Effectiveness of Kumon Teaching Method for Academic Achievement of Children in Mathematics

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Abstract

The experimental study was designed to investigate the effectiveness of Kumon method in comparison with traditional lecture method in the teaching of Mathematics to grade-5. Kumon is a math and reading enrichment program, which provides practice and instruction to each individual. This helps to think and work independently. The hypothesis of this study was that in Mathematics, Grade-5 students have no significant difference in their academic achievement treated by Kumon method and by traditional lecture method. The objective of the study was to determine the effectiveness of Kumon method for academic achievement of children in Mathematics. All grade-5 students of Fazaia inter colleges of Rawalpindi and Islamabad was the population. Cluster sampling technique was used. One of the three Fazaia colleges (junior section) was selected randomly. All grade-5 students of the selected cluster formed the sample of the study. Data was collected and analyzed by applying *t*-test and recommendations were given on the basis of findings of the study. This study shows that Kumon method is more effective for teaching mathematics to Grade 5 students in comparison with traditional lecture method and equally helpful in teaching mathematics effectively to boys and girls.

Keywords: Kumon method, teaching, learning, grade-5, achievements, effectiveness

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Introduction

Mathematics is the subject which develops creative nature of students. A skillful teacher can promote the creativity by modeling creative behavior. Mayesky (1995) stated that students with more creative teachers produce more creative work than students working under less creative teachers. Methods or strategies provide guide lines to make his/ her teaching creative and to achieve the desired objectives. Having grip on different methods of teaching, teacher is able to make his teaching effective and creative.

School mathematics should be such that; i) Students should take interest in learning mathematics and enjoy it. ii) Learn the importance of Mathematics. iii) Every child has certain experiences in his life and Mathematics is a part of it, which he/she can share it with others. iv) Mathematics helps children to put and solve the problems. v) Students make relationships by using abstractions. vi) Teachers must have the ability to engage every student in the classroom. Following are the core areas of concern; i) Majority of students have fear of Mathematics. ii) Existing curriculum is disappointing both for the talented and non participating students. iii) Old strategies to assess a student which considers mathematical perception as mechanical computation. iv)Teachers lacking in preparation can't help students in learning of Mathematics(Ahmed, Clark-Jeavons, & Oldknow, 2004).

Mathematics education also reflects social discrimination, especially in case of gender differences which states that boys are better in doing mathematics as compared to girls. This analysis helps us to suggest the followings; i) Math education should focus on achieving higher goals rather than narrow goals. ii) Engage every child to work hard and achieve success; also teach them conceptually to face the challenging situations of mathematics. iii) Use different assessment techniques to evaluate student's mathematical skills instead of examining the factual knowledge. iv)Variety of resources should be used by math teacher to teach this subject effectively (Zohrevand, Jafari, & Arshad, 2010).

Kumon is a method which develops computational skills and enables students to work within prescribed time and in more complex situation. It enables the students to make rich connections among different concepts of Mathematics. By doing such activities, without any conscious thought, students can perform basic functions and fundamentals of Mathematics.

"Private tuition for children in core subjects of maths & amp; English," n.d. believed that having learnt through Kumon method, the student can reduce his/ her anxiety in Mathematics, can improve his/her

mathematical ability to solve problems and he/she can learn to know the reason which hindered performance.

Objectives

i.   To determine the effectiveness of Kumon teaching method for academic achievement of children in Mathematics.
ii. To compare the effectiveness of Kumon method and traditional lecture method for academic achievement of children in Mathematics.

Hypothesis

H_1 There is significant difference in the mean achievement scores of Grade Five students if they are taught Mathematics through Kumon Method of Teaching and through Traditional Lecture Method of Teaching.

Literature Review

In the last 50 years, a lot of changes were made in the fields of Mathematics such as research, applications, education, and exposition. Some of these changes, such as invention of computers, are extensively used in mathematical education. These trends can influence primary, secondary and higher secondary levels. There are other, more subtle trends that may not be so obvious.

New Applications and Rapid Increase in their Significance

The subject of mathematics is used significantly in all branches of science and technology and the field of economics. Mathematics can help students not only in recognizing the problems but also helps in their solutions (Tarasenkova, 2014).

