

Institute for Christian Teaching  
Education Department of Seventh-day Adventist

TEACHING SPIRITUAL VALUES  
IN PHYSICS CLASS ROOM

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Physics, one of the outstanding branches of science, is undoubtedly respected by one and all. It is Physics which provides answers to many questions which a common man finds it impossible to understand. The physical or the technological aspects of the living and non-living things are understood with the knowledge in Physics. God's creation and man's findings are better defined by this unique field of science.

A teacher, who bears God's image, can make an impact on the minds of the students only when she makes an effort to understand the very creation of God. In fact, a dedicated teacher, who is also Christ-centered, searches thoroughly for evidences in nature to integrate faith with learning. The teacher's convictions become real to the students when they are presented in such a way that the Creator-Redeemer aspect is dealt with.

Jesus Christ, the greatest teacher, in spite of His Omniscience (all-knowledge), used very simple illustrations which are actually day-to-day happenings. Those illustrations or parables, which stimulated interest and aroused curiosity, helped His listeners not only to understand easily but also to keep the His lessons in the mind for a long time. In this paper, by using simple

illustrations in the secondary school class room and laboratory, an attempt is made to explain the spiritual values from the physics lessons.

### **Importance of Physics**

The knowledge of Physics is so vast and varied that a single individual can learn very little in his short span of life. In fact, the study of Physics gives a clear understanding that is from motion of the electrons around the nucleus that enables the motion of a satellite around the earth and to the universe. So Physics is subdivided into Atomic Physics, light, sound, electricity, mechanics, Astrophysics, Nuclear physics etc.

Study of Physics is interesting and exciting as Physics deals with many natural phenomenon it provides a variety of experiences to understand the man's surroundings and nature at large. Apple falls because of Earth's gravitation. The Rocket works on the principle of conservation of momentum. Vibrating bodies produce sound. The invention of radio, television, satellite communication system, and the discovery of X-rays, Lasers etc. have opened way to many new fields of study as well as a variety of applications in medicine ,engineering etc. The principles applied in one branch of Physics are equally applicable to the other branches of Physics.

The Adventist educators believe that the Omnipotent God, the Maker of the Universe, imparted this knowledge to human beings. With God our knowledge is complete. Without God our knowledge is incomplete<sup>1</sup>.

Before we go to spiritual lessons from Physics both theory and laboratory let us select the objectives and outcomes, some important ideas, values, issues, etc.

### **Selection of Objectives and Outcomes<sup>2</sup>**

1. Recognize the law and order in nature
2. Recognize the value, legitimate roles and limitations of scientific and technological knowledge and their subordination to the knowledge revealed through the Divine inspiration.
3. Appreciate and respect the hard work of the Creator.
4. Develop an attitude of curiosity and experience the excitement of the verification of laws.
5. Value honesty and integrity and while striving for accuracy, recognize that the observation and subject to uncertainties.
6. Recognize through the experiment, the evidence for the existence of an intelligent powerful and orderly creator who established natural laws through which sustains the universe.
7. To develop confidence on himself
8. Develop and maintain an awareness of safety precautions.

**Important Ideas:**

Man was created with the capacity and desire to inquire and expand knowledge.

**Values**

Appreciation of nature

Appreciation of design

Following directions explicitly and willingly

Intellectual curiosity

Cooperation with others

**TEACHING VALUES IN THE THEORY CLASS ROOM****LIGHT****Illustration 1**

Transmission of light through i). Transparent  
ii). Opaque and iii). Translucent bodies<sup>3</sup>

**1). Transparent bodies**

Transparent bodies (Ex: glass, air, water etc.) are those through which light can pass freely, and through which things can be seen distinctly.

We should be willing to accept the truth of God with an open mind. As the transparent bodies allow the light to pass through, the free and open human minds receive the Light and the knowledge of Truth and understanding, which is from and in God (II Cor. 4:6). God's word can be understood very easily by the students when they are free and open minded(transparent). The students' character is molded in

such a way that they become obedient. To make the students obedient, the teacher plays an important role, i.e. he inculcates belief in the minds of the students.

## 2). Opaque bodies

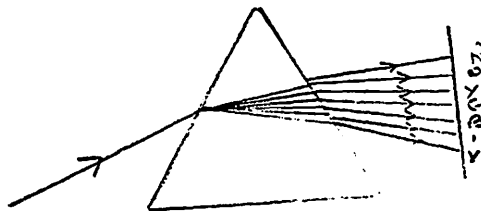
Opaque bodies(stone, wood, iron etc.) are those which do not allow any light to pass through them, and through which vision is not possible. As opaque bodies do not let light to pass through, the minds blinded by the sin of this world (II Cor. 4:4) can have neither light nor vision.

