EFFECTS OF ASYNCHRONOUS E-MAIL INTERVENTION ON LEARNING PERFORMANCE IN RELATION TO THINKING SKILLS, EXECUTIVE FUNCTIONS AND ATTENTION BENEFITS OF INDIAN CHILDREN

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ABSTRACT
In this 21st century, both developing and developed countries are providing technology based distance mode of learning to the learners. Along with the traditional textbooks, blogs, tweets, podcast, webcast, online chats, discussion boards, and other virtual modes are becoming more popular and influencing the masses. Now a day, electronic mailing is the cheapest and accessible mode of learning. The main objectives of the study were to assess the effects of asynchronous e-mail on the performance in relations to thinking skills, executive functions and attention benefits of elementary students. The whole standard eight students (n=46), age range was 13.1 years- 13.7 years mean age 13.3 and SD 2.2 of Holy Cross school, Silchar, Assam, India was the experimental group was assigned for asynchronous e-mail learning. Pre-test posttest along with these attentions, working memory and executive functions scale was administered to assess the effects of asynchronous e-mail on the performance in relations to thinking skills, executive functions and attention benefits of elementary students. It was resulted that asynchronous e-mail learning was effective and the attention, working memory and executive functions of students has significant relations with their performance.
Keywords: Asynchronous e-mail learning, attention benefits, e-mail learning, executive functions and thinking skills

INTRODUCTION

The delivery of a learning, training or education program by electronic means may be term as e-learning. E-learning involves the use of electronic devices (e.g. a mobile phone or computer etc) in some way to provide training, educational or learning materials. In most cases, it refers to a course, program or degree delivered completely online. In modern time e-mail learning are becoming important elements of an educational system as it supportsin improving or evaluating the quality of education. Asynchronous e-mail learning is a teaching method, which uses online learning resources to facilitate information among a network of people,and it can be carried out even when the student teacher is in offline mode. Asynchronous learning combines self-study to promote learning in traditional on-campus education, distance education, and continuing education. It is a combined network of learners'along with the electronic network in which learner's communications are referred to as an asynchronous learning network. Asynchronous learning includes resources like Video-cassette/DVD, Voice Mail/fax, Print Materials, E-mail, conferencing systems, online discussion boards, wikis, and blogs. Asynchronous learning systems like Campus Cruiser LMS, Desire2Learn, Blackboard, Web CT, Moodle, and Sakai, have been developed to support online interaction, allowing users to organize discussions, post and reply to messages, and upload and access multimedia. These asynchronous forms of communication are sometimes supplemented with synchronous components, including text and voice chat, telephone conversations, video-conferencing. Asynchronous learning provides students the freedom to access the course and its instructional materials at any time they choose, and from any location, with an internet connection (*From Wikipedia and encyclopedia*). This allows for accessibility over large populations ranging from traditional-on-campus students to working professional also including international students in foreign countries.

ASYNCHRONOUS E-MAIL LEARNING

In support to asynchronous e-mail learning performance of the students, a total of 10 studies were reviewed and out of these 7 studies were experimental and remaining 3 were other related studies. Mostly, the present studies were conducted in American countries and United K kingdom areas. The firststudy was conducted by (Hiltz, 1997) in New Jersey undertaking 34 IT college students found a significant effect of collaborative e-learning at higher education system. A study was conducted in Netherland understanding participant from 4-11 open-university students found a significant effect of collaborative learning (Dewiyanti, Gruwel, Jochems & Bores, 2004). A study in France including 20 university students was conducted by (Scherer, 2005) found significant effect of asynchronous learning in mathematical mapping solution in a neuro computing way. Another study was supported by (Schellens & Valcke, 2005) undertaking 230 participants in Belgium found discussion orientated reflects high phases in knowledge construction were not significant. In USA a cross case design was framed on 286 secondary and 287 elementary school students resulted a significant effect of video base

communication used for taking classes (Spiceland & Hawkins, 2008). Hull Saxon, 2009 conducted a study on the participant ranged from 66-280 in USA found a significant effect on collaborative learning in asynchronous courses compared to traditional learning. A study was conducted in UK with 16 school students found computer mediated asynchronous is significantly effective for developing skills (Coffin, Hewing & North, 2012). A study was conducted in Korea by (Kim, Park, Yoon & Jo, 2016) found significant effect of asynchronous online discussion for blended learning. In the above discussion, it was noted that asynchronous e-learning was effective over traditional approach but few studies were not significant and was disagree with the results and findings over traditional approach of learning that is why the present study was undertaken. A last study was conducted in Turkey by (Serife, 2016) on 60 university students found technology and problem based online asynchronous discussion has significant effect on students task orientation.

ASYNCHRONOUS E-MAIL LEARNING IN RELATIONS TO THINKING SKILLS

A total of 12 studies were reviewed in support to asynchronous e-mail learning performance in relations to thinking skills; out of these 10 were experimental studies and one is survey study. The first study was conducted in London by (Blakemore & Choudhury, 2006) undertaking 145 participant from medical institute found a significant effect of changes in brain structured in both adolescence and early adulthood stage of development among the learners. A study was conducted in Ankara by (Akyuz, 2009) undertaking 44 participants of university students found no significant difference between pre-test and post-test result among the student's academic achievement. A study was conducted by (Cavus, 2009) in North Cyprus undertaking total no. of 41 participants were 20 male and 21 female university undergraduate students found a significant effect of mobile learning in changing students attitude towards learning environment. One study was conducted by (Lee, 2013) in Australia undertaking 1st group 672, and 2nd group 23 college students' found no significant difference between thinking skills and cognitive social presence among the students. One survey study was conducted in Auckland by (Samarraie, Teo & Abbas, 2013) undertaking 210 university students as a participant found a significant effect of structured representatives in influencing students metacognitive activities. In the above discussion, it was noted that most of the studies in relations to thinking skills has a significant effect over traditional learning but few studies were not significant and disagreed with the findings that is why the present study was undertaken. Two studies were conducted in Thailand were 1st study included 30 school students found a significant difference between pre-test and post-test among the learners (Petchtone & Sumalee, 2014) whereas 2nd study included 30 university students' found e-learning has a significant effect in developing creative thinking among learners in pursuing higher education (Songkram, 2015). One study was conducted by (Vainikainen, Hautamaki, Hotulainen & Kupiainen, 2015) in Finland undertaking 1543 school students' found formal thinking of an individual has a significant effect on verbal and quantitative reasoning. Another study was corroborated in Melbourne by (Broadbent & Poon, 2015) taking 140 online group students and 466 blended group students found a significant effect of using time management and elaborative strategies for academic achievements between both the groups of student's. Another study was supported by (Thaiposri &Wannapiroon, 2015)findings showed that information and communication technologies could play an important role in student developments in 21st century learning. Lee, Parsons, Kwon, Petrova, Jeong & Ryu, 2016 conducted a study in New Zealand and Korea where 25 university students were participated found significant effect of mobile learning on academic achievement. Cheng & Wan, 2017 conducted a study in Hongkong included 3,869 college student found there is no significant difference between students' thinking skills and learning dispositions.