New Tools: CIT (Computers & Information Tech)

There is enough work on introduction of computers in educational setup. But the influence of computers in the life of a person and fast changes in the field of research, Email, electronic encyclopedias and internet sources are visible to draw the illustrations, graphs and algorithms (Gawron et al., 2016).

New Forms of Mathematical Activity

Various new forms are introduced as mathematical activities, such as algorithms and programming, modeling, conjecturing, expository writing and lecturing which are quite significant (Graeber, 1999).

Followings are some areas telling the importance of Mathematics;

Animator: In the field of animation, where linear algebra is used to describe the ways to rotate, to shift to make an object large and small.

Computer Engineer: Mathematics is involved in creating different applications and gadgets of next generation more than our thinking.

Fashion Designer: Mathematics is used to determine areas, perimeter using algorithms by fashion designers to design and to calculate the cost of material used.

Astronaut: In space- technology, mathematics is used to make precision of calculations from the point of leaving the earth till the end of the project.

Architect: Mathematics is also used in the field of Architecting to calculate the areas, perimeters of buildings, dimensions; floor layout, parking areas etc (Barrett & Zhang, 2009).

Mathematical background is the main requirement of various appealing fields and careers. If some students want to become a math's teacher, data analyst or want to choose the field of fashion designing, teacher and parents both must help them and provide them the necessary tools to make them successful members of society. Kumon program of Mathematics helps students by its problem solving technique even from basic to advance levels of Mathematics and also enhance their thinking and analytical reasoning ability; which are necessary for their future life success.

According to Kochhar (1990) teacher plans his/ her lesson by using different strategies to deliver his / her lesson effectively by keeping this thing in his/ her mind that all his / her approaches must be relevant to desired teaching learning process.

Every teacher should have characteristics to be persistent and have behavior relevant to the contents and methodologies which must be in

accordance with teaching-learning process. A set of teacher's behavior occurs simultaneously or sequentially in a valid way.

There are different ways of learning for individuals. Its pattern consists of pedagogy of lecture method, which covered the journey over centuries from early Greek to Dewey. According to the Philosophy of Progressivism, Athenian's methods of teaching were used to enable little children for discussion publically. By doing so; they could have effective and efficient discourse. Socrates used successfully the combination of different approaches to encourage the young students to get the best. Dewey supported project based learning because in this method, learner involves himself actively in learning studio, and also be able to solve problems which he considers that are real to him. Discussion here shows that teaching process needs continuous revision to fulfill the need of students when they face and go through different learning environments. Although lecture method has countless advantages, is continuously reshaped and redesigned by curriculum experts. Curriculum developers are trying to make methods of delivering contents more purposeful and more effective. The stress has been shifted towards construction of knowledge instead of simply delivering the facts. Lecture method fails to teach advance and upcoming ideas in the scientific world which requires new trends and approaches (Kochhar, 1990).

Lecture Traditional Method

Shinn (1997) said that the traditional approach of teaching which is still used in present day classroom situations needs to be revised to fulfill the needs of advance concepts in the field of science. Teachers must play an active role throughout their lessons and disseminate the facts to students. Lecture method is very cheap and economical. That's why it is commonly and frequently used in teaching process. It also a time-saving method. Once a teacher prepares a lesson, he / she can repeat it more than one time. In very little time, a teacher can deliver a lot of knowledge.

Teaching objectives are continuously changing; although this traditional method has a lot of advantages, it is now discontinued. It is not recommended to use this traditional method alone. It is quite difficult to achieve the new objectives of teaching by using lecture method. The goals of teaching can be achieved by maximum and active participation of children in the process of learning.

The role of a teacher should be like a facilitator, which makes learning easier to young kids and involves them in the process of

learning. Teacher should make classrooms as student-centered instead of teacher- centered, and allow students to recognize their problems freely. The teachers should help the learners to build up their knowledge by using different and new instructional material and strategies. Lecture method needs to be revised because students get bored when they are passive listeners (Freeman et al., 2014).

