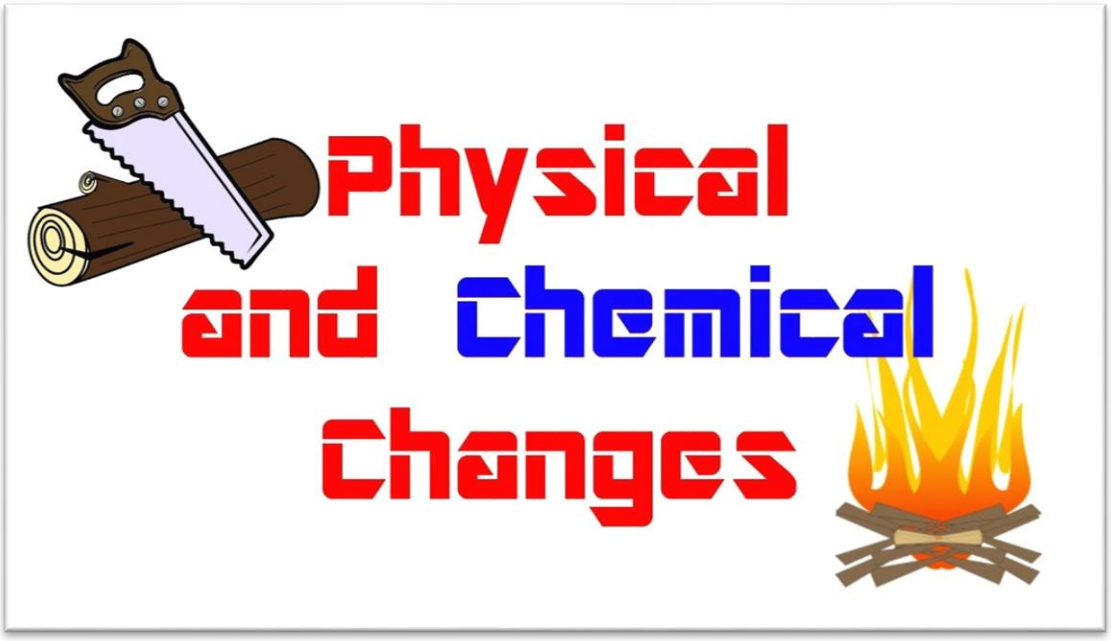
Enhancing the understanding skill on Physical and Chemical changes of matter through visual and practical method

ACTION RESEARCH (2024)



DISTRICT INSTITUTE OF EDUCATION AND TRAINING,
PALAYAMPATTI, VIRUDHUNAGAR DISTRICT

Dr.Selvi, Principal
District Institute of Education and training
Palayampatti
Virudhunagar district

C E R T I F I C A T E

This is to certify that the investigation described in this action research entitled " **Enhancing the understanding skill on physical and chemical changes of matter through visual and practical method** " is a record carried out by L.Rani under my guidance. I further certify that this action research work has notpreviously been submitted in any Research .

DECLARATION

This Action research entitled " **Enhancing the understanding skill on physical and chemical changes of matter through visual and practical method** "is the actual work done by me at GHS ,Kalkuruchi of Virudhunagar districtand submitted to SCERT, Chennai during the year 2024.

Place: DIET , Palayampatti

Date:

L.Rani, Lecturer
DIET,Palayampatti

ACKNOWLEDGEMENT

I am thankful to the Director, SCERT, Chennai for having provided the opportunity to undertake this Action research.

My heartfelt thanks to our Respected Principal Dr.Selvi , DIET, Palayampatti, for her encouragement.

My sincere thanks to all 7th standard students , Science Teacher and Head of the school, GHS, Kalkuruchi , Kariyapatti block.

I am thankful to all faculties of DIET, Palayampatti , who directly helped to complete my Action research successfully.

CONTENT

Physical change

Ice cubes (100g)

Liquid water (100g)

CHEMICAL CHANGE

teachoo

A chemical reaction forms new products.

Combustion

Rotting

Rusting

Digestion

ACTION RESEARCH TITLE:

" **Enhancing the understanding skill on physical and chemical changes of matter through Visual and Practical method** "

I . INTRODUTION

“Science is a language that transcends boundaries; it is a universal tool for understanding the world.”

- **Sir C.V.Raman**

Science is a significant part of human culture and represents one of the pinnacles of human thinking capacity. It provides a laboratory of common experience for development of language, logic, and problem-solving skills in the classroom. Science teaches several valuable skills, but being able to analyze a large amount of information in a concise way which is important for all disciplines. Science is just as important as learning other subjects like mathematics and history .Science is one of the most important subjects in school due to its relevance to students lives and the universally applicable problem-solving and critical thinking skills, these are lifelong skills that allow students to generate ideas, weigh decisions intelligently .Teaching technological literacy, critical thinking and problem-solving through science education gives students the skills and knowledge they need to succeed in school and beyond.

1.1 BENEFITS OF SCIENCE EDUCATION IN SCHOOLS

1. Science Enhances Critical Thinking

Scientific concepts typically begin with an idea followed by an experiment to substantiate that idea through technical methods and analysis. Scientific method dictates a logical way of approaching unfamiliar topics, ensuring students can learn how to relate theoretical and practical work. Learning to find the relationship between theories and empirical evidence holds cognitive benefits, which confer to other subjects and areas of life. Like gas to a stove, science is the fuel that accelerates young minds into peak performance.

2. Science Knowledge Cultivates a Passion for Learning

Science feeds the natural curiosity that makes learners tick and encourages them to explore the mysteries observable everywhere. A hands-on approach also appeals to many. The possibility of demonstrating scientific concepts first-hand builds an appetite for learning.

3. Science Uplifts Many Disciplines

Scientific method is based on technical skills, such as the careful observation of the world around us and the ability to conduct highly controlled experiments. The presentation of results in science reporting teaches the values of objectivity and thoroughness.

4. Science Holds the Key to the Future

Science ensures students aren't left behind by the ever-shifting tides of the technological wave. A strong science foundation teaches learners to be self-sufficient in an environment.

1.2 CHANGES IN MATTER – PHYSICAL AND CHEMICAL CHANGES

Matter is the "stuff" of the universe. All substances are composed of matter. Matter is made of particles that are too small to be seen but still exist and can be detected by other means. Substances have specific properties by which they can be identified. When two or more different substances are combined a new substance with different properties may be formed. Whether a change results in a new substance or not, the total amount of matter is always conserved. It is important to learn about physical and chemical changes because these changes take place in day to day lives. And learning them makes us more aware about our surroundings. Such reactions help us to understand the properties and behavior of things around us. Chemical reactions help us understand the properties of a substance. By studying the way, a substance interacts with another substance, students can learn its chemical properties. These properties can be used to identify an unknown sample. By observing chemical reactions, students are able to understand how the natural world works.

PHYSICAL CHANGE :

Physical changes are those in which the shape, size, or state of the matter changes, but the substance is still essentially the same. For example, chopping up a carrot or ice melting into water are both physical changes.

CHEMICAL CHANGE :

Chemical changes are those where one or more substances are combined to produce a new substance. At the end of a chemical change, you have a new substance. Burning a piece of paper would be a chemical change, as would baking a cake.

