

# Google Classroom: A Collaborative Platform for Teaching and Learning of Physics

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**Abstract:** *The result analysis of Scientific aptitude Test (SAT) shows that students often form alternative or incomplete scientific conceptions well before they begin learning it in the Physics classroom. This innovative project was undertaken to investigate if Google Classroom would be more interactive and engaging pedagogical approach, such as authentic, inquiry based learning and could make students' thinking more clear. This is a learner-centered pedagogy. The Google classroom was created and 30 students were selected. Out of which 15 students of class XII<sup>th</sup> were taught Wave Optics (Interference/Diffraction/Polarization) in Google Class Room and the other 15 students were taught in the traditional way. The mean achievement score of experimental group was found to be higher than that of traditional group in terms of Conceptual understanding, Student achievement and Self achievement. It was found that the students taught using Google Class Room had greater motivation to learn and could easily understand the concepts in Wave optics, they did better in physics formal as well as informal tests, learned lesson well and could answer questions both from theory and practical's.*

**Keywords:** Google classroom (G C R), Teaching and Learning, Collaborative Platform, Learner Centered Pedagogy, Scientific aptitude Test (SAT)

## 1. Introduction

The Digital Technology has influenced all aspects of human life. Education is not an exception, understanding technology use at the level of pedagogical engagement will provide us valuable insights into their relationship with teaching and learning. Pedagogy is about the various forms of interaction between three agents: teacher, student/s and knowledge domain. These three agents comprise three elements in a triangle of interaction (1) (Garrison et al. 2002).

The use of ICT in general merely showed characteristics of traditional approaches to learning. The chances of using open-ended ICT applications, which are expected to contribute to the power of learning environments, were greater with teachers who created powerful learning environments for their pupils, (2) (Ed. Smeets 2005), (3) (Chucle P. 2002)

Traditional instruction is defined as instruction that is not supplemented with the use of computer. Current traditional method of teaching is teacher-centered learning where lecturers use visual aids in the form of presentation slides, whiteboard and visualize (4) (Izwan et al. 2018.)

Google classroom can be elevated to become a pedagogical/cognitive tool to help in changing the focus of the classroom from one that is teacher-centered and controlled to one that is learner-centered and open to inquiry, dialogue, and creative thinking on the part of learners as active participants (4) (Izwan et al.)

Google classroom is used as an alternative way to enhance learning quality (5) (Sewang, 2017),

Google classroom also promotes higher order thinking skills, promotes the development of problem solving skills and supports "what if..." type questions which are more desirable in this computer age. (4) Izwan et al)

In addition, Google Classroom can be an alternative to postpone meetings when the lecturers are outside the city or are busy during class hours. Google Classroom also minimizes the costs incurred due to the use of more affordable stationery and other materials, and can minimize time-released energy (6) Inoue & Pengnate, 2018)

### 1.1 Google Class Room

Google is a popular Web 2.0 tools that offers a lot of interesting facilities and applications. It has potential for teaching and learning because of its unique built-in functions that offer pedagogical, social and technological affordances [ (7) Wang Q et al 2012].

Google Classroom is a new tool introduced in Google Apps for Education in 2014. This classroom facilitates the teachers to create and organize assignments quickly, provide feedback efficiently, and communicate with their classes with ease. (4 \*izwan, et al 2180-1845)

The Google classroom application depends on Google documents and cloud storage and Gmail mail service in order to accomplish the required functions, research and follow-up with students, on the other hand the service also provides tools for teachers continues to allow them to publish the assignments, home works, questionnaires and tests for students and get answers to them in real time (8), Shanaz Alberadin 2017)

Google Classroom as a supplementary tool for classroom learning, Students used it both in class (when directed by the teachers and also to communicate and ask questions of each

other) and outside of class to discuss readings and share resources (9) **Kieth Heggart et al. 2018)**

Google Classroom is one of the free services by Google in GSuite for Education plan. It promotes paperless instruction for streamlining assignments; it boosts collaboration and fosters seamless communication to make teaching more productive and meaningful. Google Classroom can be easily deployed in the URL classroom.google.com, (10) **(Randy Joy Magno et al 2018)** educators can set up classroom in minutes and create content for students. It is also free for schools, best-in-class security is also included without cost for plan holders The platform also integrated with other Google tools to help educators provide instant feedback and track a student progress to improve performance, it has also a mobile application for easy access anytime and anywhere (11), **GCR retried. 2017)**

Google Classroom utilization can be made through multiple platforms, i.e., through computers and mobile phones. Lecturers and students can visit the website at <https://classroom.google.com> or download the app via Play Store on android or iOS app store with keywords "Google classroom". (12 **Nur Alim et al. 2019)**

*"If a child can't learn the way we teach, maybe we should teach the way they learn."*

— Ignacio Estrada.

