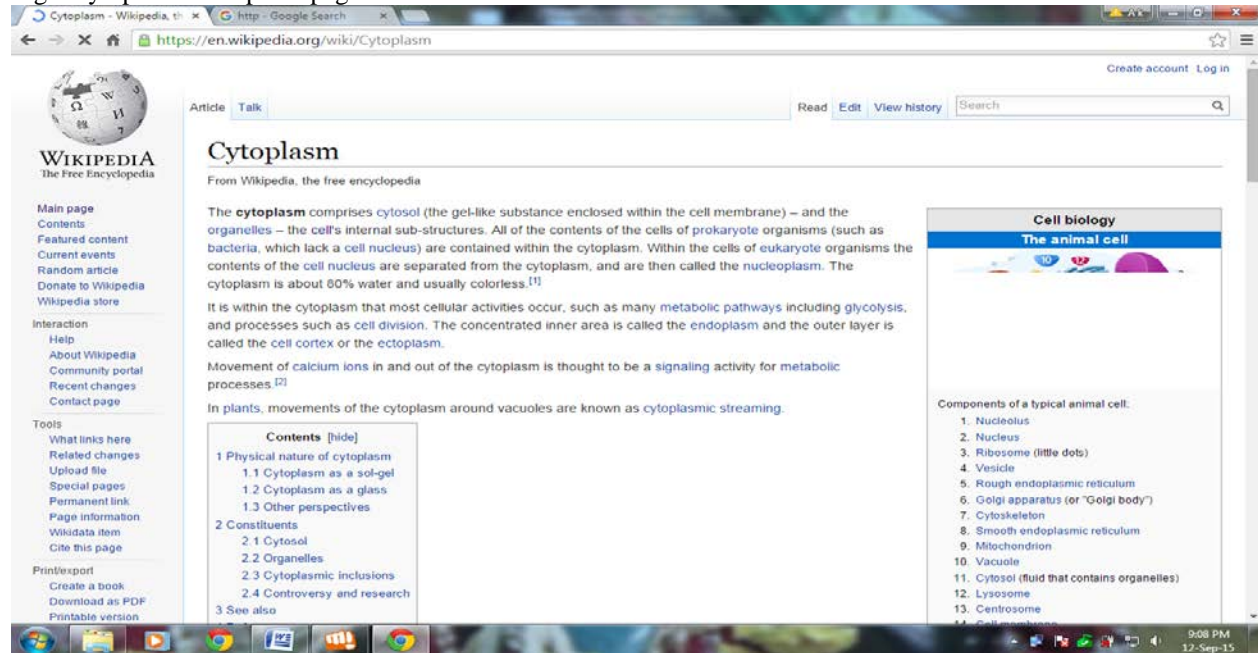
The Hypertext Transfer Protocol (HTTP) is an application protocol for distributed, collaborative, hypermedia information systems. HTTP is the foundation of data communication for the World Wide Web. Hypertext is structured text that uses logical links (hyperlinks) between nodes containing text. Different authors develop the contents linked to the hyperlinks but learners read at a time more than related contents by clicking in the hyperlinks.

Stage III Collaborative discussion

Learner collaborately discussed with each other and in the mean time, researchers helped and clarified researchers all arguments through examples. However, the researchers experienced learners feeling and understanding regarding the existence of cell, types of cell, compositions and functions of cell. Students drawn the labelled diagrams of ultra structure of cell and diagrams of cell organelles, and shared these among the peers for modification or addition or deletion of error concepts. Later these diagrams generalized among the students.

Activity II Administration of Questionnaires

Before instruction, cell test was administered as a pre-test and after instruction, the same cell test was administered as post -test. Moreover, cognitive style and science ability questionnaires were administered among the students to assess the students' deep learning styles, surface learning styles, strategic learning styles, and apathetic learning styles.

Procedure of data collection

Ten students were interested and showed their willingness to attend the traditional and virtual learning instruction. Out of them, five student of school 1, and 5student of school 2 were assigned traditional learning and

Wikipedia learning respectively. Before instruction, all three groups of students were assigned to response the cognitive style questionnaire, science ability questionnaire and learning style inventory, and pre-test of cell. After the collection of students' response sheets, the researcher administered that teaching strategies and activities in three sections. After instruction, the researcher again administers the cell test to collect the post instructional achievement as the data for study. As a whole, the researcher has collected cognitive style questionnaire dada, science ability data and pre-test, post-test data for scoring, analysis and interpretation.