2. NEED OF THE STUDY:

During school visit, the investigator interacted VIII standard students in Science class. The investigator asked some questions related to Physical and chemical changes. The Students have difficult in distinguishing between physical and chemical change in formal teaching . An understanding of the differences between physical processes such as melting, evaporation and boiling and the changes that take place in chemical reactions, particularly the idea that new substances are formed, is important to an understanding of chemistry and students are very frequently confuse the two changes. Students are often taught wrongly that if a change can be reversed, it is physical, whereas a change that cannot be reversed is chemical. For example, when some students explain the boiling of water, they say that the bubbles in water are made of air, hydrogen or oxygen. This case demonstrates that, even if students use scientific terms, they may not have developed a clear understanding of some fundamental concepts. A student who has a clear understanding of fundamental chemistry concepts would say that the bubbles in water are filled with water in a gaseous state or they might mention steam or water vapour. It is important to learn about physical and chemical changes because these changes take place in day to day lives. And learning them makes them more aware about their surroundings. In order to overcome from this confusions, the investigator had selected this topic for the action research.

3. STATEMENT OF THE PROBLEM

This action research is entitled as

" **Enhancing the understanding skill on physical and chemical changes of mattr through visual and practical method** "

4. DEFINATION OF KEY TERMS

VIII STANDARD STUDENTS:

In our country grade eight is called Class 8 and forms middle school.

PHYSICAL AND CHEMICAL CHANGES

A physical change is a change in properties such as texture, shape, or state, while a chemical change represents the formation of a new substance after atoms are rearranged in a chemical reaction.

VISUAL METHOD

Visual methods use a huge range of images including maps, drawings,graphic novels, photos, film, video, selfies and diagrams.

PRACTICAL METHOD

Practical method refers to a person, idea, project, etc, as being moreconcerned with or relevant to practice than theory.

5. OBJECTIVES:

At the end of the activities, students were expected to be able to:

- define chemical and physical reactions
- give an example of an event that changed only the appearance of the substance
- give examples of events in which material changes into another substance.
- differentiate between physical and chemical properties of matter.

6. ACTION HYPOTHESIS

There exists a significant improvement in the concept physical and chemical changes through visual and practical method.

7. METHODOLOGY

SAMPLE

The sample for this study is 23 Students (English medium) of VIII standard students from GHS, Kalkuruchi, Kariyapatti block.

DATA COLLECTION

Data collection tools refer to the instruments used to collect data, such as a paper questionnaire or computer-assisted interviewing system. Case Studies, Checklists, Interviews, Observation sometimes, and Surveys or Questionnaires are all tools used to collect data. Here, the investigator has selected Paper questionnaire tool to collect the data. The tool consists

of 20 questions related to the basic knowledge of physical and chemical changes. This tool is prepared by the investigator and concern science teacher.

In order to test the basic knowledge of the topic the investigator has given Pre-test for the students. After the Pre-test, the treatment was given by the investigator. After treatment the investigator has checked the content knowledge through Post-test.

8.ACTION PROGRAMME

PHASE –I :

The investigator administered a Pre-test for 23 students of VIII th standard of GHS, Kakluruchi. The question paper given in the annexure was used for the Pre-test. For the correct answer one mark was given. The maximum score was given. The scores obtained by thewere analyzed. Error analysis was done with help of the teacher. The reasons for the mistakes made by the students and activities to be imparted as a remedial measure were discussed with the teacher.


and its form
Person
Possessive pronoun
Present Tense
I
you
he
She
it
my
you
his
her
its
we
you
they
Our
your
their
am
are
is
are
was
were
was
were


G.H.S
G.H.S. KLK-67
Great
Apple

PHASE-II

The students were imparted various activities to remove the difficulties in understanding the concept physical and chemical changes .

INTERVENTIONS

Activity - 1

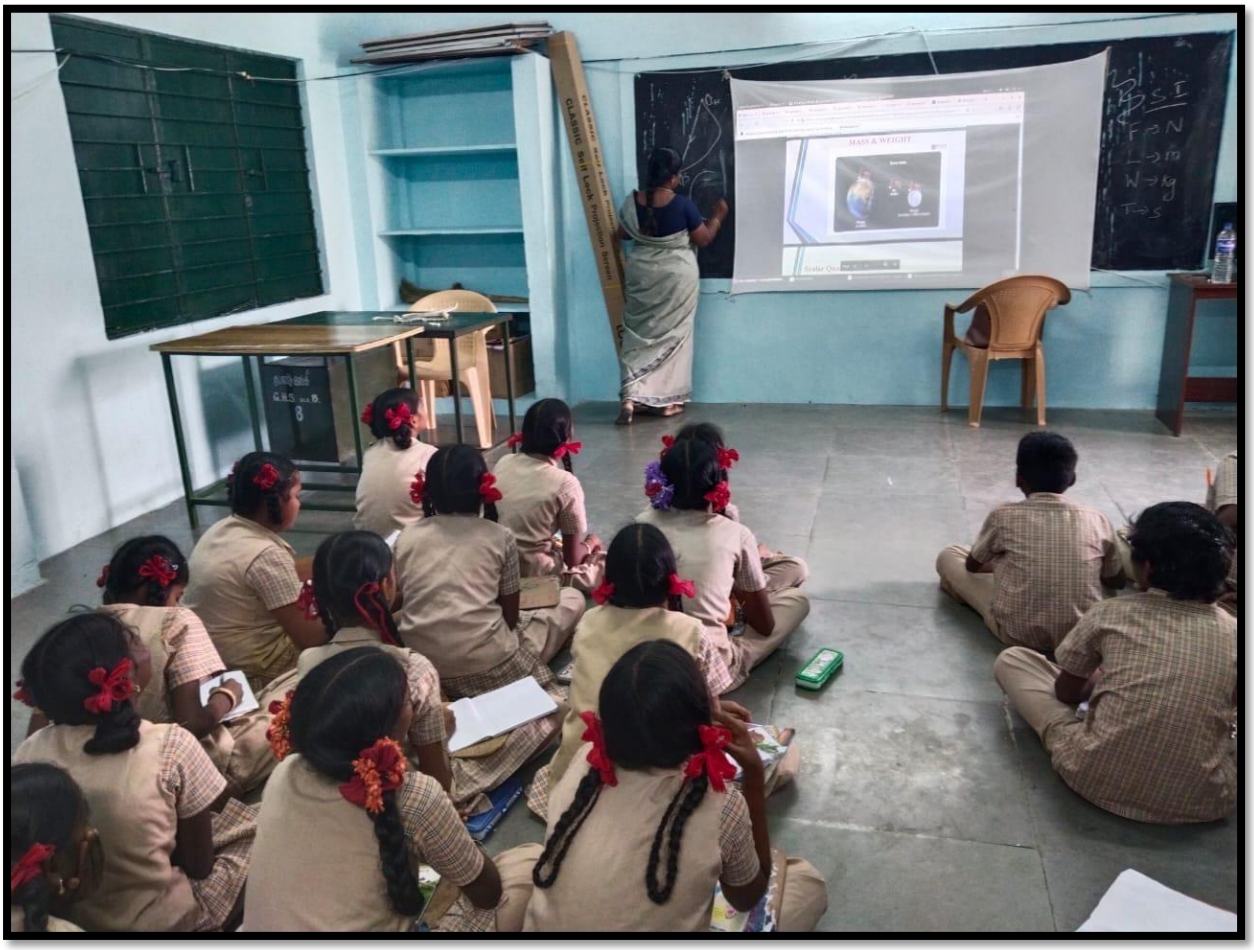
In order to prepare the students mind, the investigator asked few motivation questions.

1. When baking soda is mixed with lemon juice, bubbles are formed with evolution of a gas .What type change is it ?
2. When a candle burns both physical and chemical changes takes place .Identify these changes.
3. Why resting is faster in coastal areas than in deserts?
4. Why we are painting iron gate?
5. What changes will happen while burning a candle ?

In this activity the investigator created the curiosity on content.It fosters the strong and flexible critical skill.

