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Comparison of Teaching with Virtual LEGO and Traditional Method on Academic Performance Mathematics Students at Elementary Level

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Abstract

The purpose of the study was to examine the effectiveness of Virtual LEGO-based teaching compared to traditional methods in enhancing mathematical understanding among elementary school students. The major objective of the study was to compare teaching with virtual LEGO and traditional method on academic students' performance of mathematics belonging to the experimental group and control group at elementary level. The study involved an experimental design that compared two teaching approaches: a traditional method (control group) and a virtual LEGO approach (experimental group). The research was conducted at City Garden Public School in Skardu, focusing on 7th-grade students. From a population of approximately 50,000 students in the district, a random sample of 20 students was selected and divided equally into two groups (control and experimental). Over a period of two weeks, the control group was taught mathematics using traditional teaching methods, while the experimental group used virtual LEGO, a digital, interactive tool developed based on Froebels educational principles. The researchers used a post-test experimental design to assess learning outcomes. To measure students' performance, a Digital Complexity Scale, based on established block design stages, was utilized. The data was analyzed using SPSS (version 26) and a t-test to determine statistical significance. The results revealed a statistically significant difference in performance between the two groups, with the experimental group showing higher post-test scores (t-value = 8.31, $p < 0.01$). This indicated that virtual LEGO had a positive and significant effect on students mathematical understanding and evaluative skills. Based on the findings, the study concludes that virtual LEGO is an effective teaching tool in mathematics at the elementary level. It recommends incorporating information and communication technology (ICT) into the classroom to enhance conceptual understanding. Furthermore, it suggests that group activities can foster social interaction, and both control and experimental groups should be provided with equal learning facilities to support fair comparisons. It was concluded that teaching through Virtual LEGO was found effective in teaching of Mathematics subject to enhance students skills while its practice in the class room have awaken the mind of the learner to generated by making example. It was observed that the performance of the learner increased through LEGO.

Key words: Virtual LEGO, Mathematics Education, Elementary Students, Digital Learning Tools, Traditional Teaching Methods, Student Engagement, Conceptual Understanding, Comparative Study, Educational Technology, Interactive Learning

Introduction

Nowadays using technology related to tools in education is trending all over the world. Altbach, Reisberg & Rumbley, 2019 indicated that European countries are focusing on digital means of education for making improvements in the learning experience of their students & making them more competent and favourable for the country. With this dramatic change in society, the use of computers has been increased and computers have become the part and parcel of every home, workplace and school (Xharg, Yang, chang & chang, 2016). Indicated in has studied that Second Information. Technology in Education Study (SITES) conducted a project and highlighted that developed countries are having more computers in educational institutions and easy access to the internet. The limited internet access and less number of computers in educational institutions have been observed in underdeveloped or developing countries (Mahnaz & Kiran, 2024a).

Pakistan as a developing country needs to bring a change in its educational sector for improving the teaching learning quality for students. Technology is being served as a tool for making improvements in the educational sector, National educational policy framework (2018) in this policy benefits associated with the use of technology in education are also discussed, details of these benefits are as follows. First, for enhancing teacher training, learning, improving their content relevant knowledge and making them able to play an active role in the classroom we can make our new generation capable of surviving in a workplace that is completely based on technology second, By using technology in classroom we can make our new generation capable of surviving in a workplace that is completely based on technology. Third, for transferring new and unique knowledge to the teachers and students of remote areas technology is considered a most powerful tool. National Education Policy (2018) indicates that technology based teaching and learning promotes students cantered learning which follows constructionist's education method and allows students to work freely, explore more do experiment with the learning materials and bring innovation in their work, if want to implement this approach of learning in Pakistan we need to keep on mind the five points given by UNESCO (2008) for using technology in education. Teaching styles of teacher have a greater impact on students' performance and a teacher is a person who can use various strategies to mean a boring lecture attractive for students., for producing highly skilled and quality learning teachers teaching method serves a vital role (Mahnaz & Kiran, 2024b). Moreover, Davis (2019) explained in his book that teachers adopt an itching method as per their teaching style a teachers teaching style involves personal behaviour of teachers and tools utilized for Trans furring knowledge and getting information about the needs of the learners. Various teaching method are present but most of the teachers can chose a teaching method as per their own choice. For example, teaching addition concept words such as add end, sum, result, solution, and altogether are content words, Mathematics teachers should use the action of the math so that students can attach words to their understanding of the process of adding. Shown in following figure 1.

