

**Impact
Factor
3.025**

ISSN 2349-638x

Refereed And Indexed Journal

**AAYUSHI
INTERNATIONAL
INTERDISCIPLINARY
RESEARCH JOURNAL
(AIIRJ)**

UGC Approved Monthly Journal

VOL-IV

ISSUE-XI

Nov.

2017

Address

• Vikram Nagar, Boudhi Chouk, Latur.
• Tq. Latur, Dis. Latur 413512 (MS.)
• (+91) 9922455749, (+91) 8999250451

Email

• aiirjpramod@gmail.com
• aayushijournal@gmail.com

Website

• www.aiirjournal.com

CHIEF EDITOR – PRAMOD PRAKASHRAO TANDALE

**Identification of Misconceptions for Gravity, Motion and Inertia among
Secondary School Students**

Dr. V S Khandagale

Assistant Professor,
Deptment of Education,
Shivaji University, Kolhapur (India)

Rajendra Chavan

UGC NET-Senior Research Fellow,
Deptment of Education,
Shivaji University, Kolhapur (India)

Abstract

Physics is a science that deals with matter and energy, and their interaction. The subject matter of Physics includes mechanics, heat, light, optics, electricity, magnetism, radiation, gravitation, atom structure etc. Physics concepts are included in science textbook form primary level of education. Some Physics abstract concepts are difficult to comprehend for Primary and Secondary students. The complex and abstract nature of many concepts in physics make them difficult to understand. It results into that the Physics subject become much more difficult due to the presence of varied misconceptions in students.

The aim of the study is to identify the Physics misconceptions related to gravity, motion and inertia concepts among secondary school students. The study was descriptive in nature. One hundred forty (N=140) Ninth standard semi-english secondary school students of Kolhapur city were selected by purposive sampling method.

The researchers identify three concepts of Physics i.e. Gravity, Motion, Inertia. The tool was constructed and data was collected from the Ninth standard students of affiliated to State Board of Kolhapur city. The misconceptions found were 'gravitational force just act on only heavy object', 'gravity does not affect object in water', 'a continuous force is needed for continuous motion', 'speed and motion are same and 'inertia is the force that keep objects in motion' among the students.

Key words: Misconceptions, Physics, Identification, Secondary School Students

Introduction

Science education increases common knowledge about the science and widening social awareness about scientific finding and issues. Learning science goes beyond scientific facts, terms, attributes, concepts, principles and theories. Students do not enters as a blank slate in the classroom as they have already develop concept about natural phenomena before they are taught science concepts in school.

Physics is an important subject of science which deals with matter and energy. The subject matter of Physics includes mechanics, heat, light, optics, electricity, magnetism, radiation etc. In secondary school science curriculum important basic Physics concepts are included. The scientific understanding of the physics concepts plays an important role in secondary school students life. It helps to develop scientific thinking, logical reasoning, scientific and technological literacy and awareness about the surrounding in students.

In 21st century science pedagogy emphasizing on constructivism to form conceptual structure among the school going children. The process of constructing a concept about how things go together is called concept formation. Science teacher plays key role for scientifically

correct concept formation in the students brain. Concepts present in any subject acts as a linking bridge between prior knowledge and new knowledge in the conception process. Concepts are mental images which assists children in classifying his experiences and which continually changes as his experiences accumulate.

Concept of Misconception

The terms Misconception refers to as an inaccurate understanding of concept, the misuse of concept name, the incorrect classification of concept examples, confusion between differing concepts, improper hierarchical relationships, over or under generalizing of concepts (Bas-Jaoude,1991). Misconceptions are conceptions which are incorrect viewed from the standpoint view. Misconceptions also describe by the other terms like erroneous concept, preconceptions, alternative conceptions, alternative ideas, conceptual stumbling blocks, spontaneous conceptions.

Many secondary school students completed their course without developing an adequate understanding of the concept and theories which they had been taught.

Misconceptions are more prone to occur in abstract concept and not easily eradicated. Physics one area in science where students have to learn many concepts that are not tangible. Early stage misconceptions can be minimize. Due to misconceptions students become confused and mis-learn and develops alternative conceptions.

Most of the daily work processes all over the world related to human beings are related to the principles of the gravity, motion and inertia. If secondary students carries some misconceptions about these Physics concepts, it may hamper the conceptualization of other terms, concept in Physics may have impact in the form of superstitions in the society, Therefore researcher strongly felt to conduct a study of identification of misconceptions related to Physics concepts-gravity, motion and inertia among Secondary school students

Need and Rationale of the Study

Misconceptions are the obstacles in the growth an individual knowledge and scientific thinking. It is carried on unknowingly and leads confusion and affects the confidence of the students. Driver (1981) found that many students pass science classes without acquiring adequate understanding of the science concepts and it may due to variety of factors like misinformation given by the teacher, selective attention of the students, misinterpretation of the concepts, etc. It develops misconceptions about that particular concept in students.