Activity - 2 (PowerPoint presentation)

PowerPoint allows the investigator to use images, audio and video to have a greater visual impact. These visual and audios may also help the investigator to be more improvisational and interactive with the students. So, the investigator has chosen the PowerPoint presentation to teach about Power point presentation to teach about the basic concept of physical changes ,chemical changes, Examples of physical change, Examples of chemical change, difference between distance and displacement, difference between reversible and irreversible process.



CHRACTERISTICS OF A PHYSICAL CHANGE

- ONLY THE PHYSICAL PROPERTIES OF THE SUBSTANCE UNDERGO CHANGE.
- PHYSICAL CHANGES ARE GENRALLY REVERSIBLE.
- NO NEW SUBSTANCE IS FORMED.
- NO OR EITHER VERY SMALL AMOUNT OF ENERGY IS EITHER ABSORBED OR EVOLVED DURING PHYSICAL CHANGE.

EXAMPLES OF PHYSICAL CHANGES

- Crushing a can
- Melting an ice cube
- Breaking a bottle
- Boiling water into steam
- Forming clay into a sculpture

CHEMICAL CHANGES

WHEN TWO OR MORE SUBSTANCES REACT IN SUCH A WAY THAT THERE IS FORMATION OF NEW SUBSTANCE, THE CHANGE IS CALLED AS CHEMICAL CHANGE.

A + B= C

HERE A &B ARE REACTANTS

C IS PROCUCT.

Examples of chemical changes:

Striking a match releases heat and light and results in ash, smoke and gas

~ burning a match

Cooking bread changes the color, texture, odor, taste

~ baking bread

~ silver tarnishing

~ food rotting or souring

~ a nail rusting

At the end of this activity, the investigator discussed the answers with the students and allowing them to correct answers. Through this activity the students were able to identify the difference between physical and chemical changes.

Activity - 3

The Students were asked to identify the following changes as chemical (C) or physical (P):

- melting of ice cubes
- dissolving of sugar in water
- inflation of a tyre
- absorbing of water by a towel
- cooking omelet
- souring of milk
- evaporation of perfume
- fermenting of cheese
- breaking of glass
- squeezing oranges for juice
- freezing of water
- drying of paint

At the end of this activity ,the investigator discussed the answers with the students and allowing them to correct answers. Through this activity the students were able to identify the difference between physical and chemical changes.

Activity – 4 : Cooperating (groupwork)

Group discussion helps the students to train themselves to discuss and argue about the topic given, it helps them to express their views on serious subjects and in formal situations. It improves their thinking, listening and speaking skills. Increases students' interests and engagement. It can help to maintain students' focus.

The Students worked in groups of five. Each group chose a job and presented a dramatization to other groups, who had to guess what the job was. The groups also tried to explain the kind of changes (physical or chemical) occurring when the jobs were being performed. The jobs can be cooker, hairdresser, fireman, tailor, dustman, carpenter, etc..This activity motivated the students to search the details of the various job and try to identify the physical and chemical changes involved in various job.

ACTIVITY – 5 (Hands on experience)

Hands-on experiences allow students to experiment with trial and error, learn from their mistakes, and understand the potential gaps between theory and practice. The students worked on these experiments in groups of three. The materials required are paper, baking soda, matches, vinegar, a candle, a lemon, an apple & tea. In this activity students were asked to answer the following questions

a. Is it a chemical or physical change when a candle, match or paper burns? How do we know this? (It is a chemical change. The candle and paper become black.)
b. Is it a chemical change when a candle melts? (No, it is a physical change.)
c. Why do we throw milk out when it has gone sour? Why don't

we drink it? (A chemical change occurred and its taste becomes bad. It could cause minor illness.)

d. Why do we add baking soda when making cake? (Baking soda increases the volume of the cake and make it softer by producing carbon dioxide.)
e. Why do apples turn brown after they are peeled? (Apples turn brown because an enzyme in the apple catalyzes other reactions.

Then students were asked to carry out the processes in Table 1 and to record their observations in the relevant columns.

TABLE: 1

MATTER	STATES OF MATTER	PROCESS	OBSERVED CHANGES	FINAL STATE	COMPARISON OF INITIAL AND FINAL STAGE
PARER					
MATCH STICK					
CANDLE					
BAKING SODA					
APPLE					
TEA					
MILK					

The students were then asked to answer the following questions based on their observations:

1. How do you define a chemical change?
2. Give some examples of chemical change.
3. How do you define a physical change?
4. Give some examples of physical change.
5. Explain briefly the differences between physical and chemical change

Activity - 6

The investigator explained the concept by students viewed videos of matter changing and determine whether the changes you observe are physical or chemical in nature. The six changes included in this simulation are: shape change, color change, bubbles formed, odor production, heat given off, size change, change of state, new substance formed, sound production.

How are physical and chemical changes distinguished? Observation Checklist continued

1. Event: The water is boiling. Circle your answers.

Shape change	YES	NO	?
Size change	YES	NO	?
Bubbles formed	YES	NO	?
New substances formed	YES	NO	?
Odor production	YES	NO	?
Sound production	YES	NO	?

2. Event: The water is freezing. Circle your answers.

Shape change	YES	NO	?
Size change	YES	NO	?
Bubbles formed	YES	NO	?
New substances formed	YES	NO	?
Odor production	YES	NO	?
Sound production	YES	NO	?

3. Event: The bananas are ripening. Circle your answers.

Shape change	YES	NO	?
Size change	YES	NO	?
Bubbles formed	YES	NO	?
New substances formed	YES	NO	?
Odor production	YES	NO	?
Sound production	YES	NO	?

4. Event: The match is burning. Circle your answers.

Shape change	YES	NO	?
Size change	YES	NO	?
Bubbles formed	YES	NO	?
New substances formed	YES	NO	?
Odor production	YES	NO	?
Sound production	YES	NO	?

5. Event: Butter is melting. Circle your answers

Shape change	YES	NO	?
Size change	YES	NO	?
Bubbles formed	YES	NO	?
New substances formed	YES	NO	?
Odor production	YES	NO	?
Sound production	YES	NO	?

ACTIVITY : 7

The Students were also asked to find the hidden words in the grid that describe physical or chemical changes. The words to be found are breaking, melting, evaporation,freezing, condensation, cutting, slicing. Students were asked to identify the following changes as chemical (C) or physical (P):

A. melting of ice cubes;
B. dissolving of sugar in water;
C. inflation of a tyre;
D. absorbing of water by a towel;
E. cooking pancakes;
F. souring of milk;
G. evaporation of perfume;
H. fermenting of cheese;
I. breaking of glass;

Students were also asked to find the hidden words in the grid

E	V	A	P	O	R	A	T	I	O	N	A
B	D	A	Z	Z	N	Z	T	N	G	O	F
E	F	Z	N	F	M	F	I	G	A	I	V
O	C	F	M	R	E	R	N	C	M	T	B
G	B	R	E	A	K	I	N	G	G	A	N
N	X	E	L	W	T	E	D	I	N	R	J
I	K	E	T	A	U	W	T	N	I	O	K
C	L	Z	I	X	K	X	G	D	I	N	J
I	G	I	N	X	H	A	F	O	T	P	L
L	T	N	G	Z	N	E	U	V	U	A	Y
S	I	G	A	F	Z	N	E	U	V	U	Y
G	N	C	M	E	F	Z	N	U	E	V	U
C	O	N	D	E	N	S	A	T	I	O	N

PHASE III

A post test was conducted with same tool used for the pre-test. For every correct answer one mark was given. The scores of the students in Pre-test and Post-test were compared. And the scores of the Boys and Girls were compared.

DATA ANALYSIS

Data analysis was done on the basis of the average scores of the marks secured by 24 students in the Pre-test and the Post-test.

