Science Utsav 2015

Proceedings of One day Teachers' Conference on Collaborative Learning as a Teaching - Learning Method

Saturday, 21st February 2015
At
Gujarat Bhavan, Vashi
Organised by
Navi Mumbai Science Foundation, Vashi
In Association with
Shree Gujarati Samaj, Vashi
Maharashtra Academy of Sciences (Mumbai Chapter)

About Navi Mumbai Science Foundation (NMSF): A Concept Portal for Innovations in Education

Philosophy: '*Freedom to innovate'* is a basic component to healthy growth of every individual and if guided properly will lead to a technologically advanced yet socially balanced Nation

Focus: Enable students in the receptive age group of 10 – 15 years to innovate in a collaborative spirit

Vision: Kindle and nurture Student's scientific temperament.

Support their ability to convert information into knowledge.

Enhance their Soft Skills including communication skills.

Enable their Creativity.

Nurture a sustained growth of scientific and collaborative outlook.

Build problem solving attitude in child's personality.

Approach: Build problem solving attitude in child's psyche.

Develop a network of proactive research professionals and personalities who would further the '*pupil centric' approach* in education.

Expose students to a rich variety of subjects, highlight the linkages in various disciplines and emphasize their relevance to real life. Make arrangements to mediate periodic interactions between leading educationist and teachers.

Activities:

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Science Utsav 2015

For the fifth consecutive year, Science Utsav is being held in collaboration with Shree Gujarati Samaj. The two day event now was a single day of exhibition science experiments by students. From the second year onwards one day teachers' conference was included. Like in the previous years, this year too Science Utsav enjoys the patronage of Shree Gujarati Samaj. In this year Maharashtra Academy of Sciences also involved itself as a collaborator instead of being a sponsor like in the previous years.

Organizing Committee of Science Utsav 2015

Dr. A.M. Bhagwat Chairman	Shri. S.P. Agarwal Convener	Dr. P.R. Sangurdekar Secretary NMSF
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One day Teachers' conference

The one day teachers' conference is a gathering of teachers for a technical discussion on teaching methods especially for science education. In the previous years the theme has been mainly on practical education with topics ranging from "Hands on Science learning", "Project based science Education" and "Science Demonstration in high Schools etc. This year's concept covers more modern and wider aspects of education itself instead of being specific to science education alone. Education researchers from Homi Bhabha Centre for Science education, teachers, principals and enthusiasts from various organizations take active part in this conference.

Advisory Committee of Teachers' Conference

Dr. S. Kailas, Former Director Physics Group, BARC, Mumbai. (Chairman)

Dr. S.P. Khened, Director, Nehru Science Centre, Mumbai.

Dr. T. Mukherjee, Former Director Chemistry Group, BARC, Mumbai.

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Organizing Committee of Teachers' Conference

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Dr. A.M. Bhagwat, NMSF

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Dr. K.P. Muthe, NMSF.

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Dr. N.D. Deshmukh HBCSE (TIFR).

Ms. Shikha Takker HBCSE (TIFR).

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Collaborative Learning: A Useful Teaching- Learning Method

Chitra Natarajan and Sugra Chunawala

Homi Bhabha Centre for Science Education (HBCSE), TIFR

Collaborative learning requires working together toward a common goal. The Teachers Conference is planned by Navi Mumbai Science Foundation as a Collaborative Learning forum for interested teachers and experts to exchange ideas and learn from one another. Collaborative learning is an educational approach that involves groups of learners working together to solve a problem, to complete a task, or to create a product. It is based on the idea that learning is a naturally social act in which the participants talk among themselves. It is through the talk that learning occurs.

Collaborative learning derives its strength from the following ideas:

1. Learning is an active process in which learners relate the new knowledge to a framework of prior knowledge.
2. Learning requires a challenge that helps the learner actively engage with his/her peers, and to process and synthesize information rather than simply memorize and reproduce it.
3. Learners benefit when exposed to different viewpoints from people with diverse backgrounds.
4. Learning happens best in a social environment through conversation between learners. During intellectual conversations, the learner creates meaning to the talk.
5. In the collaborative learning environment, learners listen to different perspectives, and are required to defend their ideas. While defending their ideas, the learners begin to create their own frameworks and not rely solely on a text's framework.

Thus, in a collaborative learning setting, learners have the opportunity to converse with peers, present and defend ideas, exchange diverse beliefs, question other conceptual frameworks, and be actively engaged.

A commonly used collaborative learning method is THINK-PAIR-SHARE. The teacher poses a question that requires analysis, evaluation, or synthesis, and gives students about a minute to think of an appropriate response. This "think-time" can be spent writing, also. Students then turn to a partner and share their responses. During the third step, student responses are shared within a four-person learning team, within a larger group, or with an entire class during a follow-up discussion. The level of the discussion is enhanced by this technique, and all students have an opportunity to learn by thinking and talking about it.

In collaborative learning students are responsible for one another's learning as well as their own. Reaching their common goal implies that students have helped each other to understand and learn. Some kinds of knowledge, which is derived through reasoning, questioning, discussion and negotiation of beliefs, is best learned through collaborative learning. This is the kind of knowledge that calls for higher order thinking. Research studies show that students

working in small groups tend to learn more of what is being taught, and retain the information longer.

Collaborative can be effective when there are group goals as well as individual accountability. This means that the collaborative learning task must ensure that every group member has learnt something. One way to ensure this is make each member responsible for some concept necessary to complete the task. This implies that every group member will learn their assigned concept and will be responsible for explaining this to other members of the group. As most teachers must have discovered, we usually learn more by teaching than we ever learnt as "learners"!

Collaborative learning activities are structured tasks designed to be completed by groups of students. They are not intended to replace teacher-led learning, nor to leave students entirely to themselves. Rather, they provide a framework for students and teachers to work together on the learning process. They complement teacher interaction with the whole class by providing students with the opportunity to talk about their thinking in small groups. Different groupings can be used according to the nature of the content and the task, although randomly mixed groups of pupils often seem to work better than self-chosen friendship groups.

Note on Sub-themes:

1. Collaborative learning methods, implementation and assessment

Teachers report on the strategies (methods) used by them to ensure collaborative learning. This can be in any subject – language, social studies, craft, science, mathematics, etc. What method did the teacher use? Eg. Think-pair-share, group design of a product, group solution to a problem, etc. How did the teacher ensure that students interacted with each other? Were they informal or were there formal structures, like explaining to whole class, etc. How did the teacher whether individual student and the group as whole had learnt the concepts, procedures and skills needed for the task?

2. Collaborative learning experiences among teacher-teacher, teacher-student, student-student

Teachers report on the experiences of collaborations or extended interactions that they have had or which they have facilitated in which they have seen evidence of learning concepts, procedures, methods, skills, etc.

3. Experiences of planning and conducting collaborative scientific enquiry or experiments in class rooms

Teachers report on what planning they had to do so that their students could conduct an enquiry of a science concept or phenomenon in groups, or students could conduct an experiment in groups and discuss it. They will include in their reports the reading materials provided, the materials provided, how they formed student groups, and how they facilitated the learning.

4. Gathering evidence of students' learning in collaborative activities

Teachers will report on how they planned to get evidence of each student's learning in a collaborative task, how they administered the task, what evidences they collected about their students' learning, and how they evaluated the evidence to assess the students. Did they share their plan with the students? Did they share the students' performance with them after the assessment/ evaluation?

Collaborative Learning as a Teaching and Learning Method in Research and Development

S. Kailas

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The most common method of learning and imparting training is through the medium of class room lectures. It varies from one teacher to a few students or one speaker to a few hundred listeners. Of course this method has some limitations as it depends strongly on teacher to student ratio and the associated better attention of teacher to a student. In addition we also have lectures delivered through audio or video mode from remote locations. In this context, the collaborative learning as a teaching and learning method serves as an effective method to enhance the assimilation by the students of the material taught by the teacher. This is also often called the group study where there is good exchange of ideas amongst the students leading to a better understanding of the subject being taught. It may be pointed that the collaborative learning is also being practiced in research and development involving professionals/teachers and students. In fact the collaboration and sharing of knowledge/expertise amongst the participants is an absolute necessity for the success of research and development. In the present note, I would like to summarize the collaborative learning as prevalent in the area of Research and Development be it national or international programmes.

The students pursuing higher studies like doctoral programmes and their guides/mentors do make use of the concept of collaborative learning. They do discuss the scientific literature relevant to their programmes and analyze the research problem together. Finally they work out a methodology and solve the problem. Finally a research publication comes from this collaboration. Building mega science facilities, the collaborative learning is a part of the execution of the project. Different people with different expertise join this activity. The various subsystems are developed by the experts and finally integrated to realize the ultimate facility. At every stage of this project, collaborative learning and teaching are practiced for the successful completion of the project, as in general no one is an expert in every aspect of the project. E.g. The successful completion and operation of mega science facilities like the Giant Meter Wave Telescope (GMRT), a world class facility in India owes its success to the collaborative learning and sharing of expert opinions and domain knowledge.

Collaborative Learning as a Teaching – Learning Method

On a larger scale, the mega science facilities operational in the world like the Large Hadron Collider (LHC) at CERN, Europe could be realized mainly due to active collaboration of the participants. In fact, the LHC is one of its kind in the world and a project of this magnitude cannot be easily executed by any one country in the world. It is an absolute necessity and inevitable option to embrace collaboration amongst different countries, involving experts. Right from visualizing this facility, followed by the design, development and commissioning of this world class facility collaboration learning/teaching was practiced. Indian scientists and engineers from national labs, teachers and students from academic institutes were all part of this venture which took more than a decade for completion. India has contributed to not only building the LHC accelerator, but also developing large size detectors and associated electronics. Indian researchers are now engaged in data taking and analysis. In the research programmes associated with the LHC facility, the collaborative learning is in fact at its best amongst participating scientists cutting across different countries of the world, as most of the research goals are being pursued for the first time in the world. These are examples were collaborative learning and teaching is a necessity for the success of this programmes.

To sum up, the collaborative learning is an important additionality to regular class room lectures and has a great role to play in the broad area of research and development.

Societal Implications of Science Teaching

Tulsi Mukherjee

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Science is a versatile subject comprising of many branches. The fundamental idea of learning science is not just for obtaining a degree, but is very deep-rooted. All scientific subjects are interlinked! For example, chemistry is a versatile subject with its roots in all other branches of science like physics and bioscience. The role of chemistry towards benefits of the human society need not be exaggerated. Like any science subject, consideration needs to be given for ideal education and teaching, research and development and finally fruitful societal applications. Today, in the area of multidisciplinary science education and research, it has become all the more important that chemistry gets its due pride of place, in view of gross misuse in handling the delicate subject, wrong methods of inefficient teaching leading to the loss of interest in the subject by the students, research without a vision and mission.

The most important basic needs of a human society are: water, energy and food. We are far from satisfactory state of affairs in all these three areas. Time has come for an introspection and try to do the needful. The most important role for achieving success in this vision is that of an ideal teacher.

