

Problems of Teaching Optics in Middle School: A Survey in Batadraba Education Block of Nagaon District, Assam, India

Debnath D., Barthakur N. K., Baruah R.S. & Goswami P. K.

Department of Physics, Dhing College, Dhing, Nagaon, Assam

Abstract- Optics is the branch of Physics which deals with study of nature, propagation and properties of light. Light is a form of energy and moves in all directions in the form of waves. The challenges lie in developing an appropriate learning environment with theory as well as practical knowledge in the field. It is here that an assessment is required regarding the effectiveness of textbooks, the needs of school children and science teacher and the reforms that are needed to make optics an enjoyable learning subject.

The main aim of research study was – To teach optics in simplest way by experiments, using modern tools available in schools and at home.

As far as our study is concerned, we observed that most of the students of higher classes ignore or give less importance to the branch ‘optics’. Therefore it is required to motivate and create interest in this subject in children from school onwards. In this case we think the experimental tools can help in a big way.

In order to fulfill the objectives a field study was conducted in 7 Schools of Batadraba Block of Nagaon district. The research tools included the use of questionnaires where school students made respondents. Science teachers as well as Head of the institution were also made respondents. The key findings of the field work are depicted in the form diagrams and tables where required. The study aims to suggest how to teach optics in simplest way. Also it focuses on the needs and competence of students and teachers.

I. INTRODUCTION

Teaching science is very simple if we correlate theories with practical like carrying the mirror which I have already mentioned. As a result, students can easily understand reflection phenomenon, formation of images etc. But, unfortunately, importantly none of the teachers came forward with such type of innovative ideas. Again the learning process of students has to be questioned. The general knowledge test of students has revealed that the students are poorly equipped & hence they are not able to answer basic questions. As a result it can be concluded that there is a gap between the knowledge gathered through books and its applicability in real world.

The basic needs of the science teacher to impart meaningful science teaching to his/her students, are – ideal laboratory (well-equipped according to syllabus), teacher student ratio, class room infrastructure and power supply. At the same time, the teachers must be properly trained so that they are able to handle the infrastructure & provide quality education to the students. For

this continuous training & periodic refresher courses can be organized.

There is an urgent need to look into the quality of text books. The ray diagrams, pictures should be coloured so that it can attract the students. Therefore in order to make teaching optics effective & yet interesting, several techniques may have to be adopted, which has been discussed earlier. The teaching mode plays a very important part in bringing up the abilities of students in engineering, cooperation, digesting the knowledge at a high level and problem analyzing and solving (Cen Zhaofeng, Li Xiaotong*, Liu Xiangdong, Deng Shitao). We bring into the field optical devices and components that the students have seen or used them before but they do not realize the principles behind. For example, an optical fingerprint scanner is used for their exploration of law of refraction and total internal reflection phenomenon. A multicoated eyeglass is used to guide them to the optical interference. The use of a CD or a DVD helps us to easily demonstrate the diffraction of white light and to investigate the spectrum of laser and other light sources (Suwannee Phoojaruenchanachai*, Sarun Sumriddetchkajorn, and Sataporn Chanhorm).

The importance of science in the early childhood / elementary years is very important if we are to expect the young people of this nation to become active & interested in science and technology. The school years are very important because it is this precious years children develop a foundation of science (Lidar, M., Lundqvist, E., and Östman, L). Here the prime responsibility of the teachers is to make science interesting to the students from the early years of schooling. These skills are required for processing information in to a developing system of knowledge.

It is here that an assessment needs to be done regarding the effectiveness of teaching procedure, additional requirements of the school children and the teachers and the reforms that are needed to make science an enjoyable learning subject.

II. OPTICS-AN INTRODUCTION

Optics is the branch of physics which deals with the study of nature, propagation and properties of light. We may consider the light as a form of energy which produces in us the sensation of sight. The elementary school years especially are important because this is the time in which children develop a foundation of science for entire life. So it is very important to guide them carefully. Optics in school standard is the basic of science. Unfortunately it has been observed that students are not

interested about optics. If the status of science education is too changed then the education of teachers who have the responsibility for teaching those children will be a critical factor. Teacher who teaches optics must have sufficient content knowledge in optics and skill in different teaching techniques, an ability to evaluate and use appropriate tools to supplement the text.