Tabular column –I (SCORES OF BOYS)

S.no	Pre-test(100)	Post-test (100)
1	42	55
2	61	65
3	31	53
4	49	55
5	65	71
6	35	46
7	23	35
8	39	56
9	42	51
10	56	65
11	65	73
12	71	79
13	55	64
14	76	82

Figure – 1 - Pre-test marks for Boys

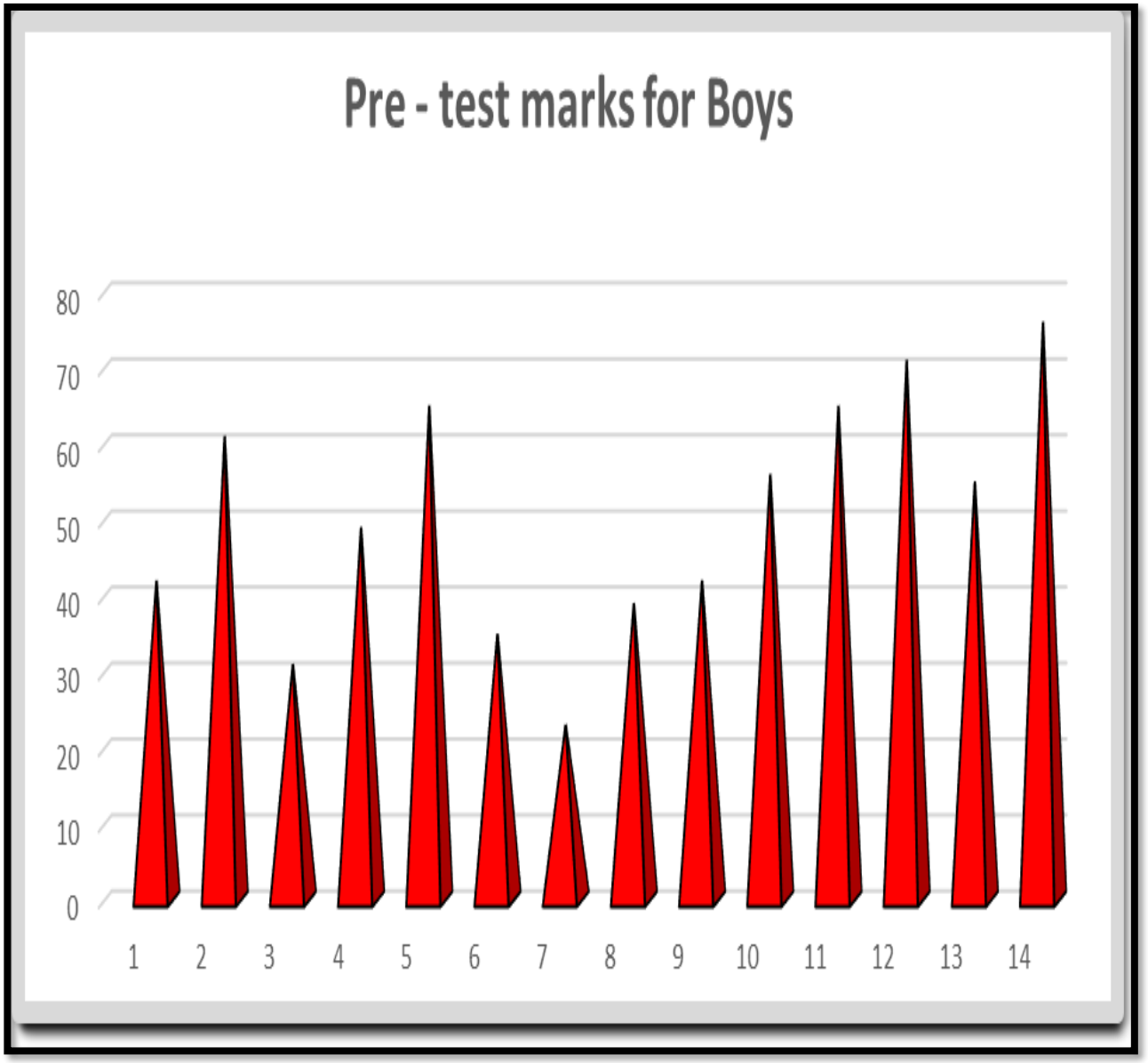


Figure -2 : Post - test marks for Boys