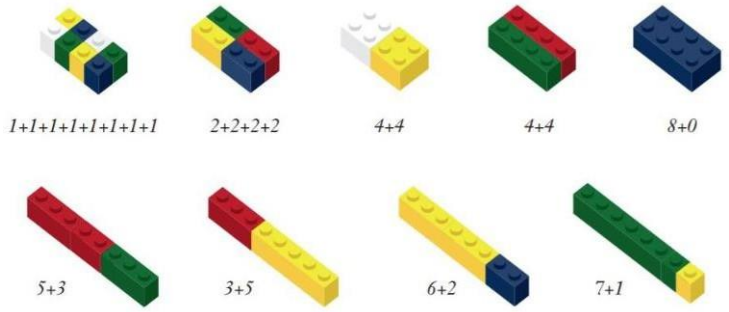


Figure 1: *possible models for counting eight (this figure was derived from the book titled "teaching addition using virtual LEGO, Disseler, 2017, p, 14).*

Statement of the problem

Elementary level school of Pakistan traditional approach to teaching is more common, students are passive learners in this approach that is why their classroom engagement in terms of cognitive, behavioural and emotional engagement may be less for enhancing students engagement, teachers can use more technology based pedagogies in their teaching, in addition to this Virtual LEGO serve an important role in making students independent learners, (Suhonen & Tiili, 2016) , that is why the researcher wanted to investigate the effects of teaching through Virtual LEGO on academic performance of mathematics students belonging to the experimental group at elementary level.

Objectives of the study

This study was conducted to achieve the following objectives:

1. To compare of teaching with virtual LEGO and traditional method on academic students' performance of mathematics belonging to the experimental group and control group at elementary level.

Research hypothesis

Following hypothesis was formulated in this research.

H_0: There is no significant difference in the mean post-test academic scores of the experimental group and the control group, taught trough virtual LEGO and traditional method of teaching at elementary level.

Significance of the Study

It is a proven fact that quality of education is directly proportional to the quality of instruction. Changing the instructional strategies of science instruction can enhance the quality of education. The findings of the study will be helpful for.

1. Motivating the teachers to teach math in a more innovative way i.e. students learning independently and at their own pace may charge the role of his/her professional growth.
2. Providing guidelines for further research i.e. the results of study may provide useful dimension in research and open the doors of further individualization of teaching and learning in the subject of Math through Virtual LEGO.
3. Making the learning of Math more interesting and independent i.e. the student learns according to their own learning style and pace.
4. The users of this study will be curriculum planners, math teachers, teacher training institutions, further students and the people related to the field of math education.
5. The users of the study will be software developers, and also educational planners.

Literature Review

Introduction to STEM and Manipulative in Math Education:

Mathematics education at the elementary level is foundational for later academic success. Research supports the use of concrete manipulative in facilitating conceptual understanding, particularly in subjects like geometry, spatial reasoning, and basic arithmetic (Carbonneau, Marley, & Selig, 2013). Traditional methods, often teacher-centered and textbook-based, focus on procedural learning, while manipulative offer hands-on experiences.

Theoretical Frameworks:

The constructivist theory of learning, as proposed by Piaget and extended by Vygotsky, underpins the use of manipulative. According to these theories, children learn best when they actively construct knowledge through experience. Virtual LEGO fits within this framework, providing interactive and visual-spatial learning opportunities. Vygotskys concept of the "zone of proximal development" also supports the guided use of digital tools to scaffold learning.

Virtual LEGO in Education:

LEGO Education tools have evolved from physical blocks to digital platforms like LEGO Digital Designer (LDD) and LEGO Education SPIKE. Virtual LEGO allows students to manipulate blocks in a simulated 3D environment, fostering spatial reasoning and problem- solving skills (Resnick et al., 1998). Studies have found that digital LEGO use can increase engagement, motivation, and understanding of complex mathematical concepts such as symmetry, geometry, and proportions

(Highfield & Mulligan, 2007). Virtual LEGO offers a wide range of engaging and hands-on methods to teach mathematical concepts effectively. Children can begin by learning numbers using printable LEGO math mats to align bricks and represent numerals, followed by practicing skip counting through brick stacking or using the number of studs on each brick. They can build LEGO number lines for interactive movement, create ten frames, and explore addition and subtraction through visual and tangible activities. Place value is introduced with printable mats, while multiplication and division are reinforced using arrays, fact practice, and stacking activities for visualization. Puzzles, dice games, and regrouping exercises make abstract concepts more accessible. LEGO clocks help with telling time, and comparing numbers becomes more intuitive through visual representations. Fractions are made simple using bricks to show parts of a whole, and students can calculate area and perimeter using the studs. More advanced applications include solving story problems, working with money by assigning values to bricks, and building bar graphs after mini bowling games. Geometry concepts such as polygons and model rooms are explored with bricks, while statistics—mean, median, mode, and range—are taught using data collected from LEGO towers. Finally, students can map on coordinate planes and design unique LEGO patterns to represent equations, fostering both creativity and a deep understanding of mathematical relationships.