The new millennial generations way of learning is totally different than the way we all have learnt during our school and college days. These screen agers are constantly glued to screens. Can we use this to our advantage?

The answer is certainly yes.

Hence the study –Google classroom a collaborative platform for teachers and students was undertaken.

Google has developed a virtual collaborative tool which is Google class room. It connects the teachers and the students. This is a free web service for schools, non profits and personal users. This tool is developed with the objective of simplifying the teaching learning process, creation, dissemination and grading in a paperless way. Google classroom combines its other utilities for creation, communication and scheduling of the teaching learning content or assessments like for creation we have Google docs, Google slides, Google sheets and Google forms. For communication we can use Google e-mails, Hangouts and sites. For scheduling we have Google calendar ad one of the handy options. Google Classroom is available on Android as well as iOS devices and hence it gives the freedom of operating or being a part of the classroom anywhere and anytime in the world

It gives all the utilities which are there in the desktop version, it gives the freedom and facility to share links, videos, images from teachers mobile handled devices to the classroom. It is equally useful for the students as well as the teachers.

## 2. Methodology

To provide experimental evidence of the impact of authentic, inquiry-based learning over traditional instruction on the learning of CONCEPTS of Interference/ Diffraction/ Polarization in Wave Optics in physics. The Google Classroom tool was used.

The research is aimed to study the –

- 1) Conceptual understanding using a standardized test
- 2) Student achievement scores using a questionnaire
- 3) Self achievement in Physics- Wave Optics (Interference/Diffraction/Polarization) using the CBSE Course's Questionnaire.

All teaching and learning activities were teacher-directed and pre- and post-test design was used.

To carry out the present study 30 students of Class XII, at KV AFS, High ground, Chandigarh were selected.

15 students were taken in the treatment/Experimental group (EG) and were taught using Google Class room (GCR) and other 15 students were taken in the Control group (C G.) who were taught in the traditional way. Lesson plans for both groups were based on the same instructional objectives.

Pre-test and post-test was given to see change in student performance level. A MCQ-based pre-test, comprising of 15 questions was given before teaching, followed by post-test after teaching by scheduled methods. Each question was of two marks with total 30 marks in each pre-and post-test. Pre-and post-test Questionnaire were from same Topics of Wave Optics (Interference/Diffraction/Polarization) and there was no negative marking.

The Pre-Test and Post Test was administered to all 30 students and the following results were found

Test results showed that the mean achievement score of experimental group was higher than the traditional group in terms of Conceptual understanding, Student achievement and Self achievement.

## 3. Result of Pre Test and Post Test

Chapter -Wave Optics

Topic: Interference, Diffraction and Polarization

**Table 1**

Conceptual understanding Pre Test				
Groups	Mean (M)	Standard Deviation (SD)	Total Number (N)	M M
Control Group (CG)	14.66	3.82	15	30
Experimental Group (EG)	14.8	3.98	15	30

