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Modern learning of materials science and fundamental physics through the implementation of new communication skill-based (CSB) teaching and learning process during Covid-19 lockdown - A booster of research-based teaching and learning education

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Abstract
Worldwide importances have been given in education for slow learners since the adoption of innovative teaching methods introduced in the Indian education system. The majority of innovative teaching and learning method has introduced based on these criteria. During COVID-19 lockdown, the teacher's world has struggled to guide their students under all were pushed to home quarantined by the government. The education department also insists to guide the students through various portals. Based on the present situation, this education research focused on slow learners from higher secondary and postgraduate students and proposed a new innovative teaching and learning method. The resultant reflection of the implementation of new communication skill-based education through Google classroom, Zoom Platform, has evaluated under the understanding level of students from the subject of materials science and fundamentals of physics. The impacts of implemented new education methods also were evaluated from responses of Google form.

Keywords: innovative teaching method, communication skill- based education, research- based teaching

1. Introduction
Based on the educational uplift and development for slow learners the modern learning of Materials Science and fundamental Physics through the implementation of new Communication Skill-Based (CSB) teaching and learning process hereby declare those two kinds of communication skill-based learning method, such as functional communication method and the other one would be a play way communication method in chart. 1. Here author proposed a Communication skill based (CSB) method called functional skill-based learning method. This method has been used to stimulate the basic idea to put a platform and a road for the preparation of the lesson plan to the teaching faculties and the basic understanding of the subjects and its classification. Each staircase dealing that, how to receive the effectiveness and the depth in the subject, and how it makes an impact on our higher education system. Especially in physics teaching and learning has been a difficult process. Hence for the acquisition of physics language, particularly in materials science, a main branch of physics. It could deal with the character of the materials nature and habitat. One could advise following the CBS system to balance the improper management between subjects to subject.

1.1 The functional skill-based learning method
Teaching and Learning in the subject of materials science is a hectic task for teachers and learners. Learning a detailed knowledge in this same area is also a big headache and trouble for the Learners [1, 4]. Therefore, the author suggested the following five Teaching methods in functional skill-based teaching and learning methods from the proposed CBS system. Such as represents in chart 2. One could follow five steps in this teaching and learning method are, Sound communication, Light communication, Non-Living things to Non-living things Communication, living things to non-living things communication and Living things to living things communication

Before starting with these five specialized areas, the author would like to separate the materials by two types Such as living materials and nonliving materials. Generally, the physics approaches the materials by many kinds, majorly, conducing materials, nonconducting materials, semiconducting materials, superconducting materials, dielectric materials, magnetic materials [5]. One could understand why it might have the name, is it because of the property of the material? If yes, then it might be based on the natural behavior of the materials and therefore it could hold the name consistently in their lifetime.