## 3. Translucent bodies

Translucent bodies(ground glass, paraffin wax etc.) are those which allow only a part of the light to pass through them, and through which vision is dim. As translucent bodies allow light partially, the hearts not rooted in the soil of Truth (Mt. 13:21), cannot either receive the light in its totality or understand upto the point of bearing fruits.

### Illustration 2

### Dispersion of Light



When a narrow beam of white light is allowed to pass through a prism, a beautiful pattern of colors are seen on the screen. This is called as spectrum, which was first discover by Sir Isaac Newton<sup>4</sup>.

Dispersion of light is nothing but the splitting of white light into its constituent colors. and different colors are due to the difference in wave lengths and their speeds.

When the light or the Word of God penetrates through our hearts, it bends and spreads in different directions. Similarly, when we exercise humility and obedience (bending) God enlightens our hearts (light entering through the prism), and the knowledge of God influences us (dispersing), penetrates through the heart and makes the life attractive and fruitful.

As the speed of light is different in different materials, the dispersive power of the prism made out of different materials is different. Dispersive power is nothing but the ability of the prism to disperse the light. Similarly, the knowledge acquired by different people is different, though they are exposed to the same light.

**GRAVITATION****Illustration 4:**Revolution of Earth around the Sun

After performing many experiments and careful examinations by Copernicus and later by Kepler stated that earth rotates around the sun. In order to rotate round the sun, the earth should be provided with centripetal force which is equal to the attractive force between the sun the earth. Similarly, if our lives are to go around the Sun of righteousness, we need to be attracted to Him. Only then we will be saved from the enemy who is striving to pull us away (centrifugal force) from our path of righteousness.

**EINSTEIN'S MASS-ENERGY RELATION****Illustration 3**

God created the planet earth out of nothing. When God said, "Let there be lights (sun, moon and stars)" they appeared. Similarly, plants, animals etc. are all created by the spoken word of God. There is power and energy in God's word. This energy became matter. This phenomenon was first discovered by Einstein in the beginning 20th century. It states that mass can be converted into energy, according to the relation  $E=mc^2$  where  $m$  is the mass converted into energy  $E$  and vice versa.



**Illustration 4****Change of Water into Wine**

Jesus performed this first miracle in a wedding at Cana. The density of wine is greater than the density of water. When Jesus prayed, insignificant water has turned into significant wine, i.e. energy is converted into matter which is tasty and colorful. In the same way, when God works with us, we the most insignificant ones will be changed into significant and worthy people.

**TEACHING VALUES IN THE LAB**

What is covered in the theory class room is experimented in the lab. While doing so we are trying to give the student a clear concept developing in mind. So it is very important at this stage to plan for the experiment in turn developing the christian values in their minds.

**Teaching Activity****Illustration**

A lens is a transparent medium bounded by two curved surfaces. A lens which is thicker in the center than its edges is called a convex lens. Considering a lens to be formed by portions from a large number of triangular prisms whose refracting angles decrease from the edge of the lens to the centre, it can be seen that a convex lens placed in air will converge a parallel beam of light. Therefore a convex lens is a converging lens. It has two focal points

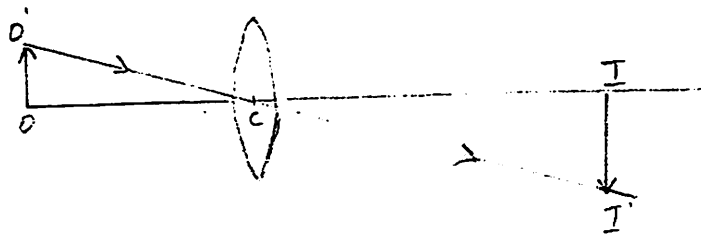
on either side of the lens. Focal point is a point on the principle axis of a lens which has the property that a parallel rays actually converges at that point. The image position of the object kept in front of the lens can be obtained by drawing the ray diagram. The ray diagram can be drawn by using certain rules which are given below.

For the construction of the image the following two rays are taken.

1. A ray parallel to the principal axis will pass through the second focus.
2. A ray through the optical center passes through the lens undeviated.