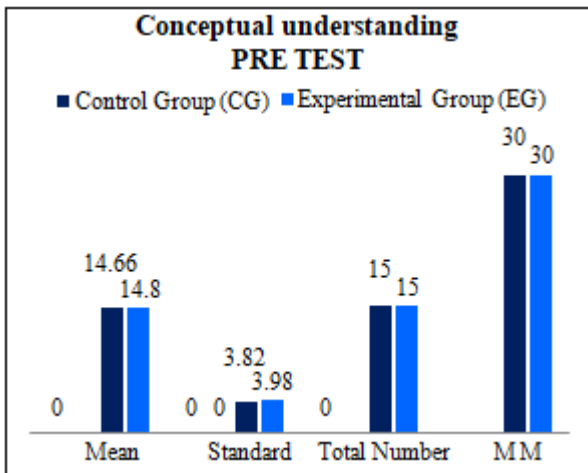


Figure 1: Conceptual understanding PRE TEST -Graphical Representation

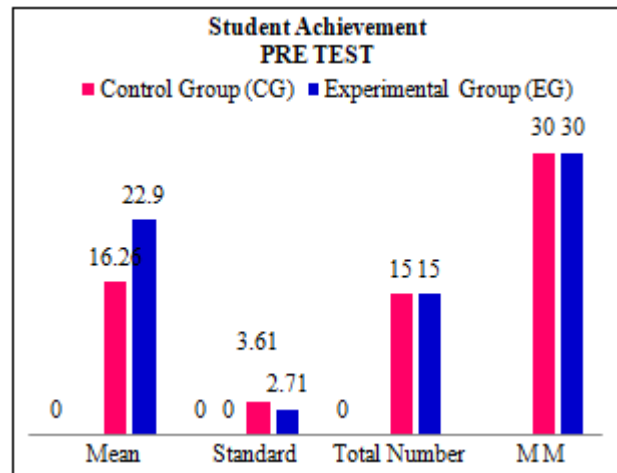


Figure 3: Student Achievements PRE TEST- Graphical Representation

Table 2

Conceptual understanding POST TEST				
Groups	Mean (M)	Standard Deviation (SD)	Total Number (N)	MM
Control Group (CG)	15.06	3.69	15	30
Experimental Group (EG)	15.86	3.96	15	30

Table 4

Student Achievement Post Test				
Groups	Mean (M)	Standard Deviation (SD)	Total Number (N)	MM
Control Group (CG)	16.8	3.18	15	30
Experimental Group (EG)	23.86	2.55	15	30

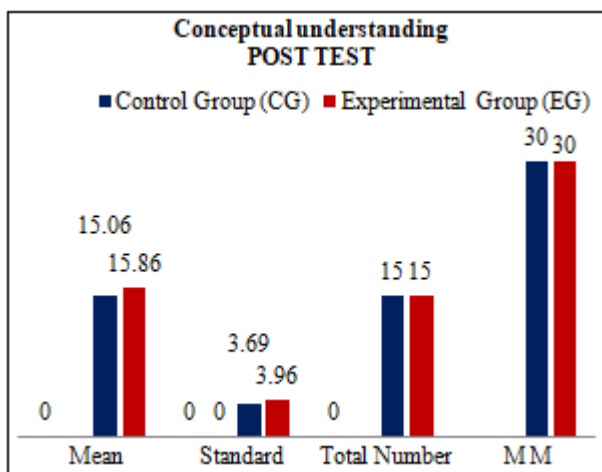


Figure 2: Conceptual understanding POST TEST - Graphical Representation

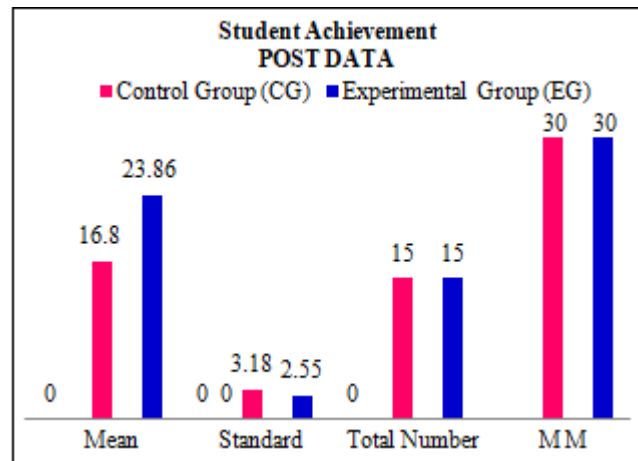


Figure 4: Student Achievements POST TEST- Graphical Representation

Table 3

Student Achievement Pre Test				
Groups	Mean (M)	Standard Deviation (SD)	Total Number (N)	MM
Control Group (CG)	16.26	3.61	15	30
Experimental Group (EG)	22.9	2.71	15	30

Table 5

Self Achievement Pre Test				
Groups	Mean (M)	Standard Deviation (SD)	Total Number (N)	MM
Control Group (CG)	17.2	3.18	15	30
Experimental Group (EG)	24.53	2.66	15	30