ASYNCHRONOUS E-LEARNING IN RELATIONS TO EXECUTIVE FUNCTIONS

The researcher reviewed a total of 13 experimental studies were undertaken in support to asynchronous e-learning performance in relations to executive functions. The first study was conducted by (Welsh, Pennington & Groisser, 1991) undertaking 110 university students in Denver found no significant early prefrontal skills in relations to attentional stage of order. In the above discussion, it was noted that executive function has a significant effect over the traditional learning style but few studies were not significant and effective so the present study was undertaken. A study was conducted in London including 50 participants were 25 were male and 25 were female school students found a significant links between Executive Functions (EFs) and Theory of Mind (TOM) in students' performance (Hughes, 1998). One study was conducted in USA by (Carlsona, Mosesb & Bretona, 2002) undertaking 47 university students found there is a no significant relations between Executive Function (EF) and false belief understanding among the learner's. A study was conducted by (Kane & Engle, 2002) undertaking 104 university students in North Carolina and Georgia found a significant bonding between working memory, intelligence and prefrontal cortex functions simultaneously among learners performance. One study was conducted by (Carlson, Stephanie, Mandell, Dorothy, Williams & Luke, 2004) found a relation was non-significant with the controls included as individual differences in EF were relatively stable. Another study was conducted by (Willcutt, Doyle, Nigg, Feroane & Pennington, 2005) participants ranged from 2969 without ADHD and 3734 with ADHD group of medical institute found a significant difference between both the groups of children's. A study was conducted by (Thomson & Gathercole, 2006) including 51 participants were 27 were

boys and 24 were girl's school students in England found that working memory and inhibitory control has significant effect over the traditional learning approach. A study was conducted in UK by (Bull, Espy & Wiebe, 2008) undertaking 124 pre-school children found a significant effect in between the variance of cognitive skills and math and reading. Another study was supported by (Anderson, 2002) on ecological validity of EF tests and neuropsychological assessment procedures are examined, and adjunct methods of measurement are presented to enable a more comprehensive and valid assessment of EF. One study was conducted in Spain by (Rueda, Posner & Rothbart, 2010) undertaking participant ranging from 2 to 3 years kindergarten school children's found a significant effect between cognitive and behavioral training in relations to attentional control. One study was conducted by (Becker, Miao, Duncan & McClelland, 2014) undertaking 127 pre-school and kindergarten school children's in United States found a significant relations between stimulus Response (SR) and Executive Functions (EFs) with Visuo Motor Stimulus (VMS) among the children's. A study was conducted by (Cragg, Keeble, Richardson, Roome & Gilmore, 2017) undertaking total of 293 participants were 84 primary students , 67 secondary students , 67 university students and 75 adult young ; U.K found there is no significant effect between executive function and mathematics achievement among the learners performance. One last study was supported by (Vandenbroucke, Verschueren & Baeyens, 2017) results indicate moderate to large growth and stability in working memory and cognitive flexibility and small improvements and stability in inhibition.

ASYNCHRONOUS E-MAIL LEARNING IN RELATIONS TO ATTENTION BENEFITS

A total of 10 studies were undertaken in support to asynchronous e-mail learning performance in relation to attention benefit of the student's achievements. A first study was conducted by (Posner & Peterson, 1990) in Missouri undertaking 25 university students found a significant effect of attention to the targeted group as it was impaired in nature. Another study was conducted by (Cowan, Nugent, Elliot, Ponomarev & Saults, 1994) in Missouri, Columbia & Portland undertaking total number of 24 school, college and university students found a significant effect of spatial cueing modulation over spatial Stroop object based attention. Another experimental study is conducted by (Pomplun, Reingold and Shen, 2001) in Toronto, Canada undertaking 24 university students including 8 students in each group found a significant effect of both comparative task and attentional manipulation on visual span size. A study was conducted by (Perez & Solis, 2007) undertaking 521 college students found a significant effect of attention, working memory, and executive functions are separated but itsustained a fast improvement in performance of the students. Another study was conducted by (Chen & Wu, 2015) in Taiwan undertaking 37 university students found that videos lecture has a significant effect on student's performance. A study was supported by (Gaston, Moore & Butler, 2016) in Canada undertaking two group of students i.e., 23 and 18 found in attention, hyperactivity, oppositional behaviour has a significant effect on the nature of the learners. The last study was conducted in Finland by undertaking a total of 15 medical students were 8 female and 7 male by (Salo, Salmela, Salmi, Numminen & Alho, 2017) found a significant effect of attention as same while using or applying other objects too. Another study was conducted by (Bosse & Valdois, 2009) in France found visual attention span gas a significant effect on reading skills of the learners.

OBJECTIVES OF THE STUDY

1. To study the effects of asynchronous e-mail learning performance in relations to thinking skills of elementary students.
2. To study the effects of asynchronous e-mail learning performance in relations to executive functions of elementary students.
3. To study the effects of asynchronous e-mail learning performance in relations to attention benefits of elementary students.

HYPOTHESES OF THE STUDY

H1 There is no hierarchical significant relationship among the asynchronous e-mail learning performance and thinking skills of elementary students.

H2There is no hierarchical significant relationship among the asynchronous e-mail learning performance and executive functions of elementary students.

H3There is no hierarchical significant relationship among the asynchronous e-mail learning performance and attention benefits of elementary students.

METHODOLOGY

Participants

The study aimed to assess the effects of asynchronous e-mail learning performance in relations to thinking skills, executive functions, and attention benefits of elementary school students. The whole Class VIII students (n=46), age range was 13.1 years- 13.7 years mean age 13.3 and SD 2.2 of Holy Cross school, Silchar was assigned for asynchronous e-mail learning counted as the experimental group. For asynchronous E-mail, intervention was given to the students.

Design of the study

Single group Pre-test-Post-test quasi-experimental design was used in this study by following non-randomization manipulation principle. The effects of asynchronous e-mail learning on performance of experimental group students were assessed through ANCOVA and its relation with thinking skills, executive functions, and attention benefits was predicted through multiple hierarchical regression analysis. The findings of the study were generalized on the whole population. The details of the design of the study are given below in the table no. 1.

Table 1 Design of the study

Groups	Nature	Pretest	Intervention	Post test
Experimental Group (n=46)	Asynchronous e-learning	Achievement Test Thinking skill Test Executive function Scale Attention benefit scale	E-mail	Achievement Test

Instrumentations

There are four tools such as Achievement Test, Thinking Skill Test, Executive Function Scale and Attention Benefit Scale used in this study. The details of the tools regarding construction and standardization procedures were given below.

Achievement Test in Geography

Barman & Jena (2017) developed an achievement test on Geography based on the syllabus for Class VIII students affiliated to NCERT, New Delhi. The test contains 40 items having 10 short type items, 18 multiple-choice items having 4 options with three good distracters, and 12 very short type items developed with equal weightage. A maximum mark of the achievement test was 100. In addition to that, Content validity ratio (CVR=.86), test-retest reliability and split half reliability coefficient was .90 and .89 respectively and the time duration to response the items was 10-15 minutes has established.

Thinking Skill Questionnaires

Thinking Skill Test (Barman & Jena, 2017) has 3 sub-areas (convergent thinking, divergent thinking and creative thinking) assessed through MCQ, assertion and picture identification type of items constructed in corroboration with 4 chapters of 8th class Geography. The standardized criteria were followed during the construction of the items. The Construct Validity Ratio was .83, split half .89 and Cronbach α .88 and time duration (10-15 minutes) to response the whole items was established.