Limitations of Lecture Method

i. It makes the students passive listeners. Learning is participating in a lecture. It needs the opportunity to talk, to ask, so that the best teaching can take place.
ii. Lecture reduces the opportunity to learn by doing as readymade material is presented to the students.
iii. Lecture is an inefficient teaching tool in the development of attitude and process outcomes. There is no teaching where there is no learning.
iv. The lecture does not guarantee that the students will understand its contents. Being almost teacher- centered, it offers little opportunity to evaluate the students during the lesson.
v. The average high school students may not have sufficient attention span to attend forty minutes class.
vi. A lecture can quickly develop a deadening monotony. It is the exceptional teacher who can stimulate and keep up the interest of the learners continuously.
vii. Most of school teachers are not good lecturers (Johnson, 1989).

About Kumon Method

Kumon method is time-framed method of learning with emphasis on building ability of independent learning among students. Kumon lectures or lessons are planed according to needs of every student, which encourages each student to get more and more. It is supplementary program which help in achieving goals of an institution ("Private tuition for children in core subjects of maths & amp; English," n.d.).

In Kumon method of teaching, every child goes through a diagnostic test of his/ her previous learning which decides the exact starting point, which is comfortable to each individual and that starting point is kept one level below their present status in school. This starting point which is determined by Kumon instructors is most beneficial to them in

developing their independent learning ability, in building self confidence and to set a proper routine with program.

In Kumon program, students are allowed to work on their own comfortable pace and flourish neither keeping ages nor grades in mind, so Kumon provides just right level to them. After having ability to comprehend the concepts, students move to the next or advance level.

Students become able to comprehend and understand truly after completing their work correctly within allotted time-frame. Completion of assignments not only correctly but also in recommended time will enable them to get strong grip of each concept and have ability to comprehend it.

When students work daily under Kumon for 30-minute, that practice develops skills and they fully and deeply concentrate on each topic. Regular work practice makes them able to understand mathematics ("Private tuition for children in core subjects of maths & amp; English," n.d.)

Instructors have strong belief in every student's potential and ability to do well by Kumon. Teachers play a role of facilitators at Kumon who guide them to perform their activities at their level best. Teachers plan their lesson-notes to achieve desired learning objectives of every child in the long-term.

Self- Learning

Kumon Curriculum has 26 levels in Mathematics and 24 levels in reading. Every next coming level follows the previous one, with teacher's effective lesson planning, by which students are able to learn their lesson independently which inculcates creative ability and analytical approach among them.

- Students get confidence and success in their academics.
- Kumon builds basic skills of students, key to overall success.
- Kumon helps students become able to get mastery on Math's basics.
- Kumon helps students in improving their study habits.
- Kumon builds confidence and discipline
- Kumon helps in developing logical thinking and problem solving skills.

Kumon Program is Good for Everyone

Kumon program is carefully planned and has complete curriculum for all students from pre-school to high-school even up to college. Kumon facilitates students of all ages and at all stages in their schooling,

which enables them to face the challenges of higher classes (Private tuition for children in core subjects of maths & amp; English, n.d.).

Kumon Centre Work-Pattern

Mostly students go to Kumon Center twice in a week. Each Kumon Centre deals with students in a friendly manner and gives them comfortable environment, where they can concentrate on work with enough space. Students receive their tasks or class assignments which they have to complete independently. After completion, their works is checked and marked and also corrected if students have made any mistake, before leaving the centers. This practice make them realize what are the expectations and how they can remain comfortable and focused on their work during center-time which enables them to realize the actual benefits of learning on their own ("Kumon India opens new Centres in Mumbai and Pune," n.d.).

Kumon teachers are trained and also certified according to Kumon's requirements which is, each learner's need based lesson plans. In Kumon lesson plans, ability of each student is kept in mind and makes material understandable to each child. Students work at their own pace under the kind supervision of instructors, which ensures that each child gets mastery before promotion to the next level. Kumon method of teaching enables each child to do his/ her work independently, above his/ her present level and this is the main aim of Kumon program.

Kumon Program Helps Children to Grow Academically and Personally

Kumon method helps students to get mastery over basic skills which are key to their academic success as well as to groom their personality. Kumon enables the students to do the following:
- Mastery on fundamentals of mathematics and reading.
- Improvement of study habits.
- Enables students to concentrate deeply.
- Build confidence and discipline.
- Enables the students to learn independently.
- Develop their skills to think critically & analytically.

