

“Students Of 9th Standard Are Unable to Memorize the Equations of Motion”

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Abstract—Physics is the branch of science. Science is a systematic study of knowledge. It is essential in bringing the behavioral changes and incorporates the qualities like discipline, scientific attitude, Discovery nature Problem solving ability, Creativity, and many more. But some of the students are facing very difficult in understanding the physics concept in science. In the same way they are unable to memorize the related formulae in the examination. This is due to lack of interest in the classroom, no practice at home, indiscipline in their studies, lack of previous class knowledge to the students, not doing the home work regularly and many other. On doing the unit test on the physics topic students made mistakes in applying the formula in the test paper. They lose their marks in solving the numerical problems. From the test results noticed that out of 40 students 16 students are facing difficulty in applying the formula in the numerical problem. In order to make the students to overcome the problem many feedback activities are done till 48 days. After giving a appropriate feedback activity students' scores have been improved.

Index Terms—Velocity, Acceleration, Equations of motion, Average, Mean, Median, Mode

I INTRODUCTION:

The action research is a reflective process of progressive problem solving carried out by individuals or group to improve practices, understanding, or situations. It investigates the impact of activity-based learning on students understanding of the topic of physics. It is a cyclic process promotes the continuous learning and collaboration. It focuses upon real world challenges. Physics is one of the branches of science. Topics like Motion, Sound, Magnetic field, Gravitation, Light [Reflection and Refraction], Work, Laws of motion, and so on which comes under this branch. It consists of many numbers of derivations, formulae, scientific phenomenon. In the class 9th there

is a concept namely motion which contain basic ideology along with the equations of motion they are applicable for the further concepts. The study concludes that incorporating interactive and student-centered teaching methods significantly benefits learning in physics at the secondary level.

II IMPORTANCE:

- Action research is a process in which a problem of a student is identified in order to get solutions for those problems faced by the students.
- Action research in physics helps in identification of the problems faced by the students in physics (definition, derivation, equations, formulae)
- Essential in learning by doing
- To memorize the equations in easy way
- Enhance teaching strategies for better student understanding
- Promotes problem solving ability
- Enhance the academic achievement
- Strengthens the use of technology and tools in teaching
- Improves classroom engagement through interactive experiments
- Helps to understand the difficult concepts in physics

III OBJECTIVES:

- Enhance instructional strategies for better student understanding of physics concepts
- Develop methods to make physics more interesting and relatable
- Identify and address student misconceptions in physics topic

- Experiment with new teaching tools, models, or apps in physics education
- Develop better approaches to practical experiments and lab engagement
- Enhances problem solving ability
- Encourages clear scientific communication among students
- Promote active learning strategies like inquiry-based or project-based learning
- It is essential in reducing the anxiety and fear
- Develop method for collecting and applying student feedback effectively

IV CAUSES:

- Lack of interest in the classroom
- Confusion in understanding
- Less attention while explaining
- No practice
- Very few illustrations
- Negative attitude towards physics
- Difficult subject
- Lack of guidance and monitoring
- Improper use of tools and instruments
- Failure to connect theory with practical

V DATA COLLECTION AND ANALYSIS

To know how much the students has understood the concept of the physics first made the pretest. The tool used was question paper containing the questions. The test results were differed from one to another. Out of 40 students 16 students scored less than ten marks these students who scored less than ten marks are given feedback activities of 48 days. On giving the proper feedback activity again, the posttest was made to those students. In the post test the scores are increased. It indicates that the feedback activities brought the progress in their studies.

Following are the pretest scores that scored by the students: -

| Sl. No | Name of the student | Total marks | Obtained marks |
|--------|---------------------|-------------|----------------|
| 1 | Bebi M | 25 | 6 |
| 2 | Sindu G A | 25 | 8 |
| 3 | Swapna L S | 25 | 2 |
| 4 | Sudha L R | 25 | 3 |
| 5 | Pratibha G V | 25 | 4 |
| 6 | Mehek G Y | 25 | 5 |
| 7 | Iresh | 25 | 3 |
| 8 | Supriya M N | 25 | 6 |
| 9 | Rahul R L | 25 | 4 |
| 10 | Kavakava K L | 25 | 3 |
| 11 | Manoj R | 25 | 2 |
| 12 | Deeraj | 25 | 5 |
| 13 | Anusha banu M M | 25 | 5 |
| 14 | Kiran S | 25 | 6 |
| 15 | Harish G L | 25 | 2 |
| 16 | Tarun K S | 25 | 1 |

The scores obtained by the students in pretest are =6,8,2,3,4,5,3,6,4,3,2,5,5,6,2,1