As the research studies proved misconceptions affects the learning of an individual and could not explore an individual potential in the specific subject to its fullest. Misconception in one subject of science is correlated to the other subject as well. Once the misconceptions are formed they get deeply rooted and then it difficult to minimize and it have prolonged effects.

Hence, researchers felt the need and rational of the present study to identify the misconceptions with reference to Physics concepts Gravity, Motion and Inertia among secondary school students

Review of Related Researches

Gafoor, A. K. & Akhilesh, P. T. (2018) identified misconceptions in Physics and tested the effectiveness of certain instructional programmes on remediation of the misconcepts among Eight standard students. Researcher was selected major and minor Physics concepts included in Ninth standard science textbook content. Mixed method approach was used in this study. Data was collected form Ninth standard students (N=627) with the help of Test of Concept Attainment in Physics (TCAP). Findings of the study showed that, Rural students have more physics misconceptions than urban students In velocity and its definition, work, mass, sound, and energy urban students have higher number and rate of misconception; while for force and inertia, density, energy transformation, solar system, and light, rural students have higher rate and number of misconception. The study suggests steps for remedying misconceptions.

Nik Syaharudin Nik Daud and et al (2015) provided an overview of some literatures pertaining to misconceptions and difficulties in introductory physics among high school and university students. Misconceptions and difficulties in mechanics are listed and described based on past studies in science education. Consequently, this paper also presents the implications these misconceptions have on teaching and learning physics and its role in conceptual change

Derya Kaltakci-Gurel et al (2016) investigated pre-service physics teachers' (PSPTs) misconceptions and conceptual difficulties about geometrical optics in the contexts of plane mirrors, spherical mirrors and lenses. Researchers used prolonged interviews and open-ended test as data collection. The finding of the study showed that teachers perceived vernacular misconceptions related to geometrical optics concept.

Dermini, N. (2005) carried out an experimental study on 'A study about students misconceptions in force and motion concepts by incorporating a web-assisted physics programme to normal traditional classroom instruction and study about students misconceptions in force and motion concepts in physics.

Sangsupata Sopapun (1993) developed a Two-tier multiple choice test for measure misconceptions in physics among high school students in Thailand. Two-Tiered Optics Misconception (TTOM) test instrument was administered on 932 high school students in Thailand. The findings of the study showed that students have highest degree of misconceptions in properties of covering lens, plane mirror, shadow formation etc.

Mahopatra (1988) investigated misconceptions regarding second law of light reflection and research findings indicated that physics misconceptions existed in all educational level.

Statement of the Study

Identification of Misconceptions for Gravity, Motion and Inertia among Secondary School Students

Terminologies used in the study

Misconception

In the present study misconceptions refers to ideas that are incompatible with currently accepted scientific knowledge, ideas provides incorrect information, blind beliefs, alternative conceptions, unscientific reasoning, about Gravitation, Motion and Inertia among Ninth standard students.

Identification

In the present study identification refers to selection of the important concepts of Physics, and the process of identification of Misconceptions with refers to Gravitation, Motion and Inertia.

Secondary School Students

Secondary school students refers to students studying in the Ninth and Tenth Standard class. For the present study Ninth standard Semi-English medium school students are considered as secondary school students.

Objectives of the Study

- 1) To find out the misconceptions related concepts of Physics - Gravitation, Motion, Inertia
- 2) To make suggestions based on the findings of the study

Assumptions

Ninth standard students have misconceptions for the concepts Gravity, Motion & Inertia

Scope of the study

The finding of the study may applicable to similar context of State Board (Maharashtra State Board of Secondary and Higher Secondary Education) of Ninth standard students in Maharashtra.

Delimitations of the Study

- 1) The study is delimited for Ninth standard students of English medium affiliated to State Board (Maharashtra State Board of Secondary and Higher Secondary Education) of Maharashtra for the academic year 2017-18 year and with reference to selected Physics concepts- Gravitation, Motion and Inertia only.

Research Methodology

Descriptive survey method was used to collect the data from the Ninth standard students.

Sampling Method, Nature and Size of the Sample:

From Kolhapur City four Semi-English medium school were selected through purposive & incidental sampling method and from each school 35 Ninth standard students were selected as a sample ($35 \times 4 = 140$) for data collection

Tool for Research

Researcher made open ended questionnaire was used as a tool for data collection.