Kumon Method is Aligned with Standards of a State

Kumon is world wide accepted curriculum which is organized in logical and systematic concepts and levels which help the students to achieve success in their organizations.

Kumon program is a supplement to school curriculum. Classroom experiences are much important to every child, and Kumon does not replace that and has no conflict with classroom activities. It reinforces which helps students to get proficiency and mastery in Mathematics and reading.

Kumon Program is for All Kind of Children having Learning Disabilities

Kumon flourishes every child even from pre-school to high-school. Kumon program is highly flexible according to the needs of every individual. It can adjust or accommodate every child.

Data Supports the Efficacy of Kumon Method

Many research studies have been conducted to show the performance of Kumon students in standardized tests. Data from the Trends in International Mathematics and Science Study show that 4th and 8th grade Kumon children scored above national and international averages in mathematics. In the United States, more than 50 percent math students are above their grade level, and one-fourth of them are 2 to 3 years above their grade in school ("Kumon India opens new Centres in Mumbai and Pune," n.d.).

Methodology

This experimental research was conducted to determine the effectiveness of Kumon method. The population of the study consisted of all Fazaia Inter Colleges in Rawalpindi and Islamabad. There are three Fazaia Inter Colleges in Rawalpindi and Islamabad. One of the three Fazaia colleges was selected as sample through cluster sampling randomly. All grade-5 students of the selected cluster formed the sample of the study.

Population

The population of the study consisted of 5th grade students studying in three Fazaia Inter Colleges in Rawalpindi and Islamabad. The population consisted of 97 boys and 118 girls. The population size was thus 215 students.

Sample

One of the three Fazaia colleges was selected as cluster sampling randomly. All grade-5 students of the selected college formed the sample of the study. First of all one college was chosen randomly and then whole grade-5 students were chosen as sample. Control and Experimental groups were formed and equated after conducting pre-test on the basis of pre-test scores.

Cluster sampling randomly was used to select the sample.

Instrument

The basic tool for collection of data was ''Mathematics Achievement Test'' developed by Teacher's Training Institute Islamabad. The test consisted of objective type questions from the units used in the study. There were 25 test items (MCQs) in Pre-test and Post-test with 10 items in end chapter test.

Time-Table

The study was carried out for twelve (12) weeks (October, 2014 to December 2014) for teaching Mathematics to Grade 5 students of the Fazaia Inter College Jinnah Camp Nur Khan Rawalpindi.

Experiment was conducted for 12 weeks in F.I.C J/C Nur khan Rawalpindi.

The researcher took 60 sessions in F.I.C J/C Nur Khans. The control group was taught by another mathematics teacher of the same qualification and experience as that of the researcher, the experimental group was taught by the researcher. Control group was taught through tradional lecture method while experimental group was treated by Kumon method.

The time-table of study was as under:

September, 2014 Pre test (academics) was conducted on Grade-5 students of F.I.C J/C Nur Khan 22-09-2014 at 9:00 A.M.

Weekly Time-Table from October to December (Three months)

Daily 3rd period from 9:10A.M to 9:50 A.M for both the groups (Experimental and Control).

Three End Chapter Tests were also conducted after completion of every chapter.

December, 2014 Post-test (academics) was conducted on 31-12-2014 at 9:00A.M.

Teaching was conducted from October 1, 2014 to December 24, 2014. After completion of every chapter, students were given tests. Three ECTs were conducted during treatment. ECT_1 was conducted on October 27, 2014, ECT_2 was conducted on November 24, 2014 and ECT_3 was conducted on December 28, 2014. Three days were given for revision. On December 31, 2014, after 12 weeks, both groups were given the posttest. Independent t-test was applied to find out the significant difference in their achievement. Significance level was 0.05.

The study was conducted in October to December because of the institution allowed in the period only, after having mid term and before Bi-monthly examinations.

Experimental Design

In comparison to other experimental designs, Pre-test Post test time series equivalent group design was decided to be more effective for Mathematics because it easily excludes irrelevant materials.