Range= HS-LS
=8-1= 7

The number of class interval= $\frac{\text{range}+1}{2} = \frac{7+1}{2} = 4$

The number of class interval= 4

i) Mean: -

| Class interval | f | x | fx |
|----------------|-------------|---|----------------|
| 1-3 | 4 | 2 | 8 |
| 3-5 | 5 | 4 | 20 |
| 5-7 | 6 | 6 | 36 |
| 7-9 | 1 | 8 | 8 |
| | N=16 | | Σfx= 72 |

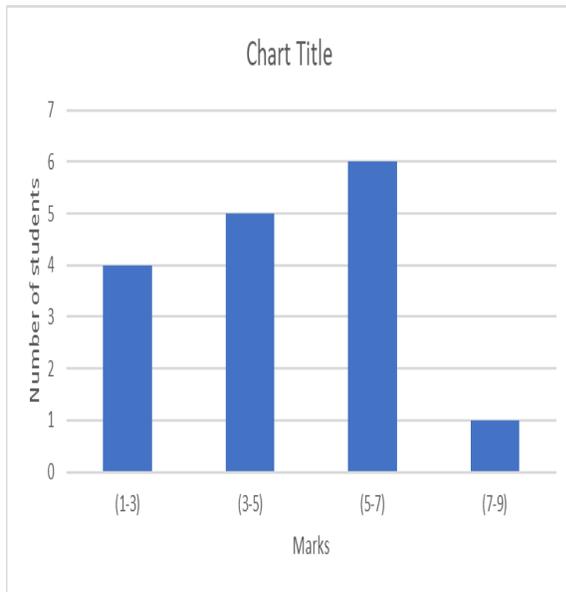
Mean = $\frac{\sum fx}{N}$
= $\frac{72}{16}$
Mean = 4.5

ii) Median: -

| Class interval | f | cf |
|----------------|-------------|----|
| 1-3 | 4 | 4 |
| 3-5 | 5 | 9 |
| 5-7 | 6 | 15 |
| 7-9 | 1 | 16 |
| | N=16 | |

Where, $N/2 = 16/2 = 8$
 $Cf = 4$
 $Fm = 5$
 $i = 2$
 $l = 3$
 $Median = l + [(n/2 - cf)/fm] \times i$
 $= 3 + [(8 - 4)/5] \times 2$
 $Median = 4.6$

iii) Mode:
 $Mode = 3(\text{median}) - 2(\text{mean})$
 $= 3(4.5) - 2(4.6)$
 $= 13.5 - 9.2$
 $Mode = 4.3$



Standard deviation: -

| Class interval | f | x | Fx | d=x-m | d ² | fd ² |
|----------------|------|---|----------------|-------|----------------|------------------|
| 1-3 | 4 | 2 | 8 | -2.5 | 6.25 | 25 |
| 3-5 | 5 | 4 | 20 | -0.5 | 0.25 | 1.25 |
| 5-7 | 6 | 6 | 36 | 1.5 | 2.25 | 13.5 |
| 7-9 | 1 | 8 | 8 | 3.5 | 12.25 | 12.25 |
| | N=16 | | $\sum fx = 72$ | | | $\sum fd^2 = 52$ |

$$\begin{aligned} \text{Mean} &= \frac{\sum fx}{N} \\ &= \frac{72}{16} \\ &= 4.5 \end{aligned}$$

$$\begin{aligned} \text{Standard deviation} &= \sqrt{\frac{(\sum fd^2)}{N}} \\ &= \sqrt{3.25} \end{aligned}$$

Standard deviation = 1.803

Quarter Deviation:

| Class interval | f | cf |
|----------------|------|----|
| 1-3 | 4 | 4 |
| 3-5 | 5 | 9 |
| 5-7 | 6 | 15 |
| 7-9 | 1 | 16 |
| | N=16 | |

$$\begin{aligned} N/4 &= 16/4 = 4 \\ l &= 1 \\ fm &= 4 \\ cf &= 0 \\ Q_1 &= l + \left\{ \frac{N/4 - cf}{fm} \right\} \times i \\ &= 1 + \left[\frac{4 - 0}{4} \right] \times 2 \\ &= 1 + [1 \times 2] \end{aligned}$$

$$Q_1 = 3$$

$$3(N/4) = 3(16/4) = 3 \times 4 = 12$$

$$\begin{aligned} l &= 5 \\ fm &= 6 \\ cf &= 9 \\ Q_3 &= l + \left\{ \frac{N/4 - cf}{fm} \right\} \times i \\ &= 5 + \left[\frac{12 - 9}{6} \right] \times 2 \\ &= 5 + [3/6] \times 2 \\ Q_3 &= 6 \end{aligned}$$