But the backbone, study and understanding of the science subjects through constructive teaching, is still neglected in our schools and colleges.

“Chemistry provides the wisdom we need to achieve sustainability, to solve, in other words, the issues that threaten humanity's continued existence”

Professor Ryoji Noyori (2001 Nobel Laureate in Chemistry)

For any subject to take a centre-stage, the foundation needs to be rock-solid. Otherwise, one will build a building of knowledge with weak foundation. Such building will collapse like a pack of cards. In this modern era of diversification of mind due to non-productive or less productive occupation involving electronic gadgets, students today are not as mindful in learning a subject, be it Chemistry or any other. There is a stiff career competition from medicine, engineering, administrative and business management. Under the circumstances, teachers teaching fundamental science today have a much harder task than earlier. While the data-bank is more enriched today due to the availability of large number of books in any subject area, internet, etc, students have less time to devote due to other preoccupations. One can easily understand that without a proper foundation at the school and college levels, knowledge cannot be built for useful applications to the societal needs. A large portion of today’s teachers in science is not capable of proper teaching! Net result is only the production of “parrots” scoring high marks in the examination, without any proper knowledge base built up!

In the coming quarter century we envisage that there will be an explosion of interdisciplinary basic and application-oriented education and research at the interface between chemistry, physics, material science, bioscience and related theory. The major areas of focus will be

• Materials
• Energy
• Bio-related
• Environment
• Society

Royal Society of Chemistry also identified Priority Areas. These are:

- Energy
- Food
- Future cities
- Human health
- Lifestyle and recreation
- Raw materials and feedstocks
- Water and air

We have to learn science from the first principles and apply it to the human needs in the society.

Collaborative Learning – Some Experiences

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Collaborative learning aims at effective learning by students working in a group. Group learning helps students to fully comprehend a topic, solve problems or perform experiments in the laboratory. Many conceptually difficult topics can be made easy if there is a discussion under the guidance of the teacher. Complete knowledge about a topic can be gained by reading, reasoning, questioning and discussion. In a collaborative learning setup, there is no room for any doubt to linger. Each member of the group may be assigned one part of the topic under discussion for detailed study. The students then share their learning and the group discussion that follows ensures that all the participants have learnt the entire topic.

Research has shown that students grasp more when they actively interact with their peers to solve difficulties. The Process Oriented Guided Inquiry Learning programme (POGIL) is based on these ideas and provides a student centered learning experience in which students, instead of being just passive listeners, actively participate in the learning process as confident members of the study group.(Ref. https://pogil.org)

In Wilson College, collaborative learning has been the guiding principle behind the Group Discussion programme. The programme has proved to be of great benefit to the student participants. The entire class is divided into small groups of 8-10 students each. The teacher first gives an outline of the topic in the classroom highlighting the salient features and the difficulties likely to be encountered during the group discussion. All groups are provided with the necessary study materials, text books and reference books. The students then discuss all aspects of the topic, exchange views and clear their difficulties. Learning thus becomes a lively interactive activity in which all students participate. The teacher is always available to solve difficulties and clear doubts if need be. At the end of the discussion, students make a summary of their learning experiences. A multiple choice question (MCQ) test is administered to judge how well the students have understood the topic.

Some of the topics discussed are Chemical bonding, thermodynamics, molecular spectroscopy and solid state chemistry (with use of tri dimensional models)

Our experience has been that Group Discussion helps students to understand fully well the topic rather than just memorize and reproduce it in the examination. Further students can retain the topic for a longer time and recall it without any difficulty.

The Group Discussion method supplements teacher led learning The students are not left entirely to themselves as the teacher is always there in the background to help solve

difficulties. Group Discussion provides a frame work within the confines of the prescribed curriculum for students and teachers to work together. This mode of education increases the comprehension skills of the students, improves their confidence to solve problems and their ability to contribute to team effort.

Information and Communication Technology(ICT) can be effectively used in collaborative learning. Video-audio lectures, riddles and crosswords pertaining to the subject can also be used to facilitate learning.

In our country, experimentation has been sadly neglected, particularly in schools. Experiments bring out the thrill and excitement of Science in young minds and motivate them to pursue Science as a career. Experiments reinforce concepts taught in the theory classroom. Sadly some of the experiments done in our laboratories are dull and uninspiring and do not create interest in Science in the students' minds. Some spectacular experiments can be demonstrated in the school classroom such as separation of components of ink by paper chromatography using paper, "chemical volcano" using ammonium dichromate to illustrate rate of reaction, identification of elements by flame test using a platinum wire,, determination of purity of vinegar by acid-base titration, analysis of aspirin and action of dyes on cloth fabrics.

Collaborative learning can also be extended to the laboratory wherein groups of three or four students each are assigned experiments. The students will first discuss the protocol of the experiment, plan the experiment, prepare all required solutions, set up the required apparatus , perform the experiment, do the calculations and discuss the results

In the 70s-80s,Wilson College introduced a new technique called Semi micro Inorganic Qualitative Analysis. 24 students of Final Year B Sc Chemistry students were involved in this group learning. The group worked on every Saturday afternoon under the guidance of a teacher (Prof. Dr James Barton).The analysis was brought down from gram level to milligram level by suitable modification of the existing procedures by a judicious choice of chemical reagents and glassware. Based on the students' experiences , a practical manual was prepared. This innovative scheme of chemical analysis resulted in a huge saving of costly chemicals and reagents and was adopted by all colleges affiliated to University of Mumbai.

In conclusion it can be said that Cooperative learning has proved to be very effective teaching-learning method with immense benefits to the students. This method of scientific enquiry supplements teacher led learning and can be used in schools and colleges.

Make, Share, Seek and Network: An Invitation to Collaborative Learning Environments (Keynote Address)

G. Nagarjuna

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1. Constructivism to Constructionism

The very design of curriculum and pedagogical practices in the majority of the schools across the world focuses mainly on delivery of content and assessment for the purpose of manufacturing graduates. Contesting this practice, research in education, including science education, recommended constructivism and a situated cognitive framework for learning. NCF 2005, an educational framework recommended and adopted by the government of India, echoed this intellectual trend. Though we agree with the direction and intent of this trend, we view constructivism as a cloud that holds no water, hence it would never rain! The main problem with constructivism as applied to education is that it expects great but rare and exceptional qualities among the school teachers. We agree with the diagnosis, but not the means of treatment. We began to trust more natural, concrete, social and culturally situated means for sustainable pathways of education.

The existing school system is itself a means of systematic alienation of the learner from the cultural contexts of knowledge construction (CCKC). Such a criticism is not new. The views of Vygotsky, Ivan Ilich and Paulo Freire are well known. Ken Robinson is a popular and celebrated critic of the system in more recent times. We think these criticisms are justified. There exists a concrete replicable means of CCKC that needs both advocacy and promotion. We began to believe in two

interwoven means that can provide the CCKC that is required for sustained science education: 1. constructionism and 2. geekdom.

Constructionism is popularized by Symour Papert, another student of Piaget, who contrasts it with the prevailing instructionism in schools and colleges. The main tenet of constructionism is that learning happens most effectively and naturally when people are engaged in making tangible objects.

2. Invitation to Geekdom

Making, sharing, remaking in collaborative peer-to-peer communities is the obsession of a new breed of people, whom we prefer to call as geeks and their community as geekdom. we couldn't find a better term to describe this increasingly new breed of life-hackers and activists. What they have done in the last 30 years has unquestionably impacted the world in so many ways that it is no hyperbole to say that they are shaping

today's world, particularly the new digital world. Some people call them as hobbyists, but turning the world around in real terms is no hobby.

3. Protocol for sharing and collaboration

Unlike unorganized hobbyists, geeks took a revolutionary turn with an interesting legislative invention, by Richard Stallman, called copyleft: A simple legislative invention, that ironically required no legislators' sanction, stupendously impacted the world. Geeks have been encouraging a participatory culture among citizens by making and remaking what they like and what they need. They have been

- building operating systems and thousands of useful applications;
- making a never ending archival project of all human knowledge;
- challenging the monopolistic publishing and music industries;
- remixing culture as if it is their birth right;
- creating distributed P2P networks for file sharing; and so on.

They have been sharing what they make with the promise of seeking in return the freedom to remake and share. They have perturbed, often disruptively, almost all departments of life, including academics and education. Geeks have been living in close proximity to academic institutions all over the world, possibly because that is where there is still a sense of free air and a consideration for creative problem solvers, despite degeneration due to excessive professionalism. The maker culture which existed as a DIY (Do It Yourself) hobby culture took off in a big way using the new digital medium after copyleft became a practice. This new digital medium is used and also shaped by them, while it is mostly abused by the Governments and big multinational corporations. Having realized geekdom's potential as a means, method and medium, we joined the constructionist maker's club, in contrast to the 'degrading' professional academic club. However, just as several academic departments around the world received, supported and produced several geeks, we wanted to build an alternative studio environment that does the investigation in structure and dynamics of knowledge networks following the geek culture. Geek culture provided the Cultural Context for Knowledge Construction (CCKC). Thus, we conceptualized a sort of a geek academy providing CCKC, and called it 'gnowledge lab'. This lab will support participatory means, methods and media for **making, sharing, seeking and connecting**. Towards this goal, we are designing and developing an online academy called **metaStudio**, taking shape at http://www.metaStudio.org. This site is being built while it is sailing in the 'middle of the ocean'. You are welcome to board it with a ticket full of passion to promote the principles outlined here.

4. An Invitation to Mapping Trees: An Open Science Project

This is a citizen science project to map trees across the country, India. How do we plan to do it? By each one of us mapping the trees in our neighbourhood. We are starting this project in Mumbai to begin with. Eventually, as the word spreads out and as we get

more supporters, coordinators and collaborators, we will extend the scope of this project to the entire country. This is a scientific investigation where there are no restrictions on who participates; no single agency owns the results of the investigation; and the process of investigation is open. Such an investigation is often called an **Open Science** project. Open science projects are **Citizen Science** projects, though not all citizen science projects are *open* as above.

4.1. What kind of investigation could one do by using such maps?

For example, during the last four years about 400 Rain trees in Mumbai died. Why did they die? That is: What is the cause of their death? What can we do to prevent further damage? In order to find answers to the above questions, we need to know the possible causes of tree death. For example, mealybug infestation is assumed as one of causes of the dead Rain trees in Mumbai. Some others feel, it is due to concretization of the pavements, since most of the dead trees are the avenue trees. Yet some others suspect, someone is poisoning the trees to make a quick buck. There can be other reasons, e.g., there aren't enough predators of the mealybug, such as beatles. Thus, while we map every Rain tree, we will also collect the information of this kind to investigate the cause of the death. Well, this is just an example. It depends on the question you may have that provokes an investigation.

4.2. Why are we doing this?

- to sensitize citizens
- to enhance the participatory base of science
- to include and invovle everyone in doing science
- to inculcate a culture of recording, reporting and conducting research
- to develop critical scientific literacy among the citizens

4.3. What are the immediate goals?

We are starting this project in Mumbai, to begin with, by mapping every Rain tree in the city and its suburbs. The immediate goal is to investigate and find out *the serial killer* of Rain trees. And to create an online platform for collaborative participation, reporting, recording and visualization of open data. You are of course free to map other trees as well.