Data Collection

Researcher took the prior permission from the concern school authority and the questionnaire was administered among Ninth standard students

Statistical Data Analysis

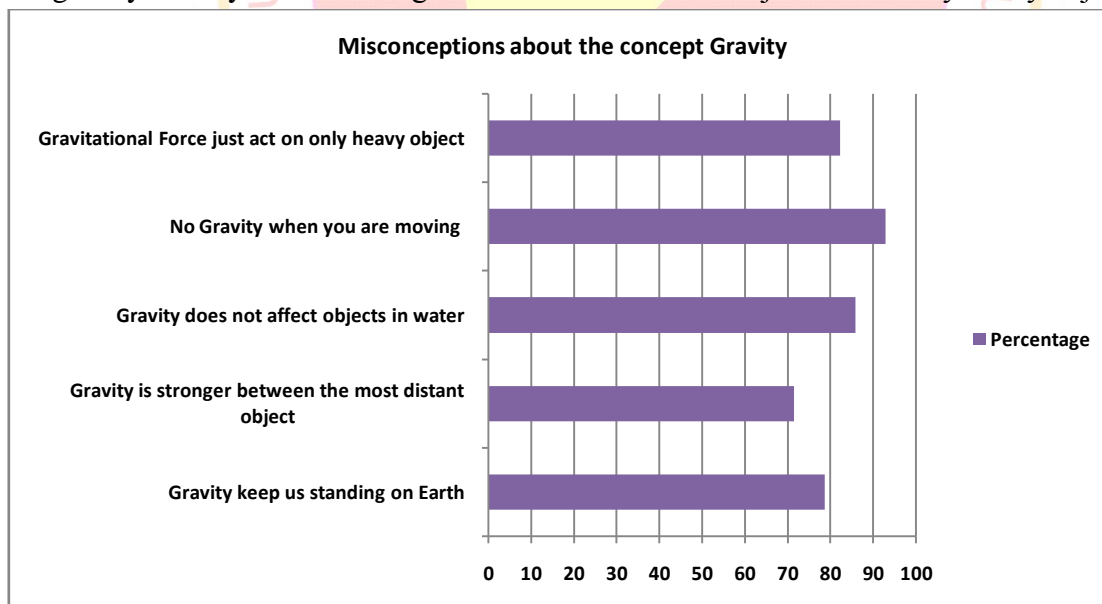
Statistical analysis of the data was done by Percentage

Table No.1 Misconceptions about the concept Gravity

Misconceptions	Frequency	Percentage
Gravity keep us standing on Earth	110	78.57
Gravity is stronger between the most distant object	100	71.43
Gravity does not affect objects in water	120	85.71
No Gravity when you are moving	130	92.86
Gravitational Force just act on only heavy object	115	82.14

Observation & Interpretation

From the above Table No.1 it is observed and interpreted that Most of the Ninth standard students perceived the misconceptions about the concep Gravity are ‘Gravity keep us on Earth’, ‘Gravity is stronger between the most distant object’, ‘ Gravity does not affect objects in water’, No gravity when you are moving’ and ‘Gravitational force just act on only heavy object’.



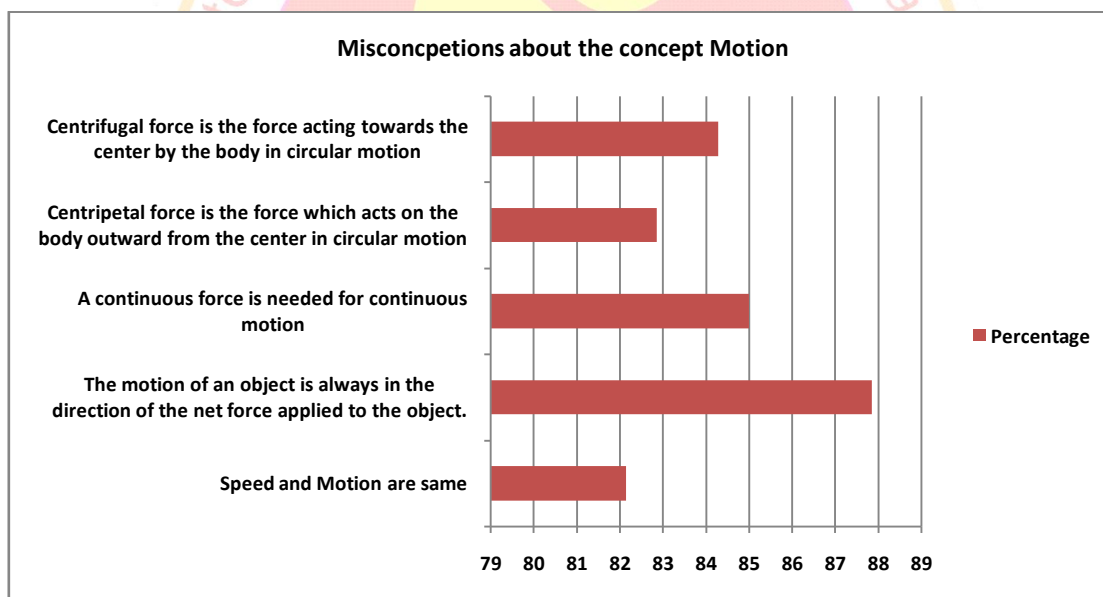
Graph No. 1 Misconceptions about the concept Gravity