The two groups were equated in the light of results of students in their pre-test. One group was named as the experimental group, and other group was named as the control group. Experimental group was treated by Kumon method and traditional lecture method was used to treat control group.

For the purpose of data collection, the following design was used.

		Pre	ECT_1	ECT_2	ECT_3	Post
E	R	O_1	$t_{reatment}O_3$	$t_{reatment}O_5$	$t_{reatment}O_7$	O_9
C	R	O_2	O_4	O_6	O_8	O_{10}

Pre-test Post test time series equivalent group design was used. Pre test was conducted before the experiment and post test was conducted

after the experiment, while the ECTs (end chapter tests) were conducted during the experiment (after completion of each chapter). After completion the period both the groups were given post test.
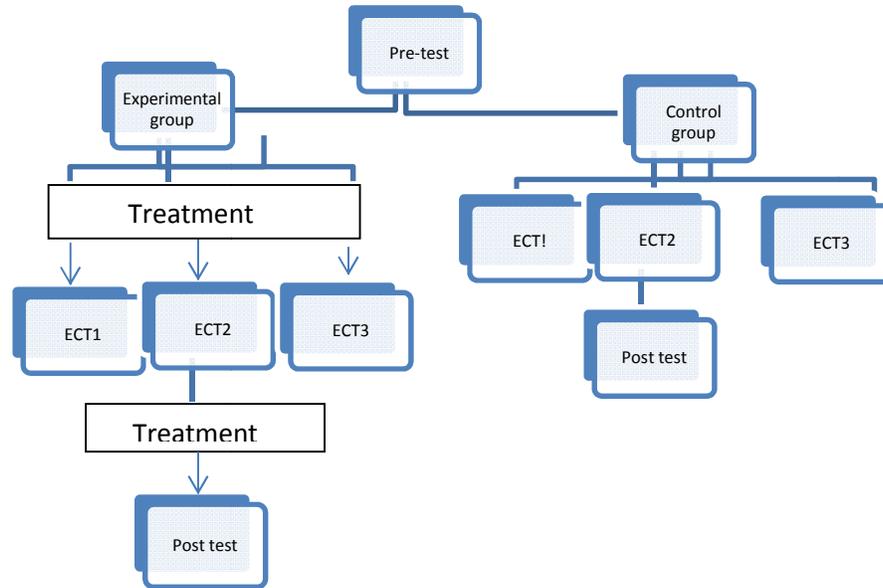

Figure 1: Theoretical Frame Work

The two groups were equated in the light of results of students in their pre-test. One group was called the experimental group, and other group was named as the control group. Kumon Teaching Method was used for teaching the students of experimental group. Lecture method was used to teach the students of control group.

Validity and Reliability

The instrument was improved in consultation with working Mathematics teachers. Reliability of the test was determined by test-retest method. The test was administered to the students of the colleges, not selected in the sample. Pearson Product Moment was used to determine the correlation in scores yielded by two administrations. The reliability figures of pre-test and posttest of academic achievement were

0.86 and 0.83 respectively which were calculated through Spearman Brown formula using Statistical Package for Social Sciences (SPSS).

Procedure of Study

For the formation of the experimental and control groups of Grade-5 students, pre-test was administered on the sample. The test was of 90 minutes duration. After conducting the test, results were prepared to form both the groups.

Students Group Formation

Two equal groups of students were formed in the light of pre-test results. There was equal number of students in both the groups, 35 students (male & female) in each group. Two groups were formed on the basis of their mean values in academics. One group which was treated by Kumon method was named as experimental group and other group was taught by traditional lecture method and it was named as control group.

Independent Variables
i.   Kumon method of teaching.
ii. Traditional lecture method of teaching.

Dependent Variables
i.   Achievement of students.

Validity Threats

The researcher also controlled other extraneous variables by keeping the same time-table, qualifications and teaching experience of teachers for experimental and control groups. To avoid the biasness it was decided in BASAR, that another teacher of same qualification and experience teach control group.

It was ensured that no extra coaching was provided during the research period.

Results

It deals with the experiment conducted for twelve weeks during the period October, 2014 to December, 2014. Academic achievement of the

two groups was analyzed by applying independent *t*-test. Using version16 of Statistical Package for Social Sciences (SPSS), the data was analyzed.