1.10.0 Analysis and results

1.10.1 Hypothesis 1: There is a significant effect of Wikipedia learning over traditional approach.

Table 1.1 Mean standard deviation (SD) of pre-test, posttest of traditional approach and Wikipedia approach

		Mean	N	Std. Deviation	Std. Error Mean
Traditional Group	pretest	12.00	10	2.309	.730
	posttest	14.40	10	2.459	.777
Wikipedia Group	pretest	13.60	10	1.578	.499
	posttest	27.20	10	3.676	1.162

Table 1.2 Mean SD and t of pre-test, posttest of traditional approach and Wikipedia approach

	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed
Traditional Group pretest - posttest	-2.400	2.066	.653	-3.674	9	.005
Wikipedia Group pretest - posttest	-13.600	3.373	1.067	-12.750	9	.000
Traditional Group posttest – Wkipedia Group posttest	-12.800	5.432	1.718	-7.451	9	.000

With reference to table 1.1 the descriptive analysis resulted that the tradition group mean, pre-test mean (12 ± 2.309) is lower than the post test mean (14.40 ± 2.459) similarly, the Wikipedia pre-test mean (13.60 ± 1.578) which is also lower post test mean (27.20 ± 3.676). It is resulted that the Wikipedia post-test mean was higher than traditional learning. The t-value of pre-test and post of traditional group (t_9 3.674 $p \le .05$) was significant and Wikipedia grouped pre-test, post-test, t value (t_9 12.750 $P < .05$). Therefore, the posttest was significantly, better than the pre test mean of traditional, and Wikipedia learning. Similarly, the t value of post test of traditional and Wikipedia group (t_9 7.451 $P < .05$) where Wikipedia group is significantly better than the traditional group performance (see table 1.2).

1.10.2 Hypothesis 2 (a) There is a significant hierarchical relationship between cognitive Styles and learning performance of traditional group students.

Table 2.1 hierarchical regression analysis between cognitive Styles and learning performance of traditional group students

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics R Square Change	F Change	df1	df2	Sig. F Change
1	.910[a]	.828	.807	1.080	.828	38.629	1	8	.000
2	.963[b]	.926	.905	.756	.098	9.333	1	7	.018
3	1.000[c]	1.000	1.000	.000	.074	.	1	6	.

a. Predictors: (Constant), Extraversion   b. Predictors: (Constant), Extraversion, Sensing

Table 2.2 ANOVA of cognitive Styles and learning performance of traditional group students

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	45.067	1	45.067	38.629	.000a
	Residual	9.333	8	1.167		
	Total	54.400	9			
2	Regression	50.400	2	25.200	44.100	.000b
	Residual	4.000	7	.571		
	Total	54.400	9			
3	Regression	54.400	3	18.133	.	.c
	Residual	.000	6	.000		
	Total	54.400	9			

a. Predictors: (Constant), Extraversion

b. Predictors: (Constant), Extraversion, Sensing

c. Predictors: (Constant), Extraversion, Sensing, Thinking

d. Dependent Variable: Traditional learning performance

Table 2.3 Unstandardized Coefficients[a] of cognitive Styles and learning performance of traditional group students

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	8.333	1.034		8.058	.000
	Extraversion	.619	.100	.910	6.215	.000
2	(Constant)	3.000	1.890		1.587	.156
	Extraversion	.714	.076	1.050	9.354	.000
	Sensing	.250	.082	.343	3.055	.018
3	(Constant)	4.000	.000		.	.
	Extraversion	.857	.000	1.260	.	.
	Sensing	.250	.000	.343	.	.
	Thinking	-.250	.000	-.343	.	.

a. Dependent Variable: Traditional learning performance

The regression of traditional performance on the basic model (R= .910 R^2=.828) and adjusted (R^2= .807 P<.05) revealed significant positive relationship with extraversion (ß= .619 P<.05) The value (dß 1/8 38.629 P< .05) the regression of sensing (R= 0.963 R^2= 0.926 and adjusted R^2= 0.905 P<.o5) found significant relationship as with traditional performance (ß= 0.250 P<.05). The F value (df 2/7 44.10 P< .05) is a significant relationship with traditional learning (*see* table 2.1, 2.2 & 2.3).