Comparative Studies: Traditional vs. Virtual LEGO:

Comparative research on traditional teaching methods and digital manipulative-based instruction, including Virtual LEGO, is emerging. A study by Sullivan et al. (2016) found that students using virtual manipulative outperformed peers in conceptual understanding of geometry. Similarly, Papert (1980) highlighted the power of constructionist tools like LEGO and LOGO programming in helping students "learn by making." In contrast, traditional methods, while more structured and widely adopted, often fail to engage students who struggle with abstract concepts. However, they may offer better results in standardized test performance, particularly where curricula emphasize rote memorization and repetition (Boaler, 1997).

Benefits of Virtual LEGO:

Enhanced Spatial Skills: Virtual LEGO helps students visualize and rotate 3D structures, improving spatial awareness (Casey et al., 2008). Increased Motivation and Engagement: Gamified learning environments tend to captivate students better than lectures or worksheets (Reimer & Moyer, 2005). Accessibility and Safety: Virtual tools reduce the need for physical resources and can be accessed remotely, supporting inclusive learning.

Challenges and Limitations:

Technological Barriers: Limited access to digital devices or reliable internet may disadvantage certain students.

Learning Curve: Teachers and students may require training to effectively use virtual tools.

Cognitive Load: For younger learners, switching between abstract mathematical thinking and digital navigation might increase cognitive demands (Sweller, 1988).

Integration with Curriculum:

Successful integration of virtual LEGO into math curricula requires alignment with learning outcomes, teacher support, and assessment adaptation. Blended learning models that incorporate both virtual LEGO and traditional approaches are gaining popularity (Mahnaz & Kiran, 2024c).

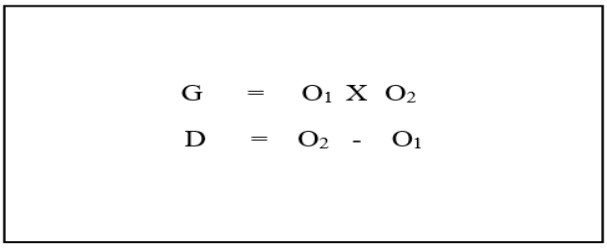
Methodology

This experimental study was conducted to explore the Effects of virtual LEGO on academic performance of mathematics students at elementary level. The research methodology was designed by keeping in view the objectives of the study. Virtual LEGO is basically a teaching mathematics and it was developed by Froebel. The theoretical framework of this study was mainly based on teaching through LEGO that was presented Froebel. This Virtual LEGO was selected as an independent variable of present research work. The dependent variable was academic performance of mathematics students.

Research design:

The post test was conducted at the end of course. Post-test was design to discover the effects of

this teaching through Virtual LEGO to mathematics students. ―Experimental research study is a method of analysing the future result of a specific theme or subject under a control condition‖ (Tuckman.1972).
The research was based on: post-test design‖. That was symbolized as follow.



Key:
G = Group of students
O_1 = Post test score of control groups
O_2 = Post test score of experimental groups
X = Treatment
D = Difference between $O_2 - O_1$
This study was designed as an experiment here group is the same in this study and post- test. Researcher used traditional method for control group and virtual LEGO for experimental group. Researcher taught two weeks beginning from 7 Marche to 12 second from 14 March to 19 March. First post test conducted at 12 March and second post test conducted at 19 march. Control group was taught using traditional method of lecturing. In the experimental group the researcher used virtual LEGO. The researcher used virtual LEGO step by step offering more detail than the text and sporadic feedback mechanism. The role of the researcher in the experimental group was that of a facilitator, guide and fulfil the needs of the students.

Population:
The population of study comprised 6,550 Mathematics students, which are enrolled at elementary level in district Skardu.

Sample size:
The experimental research was conducted on students of 7th class in the subject of mathematics. The students enrolled in City Garden public school Skardu of grade 7th were selected to conduct research experiment. The size of the class was comprised of 20 students for the experiment. The researcher used convenient random sampling technique. The size of the class was comprised of 20 students and the experimental research was designed on Mathematics subject.

Table Post test

S. No	Skills	Items
1	**Addition**	4
2	**Subtraction**	4
3	**Multiplication**	4
4	**Division**	4
5	**Fraction**	4
	Total	20

Four questions were prepared from each section. The post-test was comprised of 20 questions and 30 minutes were specified to solve it. The researcher selected topics from the book that was taught at grade 7th level in Garden city public school Skardu.