The conclusions were drawn and recommendations were made on the basis of analysis of the data.

Pre-test and Post- test

Data were used to calculate Mean value, Standard deviation value and t-values and these values have been presented in table 1.

Table 1

Data of Pre-test and Post- test

Scale	Experimental (n =35)		Control (n =35)		$t(68)$	P	95% Confidence Interval	
	Mean	S.D	Mean	S.D			LLimit	ULimit
Pre-test	17.23	3.14	17.54	2.86	0.44	.663	-1.75	1.12
Post-test	22.37	1.82	18.74	2.51	6.92	.000	2.58	4.67

It is clear from the data of Table 1 that
i.   Mean value of pre-test on experimental group is 17.23 and mean value of control group is 17.54. Difference between the Mean values of pre test on experimental and control groups is 0.31 and it is not significant and the groups are approximately equivalent at pre test level.
ii. Mean value of post-test on experimental group is 22.37 and mean value of control group is 18.74. Difference between the Mean values of post test on experimental and control groups is 3.63 and it is highly significant even at *p* < .001.

End Chapter Tests

End chapter tests were also conducted as per requirements of experimental design, and the data collected in these tests were used to calculate Mean values, Standard deviation values and *t*-values and these values have been placed in Table 2.

Table 2

Data of End Chapter Tests

Scale	Experimental (n =35)		Control (n =35)		$t(68)$	P	95% Conf.Int	
	Mean	S.D	Mean	S.D			LLimit	ULimit
ECT1	7.83	1.5	5.74	1.58	6.32	.000	1.43	2.74
ECT2	8.14	.94	6.71	1.43	4.94	.000	.85	2.0
ECT3	8.89	.77	7.0	1.52	4.46	.000	1.28	2.43

Note. ECT1= End Chapter Test-1; ECT2= End Chapter Test-2; ECT3 = End Chapter Test-3;

It is clear from the data of Table 2 that
i.   Mean values of experimental group in ECT_1, ECT_2 and ECT_3 are (7.83),(8.14) and (8.89) respectively. Mean values of control group in ECT_1, ECT_2 and ECT_3 are ((5.74),(6.71) and 7.0) respectively.
ii. Differences between the Mean values of ECT_1, ECT_2 and ECT_3 on experimental and control groups are 2.09, 1.43 and 1.89 respectively and are highly significant at $p < .001$.

Pre-test and Post-test for Boys and Girls of Experimental Group

The Means and Standard deviations of pre-test and post test for boys and girls of experimental group were separately calculated and given in tables 3.

Table 3

Data of Pre-test and Post-test for Boys and Girls of Experimental Group

Scale	Boys *(n =17)*		Girls *(n =18)*			p	95% Conf.Int	
	Mean	S.D	Mean	S.D			LLimit	ULimit
Pre-test	17.47	3.18	17.00	3.18	0.44	.66	-1.72	2.66
Post-test	22.59	1.77	22.17	1.88	0.681	.50	-0.84	1.68

Note.ECT1= End Chapter Test-1; ECT2= End Chapter Test-2; ECT3= End Chapter Test-3;

It is clear from the data of Table 3, that
i.   Mean values of pre-test for boys and for girls are (17.47) and (17.00) respectively. Difference between the Mean values of pre-test of boys and girls on experimental group is (0.47) and it is not significant at $p > .05$.

ii. Mean values of post-test for boys and for girls are (22.59) and (22.17) respectively. Difference between the Mean values of boy and girls on post-test of experimental group is (0.42) and it is not significant at $p > .05$.

End Chapter Tests for Boys and Girls on Experimental Group

End Chapter Tests for boys and girls of experimental group were used to calculate Mean values, Standard deviation values and t-values and these values have been presented in Table 4.