By drawing several diagrams it can be seen that image formed by a convex lens the nature and the size of the image depends on the position of the object.

Formation of image by lens:



$OO^1$  = Object

$O$  = Object distance =  $U$

$II^1$  = Image

$C$  = Image distance =  $V$

$C$  = Optic center

$C$  = Focal length

$L$  = Convex lens

$F$

### **Defects in the lens**

Spherical aberration is a defect by the fact that marginal rays and paraxial rays don't form the image at the same place. Chromatic aberration is a defect in the quality of the image caused by the colored images of an object illuminated by white light are formed it in different distances from the lens.

### **These defects can be rectified by**

1. Using diaphragm(Spherical aberration)
2. Combining the convex lens with a concave lens

### **VALUES**

We adventist educators are like lenses in the world of sin i,e.surrounded by air, with Jesus as our focus. We should be like convergent people to the word of God,like a convex lens and divergent to sin i,e like a concave lens. For different positions of the object ,there is always an image formation i,e when the light of God of enters in different regions(areas) of our lives the light of God(rays) refract through our hearts(lens) the image of God is shown in our lives.As the rays of light followed a fixed path to form the image of God ,even we should follow the path set by God(the laws of God). Any defect in the lens causes problems in the image which can be rectified. In the same way the sin became a problem to us which can be rectified by accepting

Jesus as our savior. Every body exhibit their own abilities depending on the position of God(object) in their lives.

### **Developing Laboratory Skills**

1. Selection of aim of the experiment.
2. Develop the usage of basic scientific terminology and laboratory skills.
3. Identify the basic laboratory apparatus required.
4. Developing skills related to the method of performing the experiment.
5. Developing skills related to inferring diagrams.
6. Developing skills related to measuring and recording observations.
7. Developing skills related drawing graphs and calculations.
8. Developing skills related to conclusion.
9. Developing skills related to creativity and to design new equipment to perform experiments.

### **Experiment:**

**Aim:** To find the focal length of given convex lens

**Apparatus:** Convex lens, lens stand, illuminated object and screen.

**Formula:**  $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

f = Focal length of the convex lens in cm  
 u = Distance between the lens and object in cm  
 v = Distance between the lens and screen in cm

**Procedure:** It consists of the systematic steps to be taken by the students, as directed by the teacher.

- 1.
- 2.
- 3.
- 4.

**Observations:** It contains a table of values, the student is supposed to enter the measured values under the particular columns.

S.NO	U(cm)	V(cm)	UV	U+V	UV/U+V
1.					
2.					
3.					
4.					
5.					

**Calculations:** By using the above formula the students find the values of the table.

**Result:** The focal of the lens  $f =$  \_\_\_\_\_ cm

**Precautions:** It Consist of a few steps to avoid mistakes while performing the experiment.

Ex: Parallax error

All the values which we stated are observed in the above experiment. As we observed more can be learn through the laboratory work than from the class room teaching. E.G. White says "The Holy scriptures are the perfect standard of truth, and as such should be given highest place in education." So as teachers our main task is to bring the tiny ones to the scriptures through our teaching.

#### **Summery and Conclusion**

Every Physics teacher should be a model teacher. He should be oriented with the Adventist world view and his teaching should be Christ centered. And the Bible should be the base of all his teachings. Teacher plays an important role in developing one's personality and values. The teachings should create a desire to appreciate God's power and goodness.

No finite mind can fully comprehend the existence, the power, the wisdom, or the works of the infinite one. Yet the works of creation testify of God's power and greatness. "The heavens declare the glory of God; and the firmament showeth His handiwork." Psalm 19:1. But God has selected the finite mind to fulfill His work on this Earth.

**References**

1. Jean - Lucienard, "God in the college class room :  
Challenges and oppertunities" ,Vol - 14 ,P - 242  
E.G.White :Education.page-17,1952.Pacific Press Publishing  
Association California
2. Dr.Barry Hill, Science Seventhday Adventist secondary  
Curriculum Second Edition 1996, P - 8.
3. G.M.Ram et.al., Concise Physics ICSE,Selina  
Publications 1990, P - 161.
- 4,6. Bhatnagar, ISC Physics, Vol - II,Pitambar Publications,  
1995,Page-477,683.
5. Bhatnagar, ISC Physics Vol - I,Pitambar  
Publications,1993,Page - 316.
7. Patriarchs and Prophets Page - 116.