Research instrument
Experiment was accomplished within two weeks from 7 March to 12 for control group and 14 to 19 March for experimental group. The researcher gave instruction in accordance with concept

Virtual LEGO steps to evaluate the topics. The researcher divided the students into four groups, to perform activity in the classroom; the specific time was given to the students to perform activity. The students supported each other to deliver their best performance. The researcher involves every student in the class room. Students took part deliberately and always intended to show their enthusiasm in the accomplishment of the task in specific time duration. The researcher spent 45 minutes per day to deliver lesson in class room. The researcher conducted post-test to find out its effectiveness for the learners. The score of the both post-test was also recorded by the researcher. Experiment study was conducted to enhance the skill of the learner at grade 7^{th} level. This study was more effective than other studies. The used post- test design. Twenty questions were prepared for both groups control and experimental group (each section) (addition, subtraction, multiplication, division, fraction and square). The post-test consisted of 20 questions and every item carried 5 marks and 30 minutes specifically to solve it. The researcher employed post-test design to know the effect of teaching through virtual LEGO as a major research instrument.

Lesson plan

The researcher developed lesson plans from Mathematics book at grade 7^{th} level from (Punjab Text Book Board). The experiment period was limited for two weeks from 7^{th} March to 12^{th} March and second week from 14^{th} March to 19^{th} March.

Research tool

A 20 items test was developed by applying table of specification for use on both post- tests. These 20 items were stratified. To ensure the content validity of questions for content validity. These questions were relevant and correlated with the standards for mathematics literacy. Content for the study of mathematics (Punjab Text Book Board seven grades) was used in the test instrument.

Independent variable

Virtual LEGO was used as a theoretical from work for the experimental research.

Dependent variable

On academic performance of mathematics students at elementary level.

Controlled variable

The research controlled various variables during teaching in class room as follow.

Teacher, Students, Time, Class room setting, A.v aids

Teacher: Research as a teacher taught two weeks in the class room. Teacher prepared the lesson in according to teaching through virtual LEGO steps. Teacher was punctual in the class for a research experiment. The researcher conducted class activities to involve every student in the lessons.

Students: The experiment study was conducted on twenty students in the class room. The students were regular during the experiment. The students deliberately participated in the lesson. The students made by using the raw material from their surrounding study**.**

Time: The research used specific time for the experiment. The second was specific for the Math subject that was fixed during the experiment in the day in the class room. The researcher divided the time according to the teaching method step by step. The researcher engaged all the activities within the time period.

Seating arrangement in the classroom: The researcher divided the students into fourth group and arranged their seating plans in specific direction. There was proper light in the class room. The arrangement of class sitting was changed according to the need of the activities.

Aids: The researcher used proper A.V aids facilities during the experiment such as charts, shite board, diagram and virtual LEGO.

The experiment was done collectively. The students participated in the experiment with keen interest.

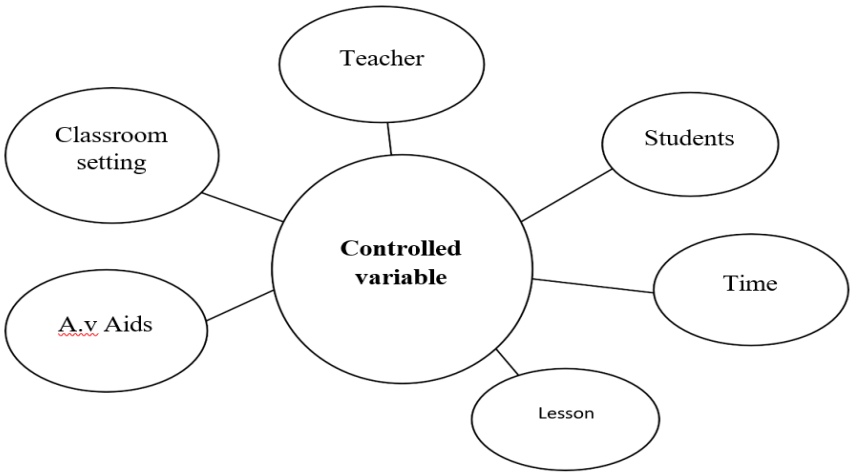


Figure 4: Diagram of control variable

Procedure of the study: Research study was engaged by the permission of authorities of in Garden city public school skardu at grade 7th level.

Selection of variables: Teaching through Virtual LEGO was selected as an independent variable and academic performance of students was selected as a depended variable of the research study.

Development of Lesson: The researcher prepared lesson plans from Mathematics books at grade 7th level from () that was published in 2021- 2022 by Punjab text book for experiment. The lesson plans were prepared from the following contents:

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Fraction

Development of post

To collect data, the researcher used post design.