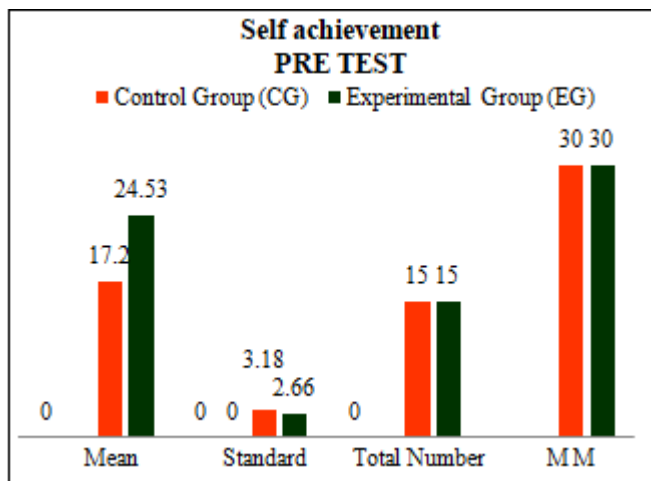


Figure 5: Self Achievement PRE TEST -Graphical Representation

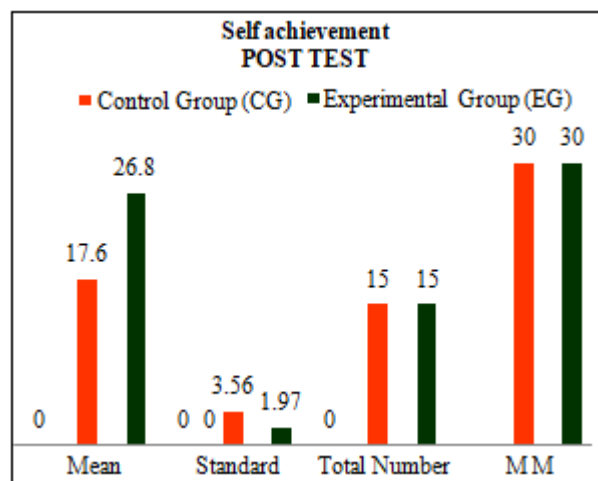


Figure 6: Self Achievement POST TEST -Graphical Representation

Table 6

Groups	Mean (M)	Standard Deviation (SD)	Total Number (N)	MM
Control Group (CG)	17.6	3.56	15	30
Experimental Group (EG)	26.80	1.97	15	30

Questionnaire (Five-point Likert's Scale) for student feedback regarding the Google Class room method, was given to students to evaluate whether this method was more interesting, and led to better understanding of the Concepts of Physics. *Likert's Scale*

- Strongly Disagree -1
- Disagree -2
- Neutral -3
- Agree -4
- Strongly agree -5

Table-7: Access to Google Class Room

Survey Questions & Responses of Learners (Experimental Group EG)

S. No.	Access To Google Class Room	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	Easy Access to System	0	1	0	11	3
2	Easy Login to GCR	1	1	0	10	3
3	Easy Access to Physics Topics	1	2	1	9	2
4	Easy Submission of Assignments	0	1	0	11	3
5	Easy Doing of Project	1	2	2	7	3

Data Analysis: Access To Google Class Room (Table7)

- More than 93% of the students said they had easy access to the System and could submit assignments easily
- More than 86% of the students said they could login to GCR easily
- More than 66% of the students said they could easily do the project
- Except 20 % students disagreed and More than 73% of the students said they had easy access to the Physics Topics

Table 8: Usefulness of Google Class Room

Survey Questions & Responses of Learners (Experimental Group EG)

1	The quality of learning was better	1	1	0	10	3
2	Could submit Assignment in Time	1	1	0	10	4
3	Conceptual Understanding was better.	1	1	0	10	3
4	Delivery of material was better	0	2	1	8	4
5	Could Method of learning be applied to Other Chapters/Topics of Physics	1	2	0	8	4
6	Could it be recommended for other subject	1	2	1	8	3
7	It's available anywhere and anytime	0	1	0	6	8
8	Acts as a Motivator	0	1	0	10	4
9	It helped me interacting with students and teacher for any query	0	1	1	8	5
10	Feedback of teacher was helpful in arousing interest	2	1	0	10	2