1.10.3 Hypothesis 3: There is significant hierarchical relationship among science ability, learning style and traditional learning performance of students.

Table 3.1 hierarchical regression analysis among science ability, learning style and traditional learning performance of students.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
					Change Statistics				
1	.765[a]	.585	.533	1.680	.585	11.267	1	8	.010
2	.773[b]	.597	.482	1.770	.012	.210	1	7	.661

a. Predictors: (Constant), Science_ability

b. Predictors: (Constant), Science_ability, Learning_style

3.2 ANOVA[c] among science ability, learning style and traditional learning performance of students.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	31.812	1	31.812	11.267	.010[a]
	Residual	22.588	8	2.824		
	Total	54.400	9			
2	Regression	32.470	2	16.235	5.182	.042[b]
	Residual	21.930	7	3.133		
	Total	54.400	9			

a. Predictors: (Constant), Science_ability

b. Predictors: (Constant), Science_ability, Learning_style

c. Dependent Variable: Traditional learning performance

Table 3.3 Unstandardized Coefficients[a] among science ability, learning style and traditional learning performance of students.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-22.000	10.857		-2.026	.077
	Science_ability	1.529	.456	.765	3.357	.010
2	(Constant)	-18.503	13.747		-1.346	.220
	Science_ability	1.636	.534	.818	3.066	.018
	Learning_style	-.280	.610	-.122	-.458	.661

a. Dependent Variable: Traditional learning performance

The regression model of basic model (R= 0.765 R^2=0.85 & adjusted R^2 = 0.533 P< .05) is significant relationship with traditional learning performance where (ß= 1.29 P<.05). The F value (df 1/8 11.267 P<.05) whereas the learning style (R=0.773 R^2 =0.597 & adjusted R^2 =0.482 P<.05) is not significant (ß= 0.280 P>.05). So, Science ability has significant relationship with traditional learning performance over learning style of the student(*see* table 3.1,3.2 & 3.3).

1.10.4 Hypothesis 4 There is a significant hierarchical relationship between cognitive style and Wikipedia learning performance of students.

Table 4.1 Hierarchical regression analysis between cognitive style and Wikipedia learning performance of students.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
					Change Statistics				
1	.749[a]	.561	.507	2.582	.561	10.240	1	8	.013
2	.980[b]	.961	.949	.827	.399	70.946	1	7	.000
3	.991[c]	.982	.973	.606	.021	7.059	1	6	.038
4	.993[d]	.985	.974	.594	.004	1.228	1	5	.318
5	.998[e]	.996	.990	.362	.010	9.453	1	4	.037

a. Predictors: (Constant), Extraversion

b. Predictors: (Constant), Extraversion, Sensing

c. Predictors: (Constant), Extraversion, Sensing, Thinking

d. Predictors: (Constant), Extraversion, Sensing, Thinking, Feeling

e. Predictors: (Constant), Extraversion, Sensing, Thinking, Feeling, Judging

4.2ANOVA[f] between cognitive style and Wikipedia learning performance of students.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	68.267	1	68.267	10.240	.013[a]
	Residual	53.333	8	6.667		
	Total	121.600	9			
2	Regression	116.810	2	58.405	85.358	.000[b]
	Residual	4.790	7	.684		
	Total	121.600	9			
3	Regression	119.399	3	39.800	108.517	.000[c]
	Residual	2.201	6	.367		
	Total	121.600	9			
4	Regression	119.833	4	29.958	84.786	.000[d]
	Residual	1.767	5	.353		
	Total	121.600	9			
5	Regression	121.075	5	24.215	184.392	.000[e]
	Residual	.525	4	.131		
	Total	121.600	9			