Executive functions Scale

Executive Function Scale (Barman & Jena, 2017) has three sub-areas (working memory, self-monitoring and task initiation). All the items were statement form, matching types, picture identification, passage, and analogy types. During the construction of the test items of executive functions scale all the standardized steps were followed. Construct validity ratio.86, test- retest reliability .87 and maximum 10-15 minutes to response the whole items was established. The details of Tool specification of Executive functions Scale is given in table 3.10

Attention Benefit Scale

Attention Benefit Scale (Barman & Jena, 2017) has three basic areas: Attention Time Span (picture identification, tick the odd out & naming the image), Attention Representing (sentence completion & short notes) and Attention Analyzing (naming the pictures, fill in the blanks & group activity). Construct Validity Ratio .89, test- retest reliability .88 and the maximum time 10-15 minutes time to response the whole items was established.The details of the tool specification of attention benefit scale is given in table 3.11

Procedure of experiment for asynchronous e-mail learning

Activity I Asynchronous e-mail learning

Before the asynchronous e-mail learning, a day pre-intervention training was organized for the participants of the experimental group. In this training program, learners were advised on how to connect internet and on how to the sign in the e-mail and on how to send or communicate the information. The researchers advised the participants to open their e-mail at any time to collect the learning materials to read and understand the concepts at their level best. For developing competency and skill, participants were advised to send e-mail to the researchers for better clarification of their difficulties, misunderstanding, and misconceptions. If the learning materials were beyond their level of understanding, then participants were advised to write the email to the researchers. As per their requirement, the learning materials were provided to the participants. This process was

continued upto three months to complete the entire 4 chapters in geography of class VIII. Before instructions, a pre-test on resources, land, minerals, and agriculture was administered and after instructions post-test was administered. The phase of instruction of asynchronous e-mail is given below.

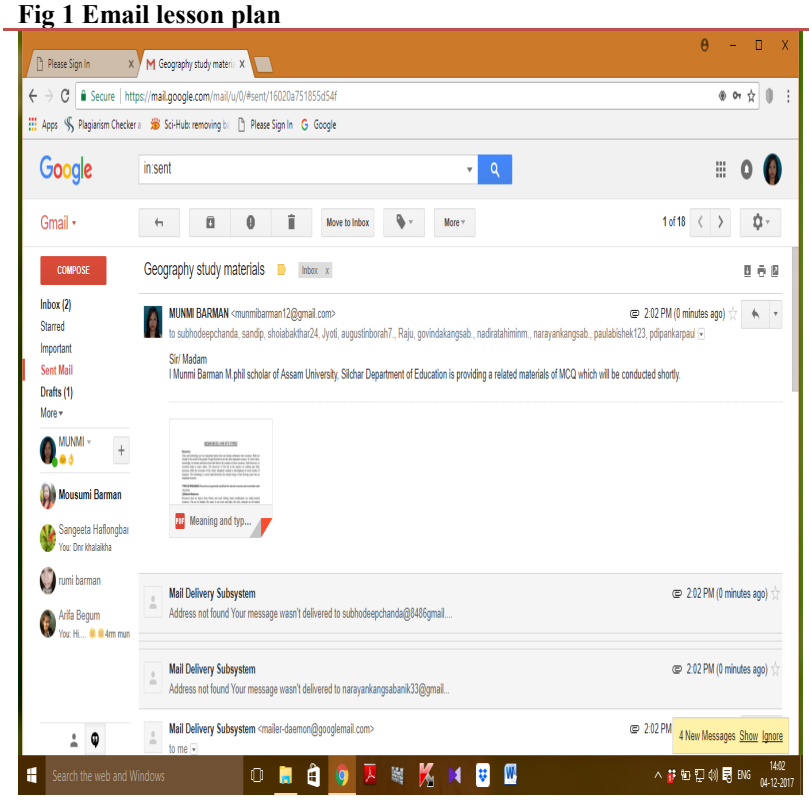
Phase1. Uploading the learning materials

Out of the whole geography book, only four chapters i.e. chapter1 (Resources), chapter2 (Land, Water & Soil), chapter 3 (Minerals & Power Energy) and chapter 4 (Agriculture) were selected for the experiment. After that, the developed, pdf files, videos, images, few Wikipedia materials, were screened and uploaded to the Email IDs of the participants and advised to read the materials at their own pace. If they find any difficulties in understanding then they could interact with the researchers about their queries at any time. As per the scheduled, the materials were uploaded frequently for the participants and that was continued upto the end of the chapters of the book.

Phase2. Learning for known to unknown

The participants after getting the learning material tried to learn by using their previous knowledge and continuously learnt the unknown contents those were provided.

Fig 1 Email lesson plan



Asynchronous e-learning(e-mail)
Activity Plan- 1
Subject- Geography
Topic-Resources and its types
Class- 8th Standard
Period- 2nd period **Time-** 11 to 12
Objectives

- understand meaning of resources
- Illustration of resources types
- differentiate between natural and man-made resources
- define biotic and abiotic resources

Materials

- Printed Materials (MCQ)
- Geography Text-Book
- PDF notes
- Internet

Methodology

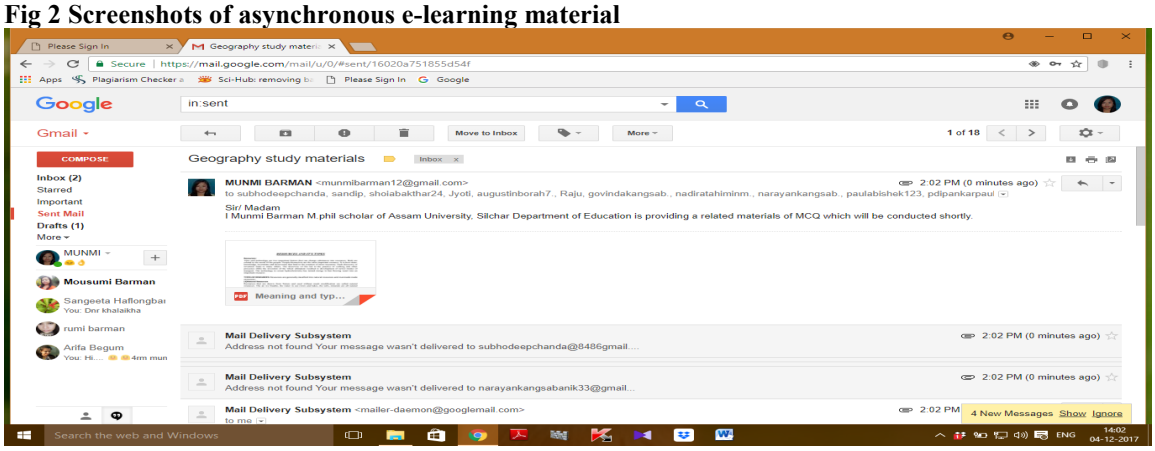
- Classroom demonstration
- assigning the MCQ
- Using of emails

Figure 1 : Meaning and Types of Resources**http://en.m.wikipedia.org/wiki/Agriculture_in_India**

Phase 3. Building concrete idea with asynchronous e-mail learning

Participants used the learning materials in addition to their previous knowledge, and they applied their own pace in learning, and constructed their ideas. (See fig 3.5 & 3.6).