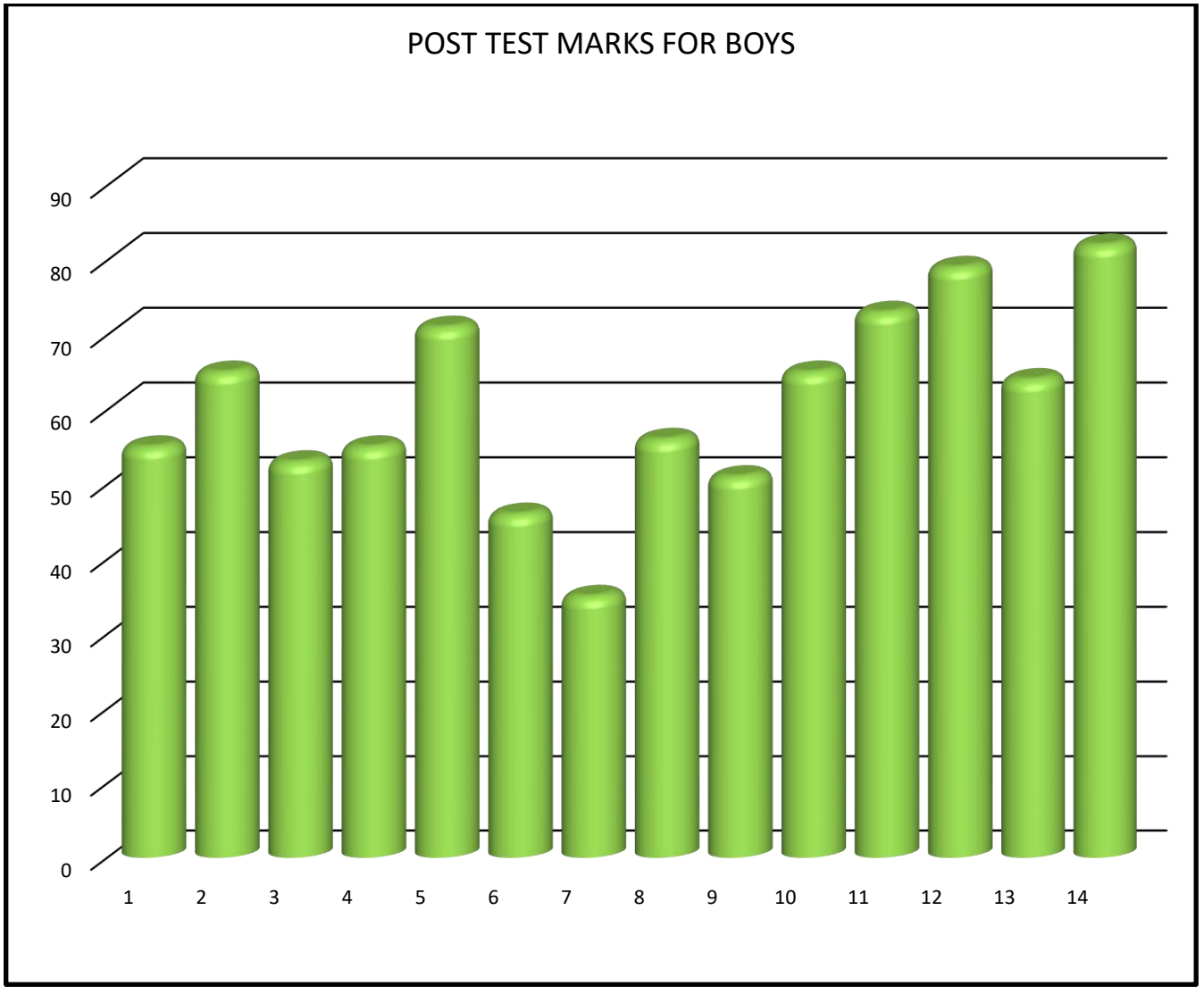
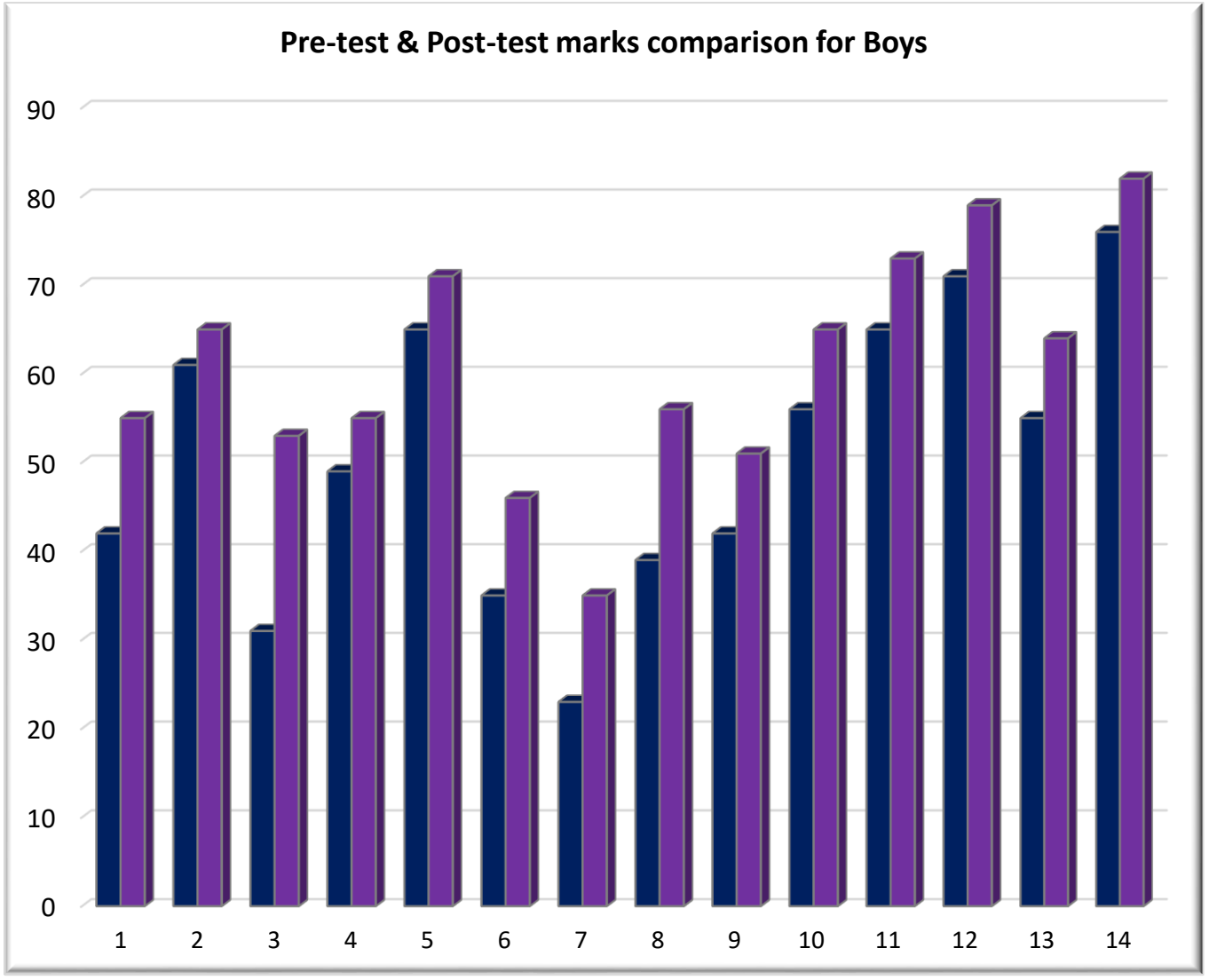


Figure -3 : Pre-test & Post-test marks comparison for Boys



Tabular column –2 (SCORE OF GIRLS)

S.no	Pre-test(100)	Post-test (100)
1	54	62
2	41	47
3	63	71
4	78	87
5	67	63
6	71	78
7	34	45
8	23	40
9	59	63
10	41	54