Table No.2 Misconceptions about the concept Motion

Misconceptions	Frequency	Percentage
Speed and Motion are same	115	82.14
The motion of an object is always in the direction of the net force applied to the object.	123	87.86
A continuous force is needed for continuous motion	119	85.00
Centripetal force is the force which acts on the body outward from the center in circular motion	116	82.86
Centrifugal force is the force acting towards the center by the body in circular motion	118	84.29

Observation & Interpretation

From the above Table No.2 it is observed and interpreted that, most of the Ninth standard students perceived the misconceptions about the concept Motion are ‘ speed and motion are same’, ‘the motion of an object is always in the direction of the net force applied to the object, ‘A continuous force is needed for continuous motion’, ‘Centripetal force is the force which acts on the body outward from the center in circular motion’ and ‘Centrifugal force is the force acting towards the center by the body in circular motion’.



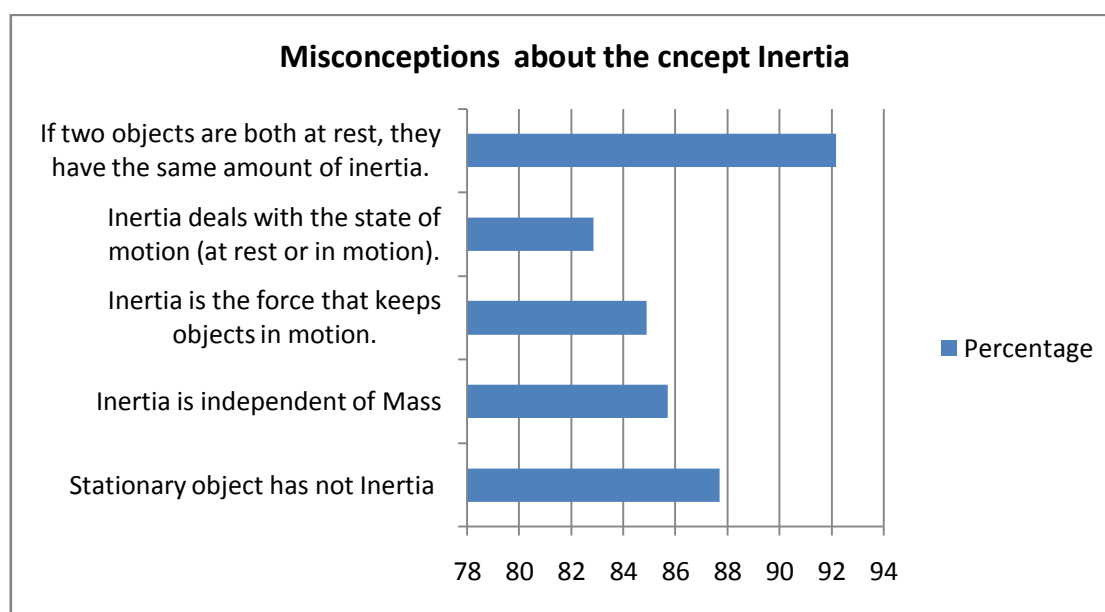
Graph No. 2 Misconceptions about the concept Motion

Table No.3 Misconceptions about the concept Inertia

Misconceptions	Frequency	Percentage
Stationary object has not Inertia	122	87.71
Inertia is independent of Mass	120	85.71
Inertia is the force that keeps objects in motion.	118	84.89
Inertia deals with the state of motion (at rest or in motion).	116	82.86
If two objects are both at rest, they have the same amount of inertia.	129	92.17

Observation & Interpretation

From the above Table No.3 It is observed and interpreted that, most of the Ninth standard students perceived the misconceptions about the concept Motion are 'Stationary object has not Inertia', 'Inertia is independent of Mass', 'Inertia is the force that keeps objects in motion', 'Inertia deals with the state of motion (at rest or in motion) and 'If two objects are both at rest, they have the same amount of inertia'.