4.4. What are the longterm goals?

To build upon this data and resources and expand it to mapping birds, seasonal changes (phenology studies), behavioral patterns, water bodies, water quality, air quality, mosqueto breeding grounds, human disease patterns (epidemiology), etc.

4.5. Who all can participate?

Any citizen of the world. Since we do have an educational focus, we specifically encourage wide participation from students, teachers and parents from school to university. This evidently includes home makers, workers, employees or any others.

4.6. How to participate?

- Look for Rain trees near your residential area or near your place of work, on the way to your school, college, office etc. •
- Registration at the website http://trees.metaStudio.org/mumbai/
- If you have a Rain tree near your neighbourhood, please mark the location at http://trees.metaStudio.org/mumbai/ by navigating and zoom-in to a location.
- After we map the location, we can return to add more details about the tree such as:
  - girth (a measure of the distance around the trunk of the tree measured perpendicular to the axis of the trunk) of the tree at about 1.4 meters from ground level.
  - if the tree is healthy or not.
  - if the tree is dead
  - if the dead tree is cut, if you know when etc.
  - if the tree stands in a concrete or paved area.
- Once you are done with your Rain trees, you may do the same other trees as well.

4.7. What tools do we need for this study?

- A desktop or laptop computer with Internet connection
- if you have a smart phone with GPRS connection, trees can be mapped directly at the site from http://trees.metaStudio.org/mumbai/
- a thread or rope to measure the girth
- a hypsometer (you can make it yourself) for measuring the height. (Will provide additional help soon) • if you contact the area that you are interested we can help you with a printed field paper

4.8. Who owns the data?

The data collected remains **open data**. Open data is freely available to everyone to use and republish as they wish, without restrictions.

4.9. Who will do research?

Any one can do. The data can be subjected to various kinds of analysis by any one. The results of the analysis be made available at the site for peer review, comments and suggestions. We encourage to publish the results as blogs at http://science.metaStudio.org, a site currently underdevelopment.

5. Join us

Visit http://trees.metaStudio.org/

Visit http://www.metaStudio.org/

Write to nagarjun@tifr.res.in

Communication and Collaborative Learning

Sugra Chunawala

Homi Bhabha Centre for Science Education, (TIFR)

Human beings have a tendency to work in groups and during these interactions, they communicate with each other, share and exchange ideas, thoughts and emotions verbally or non-verbally. Vygotsky (1978) emphasised the role of social context and language for cognitive development and functioning. Communication is 'internalization of action' (Rogoff, 1998) and in a socio-cultural perspective, discourse is considered a 'social mode of thinking'. Though the importance of communication, collaboration, socialisation and teamwork for all-round development has been extensively stressed upon, there is little appreciation that skills needed for collaboration need to be fostered in classroom activities.

Collaborative Learning (CL) - refers to "situation / interactions/ mechanisms where *two or more* people *learn* or attempt to learn something *together*- kind of *social contract*" (Dillenbourgh, 1999). In CL, learners work together by communicating; stimulated to discuss, negotiate and create new knowledge (Baker et al., 1999). CL is based on the view that knowledge is a social construct and it is most often based on four principles namely:

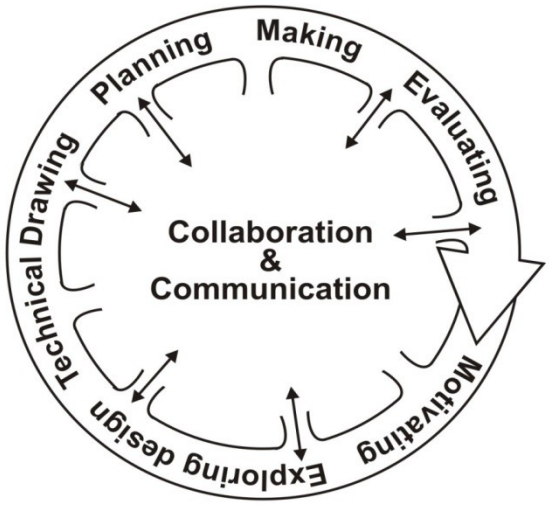
- The learner /pupil/ student is the primary focus of instruction.
- Interaction and "doing" are crucial
- Working as a team or in groups is an important aspect
- Structured approaches to developing solutions to real-world problems should be incorporated into learning.

(Source:http://www.cte.cornell.edu/teaching-ideas/engaging-students/collaborative-learning.html)

EVIDENCES OF COLLABORATION: CASE STUDY

The following section gives the highlights of a study on CL conducted at HBCSE in the context of design and technology education. *By its very nature, Design and Technology (D&T) is a social and collaborative endeavour. The need for technical skills combined with soft skills such as, skills of communication, effective presentation, negotiation, teamwork, social-esteem and self-management is being increasingly stressed by modern organizations* (Mehrotra et al, 2009). Rowell (2002) recommends that skills needed for collaboration have to be recognized and nurtured from childhood. The study involved students of Grade 6 from three socio-cultural settings (20-25 students each), namely an Urban Marathi school, a Rural (Tribal) Marathi school and an Urban English

school. Six groups with 3-4 members were made which also included single-sex boys; single-sex girls; mixed-sex groups. Three D&T units were designed namely, bag-making, windmill to lift weight and making a puppet and staging a show. The overall approach of our D&T units was a modified form of the Design-Make-Appraise approach suggested by Kimbell (1994) and is presented as a model below (Choksi et al., 2006).



The analyses of trials in the three clusters indicate the potential of D&T units to serve as collaborative learning situations for the multicultural contexts of Indian classrooms.

Evidences of collaboration

The purpose of analysing collaboration was to understand interactions between students and depict the emergence of shared knowledge or learning. This was observed through:

Realisation of Common Goal: Initially many students had problems working in groups together, they were more concerned with achieving their own goals rather than working for collective goals. But once students began working in groups, they accommodated to the fact that group goals were as (or more) important than individual goals. *Not only did group members realize the common goal but there were also evidences of the entire setting taking cognisance of the goals of the units and modifying their actions according to 'best fit' for the unit.*

Diffusion' of learning through tools, techniques, facts: 'Diffusion' - situation where several members of a community/ classroom use a resource or engage in a practice over time (Roth, 1996). It involves practice of 'appropriation' (Rogoff, 1990) and reinterpretation of ones' ideas in the light of what others have said/done. *The data showed that when students knew what others were doing, they could adjust their actions, redefine their problems, utilize new materials, build on explanations, or utilize the knowledge from their earlier experiences to solve the problem.* Working in teams aided students in learning to share their resources (both material and non-material), as well as skills and knowledge. Sharing and the verbal / non-verbal exchanges helped students to better understand the processes involved in reaching the goal along with developing a perspective of views of others.

The observations of trials of the units indicated that collaboration can be encouraged during D&T units and students can benefit from it. In India where technology education needs an introduction at the school level, collaborative learning framework can be one of the plausible ways for introducing the subject.

CL still has some drawbacks, which include intra and inter-group conflicts for resources,

work distribution, procedural aspects of tasks and possibility of domination of activities by some members of the group. Despite this, observations from this study indicate that CL can be encouraged during D&T units and students can benefit from it.

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Team Work Way to Breakthroughs

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Great team work is the only way to create the breakthroughs that define our careers. Pat Riley

Education or learning is such a tool by which you can shape your career bright, life shimmering and satisfied. Informal education starts as soon as you take birth but the formal education or learning happens only in schools, where children learn different subjects in a structured and in a disciplined schedule. School is a body where Principal, teachers, admin staff, students and other helping staff work together to educate students in a collaborative manner. Collaborative or cooperating learning is basically group learning where two or more students learn any concept by sharing their views, ideas, intellect and even the materialistic objects like technology, computer, I pads, and mobile phones or chart paper s, decorative material etc with the help of a facilitator, who is a teacher.

Podar International School CIE believes in collaborative learning most because it's a Cambridge curriculum which supports this kind of pedagogy best, because it's best suitable to its takers. In collaborative learning different groups of students are given tasks whether it's a project work, creating power point presentation, any kind of activity, either academic or extra or co curricular with the facilitator, children perform to the best of their abilities and the outcome is always implausible. We provide all the resources like technology, reference books, website addresses, links, teachers and infrastructure to our students to perform in a group. It's a team work, which develops many skills of a child, leadership quality, responsible individual, decision maker, analyzer, thinker, risk taker, social, and with that child's emotional quotient level also augments. Children become confident and their personality enhances manifolds. I would like to congratulate NMSF for organizing such a magnificent program for the benefit for our youngsters, who will take our country to another level.

Collaborative Inquiry Learning: Strategies for Teaching and Learning

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To a lay-person, the term 'collaboration' is unproblematic – collaboration simply refers to the fact that people are working together on a task. Collaborative learning is not one single mechanism: if one talks about 'learning from collaboration', one should also talk about 'learning individually'. Collaborative learning describes a situation in which particular forms of interaction among people are expected to occur by designing the situation carefully. The adjective 'collaboration' concerns four aspects of learning: situation, interaction, mechanism/process and effect. Terms such as 'peer collaboration', 'collaborative learning', 'coordinated learning', 'collective learning' appear frequently but each term carries within itself particular nuances and emphasis.

The term collaborative and cooperative learning are often used interchangeably, collaborative activity requires more than the effective division of labour that constitutes cooperative works. Collaborative learning refers to tasks that involve interaction between multiple participants and it is an instruction that involves students working in teams to accomplish a common goal. Collaborative learning is an educational approach to teaching and learning that involves groups of learners working together to solve a problem, complete a task, or create a product. Collaborative learning is based on the idea that learning is a naturally social act in which the participants talk among themselves. In a collaborative learning setting, learners have the opportunity to converse with peers, present and defend ideas, exchange diverse beliefs, question other conceptual frameworks, and be actively engaged. In this presentation let us try to understand collaborative inquiry and collaborative inquiry learning for strengthening teaching and learning in school.

Collaborative inquiry is a process in which participants come together to examine their own educational practice systematically and carefully using techniques of research. In this process group of educators interested in addressing a school, department, division, or classroom issue driven by the consideration of student learning needs comes together. They form a team and work together to narrow the question, gather and analyze evidence, determine action steps, and share their findings and recommendations. It is a powerful design for professional learning as it recognizes the role of teachers in ongoing school effectiveness. This approach is well documented as a rewarding professional learning experience for those who engage in the process for professional growth. It will also help in establishing a culture of inquiry and reflection for introducing collaborative inquiry into the work of professionals. Collaborative Inquiry

enables educators to make better informed, evidence-based decisions about issues that are directly related to improving the learning for the students in their schools. 'Learning is powerful when teachers and administrators work to understand how a school can improve learning for all children, identify strategies, collect and analyze data from students work and teacher practice. More powerful designs require learners to take specific action which may include trying a new technique and reflecting on what was learned. When people do things together, their experience is enriched' (Easton, 2004). The four-stage model for collaborative inquiry:

Stage 1 – *Problem Framing*: During this stage, the team determines a shared vision, develops an inquiry about a particular link between professional practices and student results, and formulates a theory of action.