Validation: The validation of test was designed in accordance with the expert s opinion. The researcher developed a construction tool for the experiment.

Item analysis: Item analysis illustrates the process that improves and examines the students test quality, skill and clarity of thought. The item difficulty level of the test was developed a test in according to the level of students. Test was prepared at tree level of student's low, average and high. Students were of different backgrounds _urban and rural and test items were made to check the item difficulty level of students.

Researcher developed question in according to difficulty level of students and options were given in (MCQs) test to facilitate the learner. Researcher did not use Linkert scale due to consistency of the answer such as strongly agree, agree, neuter, disagree and strongly disagree. The researcher made MCQs test to keep the validity to the test.

Data collection

The researcher conducted post-test to collect data from the learners. After teaching two weeks with virtual LEGO the researcher conducted post-test to find the difference in the score of the students. The scholar was collected numbers from two several tests. This was measured by collecting numbers from students at two different times (post-test) was used two different tests calculating the same elements.

Data analysis

Post-test experimental design was selected to conduct the experiment. The experiment was conducted on 7th class students by focusing the subject Mathematics. The data analysed by using statistical techniques with the help of SPSS 20th edition.

Analysis and interpretation

This section of the study aims to report the result of the experiment including the collection and analysis of the data, and the interpretation of the result. It further includes the most importantly testing of the hypotheses that is the major result of the experiment. This study was conducted with the purpose of exploring the effects of teaching through Virtual LEGO on academic performance of mathematics students at elementary level.

Method of data Analysis: The data of this research was analysed statistically using descriptive statistics by comparing means of the scores on the control group post-test score and experimental group post-test experimental research design. The statistical test that was employed was a paired sample t-test with the one sample post-tests to compare each other, and the Time Series Modeler was employed to find significance of each groups of the study.

T- Test : T- Test is a statistical test that is used to find out the difference in the means of two groups population. It basically checks whether the difference in the mean of two groups are statistically significant. Most experiments that tend to check the effectiveness of any intervention on a given population use this test. In present study is paired time series test was used because the chosen sample was the same in both post-tests. These assumptions are:

1. The samples must be the tested twice if they are same, or the samples must be paired or linked in some way. This assumption was also met as the samples were the same in both post-tests.
2. The dependent variable must be continuous. In this study, academic performance was administered twice so the dependent variable that academic performance is continuous.
3. The two samples should be of equal size. This assumption was also met as the participants were the same in the both post-tests and none of them left the program so the sample size was 20 at both points in time.
4. The dependent variable should not contain outliers. This assumption has also been met.

Result of data Analysis

The major data analysis procedures used in the study were the t-test for comparing difference of mean scores on the post-tests to find out difference is statistically significant. The other two data analysis was simple mathematical calculation of percentage of difference of mean scores and the percentage of difference of scores of individual participants as well. The instrument used in this study provides 20 items that can be categorized into these sections, which are

1. Addition
2. Subtraction
3. Multiplication
4. Division
5. Fraction
6. And square

Summary of the Analysis

Control group post test was conducted after the teaching through traditional method. Experimental group post test was conducted after the teaching through Virtual LEGO. The result of both tests were coded and analysed with ―SPSS 20th Edition‖. The collected data has been described in the following section.

Section I of tool construction

This section is related to tool construction analysis of the study. The tool was developed for the experimental study and validated by the experts for the quantitative item analysis that can be used for further research effectively for the research purpose.

Section II Item analysis

This section has shown the difficulty level of item analysis for the experimental research.
The quantitative research method is used to collect data.

Section III level of thinking skill (Students score)

This section iii is specifically related to assess the level of thinking skill of the students study at grade 7^{th}. post tests were conducted to check the skill of the students in five areas addition, subtraction, multiplication, division and fraction.

Section iv Effectiveness of the Virtual LEGO (Paired sample t test)

This section iv related to assess the effectiveness of concept LEGO on students skills study at grade 7th level. The researcher developed a test was based on addition, subtraction, multiplication, division and fraction to check the effectiveness of the Virtual LEGO teaching. The same test was used as post tests for that purpose. The difference between post-tests (control and experimental group) score was calculated with the use of Paired sample t test. The results have been calculated and presented in table form. Given below tables show the detail about analysis.

Table1: Analysis the score of control group:

S. No		Percentages	Mean	Std. Deviation
1	**Addition**	93.75%	18.75	2.22
2	**Subtraction**	92.5%	18.50	2.35
3	**Multiplication**	92.5%	18.50	2.35
4	**Division**	90%	18.00	2.51
5	**Fraction**	88.75%	18.00	2.99

N= 20

Table 1 indicated percentage of addition (P= 93.75%) , mean of addition was (18.75) and std. deviation was (2.22). It indicated percentage of subtraction (92.5%), mean of subtraction (18.50) and its std. deviation was (2.35), forever, indicated percentage of multiplication (92.5%), the mean of multiplication (18.50), std. deviation (2.35). it also indicated percentage (90%), mean of division was (18.00) and its std. deviation was (2.51) and last one percentage of fraction was (88.75%) , mean was (18.00) and its std. deviation was (2.99).