Fig 2 Screenshots of asynchronous e-learning material



ANALYSIS AND RESULTS

H1 *There is no hierarchical significant relationship among the asynchronous e-mail learning performance and thinking skills of elementary students*

Table 1.1 Mean and SD of asynchronous e-mail learning performance, convergent thinking skill, divergent thinking skill, creative thinking skill of elementary school students of elementary school students

	N	Mean	SD
Asynchronous e-mail learning	46	55.35	5.770
Thinking Skills			
Convergent thinking	46	6.39	1.832
Divergent thinking	46	6.17	2.143
Creative thinking	46	5.26	2.215

Table 1.1 reveals the Mean, and Standard Deviation (SD) of post-test score of asynchronous group of participants. The post-test mean and SD of asynchronous e-learning group participants was (mean= 55.35 & SD = 5.770). Convergent thinking skill Mean and Standard Deviation (SD) was (mean= 6.39&SD= 1.832), Divergent thinking skill Mean and Standard Deviation (SD) was (mean= 6.17 & SD= 2.143) and Creative thinking skill was (mean= 5.26 & SD= 2.215). However, the Mean and Standard Deviation of Convergent thinking skill was better over both the Divergent and creative thinking skill.

Table 1.2 R, R^2, adjusted R^2 and Durbin-Watson of asynchronous e-mail learning performance and convergent thinking skill, divergent thinking skill, creative thinking skill of elementary school 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	.811[a]	.658	.650	3.414	.658	84.582	1	44	.000
2	.895[b]	.800	.791	2.637	.143	30.722	1	43	.000
3	.938[c]	.880	.871	2.071	.079	27.716	1	42	.000

Table 1.3ANOVA of asynchronous e-mail learning performance, convergent thinking, divergent thinking, and creative thinking of elementary school students

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	985.679	1	985.679	84.582	.000[b]
	Residual	512.756	44	11.654		
	Total	1498.435	45			
2	Regression	1199.360	2	599.680	86.220	.000[c]
	Residual	299.075	43	6.955		
	Total	1498.435	45			
3	Regression	1318.260	3	439.420	102.432	.000[d]
	Residual	180.174	42	4.290		
	Total	1498.435	45			

a. Dependent Variable: Asynchronous e-learning
b. Predictors: (Constant), Convergent thinking
c. Predictors: (Constant), Convergent thinking , Divergent thinking

Table 1.4 coefficients for asynchronous e-mail learning performance, convergent thinking, divergent thinking, and creative thinking of elementary school students

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	39.016	1.846		21.138	.000
	Convergent Thinking Skill	2.555	.278	.811	9.197	.000
2	(Constant)	42.073	1.529		27.519	.000
	Convergent Thinking Skill	-1.086	.691	-.345	-1.571	.123
	Divergent Thinking Skill	3.274	.591	1.216	5.543	.000
3	(Constant)	46.058	1.419		32.448	.000
	Convergent Thinking Skill	-2.089	.575	-.663	-3.631	.001
	Divergent Thinking Skill	1.178	.611	.437	1.926	.061
	Creative Thinking Skill	2.921	.555	1.122	5.265	.000

The regression of asynchronous e-learningon the basic model(R = .938, R^2= .880 and adjusted R2 =.871p < .005) revealed significant positive relationship with convergent thinking skill, divergent thinking skill, creative thinking skill (β =-.663 p < .001) and the F-value (df 3/42, 102.432p < .001) was significant. The regression of convergent thinking skill, and divergent thinking skillon the hierarchical multiple regression model (R = .895, R2 = .800 and adjusted R2 = .791 p < .001) found significant positive relationship with asynchronous e-mail learning performance (β = 1.216 p < .001) and the F-value (df 2/43, 86.220p < .001) was significant. In addition, the regression model) convergent thinking skillon the model (R = .811, R2 = .658 and adjusted R2 = .650 p > .001) revealed significant with asynchronous e-mail learningperformance (β = .811 p > .001) and the ANOVA of convergent thinking skill model (df 1/44, 84.582 p > .005) was also significant.

Fig 1a, b & c for asynchronous e learning performance, convergent thinking, divergent thinking, and creative thinking of elementary school students:

Fig 1a, asynchronous e –mail learning performance and convergent thinking

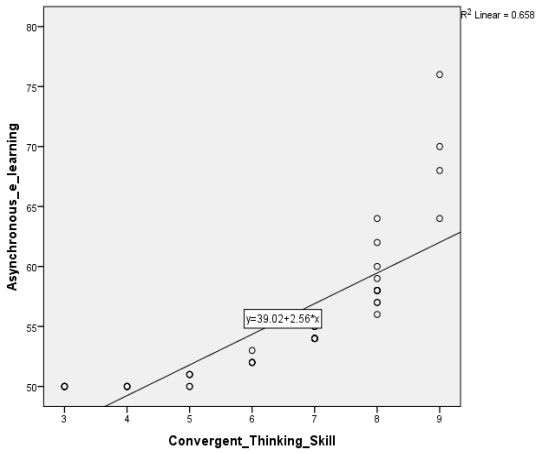


Fig 1 b, asynchronous e-mail learning performance and divergent thinking

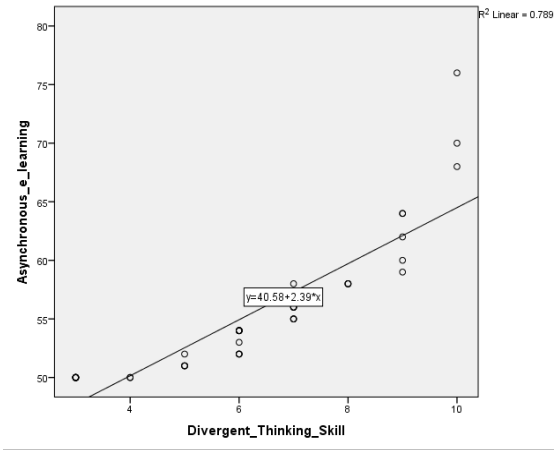
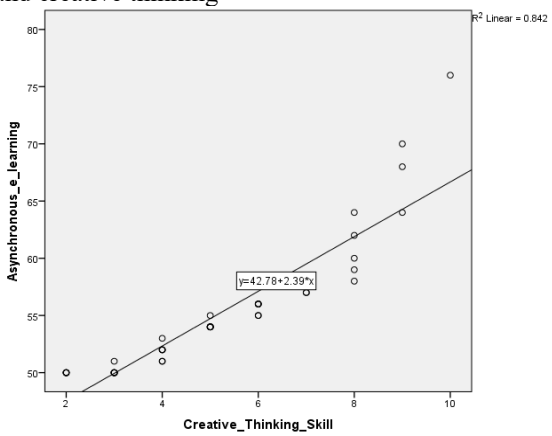


Fig 1c, asynchronous e-mail learning performance and creative thinking



The equation of the regression line for the asynchronous e-learning performance & convergent thinking skills, synchronous e-learning performance & divergent thinking skills, synchronous e-mail learning performance &creative thinking skills data is as follows: In asynchronous e-mail learning performance = 39.20+ (2.56 × convergent thinking skills) and asynchronous e-mail learning performance = 40.58 + (2.39 × divergent thinking skills) (calculated using the method of least squares, which is described below). The gradient of this line is 1.47, which indicates that for an increase of convergent thinking skills the expected increase in synchronous e-learningperformance. Similarly, the asynchronous e-mail learning performance = 42.78+ (2.39 × creative thinking skills). Here, the gradient of this line is 2.15, which indicates that for an increase of creative thinking skills the expected increase in synchronous e-learning performance (*see* figure 1 a, b & c).