Stage 2 – *Collecting Evidence*: In the second stage, collaborative inquiry teams determine what type of data to collect, how to collect the data, and where to collect it.

Stage 3 – *Analyzing Evidence:* Teams learn how to make meaning of data by identifying patterns and themes and formulating conclusions.

Stage 4 – *Celebrating and Sharing:* During this final stage, teams come together to celebrate and share their new understandings.

As we know that our current science learning is often more focused on the memorization of scientific facts and information, rather than on under-standing and applying scientific concepts and methods. Dewey (1910, 1938) argued that scientific knowledge develops as a product of inquiry. So, students' attitude to find inquiry-based solutions for authentic problems should be promoted. By inquiring complex problems, knowledge may become less inert and more applicable. NCF (2005) stressed the special value of inquiry learning in the context of science education. The National Science Education Standards (1996) are sets by National Research Council of United States, had given strong emphasis on activities that investigate and analyze science questions. They also introduced four main competence areas: domain-specific knowledge, methodological knowledge, communication, and judgment. The area 'methodological knowledge' focuses mainly on inquiry learning related activities and emphasizes the importance of this educational dimension. Inquiry learning often incorporates an element of collaboration meaning the engagement of participants in a common endeavor.

Collaborative inquiry learning is a mixed term. Its meaning is derived from the demand of practicing inquiry in science education. In collaborative inquiry learning, students acquire knowledge of how to do science as a common endeavor, they learn about the nature of science and the scientific content. Various learning technologies can support students as they work in collaborative inquiry projects by taking over some of the teachers' responsibilities and enabling direct exchange among students and also across wider distances and at different times.

There are a number of arguments that collaboration among learners is effective for inquiry-based learning (Dillenbourg, 1999). According to socio-constructivist learning theories, knowledge emerges by collaborative search of problem solutions in communities with distributed information among its members. Piaget (1926) suggested the importance of social interaction for the emergence of cognitive conflicts. These socio-cognitive conflicts form the basis of considerable cognitive developments and performances and might appear in inquiry learning processes as well. Vygotsky's (1978) idea of the 'zone of proximal development' is helpful for understanding the effects of collaborative experiences and collaborating peers offer zones of proximal development to each other. There is a growing conviction among educators that real academic excellence is more likely to be achieved by cooperation & collaboration among students rather than by competition (Deshmukh & Agarkar, 1997). Collaborative learning enhances academic achievement by having students, linked in their aims to not only learn but also to help each other to learn. Based on socio-cognitive theories of learning, investigations have suggested the effectiveness of group work on higher levels of learning such as concept development and problem solving - both areas of concern in science (Norman, 1981; Palincsar and Brown, 1986). The effectiveness of group work, according to Damon (1984) and Damon and Phelps (1989), involves three major types of peer interactions, as applied to the classroom, namely peer tutoring, cooperative learning, and peer collaboration. Generally, research conducted on the effects of peer interaction on learning has yielded positive results (Webb, 1982). Additionally, researchers suggest that peer collaboration may enhance concept development and problem solving ability (Sharan, 1980).

Considering all theoretical arguments, current educational policy demands, and empirical evidence form the basis to promote collaborative inquiry learning in science education. In science learning, inquiry is the process of posing questions and investigating them with empirical data, either through direct manipulation of variables via experiments or by constructing comparisons using existing data sets. Nowadays due to project method approach at school level students have to prepare projects. The greatest correspondences of inquiry learning are probably to project-based learning which is a comprehensive perspective focused on teaching by engaging students in investigation.

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Collaborative Learning

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Collaborative learning is a method of teaching and learning in which students team together to explore a significant question or create a meaningful project. A group of students discussing a lecture or students from different schools working together over the Internet on a shared assignment are both examples of collaborative learning.

Collaborative learning is a situation in which two or more people learn or attempt to learn something together. Collaborative learning is used as an umbrella term for a variety of approaches in education hat involve joint intellectual effort by students or students and teachers.

Collaborative learning is based on the view that knowledge is a social construct. Collaborative activities are most often based on four principles:

- The learner or student is the primary focus of instruction.
- Interaction and "doing" are of primary importance
- Working in groups is an important mode of learning.
- Structured approaches to developing solutions to real-world problems should be incorporated into learning.

Collaborative learning can occur peer-to-peer or in larger groups. Peer learning, or peer instruction, is a type of collaborative learning that involves students working in pairs or small groups to discuss concepts, or find solutions to problems.

This often occurs in a class session after students are introduced to course material through readings or videos before class, and/or through instructor lectures. Similar to the idea that two or three heads are better than one, many instructors have found that through peer instruction, students teach each other by addressing misunderstandings and clarifying misconceptions.

What is the impact of collaborative learning or group work?

Research shows that educational experiences that are active, social, contextual, engaging, and student-owned lead to deeper learning. The benefits of collaborative learning include:

- Development of higher-level thinking, oral communication, self-management, and leadership skills.
- Promotion of student-faculty interaction.

- Increase in student retention, self-esteem, and responsibility.
- Exposure to and an increase in understanding of diverse perspectives.
- Preparation for real life social and employment situations.

What are some examples of collaborative learning or group work activities?

Stump your partner

- Students take a minute to create a challenging question based on the lecture content up to that point.
- Students pose the question to the person sitting next to them.
- To take this activity a step further, ask students to write down their questions and hand them in. These questions can be used to create tests or exams. They can also be reviewed to gauge student understanding.

Think-pair-share/ Write-pair-share

- The instructor poses a question that demands analysis, evaluation, or synthesis.
- Students take a few minutes to think through an appropriate response.
- Students turn to a partner (or small groups) and share their responses. Take this a step further by asking students to find someone who arrived at an answer different from their own and convince their partner to change their mind.
- Student responses are shared within larger teams or with the entire class during a follow-up discussion.

Catch-up

- Stop at a transition point in your lecture.
- Have students turn to a partner or work in small groups to compare notes and ask clarifying questions.
- After a few minutes, open the floor to a few questions.

Fishbowl debate

- Ask students to sit in groups of three.
- Assign roles. For example, the person on left takes one position on a topic for debate, the person on right takes the opposite position, and the person in the middle takes notes and decides which side is the most convincing and provides an argument for his or her choice.
- Debrief by calling on a few groups to summarize their discussions.

Case study

- Create four to five case studies of similar difficulty.

- Have students work in groups of four or five to work through and analyze their case study.
- Provide 10-15 minutes (or adequate time to work through the cases).
- Walk around and address any questions.
- Call on groups randomly and ask that students share their analysis. Continue until each case study has been address.

As most of the classrooms in India are either overcrowded or big in size strength, it is a big task for teachers to analyse the outcome of collaborative learning at the micro level. Despite all shortcomings or problems collaborative learning is one of the best ways which leads effective learning.

Collaborative Learning

Aniket Farande

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'Eureka' became a synonymous word for the discovery of unknown. But no one gave it a thought that it was the King who played a pivotal role in asking Archemedes to conduct experiments to solve the problem of adulteration. The result of the experiments not only gave the world the concept of 'Buoyancy' but also introduced to the world a new method of learning called as collaborative learning. Indeed collaborative learning is based on the model that knowledge can be created within a population where members actively interact by sharing experiences and take asymmetry roles.

It gives students a participative role in understanding the concept related to a phenomenon because of which the student is accountable and responsible for the inputs he has given while working on a problem. Since the students are working on same problem with different views it also allows the students to question the authenticity of the solution that is provided for a problem. Apart from these advantages collaborative learning also encourages student to think about a problem without prejudice. This increases the chances of having a more fruitful solution to a problem. In short collaborative learning provides an effective and fast method to understand and overcome a problem.

A joint intellectual effort by teacher and student makes collaborative learning an efficient way in understanding things. The students are encouraged to have face to face conversation which enables them to understand or contradict the views of other students. Let us take an example where we can use collaborative learning to study a property of aqueous solutions known as colligative property. Colligative property is dependent on the concentration of the solute molecules and not on the nature of the molecules in the solution. To understand this property the students will be asked to perform four different sets of experiments.

In one set the students will be required to find out the boiling point of fresh water. Another set of students will add a known quantity of salt to the water and prepare the solution. The boiling point of this solution can be monitored. Since the addition of salt increases the number of solute molecules in the solution the boiling point of solution is raised by some degrees. The difference between the two will give elevation of boiling point due to addition of salt to water. The same experiment can be repeated with the same quantity of finely powdered salt. The results can be monitored and students can be encouraged to have a discussion on their observation.

in another set of experiment the freezing point of pure water can be checked by one group of students. The other group will add a known quantity of salt to water and

monitor the depression in freezing point. The same experiment can be repeated with the same quantity of finely powdered salt. Finally the salt quantity can be varied and the elevation in boiling point or depression in freezing point can be checked.

Students can then be encouraged to have discussion on the experiments they carried out. A requisite of at least two observations will induce the students to think why there is increase in boiling point of water or decrease in freezing point of water upon addition of salt. This in turn will enable the students to reach to the conclusion that both the properties were related to the amount of solute added and were independent on the nature of the solute. Since the students have performed the experiments by themselves it will be much easier for the students to understand the concept of colligative property.

Similar experiments can be arranged in other subjects also which will require the students to note down the observations and postulate a theory related to the observation. Thus collaborative learning can always be an effective method in teaching a new concept to the students.

Collaborative Learning: Our Experiences

Durgesh Hole

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Abstract- This article comprises experiences of conducting group- based science-research projects conducted in the academic year 2014-15 in "The North Mumbai Welfare Society's High School Ghatkopar-West". These experiences can be a good example of collaborative learning in general and learning science in particular.

In discussion with a group meeting of students and teachers it is decided to conduct 13 research based science projects. Each project is performed by a group of two students and guided by one science teacher. Contents-

- Introduction
- IRIS National Science fair
- Insef national Science fair
- Climate Ambassadors Mumbai-Stockholm 2014.

Introduction

Today, we live in a world, which is mostly governed by science and technology. Mindful of this, our school encourages and empowers student's research, create and do something wonderful, thus helping their personal growth and human capital of India.

In line with our motto, we encourage our students to participate in various science projects, details of sum of which are given below:-

IRIS (THE INITIATIVE FOR RESEARCH AND INNOVATION IN SCIENCE) SCIENCE FAIR.

Having begun as the Intel science talent and discovery fair in 1999, IRIS has been nurturing the spirit of innovation among the school students in India since 2006. An admirable example of public private partnership, this is a nationwide initiative of the department of science and technology (DST), government of India, the confederation of Indian industry (CII) and intel education.

Research Projects usually involve scientific questions that the student is interested in, and a specific topic they have chosen for themselves. Participants must research their question, learn and apply the scientific method to create a valid experiment, and think about the meaning of their results.

This is an opportunity for participating students to interact with some of the best scientific minds in the country and hone their scientific talent.