Table 2 Analysis the score of experimental group:

S. No		Percentages	Mean	Std. Deviation
1	**Addition**	97.5%	19.50	1.53
2	**Subtraction**	97.5%	19.50	1.53
3	**Multiplication**	95%	19.00	2.05
4	**Division**	91.25%	18.25	2.44
5	**Fraction**		18.25	2.44

N= 20

As shown in Table 2, percentage (97.5%), mean (19.50), std. deviation (1.53) of addition. As shown percentage of subtraction (97.5%), mean of subtraction (19.50), std. deviation (1.53). it also shown percentage of multiplication (19.00), std. deviation (2.05). Forever, shown percentage of division (91.25%), mean (18.25), and std. deviation was (2.44). As shown percentage of fraction (92.5%), mean was (18.25) and its std. deviation was (2.44).

Table 3 Effectiveness of teaching through traditional method and LEGO to Mathematics subject section of (Addition):

Item	Groups	percentage	Mean	Std. deviation	t- value	Sig.
Addition	**Control Group**	93.75%	18.75	2.22	2.48	0.44
Experimental Group		97.5%	19.50	1.53		

N = 20

Table 3 pointed that t- value (t = 2.482) both group control and experimental group was statistically signification (P<0.01). Thus there was significant difference between post-tests

(control and experimental group) results of the students related to the section of ―Addition‖. Thus the teaching through Virtual LEGO was found highly effective ($p<0.01$) for developing ability to evaluate the things. Thus hypothesis **H_o ―**There was no statistically significant difference in the mean post-test academic scores of the experimental group and the control group, taught through virtual LEGO and traditional method of teaching at elementary level‖ was rejected. On the basis of data reflected in table 4.3 it can be established that teaching the concept of _ Additionby using Virtual LEGO was very effective and efficient and students for able to clearly understand the concept of addition by using the Virtual LEGO.

Table 4 Effectiveness of teaching trough traditional method and LEGO to Mathematics subject (control and experimental groups):

Groups	**Percentages**	Mean	T	Sig.
Control	91.5%	92.25	8.31	4.69
Excremental	94.75%	94.00		

N = 20

Table 4 pointed out that total t- value (8.31) was statistically significant ($p<0.01$). Thus there was significant difference between both post-tests of control and experimental groups test results of the students related to the all section. Thus the teaching trough Virtual LEGO was found highly effective ($p<0.01$) for developing ability to evaluate the things. Thus hypothesis Ho ―There was no statistically significant difference in the mean post-test academic scores of the experimental group and the control group, taught trough virtual LEGO and traditional method of teaching at elementary level‖ was rejected. On the basis of data reflected in table 4.8 it can be established that teaching the concept of _All sections (Addition, Subtraction, Multiplication, Division and Fraction) by using Virtual LEGO was very effective and efficient and students for able to clearly understand the concept of all sections (Addition, Subtraction, Multiplication, Division and Fraction) by using the Virtual LEGO.

Discussion

The researcher study was entitled to check the effectiveness of teaching through LEGO for students skills at elementary level. The researcher emphasized on the development of the learner in specific skills (Addition. Subtraction, multiplication, division and fraction). The prior aim of teaching through LEGO was to enable the learner to know about the pre-existing concept. Teaching trough LEGO are used as instructional design. The researcher elaborated the process of producing and specifying environmental situation that cause student interaction for changing behaviour. Teaching LEGO is deployed for organizing and planning teacher activities. According to Gunter, Estes and Schwab, (2013) explained the basic need of this LEGO to motivate the students to develop their skills. This concept of teaching through virtual LEGO indicated about the positive attribute of the learning object. The need of research study was to build concepts of the learners by using LEGO positive and negative examples. According to Bruner (2003) structured instruction, logical new model and systematic approach indicate incorporation of knowledge that enhances comprehension knowledge.

Conclusions

The conclusions were drawn on the appropriate finding.