H2*There is no hierarchical significant relationship among the synchronous e-mail learning performance and executive functions of elementary students*

Table 2.1 Mean and SD of asynchronous e learning performance, working memory, self-monitoring, task initiation

	N	Mean	Std. Deviation
Asynchronous e-mail learning	46	55.35	5.770
Executive Functions			
Working Memory	46	7.41	3.297
Self-Monitoring	46	7.76	3.171
Task Initiation	46	7.61	3.448

Table 2.1 reveals the Mean, Standard Deviation (SD) of post-test score of asynchronous group of participants. The post-test mean and SD of asynchronous e-learning group participants was post-test was (mean= 55.35 & SD= 5.770) Working memory Mean and Standard Deviation (SD) was (mean= 7.41 & SD= 3.297) and Self-monitoring Mean and Standard Deviation (SD) was (mean= 7.76 &SD= 3.171) and Task Initiation was (mean= 7.61 & SD= 3.448). However, the Mean and Standard Deviation of Self-monitoring was better over both the working memory and task initiation.

Table 2.2 R, R^2, adjusted R^2 and Durbin-Watson of asynchronous e-learning, working memory, self-monitoring, and task initiation

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	.898[a]	.806	.801	2.573	.806	182.259	1	44	.000
2	.898[b]	.806	.797	2.597	.001	.198	1	43	.659
3	.935[c]	.874	.865	2.118	.068	22.653	1	42	.000

Table 2.3 ANOVA of asynchronous e learning performance, working memory, self-monitoring, task initiation of elementary school students

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	43.703	.942		46.378	.000
	Working Memory	1.571	.116	.898	13.500	.000
2	(Constant)	43.436	1.125		38.607	.000
	Working Memory	1.210	.819	.692	1.477	.147
	Self-Monitoring	.379	.852	.208	.445	.659
3	(Constant)	42.539	.937		45.414	.000
	Working Memory	1.997	.688	1.141	2.901	.006
	Self-Monitoring	1.815	.757	.997	2.396	.021
	Task Initiation	-2.113	.444	-1.262	-4.760	.000

Table 2.4 Coefficients of asynchronous e mail learning performance, working memory, self-monitoring, and task initiation

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	1207.038	1	1207.038	182.259	.000[b]
Residual	291.397	44	6.623		
Total	1498.435	45			
Regression	1208.371	2	604.186	89.567	.000[c]
Residual	290.063	43	6.746		
Total	1498.435	45			
Regression	1310.004	3	436.668	97.331	.000[d]
Residual	188.431	42	4.486		
Total	1498.435	45			

a. Dependent Variable: Asynchronous e-mail learning
b. Predictors: (Constant), Working Memory
c. Predictors: (Constant), Working Memory, Self-Monitoring
d. Predictors: (Constant), Working Memory, Self-Monitoring, Task Initiation

The regression of asynchronous e-mail learning on the basic model ($R = .935$, $R^2 = .874$ and adjusted R2 =.865 $p < .001$) revealed significant positive relationship with working memory ($\beta = 1.141$ $p < .001$)self-monitoring ($\beta = .997$ $p < .001$), task Initiation ($\beta = -1.262$ $p < .001$) and the F-value (df 3/42, 97.331 $p < .001$) was significant. The regression of working memory, and self-monitoringon the hierarchical multiple regression model ($R = .898$, $R^2 = .806$ and adjusted $R^2 = .797$ $p > .001$) found no significant relationship with asynchronous e-learning performance ($\beta = .692$ & $.208$ $p > .001$). However, the F-value (df 2/43, 89.567 $p < .001$) was significant. In addition, the regression model) working memoryon the model ($R = .898$, $R^2 = .806$ and adjusted $R^2 = .801$ $p > .001$) revealed significant with asynchronous e-learning performance ($\beta = .898$ $p > .001$) and the ANOVA of convergent thinking skill model (df 1/44, 182.259 $p > .001$) was also significant. Fig 2a, b & c is showing asynchronous e learning performance, working memory, self-monitoring, task initiation of elementary school students.

Fig 2 a, asynchronous e-mail learning memory

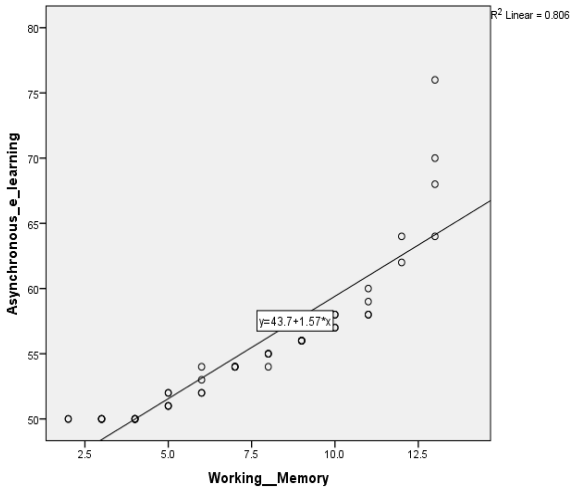


Fig 2 b. asynchronous e-mail learning & performance and working Self monitoring

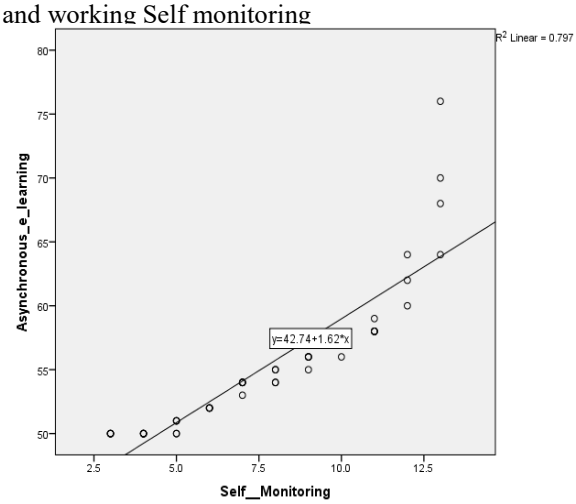
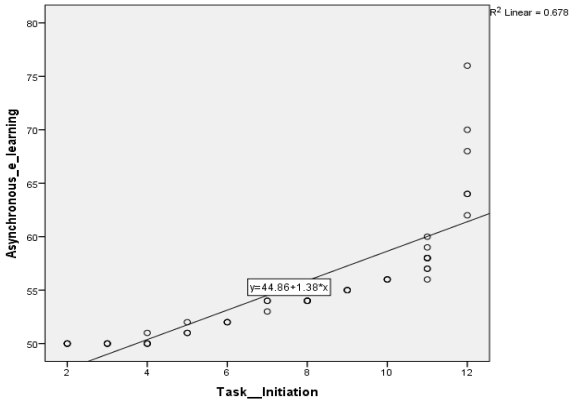


Fig 2 a, asynchronous e learning performance & task initiation



The equation of the regression line for the synchronous e-learning performance & convergent thinking skills, synchronous e-learning performance & divergent thinking skills, asynchronous e-learning performance &creative thinking skills data is as follows: In asynchronous e-learning performance = 43.7+ (1.57 × Working memory) and asynchronous e-learning performance = 42.74+ (1.62 ×Self- monitoring) (calculated using the method of least squares, which is described below). The gradient of this line is 1.47, which indicates that for an increase of convergent thinking skills the expected increase in synchronous e-learning performance. Similarly, the synchronous e-mail learning performance = 44.86 + (1.38 × Task Initiation). Here, the gradient of this line is 0.866, which indicates that for an increase of working memory the expected increase in synchronous e-learning performance (*see* fig 4.3).