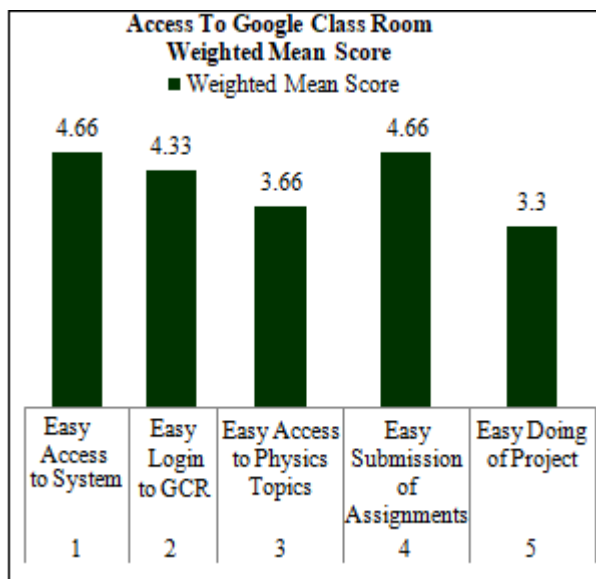
Data Analysis: Usefulness Of Google Class Room (Table 8)

- More than 86 % students agreed that Quality of Learning was better only 13% disagreed.
- More than 93% agreed that they could submit assignments in time.
- A meager 13% disagreed where as more than 86% agreed that Conceptual Understanding was better.
- More than 73% agreed that GCR could be recommended to (teach) other subjects only 20 % disagreed.

- More than 93% students agreed that GCR acts as a motivator as well as it is available anywhere any time.
- More than 86% of the students agreed that GCR helped me interacting with students and teachers for any query
- More than 80% students agreed that feedback of teacher aroused interest and only 20% disagreed.

**Table 9:** Activity Related To “Access To Google Classroom”

S. No.	Activity	Weighted Mean Score	Percentage
1	Easy Access to System	4.66	93.3
2	Easy Login to GCR	4.33	86.6
3	Easy Access to Physics Topics	3.66	73.3
4	Easy Submission of Assignments	4.66	93.3
5	Easy Doing of Project	3.3	66.6



**Figure 9:** Access to Google Class Room Weighted Mean Score- Graphical Representation

Data Analysis- Access To Google Class Room Weighted Mean Score (Table /Figure-9);

- A weighted Mean score of 4.66 indicates that students had easy access to the system and submit assignments easily
- A weighted Mean score of 3.66 indicates that students had moderate or fairly good access to Physics topics in the system

**Table 10:** Activity Related To “Usefulness of Google Class Room”

S.No	Activity	Weighted mean score	Percentage
1	The quality of learning was better	4.33	86.6
2	Could submit Assignment in Time	4.66	93
3	Conceptual Understanding was better	4.33	86.6
4	Delivery of material was better	4.33	86.6
5	Could Method of learning be applied to Other Chapters/Topics of Physics	4.0	80
6	Could it be recommended for other subject	3.66	73
7	It’s available anywhere and anytime	4.66	93
8	Acts as a Motivator	4.66	93
9	It helped me interacting with students and teacher for any query	4.33	86.6
10	Feedback of teacher was helpful in arousing interest	4.0	80



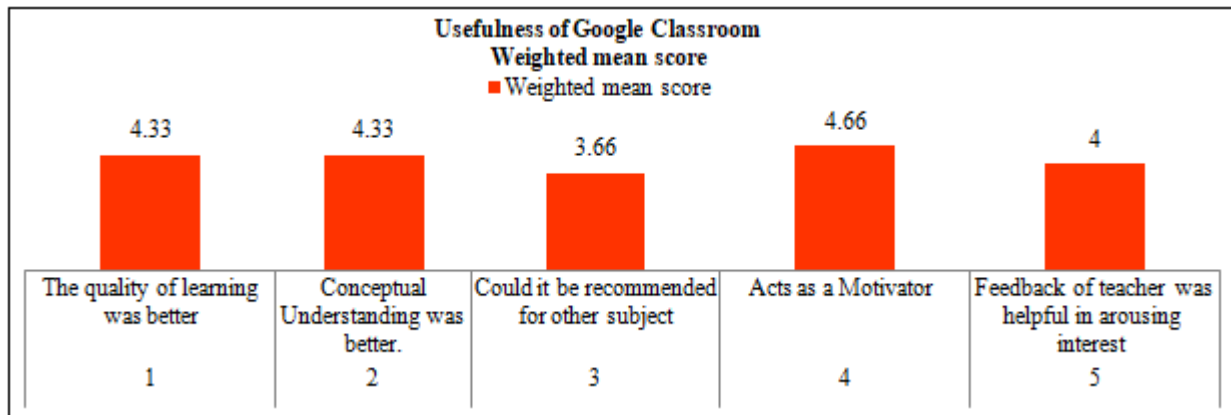


Figure 10: Usefulness of Google Classroom Weighted Mean Score- Graphical Representation