INTEL-IRIS fair is one of the largest researches based fair in India. It is organised at state, regional and national levels and several schools across the country participated and vie for national honours. Winners at a national level participate at the international fair held in U.S. A every year. In order to compete in IRIS national fair, you need to have an original and

innovative idea which can convert into a research based project for presentation. This will provide all the information required in making a science project. It is a matter of gratification that the three junior-level projects presented by the school mentioned below have been selected for IRIS national fair. The science fair was held at Science City, Ahmadabad from 05/12/2014 to 08/12/2014.

TOPIC	TEACHER IN CHARGE	STUDENTS	Result
1. Wall without cement	Mr. Hole Durgesh	1.Siddhi Kaspale 2.Aditi Parab	
2.Making insulator jackfruit waste	Ms. Seema kadam	1.Chinmay Kshirsagar 2.Monal Solani	Out- standing and special award.
3.Novel way of using jackfruit peeling	Mrs. Vanita singh	1.Charul Wakchaure 2.Rohit Patil	

EXPISCOR 2014/INSEF SCIENCE FAIR, MUMBAI REGION.

Science Society of India (SSI)

This body aims to achieve better and deeper learning by doing more projects and experiments. It organizes National Regional Fair to facilitate project-based learning at grass-roots level.

EXPISCOR-2014

This is an inter-School Science Fair conducted by VISANJI Academy Andheri East.

RESULTS OF EXPISCOR 2014/INSEF SCIENCE FAIR,MUMBAI REGION

Topic	**Teacher in charge**	**Students**	**Result**
To study the effect of coffee spent ground on insects.	Ms. Nalini Nainar	1.Deep Amit Mehta 2.Mayur Mohan Iyer	**1st grand award** (Selected for National fair at Chennai on Jan 10, 2015)
A new technique for drying and extracting liquid from fruits and vegetables.	Mrs Rajeswari Nair	1.Kajol Rajesh Shelke 2.Sakshi Kesav Prasad.Pandey	**2nd grand award** (Selected for National fair at Chennai on Jan 10, 2015)

Herbs and inhibators for bacteria.	Mrs.Priti Attarde	1.Aakanksha More 2.Alisha Qureshi	4th grand award
Composite board insulator from jackfruit waste.	Ms. Seema Kadam	1.Chinmay Kshirsagar 2.Monal Solani	4th grand award
A new alternative to synthetic fibres-lotus stem fibre.	Mrs.Pushpa Krishnakumar	1.Samiksha Rane 2.Aditi Karkare	Honourable Mention.
A wall without cement.	Mr. Hole Durgesh	1.Siddhi Kaspale 2.Aditi Parab	Honourable Mention.

The competition held in INSEF in Chennai has qualified the project " A new technique for drying and extracting liquid from fruits and vegetables" to compete in **International Sustainable World Energy Engineering Environment Project OLYMPAID to be held in Houston, Texas,U.S.A. and INESPO (International Environment Sustainable Project Olympaid) in the Netherland**

Climate Ambassadors Mumbai-Stockholm 2014.

A CLIMATE CHANGE EDUCATION AND ACTION PROJECT WITH YOUNG PEOPLE

Srushtidnyan, An environmental NGO from Mumbai in collaboration with **Climate Action**, An Environmental organization from Stockholm, Sweden, has taken up a project named '**CLIMATE AMBASSADORS MUMBAI-STOCKHOLM'** along with M.D College of Mumbai and Global College of Stockholm Sweden.

9 schools from Mumbai were involved in this project. The North Mumbai Welfare Society's High School is one among them. 50 students of IX Std and two teachers, Mrs. Rajeswari Nair and Mr. Aravindakshan Nair are involved in this project from our school. Various activities have conducted related to environmental issues such as Climate Change, Seed Banking, Water and Energy Audit, Eco-friendly festivals, Tree plantation and Nest making in school since Feb 2014 to Dec 2014.

Result of the conference at Yashwantrao Chavan Auditorium on 24th Jan'2015

SR NO	NAME	PRIZE
1	Rajeswari Nair	Outstanding performance in the project Climate Ambassadors Mumbai-Stockholm 2014 (Plaque & Certificate)
2	K Aravindakshan Nair	Sincere & active participation in the project Climate Ambassadors Mumbai-

		Stockholm 2014 (certificate)
3	NMWSHS 2nd Prize	Outstanding performance in the project Climate Ambassadors Mumbai-Stockholm 2014 (Trophy & Certificate)
4	1.Kajol Shelke 2.Sakshi Pandey 3.Deep Mehta 4.Mayur Iyer	Outstand project performance by Srushtidnyan & Climate Ambassadors Mumbai-Stockholm 2014 (Trophy)

The last conference was held at Yashwantrao Chavan Auditorium, all participants Schools and Colleges along with Srushtidnyan members were present for this Occasion. The Chief guest for this function was Smt. Supriya Sule (MP).The result of this function of our school is given above.

The North Mumbai Welfare Society's High School has the coveted distinction of winning 3 gold medals and 2 silver medals in the competition conducted by INSEF (Indian Science and Engineering Fair) in Chennai, INTEL-IRIS(The initiative for Research and Innovation in Science Fair),NCSC (National Children's SCIENCE Congress) and SHRUSHTIDYAN, an environmental NGO from Mumbai in collaboration with a similar body in Stockholm, Sweden. The competition held in INSEF in Chennai has qualified the two participants and the guide teacher to compete in International Sustainable World Energy Engineering Environment Project OLYMPAID to be held in Houston, Texas, U.S.A. and INESPO (International Environment Sustainable Project Olympiad) in the Netherland.

CONCLUSIONS-

The Students learned how to apply their existing abilities to new areas, as well as learn many new skills.

A research based science fair project can involve reading, logical thinking, writing, grammar and spelling, math, statistics and data analysis, computer science, and graphic arts, as well as scientific methodology, public speaking, and learn how to explain and defend their work in front of a panel of judges.

Some kids get so immersed in their project that they forget about other factors like prizes or the fact that they are actually learning new skills.

Science fairs are also a way for students to demonstrate motivation, self-learning, critical thinking, ethics and other important skills and traits.

Collaborative Learning Methods, Implementation and Assessment

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What is collaborative learning?

A method of teaching and learning in which students work together as a team to explore a significant question or create a meaningful project. In this, the teacher acts more as an organizer, facilitator, and mediator than as a transmitter of knowledge. Collaborative learning often involves challenging students with analytical problems which they must solve in teams.

Method for Implementation of collaborative learning:

Teams can be formed according to the task requirements. Groups of four or five members work best in most situations. It consist of,

1. **Group leader:** One person in the group who present and review the topic.
2. **Organizer:** This person tells group steps that should come first, second, and so on.
3. **Reporter:** This person reports to the group about their progress and goals.
4. **Questioner:** This person generates questions in order to involve every member.
5. **Assessor:** This person uses a set rubric or guide to evaluate the progress of each meeting.

The roles are clearly defined in advance to make each person is accountable. Give clear guidelines on each role, so that students understand the criteria for their role. Change roles regularly, so that students can learn to assume responsibility in all areas

The five phases for collaborative learning-

1. **Form questions:** those engage the students' interests and abilities.
2. **Identifying goals.**
3. **Creating a instructions:** that guide students to solve key problems
4. **Assigning a specific assessment task.**
5. **Reflecting to adjust:** Use reflective questions that encourage regular improvements.

Assessment of Collaborative Learning

Traditionally, assessment is done with grading. Today, assessment is seen as a progressive process that develops throughout the course.

Formative assessment provides instructors and learners with information to help both improve performance. Summative assessment occurs when instructors gather evidence to assign grades.

Formative Assessment

1. Monitor work on a regular basis.

2. Ascertain needs for additional resources, guidance, or revisions.
3. Determine whether all participants are contributing and timeline is being observed.

Summative Assessment

1. Compare results with goals and objectives.
2. Identify best practices.
3. Give fair grades.

Both formative and summative strategies are used for assessment with collective and individual outcomes.

Collective outcomes

Goal of collective formative assessment is to create a sense of a learning community to help learners see their individual pieces add up to something when they collaborate.

1. **Team Self-Assessment:** Collective self-assessment takes place when the team assesses their combined performance. It can be form of a written assignment, checklist completion, or a presentation. It should be built into project timeline, offering instructors the opportunity to provide both formative and summative assessments.
2. **Instructor Assessment:** When the collective outcome is assessed according to the achievement of the entire group.
3. **External Assessment:** External supervisors have a role in assessment of the team's performance.

Individual Outcomes

1. **Individual Self-Assessment:** When the learner provides their own assessment of performance and contributions. This type provides instructors with another angle for viewing the effectiveness and progress of the group.
2. **Instructor Assessment:** The instructor assesses individual achievement in the context of a collaborative activity.
3. **External Assessment: E**xternal supervisors might have a role in assessment of the individual student.

What Are the Benefits of Collaborative Learning?

Collaborative learning bring positive results such as deeper understanding of content, increased overall achievement in grades, improved self-esteem, and higher motivation to remain on task.

Collaborative learning helps students become actively and constructively involved in content, to take ownership of their own learning, and to resolve group conflicts and improve teamwork skills.

Concept of Collaborative Learning

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"COLLABORATIVE LEARNING" means the grouping and pairing of learners for the purpose of achieving a learning goal. It is a relationship among learners that requires positive interdependence, individual accountability interpersonal skills face-to-face promotive interaction, and processing.

Collaborative learning through TEACHER-STUDENT;

- Respect is given to every member;
- Enhances critical thinking;
- Projects and questions interest and challenge students;
- Students learn skills for resolving conflicts when they arise;
- Goals are clearly identified and used as a guide;
- Research tools such as Internet access are made available;
- Learners actively participate;

Collaborative learning through STUDENT-STUDENT

Collaborative learning is a method of teaching and learning in which students team together to explore a significant question or create a meaningful project.

METHODS:

1.THINK-PAIR-SHARE

THINK-PAIR-SHARE structure gives all learners the opportunity to discuss their ideas. This is important because learners start to construct their knowledge in these discussions and also to find out what they do and do not know. This active process is not normally available to them during traditional lectures.

After several minutes the instructor solicits comments to be shared with the whole group. The responses received are often more intellectually concise since learners have had a chance to reflect on their ideas. The think-pair-share structure also enhances the student's oral communication skills as they discuss their ideas with the one another and with the whole group.

2.INTERVIEW

A team-building exercise, this structure can also be used also to share information such as hypotheses or reactions to a Concept.
(1) Students form dyads; one student interviews the other.

(2) Students switch roles.

(3) The dyad links with a second dyad. learning team member then discusses the information or insights gleaned from the initial paired interviews.

Collaborative learning through TEACHER-TEACHER

Teachers collaborate with peers, university personnel, and experts in content and technology to discuss information and ideas. They plan and enact projects, reflect on their experiences, and return to the group to share experiences and strategies for supporting each other. Through cycles of collaboration, enactment, and reflection, teachers and university personnel gain new visions of instruction, develop rich conceptions of the features and associated challenges of project-based instruction, and learn strategies for enacting practices that are congruent with theory.