Fig 2 a, b & c for asynchronous e-mail learning performance, working memory, self-monitoring and task initiation of elementary school students.

H3: *There is no hierarchical significant relationship among the asynchronous e-mail learning performance and attention benefits of elementary students*

Table 3.1 mean & SD of asynchronous e-mail learning, attention time span, attention representing and attention analyzing

	N	Mean	SD
Asynchronous e-mail learning	46	55.35	5.770
Attention Benefits			
Attention Time Span	46	5.74	1.341
Attention Representing	46	7.83	3.732
Attention Analysing	46	8.22	1.672

Table 3.1 reveals the Mean, Standard Deviation (SD) of post-test score of synchronous group of participants. The post-test mean and SD of synchronous e-learning group participants was post-test was (mean= 53.35 & SD = 5.770) attention time span mean and Standard Deviation (SD) was (mean= 5.74 &SD= 1.341) and attention representing mean and Standard Deviation (SD) was (mean= 7.83 &SD= 3.732) and attention analyzing was (mean= 8.22& SD= 1.672). However, the mean and standard deviation of attention analyzing was better over both the attention time span and attention representing.

Table 3.2 R, R^2, adjusted R^2 and Durbin-Watson of asynchronous e-mail learning, attention time span, attention representing, and attention analyzing

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	.799[a]	.639	.630	3.508	.639	77.739	1	44	.000
2	.831[b]	.690	.676	3.286	.052	7.148	1	43	.011
3	.876[c]	.768	.751	2.878	.078	14.063	1	42	.001

Table 3.3 ANOVA[a] of asynchronous e-mail learning performance, attention time span, attention representing, attention analyzing of elementary school students

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	956.858	1	956.858	77.739	.000[b]
	Residual	541.576	44	12.309		
	Total	1498.435	45			
2	Regression	1034.056	2	517.028	47.875	.000[c]
	Residual	464.379	43	10.800		
	Total	1498.435	45			
3	Regression	1150.541	3	383.514	46.300	.000[d]
	Residual	347.893	42	8.283		
	Total	1498.435	45			

a. Dependent Variable: Asynchronous e-learning

b. Predictors: (Constant), Attention Time Span

c. Predictors: (Constant), Attention Time Span, Attention Representing

d. Predictors: (Constant), Attention Time Span, Attention Representing, Attention Analysing

Table 3.4 Coefficients[a] of asynchronous e-mail learning performance, attention time span, attention representing, attention analyzing of elementary school students

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	35.606	2.298		15.495	.000
	Attention Time Span	3.440	.390	.799	8.817	.000
2	(Constant)	43.481	3.648		11.919	.000
	Attention Time Span	.594	1.126	.138	.527	.601
	Attention Representing	1.081	.404	.699	2.674	.011
3	(Constant)	59.322	5.296		11.201	.000
	Attention Time Span	3.623	1.274	.842	2.843	.007
	Attention Representing	2.329	.486	1.506	4.793	.000
	Attention Analyzing	-5.232	1.395	-1.516	-3.750	.001

a. Dependent Variable: Asynchronous e-mail learning

The regression of asynchronous e-mail learning on the basic model (R = .876, R^2= .768 and adjusted R^2 =.751 p < .001) revealed significant positive relationship with attention time span (β =.842 p >.01), attention representing (β =.1.506 P<.001), attention analysing (β = -.1.516 <.001)and the F-value (df 3/42, 46.300p < .001) was significant. The regression of attention time span (β =.138 p>.001) and attention representing (β =.699 p >.001) on the hierarchical multiple regression model (R = .831, R2 = .690 and adjusted R2 = .676 p > .001) found no significant positive relationship with asynchronous e-learning performance. However, the F-value (df 2/43, 87.875 p < .001) was significant. In addition, the regression model) attention time spanon the model (R = .799, R2 = .639 and adjusted R2 = .630 p > .001) revealed significant with asynchronous e-learning performance (β = .799 p > .001) and the ANOVA of attention time spanmodel (df 1/44, 77.739 p > .001) was also significant. Figure 3 a, b & c for synchronous e-mail learning performance, attention time span, attention representing and attention analyzing of elementary school students

Fig 3 a, asynchronous e learning performance, attention time span

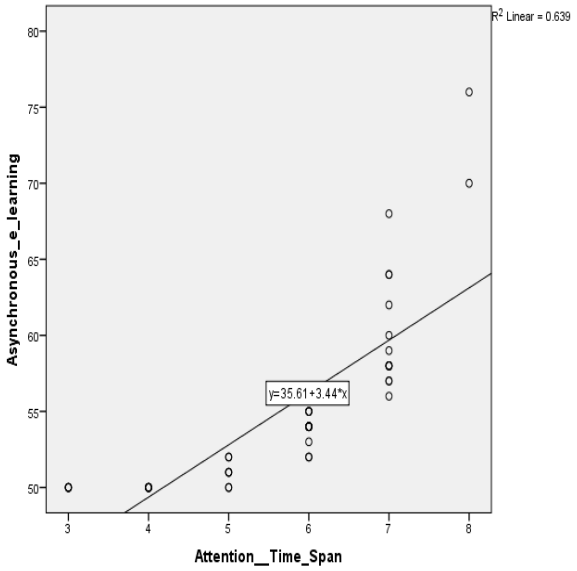


Fig 3 b, asynchronous e learning performance, attention representing

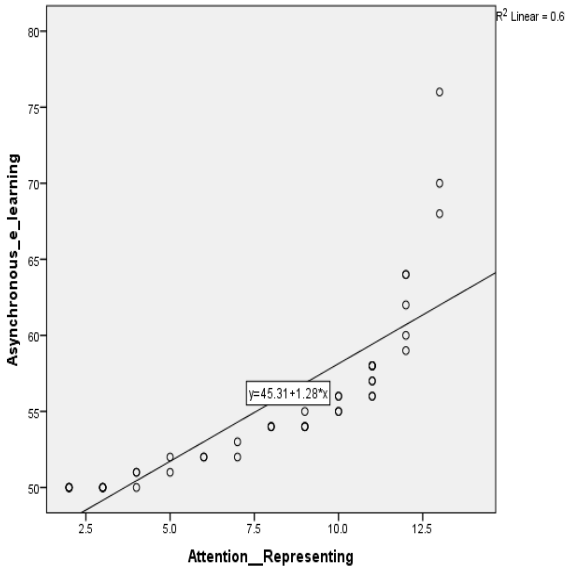
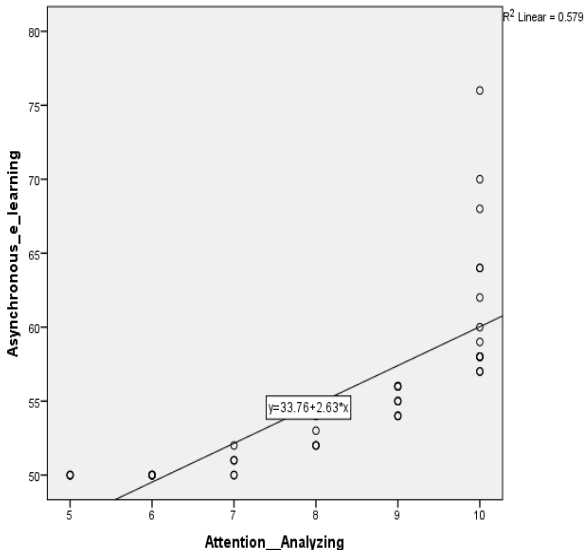