a. Predictors: (Constant), Extraversion

b. Predictors: (Constant), Extraversion, Sensing

c. Predictors: (Constant), Extraversion, Sensing, Thinking

d. Predictors: (Constant), Extraversion, Sensing, Thinking, Feeling

e. Predictors: (Constant), Extraversion, Sensing, Thinking, Feeling, Judging

f. Dependent Variable: Wikipedia_learning_performance

Table 4.3 Unstandardized Coefficients[a] between cognitive style and Wikipedia learning performance of students.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.000	6.055		1.321	.223
	Extraversion	.762	.238	.749	3.200	.013
2	(Constant)	-5.107	2.487		-2.053	.079
	Extraversion	.276	.096	.272	2.892	.023
	Sensing	.971	.115	.792	8.423	.000
3	(Constant)	.983	2.927		.336	.749
	Extraversion	.301	.071	.296	4.261	.005
	Sensing	1.004	.085	.819	11.771	.000
	Thinking	-.344	.130	-.153	-2.657	.038
4	(Constant)	-.229	3.074		-.075	.943
	Extraversion	.290	.070	.286	4.154	.009
	Sensing	.976	.088	.796	11.151	.000
	Thinking	-.310	.131	-.138	-2.367	.064
	Feeling	.085	.077	.067	1.108	.318
5	(Constant)	1.208	1.932		.626	.566
	Extraversion	.344	.046	.339	7.472	.002
	Sensing	.983	.053	.801	18.398	.000
	Thinking	-.327	.080	-.145	-4.090	.015
	Feeling	.083	.047	.065	1.769	.152
	Judging	-.106	.035	-.115	-3.075	.037

a. Dependent Variable: Wikipedia_learning_performance

Table 4.1, Table 4.2 &Table 4.3 Hierarchical extraversion, sensing, thinking and judging regressed the Wikipedia learning performance. The model Extraversion (R= 0.747 R^2 =0.561 & adjusted R^2 =0.507 P<.05) is a significant (ß= 0.762 P<.05), where the (F value 10.240 p<.05).Similarly, the Model Sensing (R=0.980 R^2 =0.961 & adjusted R^2 = 0.949 P<.05)   is a significant where (ß =0.971 & F=85.358 P<.05) was significant. Similarly, Thinking and judging model hierarchical regressed with the Wikipedia model. Thinking model (R=0.991 R^2= 0.982 & adjusted R^2=0.973 P<.05) was significant where (ß=0.344 & F value = 108.517 P<.05) was significant and Judging model (R=0.998 R^2 =0.996 & adjusted R^2 =0.990 P<.05) is significant where (ß =0.108 P<.05 & F= 184.392 P<.05) was significant relationship with Wikipedia learning but not significant with Feeling (R=0.993 R^2=0.985 & adjusted R^2 = 0.974 P>.05). It resulted that Extraversion, Sensing, Thinking, and Judging model are regressed with Wikipedia learning performance but not Feeling.

Hypothesis 5: There is a significant hierarchical relationship among science ability, learning style and Wikipedia learning performance.

Table 5.1 hierarchical regression analysis among science ability, learning style and Wikipedia learning performance

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
					Change Statistics				
1	.634[a]	.402	.327	3.016	.402	5.368	1	8	.049
2	.899[b]	.808	.753	1.826	.407	14.828	1	7	.006

a. Predictors: (Constant), Science_ability

b. Predictors: (Constant), Science_ability, Learning_style

Table 5.2 ANOVA[c] among science ability, learning style and Wikipedia learning performance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.831	1	48.831	5.368	.049[a]
	Residual	72.769	8	9.096		
	Total	121.600	9			
2	Regression	98.263	2	49.132	14.737	.003[b]
	Residual	23.337	7	3.334		
	Total	121.600	9			

a. Predictors: (Constant), Science_ability

b. Predictors: (Constant), Science_ability, Learning_style

c. Dependent Variable: Wikipedia_learning_performance

Table 5.3 Unstandardized Coefficients[a] among science ability, learning style and Wikipedia learning performance

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.846	10.125		.380	.714
	Science_ability	.885	.382	.634	2.317	.049
2	(Constant)	15.674	6.856		2.286	.056
	Science_ability	1.284	.253	.920	5.068	.001
	Learning_style	-1.022	.265	-.699	-3.851	.006

a. Dependent Variable: Wikipedia_learning_performance

Table 5.1, Table 5.2 & Table 5.3 The regression model of Wikipedia leaning performance (R=0.634 R^2=0.402 and adjusted R^2 =0.327 P<.05) found significant positive relationship with science ability (ß =0.885 P<.05) and (F =0.5368 P<.05) was significant. But the learning Style model (R=0.899 R^2 =0.808 & adjusted R^2 =.0753 P<.05) was not significant (ß= -1.022 P>.05) .The F value 14.737 was significant. Hence, Science ability has significant relationship with Wikipedia learning performance but not learning style.