Abstract

"COLLABORATIVE LEARNING " refers to an instruction method in which learners at various performance levels work together in small groups towards a common goal The learners become responsible as they help each other to be successful.

Collaborative Learning as Teaching – learning Method

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As itself teaching word is incomplete without teacher and learner. For teaching learning process teacher and learner both are equally important. I think teaching and learning are a continuous process, it cannot be restricted to classroom, or school, playground etc. for a learner the learning takes place everywhere even the age limit is also not restricted to teaching learning process.

A one year child can teach a sixty year grandmother something new which she had never experienced in her life where as for a child it is a learning stage for him or her.

Being adult we always think that we are elder and we know everything and we are bound to teach children and specially becoming part of teaching fraternity all of us have general idea that at every moment we have to guide children ,we have to teach them, we have to educate them and also we have to make them good citizens ,I am not telling that all our perceptions are wrong but I just want to be specific that we can achieve all our goal as above said ,not by dominating them but by a teamwork. By collaborative work where teacher will not remain only an educator but he will become a good listener , a guide ,a friend etc

On the other hand ,as teachers, almost our every word said becomes subject to scrutiny, intentional or unintentional. Whether it is in the class while trying to put forth the meaning of a scientific phenomenon or while amongst other teachers and colleagues, we are judged sometimes in immature ways and sometimes as beings that lack one or more essential requirements. However, the way of amending all our hidden flaws lies in making a free acceptance and sharing it with people. To build such kind of an open and healthy environment, collaborative teaching becomes a necessity.

It can begin at the staff room itself, where teachers can share and discus their syllabi over the regular cup of tea. If teachers discuss their little doubts then it will make teaching all the more easier and more importantly, widen their share of knowledge. In addition, this will help strengthen the inter-teacher relationships and prosper their capabilities. Together the many teachers can procure innovative and advanced methods of teaching. The world and children are evolving, practicality of any expression is given tremendous importance these days and thus a shift from the rigid traditional methods is required.

To break the shell of traditional methods, wherein the teacher speaks and children note down, equal participation of the students is vital. The quieter a class gets, lesser is the

appeal of what's being taught. Children should be allowed to point out their questions and open end discussions should take place.

It is difficult to understand that which method is good or bad, we follow traditional lecture method as sometimes this method also plays very important role in teaching and learning procedure at the same time benefit of collaborative learning is infinite as for a learning to take place I think we need to keep in mind about the receiving end is an immature mind. A child may not follow exactly what we say but definitely follow what we do to make the learning take place.

Thus I think being a teacher ,we can achieve all our goals by collaborative work with our colleagues as well as students. And I can say together we can ,we will fulfill all our dreams for our students.

Collaborative Learning Experiences among Teacher-Teacher, Teacher-Student and Student-Student

Baljeet Kaur

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"Collaboration operates through a process in which the successful intellectual achievements of one person arouse the intellectual passions and enthusiasms of others." *-Alexander von Humboldt*.

Teaching and learning are both collaborative processes. Collaborative learning is based on the view that knowledge is the social construct .It is an umbrella term for a variety of educational approaches involving joint intellectual efforts by students or students and teachers together.

Collaborative learning has been practiced and studied since the early 1990s.The principles are based on the theories of John Dewey(2009),Les Vygotsky(1980) and Benjamin Bloom(1956).Their collective work focusing on how students learn has led educators to develop more student –focused learning environments that put students in the center of instruction.

In collaborative learning, the **teacher** acts more as an organizer, facilitator, and mediator than as a transmitter of knowledge.

Collaborative learning often involves challenging **students** with analytical problems which they must solve in teams by obtaining information or utilizing information given to them.

Collaborative learning affords students enormous advantages not available from more traditional instruction because a group--whether it is the whole class or a learning group within the class--can accomplish meaningful learning and solve problems better than any individual can alone.

Collaborative learning is most often based on four principles:

- The primary focus of instruction is the learner or the student.
- Primary importance is given to the "Interaction" or "doing".
- The important mode of learning is the "working in groups".
- Structured approaches to developing solutions to real world problems should be incorporated into learning.

Collaborative learning has following benefits:

- There will be the development of higher level thinking, oral communication, leadership skills and self management skills.

- Interaction of student faculty will be promoted.
- There will be an increase in the student retention, self esteem and responsibility.
- Increase and exposure in understanding of diverse perspectives.
- It allows for "peer coaching," when the higher achieving students can help their less achieving team members understand a problem and possible solutions.
- The answers the students derive to a problem or issue through collaborative learning tend to be better than they would otherwise come to on their own.
- All the students become actively involved in learning information on the topic of the course.

Collaborative learning experiences

Collaborative Learning experience among Teacher-Teacher

- Teacher-teacher interaction creates the opportunity for professional development.
- It provides support that sustains teachers through communities of like-minded colleagues.
- Encourage teachers to take advantage of knowledge growth and discovery in their own subject and within the scholarly community of teachers.
- An example of teacher to teacher collaboration is lesson study. The teachers observing the live lesson that was collaboratively developed is different than any other forms of professional development.
- Lesson study is a way for teachers to work together, collect data and analyse data to reflect on teaching and learning (Lewis, 2002).

Collaborative Learning experience among Teacher –Student

- There will be the development of shared understanding by learning and unpacking the content together in the educational setting.
- Students and teachers talk and listen to each other, they gain a deeper understanding of the content and can develop the skills necessary to negotiate meaning throughout their lives(Johnson and Johnson,1986)
- It helps students to reflect and engage in their own learning experience.
- Students construct their learning with the teacher serving as the guide or facilitator.

- Collaboration between teachers and students help students to develop problem solving, critical thinking and creative skills and apply them in meaningful ways (Neo and Neo, 2009).

Collaborative Learning experience among Student –Student

The major roles of students are of collaborator and active participator.

Collaborative learning among student helps in:

- Potential gains in cognitive learning tasks.
- Increase in the acquisition of critical social skills in education (Slavin, 1995).
- Students have opportunities to ask and investigate questions of personal interest.
- They have a voice in the decision-making process. These opportunities are essential for both self-regulated learning and motivation.
- Students engage deeply with the contents.
- Students build the interpersonal skills needed to be successful in college and careers.
- It provides students to develop social skills (Johnson-Johnson and Holubec, 1993).
- The strategies such as role assignments, collaborative problem solving and task and group processing will help students to be working with others.
- Peer teaching, peer learning, reciprocal learning, team learning, study circles, study group and work groups encourages students collaboration.(Johnson-Johnson, 1986)
- It allows students to work together toward a common purpose to explore, making meaning and understand the world around them (Lee &Smagorinsky,2000)

"Education is not the filling of a pail, but the lighting of fire." *-W.B.Yeats*

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Operation Collaboration

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"Life revolves, rotates and so well collaborates.
In tandem the organs of our body work; absolute magic they create.
Heavens move around in perfect sync
Coordinated movements of Sun, earth, and moon are interlinked
Five elements manifesting soul together
Collaboration and Cooperation takes civilizations further."

Well I can site numerous examples to emphasize the need to collaborate but before that its imminent to understand that the world today would be a very different place if our forefathers wouldn't have collaborated their knowledge and skills.

Our education system is quite individualist, I study, get marks and proceed to the next task/assignment. An individual is only responsible for their own learning .As a facilitator it scares me to even think of a world where our students are not taught to work together for a purpose. Working together for a purpose is collaboration.

The caption is named Operation Collaboration because this skill is the need of the hour and every teacher who interacts with students should be passionate to learn and impart this skill.

'Man is a social animal' ..we all agree to this philosophy but what makes man a social animal ,very few prod..the answer lies in again collaboration..that is why it high time that we start spreading the collaborative ideas to our children on a mission scale.

Students learn to respect and celebrate diversity and during small group discussions they find opportunities to reflect upon the different viewpoints put across by different people..a great way to build interpersonal skills.

Using collaborative learning provides a platform to acknowledge individual differences, every task/project assigned will have a completely different end product portraying wide range of perspectives.

Each one feels important and valued in a cooperative set up and is encouraged to innovate .

The five basic elements of cooperative learning are:

- Positive interdependence.
- Individual and group accountability.
- Interpersonal and small group skills.
- Face-to-face promotive interaction.
- Group processing.

During my twelve years of teaching, I have used cooperative learning strategies at various fronts and used a lot of them like Jigsaw, Numbered Head together ,Circle the sage ,Round robin for facilitating learning ,encouraging thinking ,revising concepts or creating .

While teaching the concept of human heart, its chambers, valves, blood flow. I needed to differentiate my teaching for special needs kid and that's when I designed tasks..where in each special need kid was in separate group and each member was responsible for contributing to the task..be it diagram or acrostic poem. The whole concept was taught through cooperative structures..and my kids surprised me when they had to conclude the topic through a strategy teach the teacher..the kids who would otherwise struggle to remember simple words were flawlessly teaching difficult concepts of Heart.

It brought tears to my eyes and I promised myself not to leave any stone unturned in ensuring that each child learns his/her own way. This was my moment of realiasation and I started researching, reading attending workshops and also creating newer strategies for cooperation.

A major achievement has been in conflict resolution through cooperation. I ask groups to brainstorm ideas to resolve a conflict by first objectively looking at the cause of the problem and why did anyone take an undesirable action.

'Many heads are better than one' students come out with brilliant suggestions and there is practically no discipline issue in the class as each one feels important and valued which creates HAPPY children.

I have grown as a teacher and am able to impact children better and create values and develop their imagination through 'OPERATION COLLABOARATION'.

Collaborative Learning – Role of NGOs

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Navi Mumbai Science Foundation, Vashi

Synopsis

*With a greater emphasis on **'good quality'** education as apart of **'Right to Education'**, schools are now required to commit more resources in improving not only the infrastructure but also the quality of education. This requires a much stronger knowledge base and time & effort to supplement the existing teaching methods.*

NGO's who are committed and managed by scientists and technologists from premier institutions and corporates can contribute to not only inculcate a scientific temper in the students but can also supplement the efforts of the schools and teachers in improving the learning of students.

This essay discusses some of these collaborative efforts which the NGO's can provide

Introduction

Indian constitution has enshrined 'Right to Free & Compulsory Education' for children in the age group of 6 to 14 years. It also requires that this education should be of 'good quality'. This requires proper development of curriculum and evaluation procedure. The institutions are required to develop appropriate learning material, teacher training and evaluation procedure for quality assessment. This requires considerable more investment by institutions in three major areas

- Infrastructure
- Number of teachers & their continuous training needs and
- Development of new learning methods.

It is in the area of development of new learning methods that NGOs with their strong knowledge base can actively contribute to imparting of 'good quality' education by supplementing the efforts of the teachers.

Approach to Learning

Navi Mumbai Science Foundation (NMSF) has been a premier NGO working in Navi Mumbai for last 15 years. It's vision is to **'Kindle & Nurture scientific temperament, promote 'pupil-centric' approach in education & build problem solving attitude and entrepreneurship in their personality'**. To achieve this NMSF focuses on **'encouraging students in the age group of 10 to 17 years to innovate in a collaborative spirit'**.