Table 4

Data of End Chapter Tests for Boys and Girls on Experimental Group

Scale	Boys (n =17)		Girls (n =18)			P	95% Conf.Interval	
	M	S.D	M	S.D			LLimit	ULimit
ECT1	7.59	1.23	8.06	1.06	-1.2	.24	-1.25	0.32
ECT2	8.12	.93	8.17	.99	-0.15	.88	-0.71	0.61
ECT3	8.88	.67	8.83	.86	0.19	.86	-0.49	0.59

Note.ECT1= End Chapter Test-1; ECT2= End Chapter Test-2; ECT3= End Chapter Test-3;

It is clear from the data of Table 4 and Figure 4, that
i. Mean values of boys in ECT $_1$, ECT $_2$ and ECT $_3$ are (7.59), (8.12) and (8.88) respectively and mean values of girls in ECT $_1$, ECT $_2$ and ECT $_3$ are (8.06), (8.17) and (8.83) respectively.
ii. Difference between the Mean values of ECT $_1$, ECT $_2$ and ECT $_3$ of boys and girls of experimental group are 0.47, 0.05, and 0.05 respectively and these differences are insignificant at $p > .05$.

Pre-test and Post-test for Boys and Girls of Control Group

The Means and Standard deviations of pre-test and post test for boys and girls of control group were separately calculated and given in tables 5.

Table 5

Data of Pre-test and Post test for Boys and Girls on Control Group

Scale	Boys (n =16)		Girls (n =19)			P	95% Confidence Interval	
	M	S.D	M	S.D			Lower Limit	Upper Limit
Pre-test	17.69	3.01	17.42	2.82	0.271	.789	-1.74	2.27
Post-test	18.75	2.78	18.74	2.33	0.015	.98	-1.75	1.77

Note.ECT1= End Chapter Test-1; ECT2= End Chapter Test-2; ECT3= End Chapter Test-3;

It is clear from the data of Table 5 and Figure 5, that:-
i.   Mean value of pre-test for boys and for girls are (17.69) and (17.42) respectively. Difference between the Mean values of pre-test for boys and girls on control group is 0.27 and it is not significant at $p >$ .05.
ii.   Mean value of post-test for boys and for girls are (18.75) and (18.74) respectively. Difference between the Mean values of post-test of boys and girls of control group is 0.01and it is not significant at $p >$ .05.

End Chapter Tests Scores for Boys and Girls of Control Group (Phase-I)

End Chapter Tests for boys and girls of experimental group were used to calculate Mean values, Standard deviation values and *t*-values and these values have been presented in Table6.

Table 6

Data of End Chapter Tests for Boys and Girls of Control Group

Scale	Boys (n =16)		Girls (n =19)			P	95% CI	
	M	SD	M	SD			LL	UL
ECT1	5.75	1.39	5.74	1.759	.024	.98	-1.09	1.11
ECT2	6.50	1.71	6.89	1.15	-0.81	.42	-1.38	.595
ECT3	6.69	1.54	7.26	1.49	-1.12	.26	-1.61	.466

Note.ECT1= End Chapter Test-1; ECT2= End Chapter Test-2; ECT3= End Chapter Test-3;

It is clear from the data of Table 6 and Figure 6, that

i.   Mean values of boys in ECT $_1$, ECT $_2$ and ECT $_3$ are (5.75), (6.5) and (6.69) respectively and mean values of girls in ECT $_1$, ECT $_2$ and ECT $_3$ are (5.74), (6.89) and (7.26) respectively.
ii. Difference between the Mean values of boys and girls on control group in ECT$_1$, ECT$_2$ and ECT$_3$ are 0.01, 0.39, and 0.57 respectively and these differences are nonsignificant at $p > .05$.

Findings

Mean value of the pre-test on experimental group was 17.23 and mean value of control group was 17.54.Difference between the Mean values of pre-test on experimental and control groups was 0.31 which was not significant so the groups were approximately equivalent at pre test level.

Mean value of the post-test on experimental group is 22.37 and mean value of control group was 18.74. Difference between the Mean values of post test on experimental and control groups was 3.63 which was highly significant even at $p < .001$.

Mean values of experimental group in ECT$_1$, ECT$_2$ andECT$_3$were (7.83),(8.14) and (8.89) respectively. Mean values of control group in ECT$_1$, ECT$_2$ andECT$_3$were ((5.74),(6.71) and7.0) respectively.