III. AIMS AND OBJECTIVE

The following are the objectives of the study –

- a) To find out simplest & interesting way of teaching optics in school standard.
- b) To enhance the skill of teachers in teaching optics.
- c) To identify problems with text book.
- d) And to asses the requirements of additional support material for teaching optics.

IV. MATERIALS AND METHOD

Since the objective of the study was very difficult, a complete and comprehensive analysis was only possible if the views and apprehensions of all the parties i.e. students, science teachers as well as the Head of the institution were surveyed and studied. Unless the teachers take an active stand, the electronic teaching aids will be fancy, impressive, expensive, comfortable for professors and students, but of questionable educational value (Adolf W. Lohmann, 1991)

Different sets of questionnaire were prepared for students, teachers & HOD of the institutions to identify the right need. Direct interactions were also made with the students and teachers. The key findings are presented in the form of tables, charts. The questionnaires of the students had 21 questions regarding optics and general knowledge, problems of text book, attendance record, problems of science teachers etc.

V. FIELD STUDY

Table 1: A total of 7 Schools were covered in Batadraba Block and 320 School children who were present were made respondents.

Sl. No.	Name of the School	Class	Total no. of students	Total no. of respondents
1	Bhumoraguri S.S. Madhabdev ME School	VII	34	22
2	Batadrava Anchalic Girls ME School	VII	29	21
3	Athgaon MV School, Dhing	VII	157	114
4	Dhing Girls High School	VII	50	32
5	Dhing G.B.H.S. School	VII	58	32
6	Dumdumia Balisatra H.S. School	VII	110	91
7	Sahid Dhrubajyoti ME	VII	19	8

School			
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Table 2: Analysis of students feed back

Sl. No.	Name of the school	Total no. of questions	Average correct answer	% of correct answer
1	Bhumoraguri S.S. Madhabdev ME School	21	6	28.6%
2	Batadrava Anchalic Girls ME School	21	7	33.5%
3	Athgaon MV School, Dhing	21	4	19%
4	Dhing Girls High School	21	4	19%
5	Dhing G.B.H.S. School	21	6	28.6%
6	Dumdumia Balisatra H.S. School	21	17	80.9%
7	Sahid Dhrubajyoti ME School	21	9	43%

VI. RESULTS AND CONCLUSIONS

Teaching optics is never very easy since it requires adequate communication skills by the teacher concerned. In terms of ‘communication skills’ the teachers just manages to meet the average standards. With proper demonstrations and communication skill, students are able to have critical thinking in some topics and show more interactions through the end of the class (Suwannee Phoojaruenchanachai*, Sarun Sumriddetchkajorn, and Sataporn Chanhorm). It is observed that most of schools do not have sufficient furniture’s in the class room. Laboratory facilities also not found in many schools. It may be noted that the necessary furniture, laboratory facilities are very essential for teaching and learning. Since the schools do not have laboratory facilities with practical tools, it is not possible to impart “practical base knowledge in optics” to the students. They just go through the usual process i.e. black board and text book, thus making the learning process monotonous which is also reflected in the survey which shows that 40% of the students are able to understand the subject matter clearly. This is a big loophole. On the other hand, only a few teachers have attended carrier enhancement course / orientation course. As a result teachers are not aware of modern methods of teaching. No additional tools (computer/ study tour/ practical’s / others) are used by the teachers to make the subject matter interesting & interactive.

There is also evidence of lack of commitment and sincerity towards his/ her profession which affects the learning process negatively. Statistics reveal that there are a few teachers who are committed towards their profession. More than 90% of science teacher do not know how to operate a computer and cannot make use of visual aid to transmit better knowledge.