Figure – 4: Pre-test marks for Girls

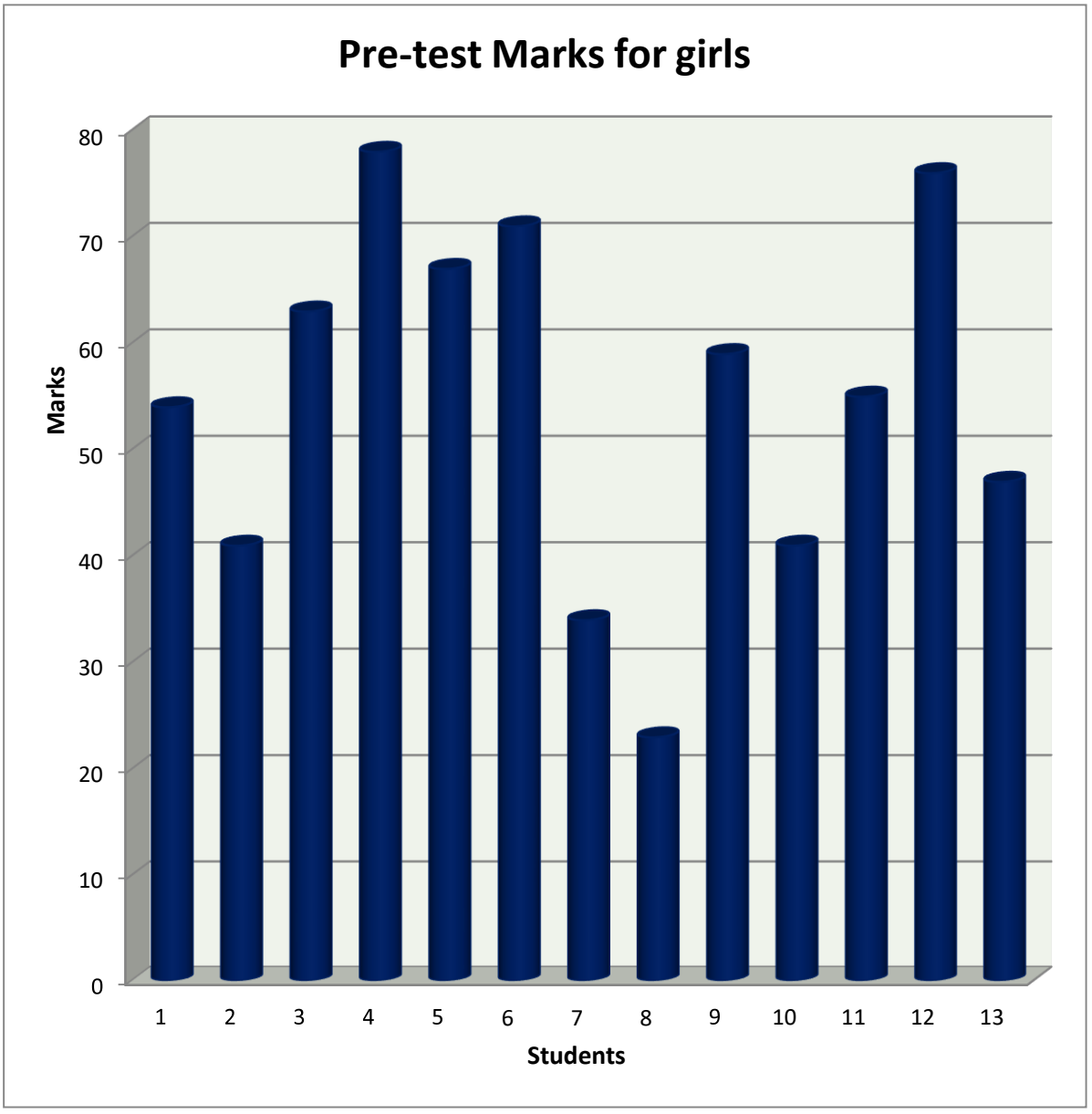


Figure – 5: Post-test marks for Girls

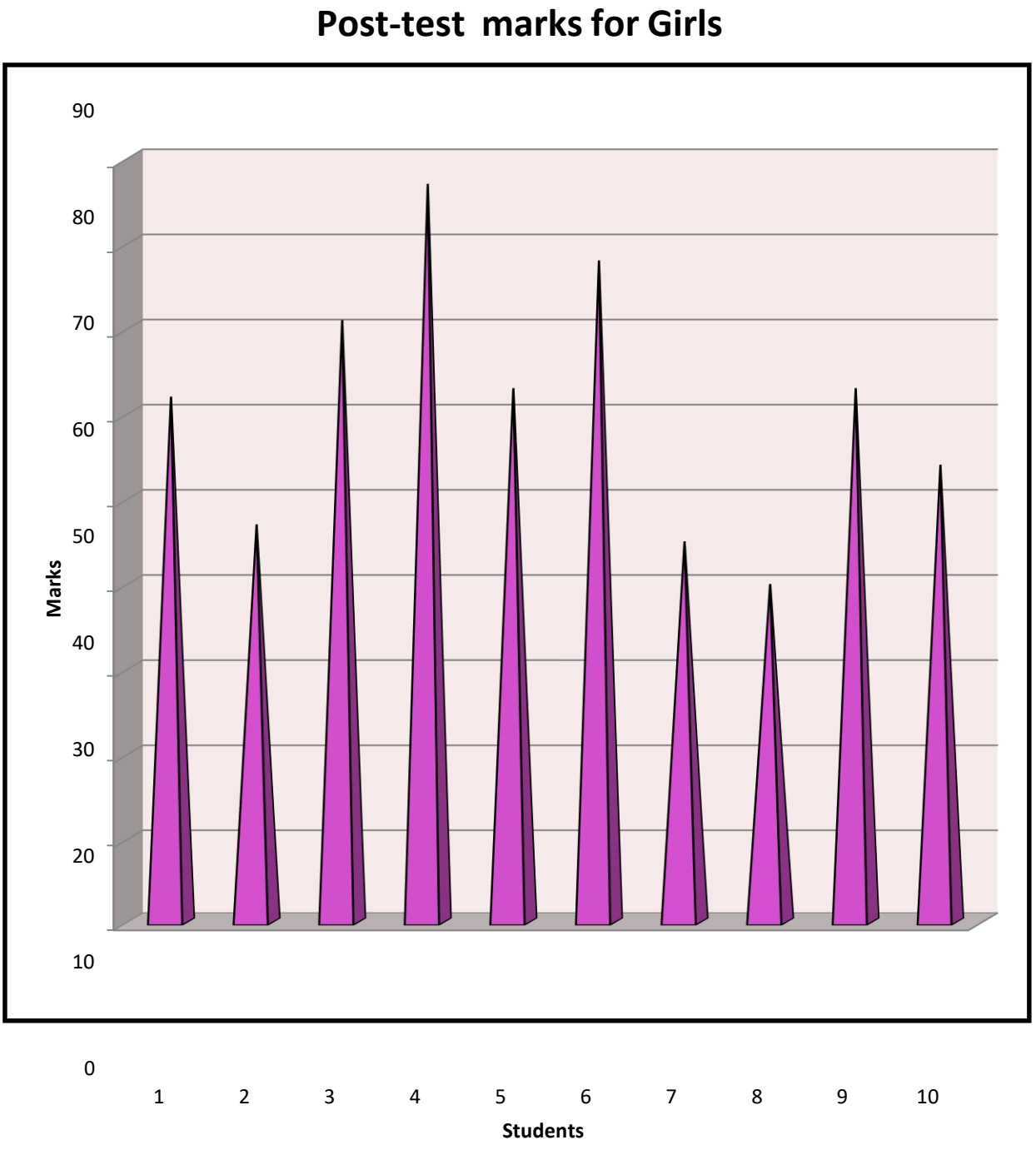
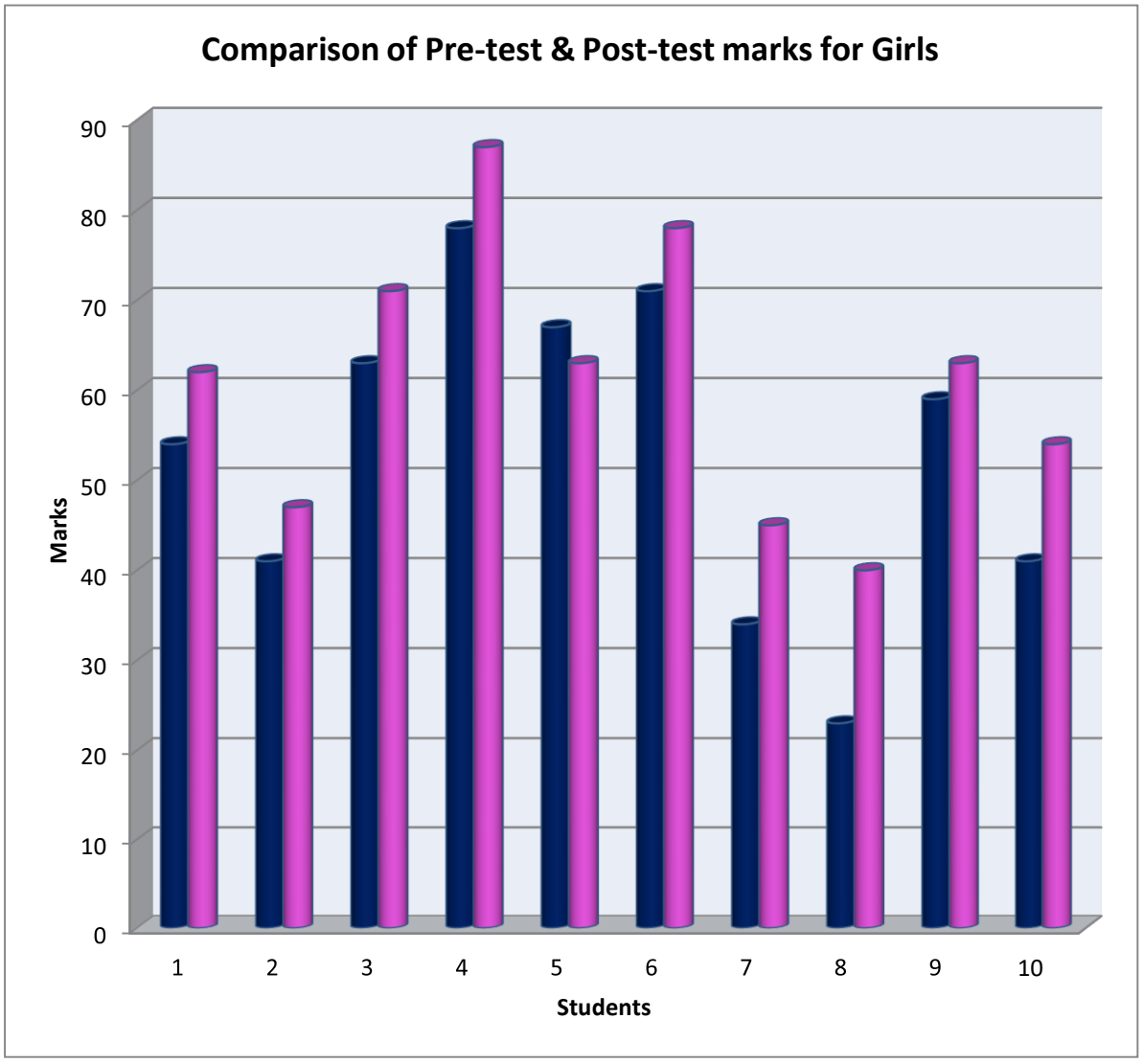