Differences between the Mean values of ECT$_1$, ECT$_2$ and ECT$_3$on experimental and control groups were 2.09, 1.43 and 1.89 respectively and are highly significant at $p < .001$.

Mean values of the pre-test for boys and for girls were (17.47) and (17.00) respectively .Difference between the Mean values of pre-test of boys and girls on experimental group was (0.47) and which was not significant at $p > .05$.

Mean values of the post-test for boys and for girls were (22.59) and (22.17) respectively. Difference between the Mean values of boy and girls on post-test of experimental group was (0.42) which was not significant at $p > .05$.

Mean values of boys in ECT $_1$, ECT $_2$ and ECT $_3$ were (7.59), (8.12) and (8.88) respectively and mean values of girls in ECT $_1$,ECT $_2$ and ECT $_3$were (8.06), (8.17) and (8.83) respectively.

Difference between the Mean values of ECT $_1$, ECT $_2$ and ECT $_3$ of boys and girls of experimental group were 0.47, 0.05, and 0.05 respectively and these differences were insignificant at $p > .05$.

Mean value of the pre-test for boys and for girls were (17.69) and (17.42) respectively. Difference between the Mean values of pre-test for boys and girls on control group was 0.27 which was not significant at $p > .05$.

Mean value of the post-test for boys and for girls were (18.75) and (18.74) respectively. Difference between the Mean values of post-test of boys and girls of control group was 0.01which was not significant at $p > .05$.

Mean values of boys in ECT $_1$, ECT $_2$ and ECT $_3$were (5.75), (6.5) and (6.69) respectively and mean values of girls in ECT $_1$, ECT $_2$ and ECT $_3$were (5.74), (6.89) and (7.26) respectively.

Difference between the Mean values of boys and girls on control group in ECT$_1$, ECT$_2$ and ECT$_3$ were 0.01, 0.39, and 0.57 respectively and these differences were insignificant at $p > .05$.

Discussion

It is clear from finding No.1, that there was no significant difference between the experimental and control group values at pre-test level and that the experimental and control groups were approximately equivalent. The results on finding 2, shows that the differences between mean values of post-tests have been significant. It was therefore concluded that the Kumon method of teaching mathematics has been effective.

Differences between the mean values of ECTs (findings 3 and 4) have been shown significant, with the result that Kumon method has been effective in teaching mathematics. When performances of boys and girls of experimental group were compared, it also shows the significant difference in their achievement which supports Kumon method. Kumon method is equally effective for boys as well as girls.

Conclusion

In our education system, for teaching of mathematics at primary school level, a number of methods are available, but lecture method of teaching is still in use to teach Mathematics to junior classes. Mathematics by Kumon method is a new and an innovated approach. Seventy students of Grade 5 were picked from Fazaia Inter College

Jinnah Camp Nur Khan Rawalpindi for research purpose. From the 5th Grade Mathematics book, an academic achievement test was designed.

It is clear from the findings, that there was no significant difference between the experimental and control group values at pre-test level which means that the experimental and control groups were approximately equivalent. The results show that the differences between mean values of post-tests of both comparison groups were significant. It was therefore concluded that the Kumon method of teaching mathematics to 5th grade students was more effective than the traditional method.

Differences between the mean values of ECTs were significant, which further supported the result that Kumon method was effective in teaching mathematics.

A comparison of the performance of boys and girls in the groups shows that there were no gender differences in learning mathematics through the Kumon method.

Recommendation

First recommendation for 5th class math teachers for teaching this subject be given by explaining to them very clearly, in simple language, how to use this method practically in the classroom.

Rote learning may be discouraged by using Kumon Method of Teaching which may be used for Mathematics in the subject of Mathematics at grade 5 level.

Kumon Method may be referred for Mathematics teachers training institutes. Practical teaching of Mathematics be conducted during the teaching practice.

Kumon Method be encouraged among working Math teachers. The departments of education may conduct refresher courses, training programs and workshops in order to introduce Kumon Teaching Method to the working teachers.

The text books of Mathematics for grade 5 be revised by curriculum planners under the shade of Kumon Teaching Method.

In public and private schools of Pakistan, Kumon Teaching Method be used at 5th grade level.

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