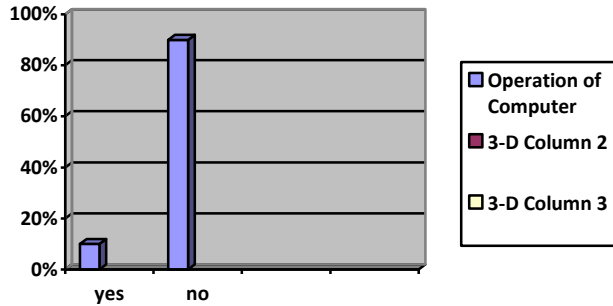


Fig. Bar diagram showing computer education of Teachers

Average percentage of the average correct answer is 36%. It reveals that the knowledge gathered from text book is very poor. The students of all schools were asked questions about the teaching method by teachers. 49% of the students said that the science teacher only read from the text book (without using black board) & they (students) listen. There is no dialogue. It is practically a monologue. Only 26% science teacher make use of black board and 25% give examples while explaining the text books. While testing the basic knowledge of the students questions were asked from the questionnaire, It was found that 36% correct answers was given by the students, which were very basic.



Fig. Methods of teaching of teachers.

Therefore in order enhance the knowledge, first we have to demonstrate with the practical tools to the students teacher should correlate with the text book with examples and using black board. I think this procedure will help the students to learn better. This test reveals that there is considerable degree of loopholes in the learning system & process. Though in some cases, students are aware of the subject / topic, they are unaware of its practical application. Adequate and comprehensive understanding of optics can only be made possible if the students are able to relate the subject matter with practical. At most 90% of the students have not been demonstrated reflection process in a plane mirror or a spherical mirrors although the tools are readily available.

In this regards, teacher should take necessary steps and work on it. The learning abilities of the students to a large extent are dependent upon the way the teacher is able to make his /her views more easily acceptable as well as interesting.

VII. RECOMMENDATIONS

- A good, well equipped laboratory is one of the very basic needs of science department of a school. There for a science laboratory is must for each school.
- A good library acts a reservoir of information. Emphasize must be laid to provide library facility to each school.
- There is a need to evaluate students learning and competence level beyond the school text books. Therefore at least 30% of the annual marks must be based on student activity in laboratory, project work, participation in science exhibition etc.
- The quality of text book needs to be looked into especially paper quality, illustrations, ray diagrams, definitions etc. The text book needs to be scientifically and professionally reviewed.
- The other important basic needs of schools include –
 - (i) Ideal teacher student ratio,
 - (ii) Class room infrastructure and
 - (iii) Power supply in class room
 For effective teaching the following are the additional needs –
 - (a) Continuous and periodic training programmes for teaching faculty. and
 - (b) Computer training programmes
- Other issues, directly related to science teaching/process –
 - (a) Mandatory participation of the students in different in projects, science exhibition etc.
 - (b) Establishment of periodic and compulsory feedback mechanism by the students about teaching methods.
 - (c) Organizing regular science quiz, science related tours to create interest in science.
 - (d) Publication of annual school science magazine with the involvement of students will help create an interesting learning environment.
 - (e) For nightly holding a “Science awareness day”.

VIII. FINAL WORD

The simplest way of teaching optics in school standard is the demonstration of optical phenomenon with the help of lab equipment because “SEEING IS BELIEVING” and “BELIEVING IS LEARNING”.

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Second Author – Dr.N.K.Barthakur, M.Sc. Assistant Professor, Dhing College, Dhing, Nagaon, Assam. E-Mail:

nandanbarthakur@gmail.com

Third Author – Rabindra Sarmah Baruah, M.Sc. Assistant Professor, Dhing College, Dhing, Nagaon, Assam. E-Mail:

rabindrasarmabaruah@gmail.com

Fourth Author – Pradip Kr. Goswami, M.Sc. Assistant Professor, Dhing College, Dhing, Nagaon, Assam. E-Mail:

bidyabrat@gmail.com

AUTHORS

First Author –Debabrata Debnath, M.Sc. Assistant Professor, Dhing College, Dhing, Nagaon, Assam. Email:

debabrata_dbnth@rediffmail.com