Graph No. 3 Misconceptions about the concept Inertia

Findings

1) It is found that most of the students have misconceptions about the concept Gravity. The major misconceptions were,

- i) Gravity keeps us standing on Earth
- ii) Gravity is stronger between the most distant object
- iii) Gravity does not affect objects in water
- iv) No Gravity when you are moving
- v) Gravitational force just act on only heavy object

2) It is found that most of the students have misconceptions about the concept Motion. The major misconceptions were,

- i) Speed and Motion are same
- ii) The Motion of an object is always in the direction of the net force applied to the object
- iii) A continuous force is needed for continuous motion
- iv) Centripetal force is the force which acts on the body outward from the centre in circular motion

v) Centrifugal force is the force acting towards the center by the body in circular motion

3) It is found that most of the students have misconceptions about the concept Inertia. The major misconceptions were,

- i) Stationary object has not Inertia
- ii) Inertia is independent of mass
- iii) Inertia deals with force that keeps objects in motion
- iv) Inertia deal with the state of rest or in motion
- v) If two objects are both at rest, they have the same amount of inertia

Suggestions

Based on the finding it may suggest that Science teachers need to apply various innovative teaching methods and techniques to minimize the misconceptions among school students. The following innovative techniques may be applied in the classrooms observation, concept mapping, Reasoning, Projects, Experiential learning Case studies etc.

To identify the misconceptions among the students the teachers may utilize indept interview, three tier, four tier identification and diagnostic test, and conceptual change strategies periodically in the science classroom.

Science teachers may use online and simulated instructions, organize activity and project based learning experiences to avoid cognitive conflicts among the school going science students

Acknowledgement

We are very grateful to Semi- English Secondary School Students and Administration of Kolhapur City for their cooperation during data collection for the present study.

References

1. Abdul Gafoor, K. & Akhilesh, P.T. (2008). Misconception in physics among secondary school students. *Journal of Indian Education*, Vol.34, No.1, pp.77-90
2. Bau-Jaoude, S. B. (1991). A study of the nature of students' understandings about the concept of burning. *Journal of Research in Science Teaching*, Vol.28, pp.689-704.
3. Bayraktar, S. Int J of Sci and Math Educ (2009). Misconceptions of Turkish Pre-Service Teachers about Force and Motion *International Journal of Science and Mathematics Education*, Vol.7, No.2, pp 273–291
4. Derya Kaltakçi & Nilüfer Didiş (2007). Identification of Pre-Service Physics Teachers' Misconceptions on Gravity Concept: A Study with a 3-Tier Misconception Test, *AIP Conference Proceedings 2007*, 899:1, 499-500
5. Derya Kaltakci-Gurel, Ali Eryilmaz, and Lillian C McDermott (2016). Identifying pre-service physics teachers' misconceptions and conceptual difficulties about geometrical optics. *European Journal of Physics*, Vol. 37, No.4 , pp. 1-31.
6. Driver, R. (1981). "Pupils' alternative frameworks in science," *European Journal of Science Education*, vol. 3, pp. 93–101.
7. Iris Levin, Robert S. Siegler and Sara Druyan (1990). Misconceptions about Motion: Development and Training Effects, *Child Development*, Vol. 61, No. 5 , pp. 1544-1557

8. Mohapatra , J. K. (1988). Induced in incorrect generalizations leading to misconceptions : an exploratory investigation about the laws of reflection of light, *Journal of Research in Science Teaching*, Vol. 25, No.9, pp.777-784
9. Nik Syaharudin Nik Daud, Mohd Mustamam Abd Karim, Siti Wan Noraini Wan Hassan & Nurulhuda Abdul Rahman.(2015). Misconception and Difficulties in Introductory Physics Among High School and University Students : An Overview in Mechanics, *EDUCATUM - Journal of Science, Mathematics and Technology*, Vol. 2 No.1 , pp.34 – 47.
10. Pablico, Jane Ragasa.(2010). *Misconceptions on force and gravity among high school students*, LSU Master's Theses. 2462. Retrired January 8, 2018 from https://digitalcommons.lsu.edu/gradschool_theses/2462
11. Sangsupata, S. (1993). *Development of a two tiered multiple choice test to measure misconceptions in physics among high school students in Thailand* (Unpublished PhD Thesis). Oregon State University, Thailand.