Figure – 6: Comparison of Pre-test & Poet-test marks for Girls



AVERAGE SCORES

The Average scores obtained by 25 students of VII standard ,GHS,Kalkuruchi are as follows

Tabular column -3

S.NO	Category	Pre-test	Post-test
1	Boys	44.91	60.16
2	Girls	54.53	74.2

Figure-7 : Pre-test marks for boys and girls

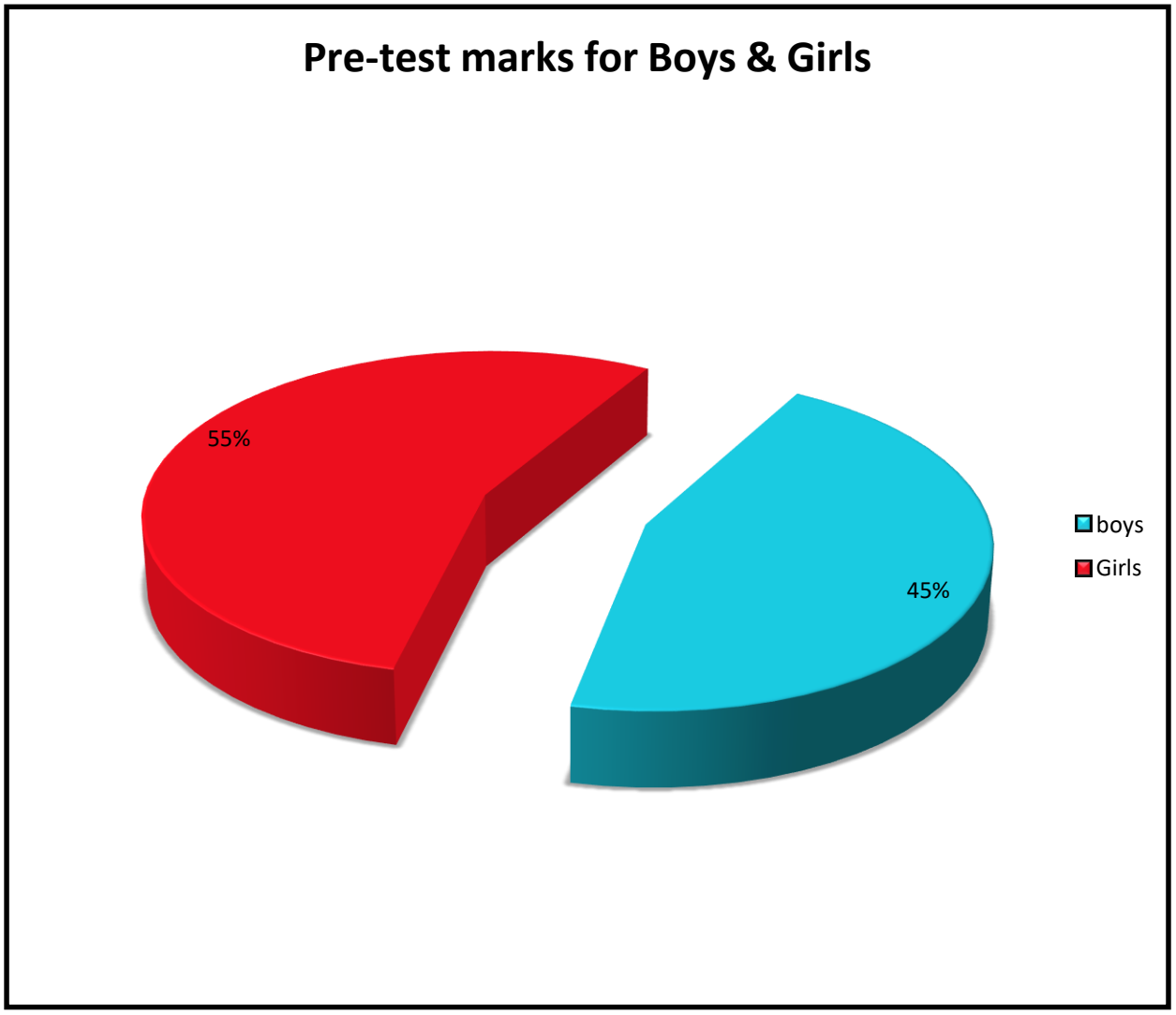
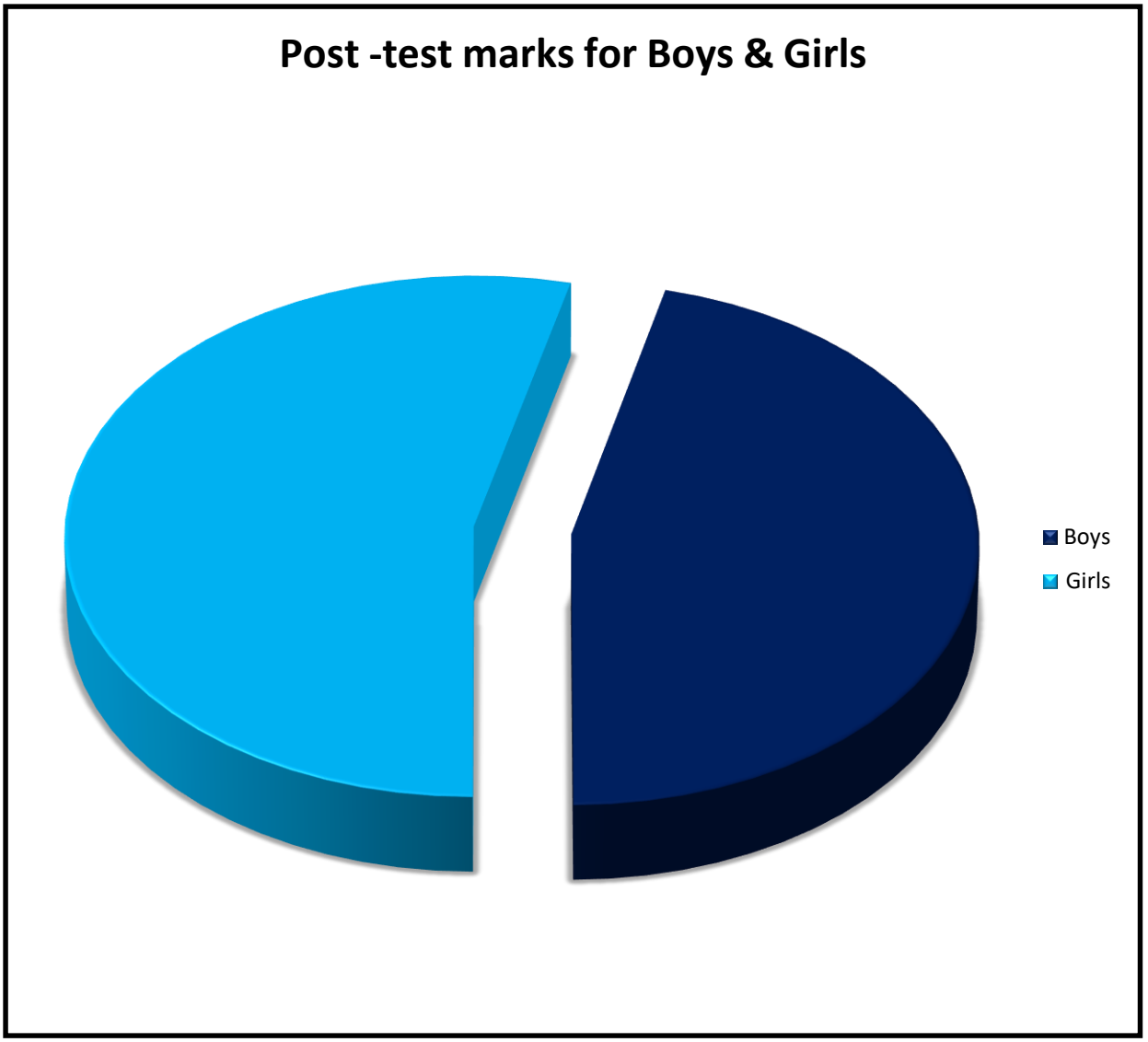