Findings

In the present study, hypothesis 1 assessed the significant effect of Wikipedia learning over traditional approach and it was found, both Wikipedia learning performance was better over traditional learning performance. The Wikipedia learning performance of students (m=27.20±3.676) was better over traditional learning performance (m=14.20±2.459). However, there was a significant difference found in between traditional learning and Wikipedia learning performance of secondary school student. Hypothesis 2 (a): tested the hierarchical relationship between cognitive Styles and learning performance of traditional group students and found that extraversion and sensing (Cognitive styles) has the significant relationship with traditional performance. Similarly, Science ability has significant relationship with traditional learning performance but not student learning style. In the testing of Hypothesis 3(a): (e.g. there is a significant hierarchical relationship between cognitive style and Wikipedia learning performance of students) it was found learners' cognitive styles (e.g., extraversion, sensing, thinking and judging) has hierarchically significant relationship with Wikipedia learning performance but feeling has no significant relationship with Wikipedia learning performance. However, science abilities and learning styles of student are hierarchically significant relationship with Wikipedia learning style.

Discussion

Cognitive styles and science ability affect the learning performance of the student (Jena,2014). It is resulted that Wikipedia learning performance was better over traditional approach. This result was supported by (Almekhlafi, 2006; Lund 2006, and Wang, 2005). In fact, Wikipedia learning was a self learning media has a significance effect over traditional approach (Ganapathy, Shaw and Kim, 2006) was supported by (Altun& Cakan 2006). Similarly, the study found science ability has a significant relationship with traditional learning performance, and this result was supported by (John & Ademla,2004). Nevertheless, cognitive styles (e.g. Extraversion, Sensing, Thinking & Judging) as the significance relationship with Wikipedia learning performance and this result was supported by (Carolina,2012: Bassey et.al,1986). In the presence study, it was resulted that the science ability and learning style has the significance relationship with Wikipedia learning performance and (Greenberg & Zanetis, 2012) supported this result. This result was supported by (Susan et. al, 1986). Finally, the presence study found that there was a hierarchical relationship among science ability and learning performance and this resulted was supported by (Cayari, 2011).

Conclusion

It was concluded that there is existed a significance effect Wikipedia learning over the traditional approach. Other researchers earlier supported this result and they argued that Wikipedia learning is the real and virtual learning medium to acquire knowledge significance relationship with traditional performance. Cognitive style is the independent variable found significant relationship with the dependent variable, the traditional learning performance. The traditional learning performance also hierarchical learning performance also hierarchically related with science ability and learning styles. In the presence study, science ability is a highly related with the traditional performance, rather learning style is not related with learning style. In the presence study, Wikipedia strategy was

used. The cognitive style of learners was related with the Wikipedia learning performance. Out of 8 types of cognitive style (Extraversion, Sensing, Thinking and Judging) has the significance relationship with Wikipedia learning performance. Similarly, both science ability and learning style has the significance relationship with Wikipedia learning performance. Wikipedia is a virtual learning more where learners used the virtual learning instruction according to their cognitive styles. In the presence study the researcher has used Wikipedia learning, learning and Traditional approach to teach 'CELL'. It was resulted that Wikipedia learning performance.

Educational implication

1. Wikipedia, online animation, online flash model, online HTML, PDF files are the source of knowledge, the student can used in their learning processes.
2. Teacher should used virtual learning instruction during instruction he/ she should motivate the learners to learn through this virtual learning model.
3. Wikipedia learning needs internet, so, teacher should used to know internet and aware the learners to take the help of virtual learning mood during their knowledge acquisition.
4. Wikipedia is the virtual learning moods. Wikipedia provides static or stable pictures, note, or text for the learners. However, Wikipedia provides the dynamic concept that can clarify the doubt and misconception of students.

Recommendation

1. The researcher has used Wikipedia learning mood over the traditional approach. However, other researchers or world of researchers may used online animation and online flash model over the traditional approach.
2. The researcher recommended the world of researcher to study the relationship among intelligence, attitude and virtual learning performance of students.
3. It needs to investigate learner's aptitude performance and skill during the curriculum transaction through Wikipedia learning.
4. The effect of gender, age, skill. Basic computer knowledge on the Wikipedia learning performance.
5. The researcher has encouraged her world of colleagues to conduct experiment on virtual learning environment and learner academic performance.

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