$$QD = \frac{(Q_3 - Q_1)}{2}$$

$$\begin{aligned} QD &= \frac{(6 - 3)}{2} \\ QD &= 1.5 \end{aligned}$$

Post test scores

| Sl.Number | Student Name | Total marks | Obtained Marks |
|-----------|-----------------|-------------|----------------|
| 1 | Bebi M | 25 | 13 |
| 2 | Sindu G A | 25 | 12 |
| 3 | Sudha L R | 25 | 14 |
| 4 | Swapna L S | 25 | 15 |
| 5 | Pratibha G A | 25 | 12 |
| 6 | Mehak J Y | 25 | 20 |
| 7 | Iresh | 25 | 17 |
| 8 | Supriya M N | 25 | 18 |
| 9 | Rahula R. L | 25 | 21 |
| 10 | Kavakava K L | 25 | 18 |
| 11 | Manoj R | 25 | 12 |
| 12 | Deeraj | 25 | 14 |
| 13 | Anusha banu M M | 25 | 17 |
| 14 | Kiran S | 25 | 19 |
| 15 | Harish G L | 25 | 18 |
| 16 | Tarun K S | 25 | 13 |

The marks scored by the students in the posttest are, 13, 12, 14, 15, 12, 20, 17, 18, 21, 18, 12,14, 17, 19, 18, 13

Range= HS-LS
=21-12
=9

The number of class intervals = $\frac{\text{Range}+1}{2} = \frac{9+1}{2} = 5$

| Class interval | f | x | fx |
|----------------|------|----|---------------|
| 12-14 | 5 | 12 | 60 |
| 14-16 | 3 | 14 | 42 |
| 16-18 | 2 | 16 | 32 |
| 18-20 | 4 | 18 | 72 |
| 20-22 | 2 | 20 | 40 |
| | N=16 | | $\sum fx=246$ |

i) Mean:

Mean = $\frac{\sum fx}{N}$
= $\frac{246}{16}$
Mean= 15.37

ii) Median

| Class interval | f | Cf |
|----------------|------|----|
| 12-14 | 5 | 5 |
| 14-16 | 3 | 8 |
| 16-18 | 2 | 10 |
| 18-20 | 4 | 14 |
| 20-22 | 2 | 16 |
| | N=16 | |

Where, $N/2 = 16/2 = 8$

cf = 5

fm= 3

i= 2

l=14

Median= $l + \left[\frac{N/2 - cf}{fm} \right]$

= $14 + [1 \times 2]$

Median= 16

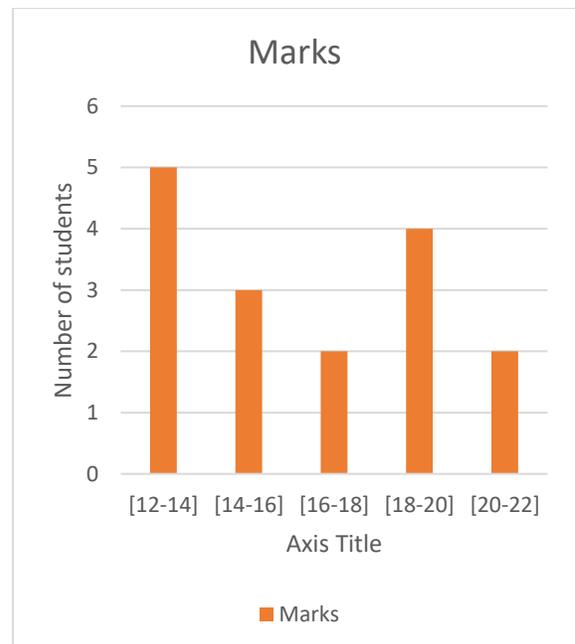
iii) Mode:

= $3(\text{Median}) - 2(\text{mean})$

= $3(15.37) - 2(16)$

= $46.11 - 32$

Mode=14.11



Standard Deviation: -

| CI | f | x | fx | d=x-m | d ² | fd ² |
|-------|------|----|---------|-------|----------------|--------------------------|
| 12-14 | 5 | 12 | 60 | -3.37 | 11.35 | 56.75 |
| 14-16 | 3 | 14 | 42 | -1.37 | 1.87 | 5.61 |
| 16-18 | 2 | 16 | 32 | 0.63 | 0.39 | 0.78 |
| 18-20 | 4 | 18 | 72 | 2.63 | 6.91 | 27.64 |
| 20-22 | 2 | 20 | 40 | 4.63 | 21.43 | 42.86 |
| | N=16 | | ∑fx=246 | | | ∑fd ² =133.64 |