Fig 3 c, asynchronous e learning performance, attention analyzing



The equation of a straight line is given by y= a + bx, where the coefficients a and b are the intercept of the line on the y axis and the gradient, respectively. The equation of the regression line for the synchronous e-learning performance & convergent thinking skills, synchronous e-learning performance &divergent thinking skills, synchronous e-learning performance &creative thinking skills data is as follows: In asynchronous e-learning performance = 35.61 + (3.44 ×Attention Time Span) and asynchronous e-learning performance =45.31 + (1.28

×Attention Representing) (calculated using the method of least squares, which is described below). The gradient of this line is 1.47, which indicates that for an increase of convergent thinking skills the expected increase in synchronous e-learning performance. Similarly, the asynchronous e-learning performance = 33.76 + (2.63 ×Attention Analyzing). Here, the gradient of the lines are 3.44, 1.28 and 1.47 respectively which indicates that for an increase of creative thinking skills the expected increase in synchronous e-learning performance.

FINDINGS

It was found that there exists a significant effect of asynchronous e-mail learning performance among elementary students. This was because of the technology assisted asynchronous e-learning motivated the learning performance of experimental group students. Infact, the impact of asynchronous e-learning (email) has significant role to share information to enrich the content knowledge over the traditional group of students. It was found that the thinking skill was hierarchical and significantly related to asynchronous e-learning performance of the students. The independent variables like convergent thinking skill, divergent thinking skill and creative thinking skills of the experimental group participants were directly correlated with their learning performance because Durbin- Watson value is (.454). This finding was equivalent to the earlier researchers by (e.g. Blakemore & Choudhury, 2006; Broadbent & Poon, 2015; Canvas, 2009; Petchtone & Sumalee, 2015; Songkram, 2015; Vainikainen, Hautamaki, Hotulainen & Kupiainen, 2015) found that formal thinking of an individual's level were statistically significant factors for verbal and quantitative reasoning. It was found that the Executive Functions was hierarchical and significantly related to asynchronous e-learning performance of the students. The independent variables like working memory, self-monitoring and task initiation of the experimental group participants were directly correlated with their learning performance because Durbin-Watson value is (.793). This result was supported by earlier researchers (e.g. Becker, Miao, Duncan & McClelland, 2014; Bull, Espy & Wiebe, 2008; Kane & Engle, 2002; Rued, Posner & Rothbart, 2010; Thomson & Gathercole, 2006) found that executive functions of working memory and inhibition plays a significant role in learning situations. It was found that the Attention Benefit was hierarchical and significantly related to asynchronous e-mail learning performance of the students. The independent variables like attention time span, attention representing and attention analyzing of the experimental group participants were directly correlated with their learning performance because Durbin- Watson value is (.516). This finding was equivalent to the earlier researchers by (e.g. Cowan, Nugent, Elliot, Ponomarev & Saults, 1999; Perez & Solis, 2007; Salo, Salmela, Salmi, Numminen & Alho, 2017; found that though attention, working memory and executive functions are separated but it sustained a fast improvement in performance of the leraners.

DISCUSSION

The study claimed that asynchronous e-mail learning was found significant better over the learning performance among the students and this result was supported by (Coogle & Floyd, 2015; Stewart; Dewiyanti, Gruwel, Jochems & Broers, 2004; Giesbers, Rienties, Tempelaar & Gijselaers, 2013; Harlow & Bacco, 2011) found that students perceived benefits to both synchronous and asynchronous e-mail learning environment. Now question may be raised why asynchronous e-learning performance was better for the participants. In Indian context, secondary schools students and their parents have smartphones to use where it creates a sound environment among the learners to get self-acquainted with new knowledge or information's. To some extend a question may arise is asynchronous e-learning are applicable in all Indian secondary schools, if so to what extent, if not why? This recent study clarify that learning through Email was really an innovative instruction, which motivated the learners and encourage to perceived the real learning linkage between different concepts which are accepted and supported by (Shahabadia, 2015; Szeto, 2014; Wang, 2008) found that asynchronous e-learning styles are helpful to compared e-learners with their academic performance of the learners. It is so applicable because with the implementation of new techniques and teaching aids in classroom creates an interesting settings for the students to learn or understand the concepts more clearly. It motivates and attracts the learners to learn the same thing through different modes or styles i.e. why synchronous and asynchronous e-mail learning is applicable in all Indian sec schools. When we are discussing about an online learning in relations to the present context a question may rise that is Email accessible in Indian school in formal schooling time if not why, then how it can be successful? Yes, Email can be made accessible in all Indian secondary schools during the formal schooling time as we know now in the present time all are familiar with the smart electronic gadgets and how, where and why to use it. The learning environment in Indian secondary schools was not fully technology supportive where students were getting traditional lectures for their clarification of concept. In this context, the researcher thought of applying a new online and offline learning style i.e. asynchronous e-learning (Email) in the experimental classes. During formal schooling hours if we introduce Email learning to students it can make the learning process more interesting and affordable to all equally. This study was supported by (Coogle & Floyd, 2015; Shahabadia, 2015) found that asynchronous e-learning styles are helpful in learners' academic performance. To know the significant effect of Email supported learning the researcher has undertaken the present study. During our emergency time email also plays a significant role in mailing the information's to a group of people at the

same time limit and it saves our time, energy and money. In present scenario many changes has come up in the real teaching learning process so, to know more about those related topic we have to go through different studies and sometimes a question may raise that in present world, how the researchers are applying Email in the formal learning process and is it useful for both formal and non-formal situations? When we looked into the present situation many options are available for conducting or providing information to the learners. As we know many changes has come up which leads to drastic mobility among different parts of the world. Now, in this modern era learning can be termed by different meaning like e.g. blended learning, flipped classroom learning, hybrid learning, synchronous e-learning and asynchronous e-learning etc. For understanding the new changes in the teaching learning situation the present study has been undertaken. Many researchers are applying Email in their research study areas linking up with different areas of interest. The present study was supported by (Asterhan & Tammy, 2011; Bower, 2011; Chang & Wu, 2015) found that online discussion has significant effect over face to face discussion format. During the formal learning process Email can be implemented for providing study materials, pdf files and information's to the students. Asynchronous online modes of learning styles which is very useful in teaching learning situation as it provides a flexible freedom to everyone to use it at his/her own pace. Yes, an Email are applicable in formal as well as non-formal situation because they are both online and offline mode of learning styles. Different researchers studies leads to different directions and to know it deeply some questions can be in this way-Does the results conflict with other researchers findings, if so, then how many research from Indian counterparts and how many from abroad? Yes, to some extend conflicts arises between the researchers of different countries. But there is no single study supported from India is found in regards to the result for the present study in using an Email.