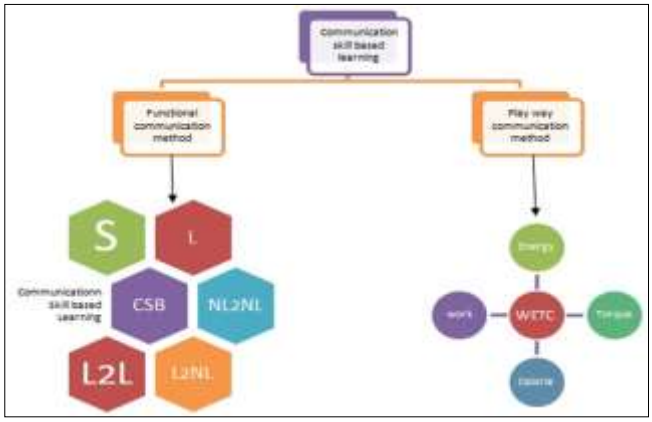


Chart 1: Communication Skill-based teaching and Learning

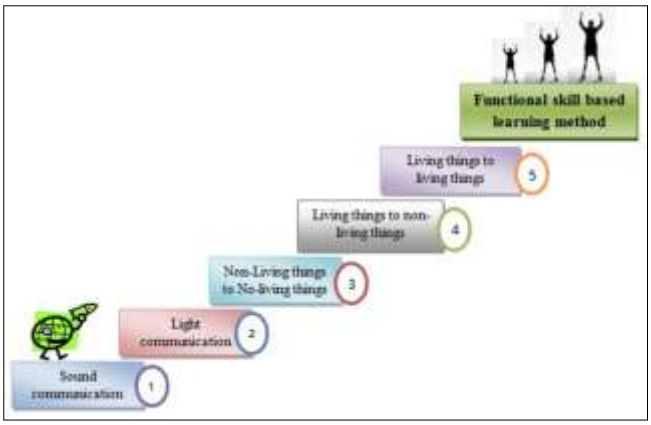


Chart 2: The functional skill-based teaching and learning method

Here the understanding of the materials has been different for different kinds of materials and also this understanding might be differing from teacher to teacher. Thereby the author introduced the new ideology to understand the materials, which are "all the materials in materials science, have been categorized based on the character nature of the materials". For example, if one wants to identify the structural nature of the materials could examine the materials into x-ray analysis [6]. Similarly, the same way if one could identify the defects in the materials without breaking it through the ultrasound analysis [7]. Therefore, for both teaching and learning, the teacher should list out the character nature of the materials under sound and light communication aspects. If anyone has hard to understand from these communications then both teaching and learning aspects one can call the other carries vice- versa. Hence for this approach author could excel all the possible ways to lift the students' understanding levels by this proposed CBS system.

1.1.1 Sound communication (SC)

Sound is the First carrier of our communication. It is the basic fundamental carrier for all kinds of living and non-living things. For example, The Lightning and thunder generated the same time from the cloud, though the light reaches fast and in advances to compare than sound, but the sound is the only carrier that uses to calculate the distance between the absorber and clouds. Here itself the first communication occurs in between the living things with nonliving things. When one can calculate the depth of borewell by dropping the stone in it and the time of reflection of sound would be the approximate distance and depth of the bore well. In general, the variation in the frequency of sounds doing a major role in different industries and medical applications. For simplicity to understand how the sound energy conveys the materials characters, that when one could expose the sound through the materials, we could understand the hardness and brittleness stiffness and the cavity under the surface and cracks inside the materials. The most probable cause that, the understanding of sound communication, which involved in primary learning and also research visualization among the students and the teacher's community. This is the major concept of this sound communication (SC). For this teacher should clarify the application of sound to the student's communities.

1.1.2 Study of Sound Communication

Example1. Sound exposed on Solid body

The reflection and resultant of sound energy depend on the elastic nature and density of the solid bodies. Hence without disturbing the materials one would understand the surface and interior structure of the solid materials. This kind of study and research is called a nondisturbing test (NDT). The teacher could realize this situation that, the materials have considered being Non-Living things but solid materials and teachers should be living things. Hence, the existence of these communications (Living versus nonliving things) has been proved through sound communication. In this case, the author would like to extend his teaching idea to the teachers that, the ordinary sound would not explicit the character of the solid materials. Hence science teachers especially materials science teachers could know that the deepest classification of sound. That has been classified above (20 kHz) and the below (20 Hz) level of audible sound. Above the level is ultrasound below has been infrasound [8]. The maximum intensity level an ear can hear is 120dB. The communication between these amounts is called Living things to living things communication, example for these communications are human to human communication. If there is a barrier between these communications, then anyone can use the other classification of sound. Those are infrasonic and ultrasonic's. Humans to animals and sea livings are the best examples of this communication.

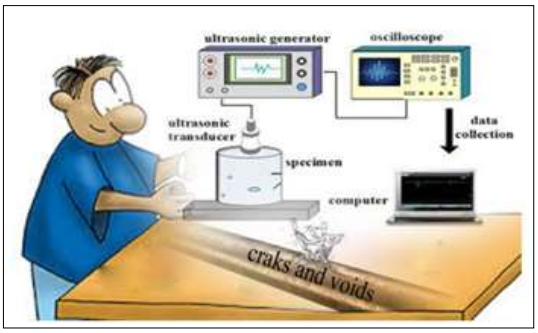


Fig 1: Sound Communication

In general, sound needs carriers, like air, materials, liquid, and water, etc. if one can face problems in air media communication then they could use other media depends on the situations. Let us consider the solid materials, if one wants to find out the defects in solid, then the need for ultrasonic exposure might involving in this case. Even the cracks on the surface also identify with the same exposure of the ultrasonic sound. The pictorial representation (Fig.1) has been explained that real sound communications between human beings and nonliving materials.

Example.2. Sound exposed on the liquid body

The reflection and resultant of sound energy depend only on the density of the liquid bodies. But sound travels very faster to compare with air medium. The application of ultrasonic sound do a vital role here. Author import some strongest deliberation here for this present research paper. If one can face problems in this communication to identify the nature and any character of the materials through sound communication then there would be another classification of the same sound helps to identify the solution of the problem.

1.1.3 Light Communication

Light does the very fastest communication; it need not depends on the carriers. The speed never changes in all mediums. The intensity might differ in the medium. It travels through all the materials because of its classification. Generally, light is called Electromagnetic waves. The human can visible the light only from the wavelength of 300 nm to 600 nm, which is called visible light. One can extract the energy from this classification range; they can expose the materials directly from this. For example, solar power is the bio green energy producer uses visible light and convert the solar energy into another energy. Other invisible lights do a vital role in character finding applications in various sectors. Below this visible is ultraviolet and above the visible is infrared light. Most of the researchers have been doing their research in materials science and especially in characters' findings, they depend from microwave to x-ray waves regions [9]. The author underling this kind of research is called light communication.