$$\text{Mean} = \frac{\sum fx}{N}$$

$$= \frac{246}{16}$$

$$\text{Mean} = 15.37$$

$$\text{Standard deviation} = \sqrt{\frac{(\sum fd^2)}{N}}$$

$$= \sqrt{(8.35)}$$

$$\text{Standard deviation} = 2.88$$

Quarter deviation: -

| Class interval | f | Cf |
|----------------|------|----|
| 12-14 | 5 | 5 |
| 14-16 | 3 | 8 |
| 16-18 | 2 | 10 |
| 18-20 | 4 | 14 |
| 20-22 | 2 | 16 |
| | N=16 | |

$$N/4 = 16/4 = 4$$

$$cf = 4$$

$$fm = 5$$

$$i = 2$$

$$Q_1 = 1 + \left\{ \frac{N/4 - cf}{fm} \right\} xi$$

$$= 12 + \left[\frac{4}{5} \right] \times 2$$

$$= 12 + [0.8 \times 2]$$

$$= 12 + 1.6$$

$$= 13.6$$

$$Q_1 = 13.6$$

$$3(N/4) = 3(16/4) = 3 \times 4 = 12$$

$$l = 18$$

$$fm = 4$$

$$cf = 10$$

$$Q_3 = 1 + \left\{ \frac{N/4 - cf}{fm} \right\} xi$$

$$= 18 + \left[\frac{12 - 10}{4} \right] \times 2$$

$$= 18 + \left[\frac{2}{4} \right] \times 2$$

$$Q_3 = 18$$

$$QD = \frac{(Q_3 - Q_1)}{2}$$

$$= \frac{18 - 13.6}{2}$$

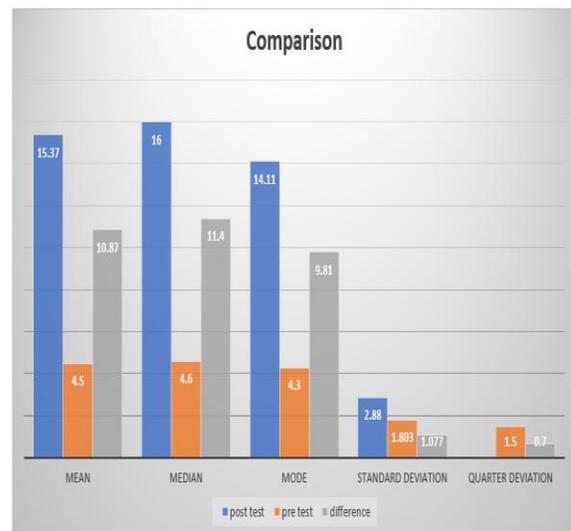
$$QD = \frac{4.4}{2}$$

$$QD = 2.2$$

$$QD = 2.2$$

Comparison between pre-test and post-test:

| | Post-test | Pre-test | Difference |
|--------------------|-----------|----------|------------|
| Mean | 15.37 | 4.5 | 10.87 |
| Median | 16 | 4.6 | 11.4 |
| Mode | 14.11 | 4.3 | 9.81 |
| Standard deviation | 2.88 | 1.803 | 1.077 |
| Quarter deviation | 2.2 | 1.5 | 0.7 |



Result Analysis:

1. Pretest result analysis:

Mean= 4.5 & Median= 4.6

Analysis= Median- Mean
=4.6-4.5= 0.1
=0.1<1

∴ It follows the NPC curve characteristic.

2. Posttest result analysis:

Mean= 15.37 & Median= 16

Analysis= Median-Mean

=16- 15.37

=0.63<1

∴ It follows the NPC curve characteristic.

Important points discovered:

- The result of pre-test and post-test are differed.
- Children achievements have improved in post test
- Children learning improved due to remedial activities
- Current action research affects children greatly
- Children fear towards learning physics has been reduced
- Students clearly understand the equations of motion
- Students do the activity given by the teachers regularly with interest
- Students have got many opportunities to enhance their skill
- Suggestions:
- Students understand the physics when they practically do the activity i.e., students learn by doing
- Introducing the concepts with relevant illustrations
- Activity of toy car race to measure time, velocity, speed
- Daily writing the equations of motion as a homework
- Revising the difficult concepts regularly in the classroom
- Teaching should be in accordance to the student's mental level
- Solving more illustration in the classroom
- Giving the exercise questions as a home work
- Organizing the quiz so that students can evaluate them self
- Using the proper teaching-learning materials in the classroom

- In order to grab the attention of students in the classroom teachers need to motivate the students with stories or facts related to science

VI CONCLUSION:

Concludingly, the action research has provided valuable insights into the issue under investigation and offered practical solution for improvement. Through the systematic process of planning, acting, observing, and reflecting, meaningful changes were implemented and evaluation. The outcomes highlight the importance of reflective practice and continues improvement in addressing real-life challenges. hence action research is a essential in identifying and solving their issues with suitable solutions. It also essential in improving the achievement of the slow learners by giving the proper feedback activities. It builds confidence level among students.

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