Figure-8: Post-test marks for boys and girls



FINDINGS

- The Pre-test and post-test achievement score analysis scores reveals that the intervention by the investigator in the action research has brought about an appropriate learning strategies to enhance the understanding of standard VII students on Force and Motion through visual and practical method
- The average scores of students in the Pre-test is 60.16% and in the Post-test is 74.2% respectively. This shows that the performance of the Post - test is better than Pre – test.
- Practical personal learning get the students involved, and motivated by connecting what has learnt with what is experienced.
- With experiential learning, students had given the opportunity to apply concept and ideas in a real-world situation where they too play an active role. As the student interacted with the information, it becomes real to them.
- This model linked the knowledge to everyday experiences, students have a chance to see the topic's usefulness in daily life. Therefore, students' interest and attitudes are increased

students become aware of factors like friction, gravity, and magnetic force in their higher classes.

- The investigator found that through visual and practical method, all the students involved actively in learning.
- The students also understand the concept thoroughly through visual and practical method
- Late bloomers grasp the concept easily through visual and practical method.

- The strategies adopted in this study become helpful in activating the students in learning process.

NET GAINS OF THE PRESENT STUDY

- The strategy can be applied to other subjects based on the need.
- Hard spot lessons can be taught with effective TLM through activites.
- Repeated drill and exercise should be given to the Leaners, so that they are able to understand the concepts.
- The teacher was instructed to teach innovative techniques in their classroom teaching.

- The teacher was instructed to interrelate the concept with daily life situation.

CONCLUSION :

The foundation of the Action research in the practical method was choose the right context, which related to daily life and the students' interests. This context was daily life events. It was useful to select activities that students find interesting and attractive. An important problem in science teaching is the potential lack of connection between the scientific content and daily life events. This strategy is a useful model to overcome this failure because not only focus on daily life, but it also tries to answer the question 'Why do we have to learn this?' It is noteworthy that if students can relate the scientific content to their daily lives, they were more motivated and ready to learn. It is fair to say that it can be time-consuming and troublesome to find an interesting and attractive context for a topic, and to plan the whole lesson, the result was students who were curious and eager to listen to the lesson and perform the activities and experiments .

SUMMARY OF THE ACTION RESEARCH

The study entitled solving the problem of VIII standard students in understanding physical and chemical changes concept through participatory method. This was carried out for the sample of 24 students of GHS, Kalkuruchi, Virdhunagar district. Pre-test and Post-test design wasselected and questionnaire was prepared . After teaching through visual and practicalmethod the students improvement is good in Post-test when compared to Pre-test. This attempt proved highly useful to the students.

REFERENCES BOOKS

1. **Tamilnadu New VII standard textbook –II term.**
2. **NCERT VII standard textbook.**

Annexure - I

ACTION RESEARCH 2022 -2023

1. Which One Of The Following Is A Chemical Change?
    A. Twinkling of stars
    B. Cooking of vegetables
    C. Cutting of roots
    D. Boiling of water
2. Which Of The Following Are True When Milk Changes Into Curd?
    A. Its state is changed from liquid to semi-solid.
    B. It changes colour and it changes taste.
    C. Its state is changed from liquid to semi-solid and it changes taste and the change cannot be reversed.
    D. Its state is changed from liquid to semi-solid and it changes colour and it changes taste and the change cannot be reversed.
3. Do You Know In Which Of The Following Sentences Is Or Are Incorrect?
    A. Cutting of a log of wood into pieces is a physical change.
    B. Limewater turns milky on passing CO2 through it.
    C. Hydrogen gas are produced when acetic acid is added to a solution of a sodium hydrogen carbonate.
    D. Explosion of a firework is a chemical change
4. Galvanization Is A Process Used To Prevent Rusting Of Which Of The Following?
    A. Iron
    B. Zinc
    C. Aluminium
    D. Copper
5. In Which Of The Following Sentences Are Incorrect?
    A. Photosynthesis is a chemical change.
    B. Digestion of food is a chemical change.
    C. Formation of manure from leaves is a chemical change.
    D. Iron and rust are the same substances.
6. Mohan Is Writing Some Sentences, Choose The Sentences Which Is Or Are Incorrect One:

A. When carbon dioxide is passed through lime water, it turns milky due to the formation of calcium carbonate.
B. The chemical name of baking soda is calcium carbonate.
C. Two methods by which rusting of iron can be prevented are painting and galvanization.
D. When a candle burns both physical and chemical change take place.

7. Consider The Following Sentences Which Is Not Associated With Chemical Change?
A. Formation of a solution of soluble salt in water
B. Changing water into steam by heating
C. Ringing of an electric bell
D. All the above

8. Boojho Is Writing Some Sentences. Choose The Incorrect One And Help Him:
A. Rusting of iron, photosynthesis and digestion of food are examples of chemical change.
B. In order to protect iron from rusting a coating of zinc is deposited on its surface.
C. Some substance cannot be obtained in pure state from their solution by crystallization.
D. None of the above.

9. Consider The Following Statements And Choose The Correct Ones:
A. Corrosion of metals causes great economic loss.
B. Corrosion of metals can be prevented if the contact between metal and air is cutoff.
C. A process of giving a thin coating of zinc on Iron sheets to preventing rusting called galvanization.
D. All the above

10. Which of the following is an example of a chemical change?

A. Formation of cloud
B. Dropping sodium into water
C. Glowing of an electric light
D. All of the above

11. Combustion is a _____ change.

A. Chemical change
B. Physical change
C. Both (a) and (b)
D. None of the above

12. Which of the following are the characteristics of a physical change?

A. It is reversible
B. It is temporary
C. No new substance is formed
D. All of the above

13. Which of the following is a permanent change and can not be recovered by just reversing the conditions?

A. Chemical change
B. Physical change
C. Both (a) and (b)
D. None of the above

14. Classify the following processes into physical or chemical changes.
(a)Beating of aluminium metal to make aluminium foil
(b)Digestion of food
(c)Cutting of a log of wood into pieces
(d) Burning of crackers

15. Which of the following option/s is correct regarding chemical change?

(a). Burning of coal, leaves and wood.

(b). Explosion of Firework.

(c). slice of an apple that change colour.

(A) Option (a) and (b)

(B) Option (c) only

(C) All options are correct

(D) None of the above