When ultrasonic sound exposed in the solid materials one could find the cracks and void on and inside the materials without disturbing the materials. Similarly, an ultra-scan extracts some of the microorganisms and microstructure inside the human bodies. Even one can break the kidney stone by ultrasound treatment. Like the sound, light doing majority research role in materials science. If where the sound carrier is not explicit the nature of the materials then, light entre into the regions and extract all the character nature of the materials. For example, the researcher wants to identify the structure of the materials by exposing them to the X-ray wave. Moreover, the amorphous materials become crystalline materials by microwave exposure, the alignments and killing microorganism like bacteria and virus has been killed by exposing the sample into infrared waves **[10]**, etc., is the major examples of light wave communication. Therefore, the author wants to underline the Functional skill-based learning system from CBS structure has been based on Sound and light communication. Such that, the Non-living things to Non-living things communication is the communications between the atoms and molecules, living things to Non-living things communication is the communication between human beings and the materials (Non-living things) through exposing the sound and light on the materials depends on the medium aspect.

1.2 Play way communication method

80 percentage out of 60% slow learner in the classroom expecting an easy way to understand the subject background **[11-15]**. They are generally slow learners but they could keep the content in their memory in a very long time. These kinds of learners have never sat properly in the classroom and even their listening capacity has disturbed in all the times. This is based on the short of communication and sometimes lack in languages. But the most probable deviation of this kind of pupils is based on the method of teaching in the classroom by the teacher. Hence the teacher should take all the responsibilities and convey their presence in new and interesting aspects. This Play way communication method from the CBS system stimulates the interest among the student's mentality.

1.2.1 Step to organized play way communication method:

Play way communication method practically applicable only for the students from X and XII standard age group. The students from the rural and remote area have not received huge subject exposure. Therefore, the teacher should collect more information on the particular topic and ask them to put new mnemonics words relative to the concepts. For this practice teacher should follow the steps.

Step.1: Collect information about the topic comparably
Step.2: Based on the convince and easy way to create a new word for that topic
Sterp.3: Explain its dimension collectively
Step.4: Declare relative questions for the discussion
Step.5: Evaluate every individual.

This is the exact crux of this present research paper. The evaluation of this research has followed through methodology and participants, data collection data analysis and results [16]

2. Methodology and participants

Under the COVID19 lockdown, during the period of March 22nd to the present date, the author followed Google classroom and Zoom classroom for this analysis. The author has taken two kinds of pupils for this case study. One part of the students from Postgraduate students (30 students) for functional Skill-based learning methods and other kinds of students from higher secondary students (30 students) for Play way communication methods. The author narrates materials science for Postgraduate students and higher secondary Physics for High and Higher secondary students separately. Generally, face to face teaching creates more impact on the student's community, but this kind of try in Zoom Classroom also would be made effective among the students. Hence the author could follow the play way method for the lower age students.

2.1 Functional skill-based communication Method

Topic: Metals and Alloys

Participants: Students from Postgraduate studies (30 Students)

Work for teachers: Through zoom platform or Blockboard classroom, the teacher should go open discussion deeply regarding sound and light communication and its application and by use of it teacher should also allow the students to classify the materials based on this aspects and forward them to take practical exposure and instrumentation character study needs.

Evaluation by the teacher: The teacher could ask the questions from these topics. For this understanding, the author creates some questions and evaluates the level of student understandings before introducing this method and after this introduction of the play way method. The example questions are given below

1. **Find the structure of the metal using**
a. X-ray diffraction studies
b. FTIR Studies
c. UV studies
d. Thermal Studies

2. **How to find the cracks, voids, and defects in the metal and alloys?**
a. Ultrasonic NDT method
b. Ultrasonic DT method
c. Powder diffraction method
d. X-ray diffraction methods

2.2 Play way communication method

Topic: Unit and Dimensions

Participants: Students from higher secondary studies (30 Students)

Work for teachers: Collect the dimension Work and search the same dimension for some more parameters in physics. Such that the Energy, Torque, Electrical couple, thermocouple, Calorie, and enthalpy are also the same dimensions. Hence the teacher should form new words for that. Here the author wanted to introduce a new word for that is "WET Couple having Calorie". Where W stands for Work, E stands for Energy, T stands for torque, Couple is stands for thermocouple and electrical couple. Hence the teacher should display the mnemonics on the blackboard and read out that by two to three times.