Lectures

With a view to improve learning by students NMSF has been conducting various programs in which scientists & technologists communicate various scientific principles and practices to students. This is done through simple demonstrations and examples which are related to students daily experiences. This is found to considerably improve their understanding and appreciation of the principles and how they can be observed in every day events.

Hands-on Experiments

NMSF also believes that 'Hands-on' activity is essential in improving the understanding and developing the skill and confidence of students in working with their hands. NMSF have therefore developed many experiments which can be performed by students in their labs or even at home to develop better understanding.

Exhibition of Experiments

NMSF annually organizes a one day session on 'Hands-On Experiments' where the students carry out 24 experiments in physics, Chemistry, Biology & Math.

Further as a part of Science Utsav which is an annual premier event of NMSF, students are encouraged to show case their learning through an 'Exhibition of Experiments by Students'. During this utsav, demonstrations by premier institution in Mumbai are also organized which provides an opportunity to see and discuss with the scientists. Book stalls of various publication by premier national scientific institutions are also arranged for their availability to students at reasonable price.

New Collaborative model

With the experience gained while working with teachers and students, a new collaborative model with schools is proposed. This model is not only economically viable but also has the advantage of a sustained interaction with students rather than only on few occasions which are short and far in between to be really effective.

The proposed model consists of the following:

- Identify the target group – say students of Std. VI to IX
- Interact with teachers regarding the teaching plan
- Develop the experiments and suitable instructions to match with the teaching plan and syllabus
- Identify the school lab & interval for the experiments – weekly/ fortnightly, Saturday/ any other suitable day
- Students carry out the selected experiments – individually/ team
- Guides to be available for clarifications, help in analysis and to improve understanding

A flow diagram for such a collaboration is given below

In such a collaborative effort, the students will be carrying out the experiments, analyze the data and come up with their own conclusions which will be verified by scientists. At the end, the guide can clarify any misconceptions by suitable examples.

Thus they will be adopting 'scientific method' to their learning.

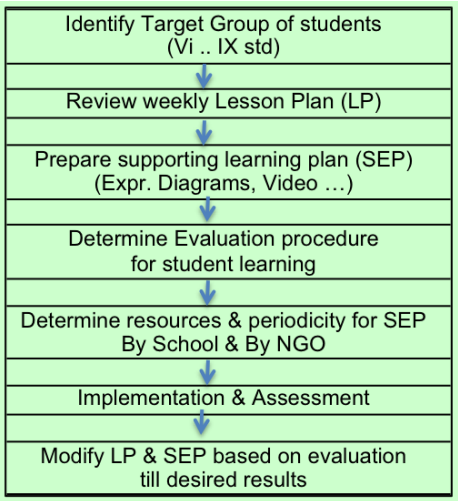
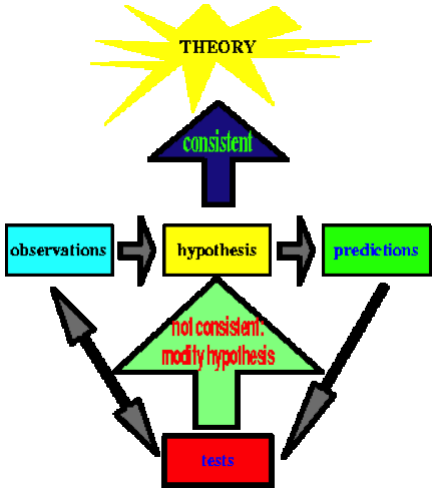


Fig 1 – Flow Diagram for collaboration



Conclusion

Such a collaborative effort between the school, teachers, students and NGO can bring in immense benefits to the school since it will be economically beneficial to both the organizations. The students will also benefit through sustained interaction with scientists and technologists. Their guidance will also be available in developing suitable projects for various state, national and international events on science projects.

Collaborative Learning as a Teaching Method

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The term "collaborative learning" refers to an instruction method in which students at various performance levels work together in small groups toward a common goal. The students are responsible for one another's learning as well as their own. Thus, the success of one student helps other students to be successful.

Collaborative learning claim that the active exchange of ideas within small groups not only increases interest among the participants but also promotes critical thinking.

The shared learning gives students an opportunity to engage in discussion, take responsibility for their own learning, and thus become critical thinkers.

Collaborative learning is a method of teaching and learning in which students team together to explore a significant question or create a meaningful project. A group of students discussing a lecture or students from different schools working together over the Internet on a shared assignment.

In small groups, students can share strengths and also develop their weaker skills. They develop their interpersonal skills. They learn to deal with conflict. When cooperative groups are guided by clear objectives, students engage in numerous activities that improve their understanding of subjects explored.

In order to create an environment in which collaborative learning can take place, three things are necessary. First, students need to feel safe, but also challenged. Second, groups need to be small enough that everyone can contribute. Third, the task students work together on must be clearly defined.

Collaborative learning is an umbrella term for a variety of approaches in education that involve joint intellectual effort by students or students and teachers. Collaborative learning refers to methodologies and environments in which learners engage in a common task in which each individual depends on and is accountable to each other. It involves use of small groups so that all students can maximise their learning and that of their peers. It is a process of shared creation, two or more individuals interacting to create a shared understanding of a concept, discipline or area of practice that none had previously possessed. Collaborative learning activities can include collaborative writing,

group projects, and other activities. Collaborative learning prepares students for their future roles in life as learners and contributors in their careers and in social settings.

Collaborative learning helps the students to do specific intellectual activities such as reading primary sources, interpreting graphs, analyzing artwork. It also helps the students in monitoring their comprehension , re-organizing the material and interpreting the material.

The interaction among group members from different backgrounds removes personal biases, gives fresh ideas and forces people to think outside the box for solution.

At the end, I can summarize the essay by saying that

“Alone we can do so little, together we can do much”

Collaborative Learning: A Tool for Effective Teaching

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Abstract

The purpose of the following study was to see the effectiveness of the cooperative learning strategy in learning. One important conclusion that can be drawn from the study is the learners take a great responsibility for learning on their own and there is less control of the teacher and more learner autonomy. The study helped the student teachers to experience and gain insight into the cooperative learning and its implications in the actual classrooms.

Introduction

Collaborative learning is an approach to teaching and learning that requires learners to work together to deliberate, discuss, and create meaning. According to Smith and MacGregor (1992):

“Collaborative learning” is an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product. Collaborative learning activities vary widely, but most centre on students’ exploration or application of the course material, not simply the teacher’s presentation or explication of it.

Concept of Collaborative learning: Collaborative learning can be practiced at different levels as follows:

Teacher-Teacher Collaboration. It is critical for teachers to have the time to collaborate. Professional learning communities, which provide teachers with established time to collaborate with other teachers, have become a more common practice in recent years. Louis and Kruse (1995) conducted a case study analysis that highlighted some of the positive outcomes associated with professional learning communities, including a reduction in teacher isolation, increases in teacher commitment and sense of shared responsibility, and a better understanding of effective instructional practices. Professional learning communities encourage collaborative problem solving and allow teachers to gain new strategies and skills to improve and energize their teaching and classrooms.

Student-Student Collaboration. Collaborative learning not only allows students to engage deeply with content but also helps students build the interpersonal skills needed

to be successful in college and careers. Johnson, Johnson, and Holubec (1993) state that collaborative learning provides students

with the opportunity to develop social skills like working together in the team, valuing and respecting every members perspective, being more tolerant and patient, developing we-feeling and cohesiveness among the members of the group. These social skills are important for the students when they actually enter the world of work. This can be achieved by various techniques, to name a few like peer teaching, peer learning, reciprocal learning, buddy system, team learning, study circles, study groups, and work group.

Teacher-Student Collaboration

Learning is not an individual act which can be done in isolation but a combined act where the learner and the more knowledgeable other who takes the role of the teacher work together to construct knowledge. Johnson and Johnson (1986) similarly emphasize that when students and teachers talk and listen to each other; they gain a deeper understanding of the content and can develop the skills necessary to negotiate meaning throughout their lives. Collaboration demands a paradigm shift from teacher centred instructions to instruction and learning that is designed by both teachers and students. Collaboration between student and teacher plays a critical role in helping students reflect and engage in their own learning experiences. The constructivist philosophy emphasizes on how teacher and students can work together to construct knowledge. Mayer (2004) defines constructivist learning as an “active process in which learners are active sense makers who seek to build coherent and organized knowledge”. Students construct their learning, with the teacher aiding as a guide or facilitator. The teacher does not function in a purely didactic (i.e., lecturing) role.

Need for Collaborative learning: The concept of collaborative learning is not something new but has been stressed upon by psychologist Lev Vygotsky, John Dewey, Benjamin Bloom and Jerome Bruner in their theories on how students learn better through interaction in a social environment rather than individual learning. Sills, Digby, and Russ (1991) found that those involved in collaborative learning understand content at deeper levels and have higher rates of achievement and retention than learners who work alone. They suggest that collaborative learning gives students opportunities to internalize their learning. Slavin’s (1989) research also suggests that students and teachers learn more, are more engaged, and feel like they get more out of their classes when working in a collaborative environment. A meta-analysis from the Cooperative Learning Center at the University of Minnesota concluded that having students work collaboratively has significantly more impact on learning than having students work alone (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981). An analysis of 122 studies on cooperative learning revealed:

• More students learn more material when they work together—talking through the material with each other and making sure that all group members understand—than when students compete with one another or work alone individualistically.

• More students are motivated to learn the material when they work together than when students compete or work alone individualistically (and the motivation tends to be more intrinsic).

• Students have more positive attitudes when they work together than when they compete or work alone individualistically.

• Students are more positive about the subject being studied, the teacher, and themselves as learners in that class and are more accepting of each other (male or female, handicapped or not, bright or struggling, or from different ethnic backgrounds) when they work together.

Collaboration can be between teachers, between students, and between teacher and student.

Purpose of the study: The purpose of the study is to see the effectiveness of jig saw technique of cooperative learning.

Methodology

For the present study experimental design was used.

Sample

For the present study the sample consisted of 90 student teachers from Hansraj Jivandas College of Education, Mumbai

Tool for the study

For the present study Jig Saw technique of cooperative learning was used. The jigsaw classroom is a research-based cooperative learning technique invented and developed in the early 1970s by Elliot Aronson and his students at the University of Texas and the University of California.

Steps of the Jigsaw technique:

Step 1: 90 students were divided into 11 groups . Each group had 8 students out of which two groups had 9 students.

Step 2: From each group one student was appointed as the leader, the one who was more mature and had good comprehension and explanation skills.

Step 3: The topic Fatigue in Educational psychology was divided into eleven small segments. Each group was assigned to work on one element. Resources were provided in form of books, notes and internet access.

Step 4: It was ensured that students had access only to their own segment.

Step 5: Students were given half an hour to work on their segment and get familiarized with it.

Step 6: An expert group was formed which had one member representing from each group. The students in the expert group were given half an hour to discuss their own segment with the other members of the expert group.