1. The students performance related to _Mathematics skillsdeveloped through teaching Virtual LEGO. The students participated in learning activities and learnt to generate their own examples. Teaching trough Virtual LEGO can be deployed for difference subjects and for different grade level. Majority of the students scored at average level of _Mathematics skillsin post-tests. The post tests were conducted after the experiment to find the difference of the students _performance. The students taught by _Virtual LEGO and majority of the students scored at high level of _Mathematics skillsin post-tests.
2. The researcher had found significant difference between students belonging to _control and experimental groups in post-tests results related to the mathematics skills in specific area (Addition. Subtraction, multiplication, division and fraction).
3. The researcher illustrated that the students taken any significant distinction on the base of

taught trough virtual LEGO and traditional method of teaching at elementary level.

4. It was concluded that teaching through Virtual LEGO was found effective in teaching of Mathematics subject to enhance students skills while its practice in the class room have awaken the mind of the learner to generated by making example. It was observed that the performance of the learner increased through LEGO.

Recommendations

On the basis of findings and conclusions of the study the scholar recommends the following:

1. It is unknown if childrens computer use at home is related to the students level of block in the virtual LEGO. This could have possibly given an advantage to some students, as LDD requires all childrens and viewing to be done with the mouse and arrow keys of the keypad.
2. Teaching through Virtual LEGO may be recommended for the higher level of students.
3. Teaching through Virtual LEGO may be recommended for other subject at elementary level such as English and Urdu.
4. The training of new teacher may be conducted to use Virtual LEGO in their teaching.
5. Teaching workshops may be arranged to encourage the teacher to teach with the Virtual LEGO to the students.
6. Cooperation learning through group work may be promoted to boost the abilities of the students.
7. Groups of students may be made during practical work to make social interaction between them. Urban and Rural students may be given opportunities to use equal facilities.
8. Similar kind of activities may be given to the students to judge the difference among their age group such as doing experiment.
9. Information and communication technologies (ICT) may be used in the class room to clear the concept of the students by showing pictures related to Math subject.
10. Math exhibition may be held to increase the interest of the students.
11. Math text books may be students cantered. Motivation factor may be used to show positive attitude in learning to collect information by teaching LEGO.
12. Teacher may be assigned new projects to the students in accordance to teaching Virtual LEGO to make math object by available material in their surroundings.

Future Studies

1. The present study was conducted to test the effects of Virtual LEGO teaching. This LEGO may be used on other subjects as English, Urdu and History.
2. Similar studies may be conducted at other levels or different age group such as high school level.
3. A survey may be conducted among teachers regarding their opinions about the use of Virtual LEGO to explore their perception and understanding.
4. Attitude of educational experts towards Virtual LEGO may be found through research studies.
5. Other teaching strategies may also test to study their effectiveness in teaching mathematics subject through teaching Virtual LEGO.

References

Abdulghani Al-Shuaibi, (2014), Importance of Education in Human Life: a Holistic Approach‖ Access online at: www.ijsc.net, 2(2), 23-28.

Adams, M. S. (2010) Digital Complexity Scale. Unpublished rating scale. Andrews, N. L. (2009). Unpublished data.

Altbach, Reisberg & Rumbley, (2019) Digital Complexity Scale. Unpublished rating scale. Andersen, R., Mørch, (2016) Mutual Development in Mass Collaboration: Identifying

Brosnan, M. J. (1998). Spatial ability in childrens play with Lego blocks. Perceptual and Motor Skills, 87, 19-28.

Brosnan, M. J. (1998). Spatial ability in childrens play with Lego blocks. Perceptual and Motor