Evaluation by the teacher: The teacher could ask the questions from these topics. For this aspect, the author creates a few example questions and evaluates the level of the understanding of the student before and after to introduce a play way method. The example questions are given below.

1. Find the same dimensions among the followings

a. Work and Energy
b. Work and torque
c. Energy and impact
d. Energy and Calorie

1. Work has the dimension of MLT-2 then what is the dimension for Calorie?

a. MLT-2
b. MLT-1
c. MLT-3
d. MLT-4

3. Data collection

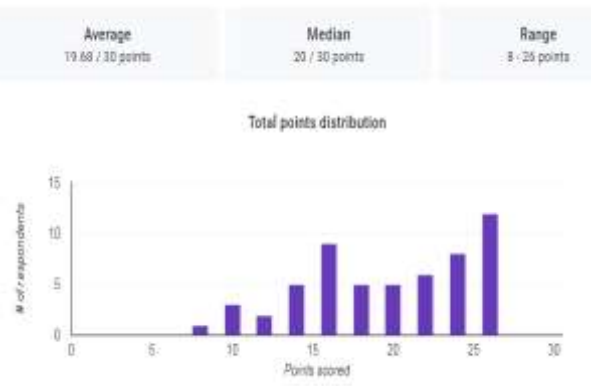
The author has made two varieties of question papers in the form of Google form. Allow all the students to attend the questions before and after this proposed method. For this data, collection author collects email id of each student for this evaluation and allow the students to attend only one-time response and author not enable the correct answer displaying option, missed questions displaying option which are provided in Google form settings. Through the students, E-mail identification author has to confirm the number of participants and also conforming that in the responses page in the Google form. The author has gone through all the individual responses according to the aspects of the question.

4. Data analysis

Grading of Google form (form 1 and 2) has been enabled as automatic mode, and the author does not allow the students to know the immediate test points and even missed questions. The author made 10 questions from this proposed CSB method. Based on this analysis, the author excels in the importance of Skill-based learning methods. The participant responses could see in bar diagrams 1 and 2 are the response generated by Google form automatically for the post-graduation students report before and after this proposed method. From this bar diagram analysis, one can find the Average point value before this new CSB method was 17.29 and after this CSB adoption method it would increase and the average point value is about 19.68 out of 30 students. Similarly, for higher secondary student's data analysis age also indicated in bar diagrams 4, 5, and 6. It also stated that the progress of the students also increases here, because of the new proposed CBS methods.15.16 was the average point before these teaching methods. 17.79 are after this CSB method of teaching.

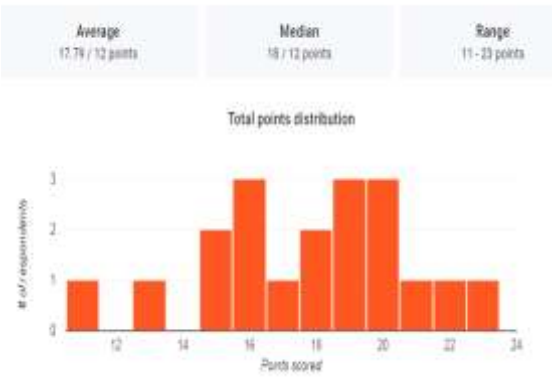
Table 1

Bar diagram.1. Postgraduate students before to CSB Method report



Bar diagram.2. Postgraduate students after to CSB Method report

Bar diagram.3. Higher secondary students before to CSB Method report



Bar diagram.4. Higher secondary students after to CSB Method report

Form 1. Google form Question page layout- for postgraduate students

Form 2. Google form Question page layout- for Higher secondary students

Therefore, above these two different data analyses, one can easily understand the method of new CSB might increase the Teacher and capacities and the student understands. From these two data minimum of 5 pupils scored above was confirming that the effect of modern teaching and learning process.

5. Results and Discussion

Slow learners are the challenges for the teachers and their development is also important for our teacher community. So many research case studies have been done since the innovative teaching method adopted in the Indian education system. This innovative teaching helps to modify the student's community. Here, the Proposed Communication Skill Based method helps especially for slow learners to understand the basic concept of physics from both higher education and postgraduate students. It helps teachers to develop their presentation skills and as well as the lesson plan writings. Based on the teacher's understandings of the presentation skill developed here and based on the interest stimulated by the faculties from the student's mentality, the development has been modified into a lower level to a higher level among the slow learners. Hence the teacher should take care of the students' life and motivate them in different and they should follow at least the latest innovative teaching methods other than the normal mode of teaching. Functional skill-based learning methods help postgraduate students to acquire fundamental knowledge and basics analysis of the materials characters. Similarly, the play way communication methods are a new boost up study method for both teachers and learners.

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