#### Data Analysis-Usefulness of Google Class Room (Table/Figure-10)

- A weighted mean of 4.66 supports the idea that Google class room is extremely helpful in submission of assignments, acts as a motivator and is available anywhere any time.
- Similarly a weighted mean of 4.33 supports the idea that Google class room is quite helpful in Conceptual Understanding and interacting with students and teacher.
- Similarly a weighted mean of 4.0 supports the idea that GCR is very helpful in applying it to the Teaching of other chapters/Topics subjects as well as arousing interest among the students
- Again a weighted mean of 3.66 supports the idea that GCR is fairly could be recommended to the teaching of other subjects.

#### 4. Result and Discussion

In this study authors were delighted to find very encouraging results on use of Google Class room method. When response of Experimental Group was analyzed using Likert's scale more than 86 percent students liked the new method of teaching and found it more interesting. More than 90 percent believed that it acts as a motivator and has led to better understanding of the concepts of Wave Optics in Physics.

##### Conceptual understanding

There is almost no significant difference in the pre and post test of control group at conceptual understanding level. It is (0.4) where as in experimental group the difference in mean scores of pre test and post test is (1.06) that indicates that there is a gain and that could be due to the easiness with which the experimental group had fairly well grasped the concepts of wave optics topics in Physics with Google Class Room

##### Student achievement

The difference in the mean score of control group in pre test and post test at student Achievement level was 0.54

The mean score of control group in pre test at student achievement level was  $M= 16.26$ ,  $SD= 3.61$  and post test mean was  $M= 16.8$   $SD=3.18$  Where as the mean score of pre test and post test of control group is 0.54 and on the other hand the mean score of Experimental Group in pre test

at student achievement level was  $M= 22.9$  at  $SD=2.71$  and the mean score of post test were  $M= 23.86$  and  $SD=2.55$

Again the difference in the mean scores of EG was found to be 0.96 indicating that there is a gain at student achievement level this is also supported by the fact that more than 86% (students having  $WM=4.33$ ) expressed the quality of learning was better due to collaborative working.

##### Self achievement

At self achievement level the students of control group had pre test mean score  $M=17.2$ ,  $SD= 3.18$  and post test score was mean  $M =17.6$   $SD= 3.56$  indicating a little difference (0.4) which is not so significant difference

Whereas experimental group (EG) had in pre test mean score  $M=20.63$   $SD= 2.66$  and post test mean score  $M =26.80$   $SD= 1.99$  having a difference of 2.27 showing a large significant difference at self achievement.

This is supported by the table for usefulness of Google classroom where in 93% stated GCR acts as a Motivator with  $WM (4.66)$  and conceptual understanding & quality of learning was more than 86%

The Large increase could be attributed to the motivation level and arousing of interest among the learners which led to their better understanding and applicability of GCR.

Despite the advantages of digital technology, GCR is not used in teaching of Physics in many of the Schools.

#### 5. Conclusion and Recommendation

In the present study, based on the results, Google Classroom is highly recommended by the students/learners.

- 1) Google Classroom application was evaluated on a limited number of students based on three aspects only: Conceptual Understanding, Student achievement, and Self Achievement it could be extended to a large number of students and considering other parameters too to make it more viable
- 2) Teaching Topics of Wave optics in Physics by Google Classroom, not only leads to better conceptual understanding of the Topics but also is more interesting method and makes learning easy.

- 3) Google Classroom is extremely useful in Assignment Submission and Collaborative Learning.
- 4) In understandability and operability Google Class room is quite useful
- 5) As Google Class Room a tool is available anywhere any time so learner can study physics and other subjects at its own pace.

## 6. Future Scope

- This study, indicative of encouraged usage of Google Class Room for Wave Optics in Physics could be extended to other Chapters in Physics.
- Also by broadening the present investigation for the best possible usage, Google **Class Room can be applied for other Subjects in Kendriya Vidyalayas /CBSE schools.**
- Google Class Room for teaching of other subjects could also be applied in other school Boards too.

## 7. Acknowledgement

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