Skills, 87, 19-28.
Budd, B. E., Clance, P. R., & Simerly, D. E. (1985). Spatial Configurations: Erikson Reexamined. Sex Roles, 12 (5/6), 571-577.
Caldera, Y. M., Culp, A. M., OBrien, M., Truglio, R. T., Alverez, M., & Huston, A. C. (1999). Childrens Play Preferences, Construction Play with Blocks, and Visualspatial Skills: Are they Related? International Journal of Behavioral
Caldera, Y. M., Culp, A. M., OBrien, M., Truglio, R. T., Alverez, M., & Huston, A. C. (1999). Childrens Play Preferences, Construction Play with Blocks, and Visualspatial Skills: Are they Related? International journal of Behavioral Development, 23 (4), 855-872.
Casey, M. B., Andrews, N., Schindler, H., Kersh, J. E., Samper, A., & Copley, J. (2008). The development of spatial skills through interventions involving block building activities. Cognition and Instruction, 26, 269-309.
Casey, M. B., Nuttall, R., & Pezaris, E. (1997). Mediators of gender differences in mathematics college entrance test scores: A comparison of spatial skills with internalized beliefs and anxieties. Developmental Psychology, 33, 669-680.
Casey, M. B., Nuttall, R., & Pezaris, E. (1997). Mediators of gender differences in mathematics college entrance test scores: A comparison of spatial skills with internalized beliefs and anxieties. Developmental Psychology, 33, 669-680.
Casey, M., Nuttall, R., Pezaris, E., & Benbow, C. P. (1995). The influence of spatial ability on gender differences in mathematics college entrance test scores across diverse samples. Developmental Psychology, 31(4), 697-705. doi:10.1037/0012- 1649.31.4.697.
Casey, M., Nuttall, R., Pezaris, E., & Benbow, C. P. (1995). The influence of spatial ability on gender differences in mathematics college entrance test scores across diverse samples. Developmental Psychology, 31(4), 697-705. doi:10.1037/0012- 1649.31.4.697.
Casey, Nuttall, Pezaris, & Benbow, (1995); ―Effects of traditional and online instructional models on student achievement outcomes‖, Paper No. 1135,
Casey, Nuttall, Pezaris, & Benbow,; Casey, Nuttall, & Pezaris, 1997; Geary, Saults, Liu, & Benbow, 2000,). Spatial ability in childrens play with Lego blocks. Perceptual and
Casey, Nuttall, Pezaris, & Benbow,; Casey, Nuttall, & Pezaris, 1997; Geary, Saults, Liu, & Benbow, 2000,). Spatial ability in childrens play with Lego blocks. Perceptual andMotor Skills, 87, 19-28.
Chapman, O., & Wood, L. (2014). Teachers beliefs influencing the implementing of a project-based high school mathematics curriculum. In D. McDougall & A. Ross (Eds.) Proceedings of the twenty-sixth annual meeting of the North American chapter of the
Chen, X. (2013). STEM Attrition: College Students Paths Into and Out of STEM Fields (NCES 2014-001),
Chris Coombes G. R ,2013 ―Values education for citizens in the new century: meaning, desirability and practice. In R. H. M. Cheng, J. C. K. Lee & L. N. K. Lo (Eds.), Values education for citizens in the new century (pp.1-35). Sha Tin: The Chinese University Press.
Clements, D. H. (2004). Geometric and spatial thinking in early childhood education. Conrad, A. (1995). Content analysis of block play literature. University of Memphis:Erikson, E. H. (1951). Sex differences in the play configurations of preadolescents. American Journal of Orthopsychiatry,! 1, 667-692.
Clements, D. H., & McMillen, S. (1996). Rethinking "concrete" manipulatives. Teaching Children Mathematics, 2 (5), 270-279.
Clements, D., Battista, M, Sarama, J., & Swaminathan, S. (1997). Development of students spatial thinking in a unit on geometric motions and area. The Elementary School Journal, 98(2), 171-186. doi:10.1086/461890.
Concepts, and Core Ideas. Washington, DC: The National Academies Press. Handbook of research on mathematics teaching and learning (pp.420-464). New York: Macmillan

Conner, J. M, & Serbin, L. A. (1977). Behaviorally based masculine- and feminine activity preference scales for preschoolers: Correlates with other classroom behaviors and cognitive tests. Child Development, 48, 1411-1416.

Conrad, A. (1995). Content analysis of block play literature. University of Memphis: U.S. Department of Education Educational Resource ED 382 357.

Developmentally appropriate practice in early childhood programs. Washington, DC: National Association for the Education of Young Children.

Dickinson, G. (2004). The right to education in Canada. International Journal of Education Law, 7, 1–2.

Disseler & Mirand, 2017). Rejeki et al.(2017), Teaching the Nintendo generation? Children, computer culture and popular technologies. In S. Howard (ed.), Wired up: Young people and the electronic media, pp. 19–42

Education, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.

Interaction Patterns in Customer-Initiated Software Product Development. Computers in Human Behavior 65, 77–91 Rana IJAZ, (2018) ―Effectiveness of concept of attainment on academic performance of the students at elementary level.‖

Mahnaz, W., & Kiran, S., (2024a). Big Five Personality Traits and Social Network Sites Preferences: The Mediating Role of Academic performance in Educational Outcomes of Secondary School Students, *Social Science Review Archives*, 2 (2), 1353-1370 https://doi.org/10.70670/sra.v2i2.187

Mahnaz, W., & Kiran, S., (2024b). Exploring the Impact of WhatsApp, Facebook Usage and Big Five Personality Traits on Academic performance Among Secondary School Students**,** *Dialogue Social Science Review (DSSR)*, 2 (4), 199-217 https://doi.org/10.5281/zenodo.14280812

Mahnaz, W., & Kiran, S., (2024c). Personality-Driven Adoption of WhatsApp and Facebook for Educational Collaboration: Academic Performance as a Mediator**,** *Social Science Review Archives*, 2 (2), 1461-1473, DOI: https:// doi.org/10.70670/sra.v2i2.198