The study claimed that thinking skill was hierarchical and significantly related to asynchronous e-learning performance of the students. The independent variables like convergent thinking skill, divergent thinking skill and creative thinking skills of the experimental group participants were directly correlated with their learning performance. The findings was supported by earlier researchers (Blakemore & Choudhury, 2006; Broadbent & Poon, 2015; Canvas, 2009; Petchtone & Sumalee, 2015; Songkram, 2015; Vainikainen, Hautamaki, Hotulainen & Kupiainen, 2015) found that formal thinking of an individual's level were statistically significant factors for verbal and quantitative reasoning. The present study was Quasi Experimental Design were there was no chance of randomization in the selection of the sample unit rather it encourages the random selection of 1 or many classes. So, on the basis of the design 3 classes of 3 schools were randomly selected for traditional intervention. Somehow the researcher has tried to minimize the internal validity through ANCOVA and Regression Analysis and through motivating the students to maximum use of an email during their experiment. In asynchronous e-mail learning experiment class all the students were not equally, utilizing their thinking skill during the interventions, but the maximum students' performance became high and as a whole thinking skill of students was highly correlated with the dependent variable. However, it was also found that the R^2 of creative thinking was much better than divergent thinking skill and convergent thinking skill of the students. The thinking skill of the learners' performance was more skewed towards the learning performance because of Email mode of interactions and interventions as the Google era generations students were felt comfortable to learn independently at their own pace and convenience. Rather formal schooling is time bound and works on parents and teachers suggestion and decision. Again, question was raised whether this ideology or intervention is applicable to all Indian schools and among all Indian class of students. The researchers are sure about the phenomena that it could be possible to implement in all the Indian schools, but if government, stakeholders, administrators, teachers, parents and students himself or herself take interest to apply in the teaching- learning process. Not only this but also maximum secondary school students now-a-days using smartphones to chat in WhatsApp, Facebook and other social media. That is why the study claimed it is possible to implement not only in all Indian schools but also in other countries too. The study claimed that the executive functions were hierarchical and significantly related to asynchronous e-learning performance of the students. This result was supported by earlier researchers (e.g. Becker, Miao, Duncan & McClelland, 2014; Bull, Espy & Wiebe, 2008; Kane & Engle, 2002; Rued, Posner & Rothbart, 2010; Thomson & Gathercole, 2006) found that executive functions of working memory and inhibition plays a significant role in learning situations. The independent variables like working memory, self-monitoring and task initiation of the experimental group participants were also correlated among the learners performance respectively. It clarified that both synchronous and asynchronous e-mail learning enhanced the learning performance of those learners who are directly or indirectly related with factors of learning styles. The recent study confined there is a significant relationship between asynchronous e-mail learning styles with working memory, self-monitoring and task initiation learning performance of the secondary school students. This result was not supported by some earlier studies (e.g. Carlsona, Mosesb & Bretona, 2002) found that combination of inhibition and working memory do not shows any relation between EF and false belief understanding. In asynchronous e-learning experiment class all the students were not equally utilizing their executive function during the interventions, but the maximum students' performance became high and as a whole executive function of students was highly correlated with the

dependent variable. However, it was also found that the R^2 of Task initiation was much better than working memory and self-monitoring of the students. The study claimed that the attention benefit was hierarchical and significantly related to asynchronous e-learning performance of the students. The independent variables like attention time span, attention representing and attention analyzing of the experimental group participants were also correlated among the learners performance respectively. It clarified that asynchronous e-mail learning enhanced the learning performance of those learners who are directly or indirectly related with factors of learning styles. Again, question was raised whether this ideology or intervention is applicable to all Indian secondary schools or not? The researchers are sure about the phenomena that it could be possible to implement in all the Indian schools, but if government, administrators, teachers, parents and students himself or herself take interest to use it in the teaching- learning process. Also, in present time all are familiar to smart gadgets- how, where and why to use it. That is why the study claimed it is possible to implement not only in all Indian schools but also in other countries too. This result was supported by earlier researchers (Cowan, Nugent, Elliot, Ponomarev & Saults, 1999; Perez & Solis, 2007; Salo, Salmela, Salmi, Numminen & Alho, 2017) found that though attention, working memory and executive functions are separated but it sustained a fast improvement in performance of the learners.

CONCLUSION

If we compare with the European, American and other advanced countries of the world, we can find that the classroom is highly assisted with internet accessibility. In this study, the researcher found developing countries should adopt e-learning aids or styles assisted learning in their classroom. Asynchronous e-learning in Indian classroom is still in progress, not all the classroom of secondary schools is facilitated with smart classroom or internet connections etc. The learning environment in Indian secondary schools was not fully technology supported where students were getting traditional lectures for their clarification of concepts. In this context, the researchers thought of applying a new online and offline learning styles i.e. asynchronous (Email) e-learning in the experimental class. To know the significance effect of an Email supported learning approach the researcher has undertaken the present study. As a result, it was observed that technology supported learning was much better than traditional learning and it was supported by earlier researcher (Cheng & Wu, 2015; Coogle &Floyd, 2015). However, few researchers who conducted the studies in European and American countries did not support the result (Granda, Garcia, Nuno & Suarez, 2010). Now-a-days teachers are acquiring and upgrading knowledge regarding video-conferencing, using different software like EMO, Skype, Google-Duo, Orientation and Refreshers courses. The literatures found that asynchronous e-mail learning has significant relationship with the learning performance of school, college and university level students. It was found that there exists a significant effect of asynchronous e-learning performance learning among elementary students. This was because of the technology assisted asynchronous e-learning motivated the learning performance of experimental group students. The present findings can be apply in underdeveloped countries if the government, policy-makers, stakeholders, teachers, parents and students take initiative and interest to implement new style in teaching learning process. There should also be the provision of smart classrooms, internet facilities, and e-learning programs in teaching learning process. Asynchronous was supported by earlier researchers (e.g. Dewiyanti, Gruwel, Jochems & Broers, 2004) found that asynchronous group of learners performance was also better among the participants. However, few researchers who conducted the studies in European and American countries did not support the result (Bower, Dalgarno, Kennedy, Lee & Kenny, 2015) found that learning outcomes before, during and after blended asynchronous learning was not statistically significant over learning performance of the students. It was found that there is a significant hierarchical relationship between asynchronous learning styles with thinking skill-learning performance of secondary school students. This was supported with the earlier studies conducted by most of the developed countries in the countries (Samarraie, Teo & Abbas, 2013; Songkram, 2015). The independent variables like convergent thinking skill, divergent thinking skill and creative thinking skills of the experimental group participants were directly correlated with their learning performance. To implements the recent findings in Indian context the responsibility should be taken by Indian government, stakeholders, administrators and other authority to promote convergent thinking, divergent thinking and creative thinking by using asynchronous e-learning modes among the learners respectively. There should be maximum utilization of virtual learning like internet, email, WhatsApp, Skype and imo etc. in teaching learning process to meet the recent results in secondary schools. It was found that there is a significant hierarchical relationship between asynchronous learning styles with executive functions learning performance of secondary school students. This was supported with the earlier studies conducted by most of the developed countries in the countries (Kane & Engle, 2002; Thompson & Gathercole, 2006). The independent variables like working memory, self-monitoring and task initiation of the experimental group participants were directly correlated with their learning performance. Different strategies are available to improve executive functions (Stroop Task, Saccadic Test and Inhibitory Control) of students that could promote high performance and retention among Google generation students.It was found that there is a significant hierarchical relationship

between asynchronous learning styles with attention benefit learning performance of secondary school students. This was supported with the earlier studies conducted by most of the developed countries in the countries (Bosse & Valdois, 2009; Chen & Wu, 2015). The independent variables like attention time span, attention representing and attention analyzing of the experimental group participants were directly correlated with their learning performance. Different programme and policies like frequent IQ test, yoga, meditation and other co-curricular activities should be implementing in educational system to improve attention benefit of students that could be transfer into learning situation to improve the learning performance of the leraners.

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