Step 7: The students from the expert group were asked to return back to their original groups.

Step 8: each student from expert group presented what they had gained to their own groups. lots of questions were encouraged by the participants.

Step 9: The teacher supervised the group work by moving from one group to another and solving the queries if any.

Step 10: The leader from every group was asked to come and present the content which was followed by discussion and clarification wherever the teacher felt was needed.

Observations of the researcher:

- It was found that students took more active participation as compared to the lecture method.
- The isolates slowly opened up and also contributed.
- It generated a lot of discussion among the group members.
- Some Groups also had conflicts with respect to the views on the topic which was resolved by the teachers' intervention.
- It was also observed that in few groups one or two members were very dominating and suppressed others views. Again the teachers' intervention helped to maintain the socio-emotional climate of the group.

Discussion and Suggestions:

As compared with the traditional teaching methods cooperative learning strategies have several advantages like

- Active participation of the students
- Enhancing social skills like team spirit, cooperation, being more tolerant and patient, valuing and respecting others views, positive interdependence, we-feeling, cohesiveness and also developing better communication skills. These skills will help the students not only to be friendly with their classmates but also to work effectively beyond the school in the larger society which is based on the philosophy of democratic, egalitarian and secular principles.
- When students work in groups the brainstorming helps in developing critical thinking and leads to mastery learning.
- Students have great autonomy in learning on their own.
- Students take responsibility for their own learning.
- It helps in fostering decision making skills in the young students.
- There is healthy competition among various groups.

Thus as very rightly said by Chris Watkins '*In classrooms where a sense of community is built, students are the crew not the passengers.'*

Cooperative learning is just not making the students sit in the groups and work together; rather it requires a careful and structured plan with well defined tasks for the students by the teacher to make it successful. Hence the role of the teacher includes:

- doing more planning and design work in advance
- To create a learning community.
- To have an effective cooperative learning group teachers must know their students well. Grouping of students can be a difficult process and must be decided with care. Teachers must consider the different learning skills, cultural background, personalities, and even gender when arranging cooperative groups.
- Having ground rules to work in the groups.
- Training the students who have good comprehension and explanation skills as experts.
- Moving from group to group as a facilitator.
- Giving constructive feedback to the students on the work done.
- The teacher needs to exercise less control on the group for better performance.

Conclusion

Thus in cooperative learning teachers fade in the background and become a coach, facilitate, or and sometimes a spectator after the lesson is implemented. Teachers who set up a good cooperative lesson teach children to teach themselves and each other. Students learn from their peers and become less dependent on the teacher for help.

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Innovative Classroom and Collaborative Learning

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There is an age old adage that says “two heads are better than one”. Consider collaboration in recent history, collaborative learning is a method of teaching and learning in which student’s team together to explore a significant question or create a meaningful project. A group of students discussing a lecture or students from different schools working together over the Internet on a shared assignment are both examples of collaborative learning.

Cooperative Learning Strategies

- Learning
- Teaching
- Classroom Management
- Teacher
- Classroom Technology
- In order for Cooperative learning groups to be successful, the teacher and students must all play their part. The teacher's role is to play the part as facilitator and observer, while the students must work together to complete the task.
- Arrange students heterogeneously in groups as few as two and no more than six.
- Assign each member of the group a specific role such as: recorder, observer, book keeper, researcher, time keeper, etc.
- Monitor each group’s progress and teach skills necessary for task completion.
- Evaluate each group based upon how well they worked together and completed the task.
- **Common Techniques**
- **JigSaw**
- Students are grouped into five or six and each group member is assigned a specific task then must come back to their group and teach them what they learned.

Think-Pair-Share: Each member in a group "thinks" about a question they have from what they just learned, and then they "pair-up" with a member in the group to discuss their responses. Finally they "share" what they learned with the rest of the class or group.

Round Robin: Students are placed into a group of four to six people. Then one person is assigned to be the recorder of the group. Next, the group is assigned a question that has multiple answers to it. Each student goes around the table and answers the question while the recorder writes down their answers.

Numbered Heads: Each group member is given a number (1, 2, 3, 4, etc). The teacher then asks the class a question and each group must come together to find an answer. After the time is up the teacher calls a number and only the student with that number may answer the question.

Team-Pair-Solo: Students work together in a group to solve a problem. Next they work with a partner to solve a problem, and finally they work by themselves to solve a problem. This strategy uses the theory that students can solve more problems with help then they can alone. Students then progress to the point that they can solve the problem on their own only after first being in a team and then paired with a partner.

Three Step Review: The teacher predetermines groups before a lesson. Then, as the lesson progresses, the teacher stops and gives groups three minutes to review what was taught and ask each other any questions they may have.

Elements of Cooperative Learning

As we discussed before, simply working in a group does not guarantee cooperative learning. There are five elements that define true cooperative learning in groups:

1. Face-to-face interaction
2. Positive interdependence
3. Individual accountability
4. Collaborative skills
5. Group processing

Face-to-face interaction is a bit counter-intuitive because it doesn't necessarily mean face-to-face as in 'in-person'. It actually just refers to direct interaction. So, it can be literally face-to-face, or it could be over the phone, on chat, via Skype, through email, etc. It's just referring to the fact that group members have to actually interact in order to cooperate.

The second element is **positive interdependence**, which means that the group members rely on each other and can only succeed together. This goes hand-in-hand with the third element, which is **individual accountability**. As an interdependent group, each individual is responsible for his or her own work and can be held accountable for that work.

The fourth element of cooperative learning is **collaborative skills**. The group members must be able to work together, but the ability to do so doesn't always come naturally; sometimes these skills need to be taught. And the final element is **group processing**,

which refers to the fact that the group needs to monitor itself to ensure that the group, as a whole, is working together effectively.

How can you evaluate group work?

Student group work can result in the production of:

- wikis
- proposals
- reports of case studies
- in-class or video presentations
- posters
- Here are some ways to provide feedback on group productivity throughout the process as well as on the group product.
- Evaluate students on both their contributions to group processes as well as the final product.
- Create a detailed explanation of what your expectations are.
- Provide scores for individuals as well as groups.
- Use rubrics. Consider asking students for feedback and including some of their ideas to the rubric.
- Incorporate peer and self-assessment at various milestones. This is a good way to check in on the assignment progress as well as the group dynamics.
- Communicate clearly to students at the beginning how you will calculate their grades.

Collaborative Learning

Podar International (CBSE)

Introduction:

There is an age old adage that says “two heads are better than one”. Consider collaboration in recent history: Watson and Crick or Page and Brin (Founders of Google). But did you know it was a collaborative Computer Club about basic programming at a middle school that brought together two minds that would change the future of computing? Yes, those two were of course Bill Gates and Paul Allen, the founders of Microsoft.

Collaborative learning teams are said to attain higher level thinking and preserve information for longer times than students working individually Groups tend to learn through “discussion, clarification of ideas, and evaluation of other’s ideas.” Perhaps information that is discussed is retained in long term memory. Research by Webb suggests that students who worked collaboratively on math computational problems earned significantly higher scores than those who worked alone. Plus, students who demonstrated lower levels of achievement improved when working in diverse groups.

Examples of Collaborative Learning Techniques

Think-Pair-Share

The learning activity involves explaining answers/ideas to another student. The teacher poses a question to the class. Students write a response and then share it with a student nearby. Students clarify their positions and discuss points of agreement and disagreement. The teacher can use several answers to illustrate important points or facilitate a whole class discussion.

1. Teacher poses question to class
2. Students write a response (1-2 minutes)
3. Students pair up with another student nearby
4. Each student explains his/her response to the other
5. If they disagree, each clarifies his/her position and determine how/why they disagree

Why use it?

1. Keep students engaged in large classes

2. Prime students for whole class discussion
3. Target key concepts for review
4. Student responses are feedback to the teacher about how they are making sense of the material

Reciprocal Teaching

The learning activity involves students teaching to one another in groups. Students jointly read a text or work on a task. Students take turns being the teacher for a segment of the text or task. In their teaching role students lead the discussion, summarize material, ask questions, and clarify material. An example focused on reading

1. Teacher preps students by showing how to read a text
2. In groups students jointly read material provided.
3. Students take turns being the teacher and leading discussion of a segment of text
4. Student summarizes the segment, asks a question, and clarifies material

Why use it?

1. To improve students' ability to do specific intellectual activities such as reading primary sources, interpreting graphs, analyzing artwork
2. Role of teaching puts student in position of monitoring their comprehension and recorganizing the material
3. Exposes student to other ways to interpret the material

Think-Aloud Pair Problem Solving (TAPPS)

The learning activity involves solving problems. Students work in pairs and alternate roles. For each problem one is the solver while the other is the listener. The solver thinks aloud—narrating his/her reasoning process—while solving the problem. The listener prompts the solver to keep talking and asks for clarification but does not intervene to help.

1. Ask students to form pairs and explain the roles:
    a. Problem solvers: talk through their reasoning process as they solve a problem
    b. Listeners: encourage PS to think aloud and ask for clarification as needed
2. Pairs solve a set of problems and alternate role for each new problem

Why use it?

1. Emphasizes process rather than product.
2. Students can practice formulating ideas, rehearse routine skills, attend to sequence, identify gaps and errors in understanding.

3. Teachers can observe students' reasoning process.

Group Writing Assignments

The learning activity involves collaborative work that culminates in a group- authored document. Assign groups to write (and submit) Wikipedia entries on course- related topics or create study guides for the course.

1. Use a wiki, Google Docs, or Office Live for collaborative writing
2. Use assignment that has authentic purpose and audience such as creating Wikipedia entries or study guides for the course
3. Establish guidelines to scaffold the process

Why use it?

1. Use writing-to-learn to help students develop and revise ideas
2. Students have opportunities to see how other students view the same topic
3. An assignment with an authentic purpose and audience can increase students' interest and commitment

For additional information about these and other collaborative learning techniques see,

Using Collaborative Learning Techniques

Designing a Collaborative Learning Environment

Collaborative learning is likely to go more smoothly if you build an appropriate context for it in your class. This means deciding how to:

1. develop appropriate tasks,
2. orient students
3. form groups,
4. facilitate student collaboration and
5. evaluate student work.

Structuring Collaborative Learning Tasks

Designing tasks that engender collaboration and foster the kind of thinking important for learning. See the handout, Task Prompts, below. The task REALLY matters:

- What are your learning goals? (Knowledge, skills, abilities, habits of mind, qualities of character)
- Task prompts—questions that induce the kind of thinking you want to take place
- What kind of interaction and discourse should take place?

Orienting and Training Students to Participate

Many students do not know how to participate effectively in group learning situations

- Do students know how to do the kind of thinking expected of them?
- Do students know how to interact in the ways expected of them?

Forming Groups

The composition of groups can influence how they function

- Teacher assigns students to groups vs. students select group members vs. random assignment Facilitating Student Collaboration

What can/should teachers do to facilitate student collaboration?

- Clarify collaborative expectations
- Monitor group work in class or online

Introducing the activity

- Explain activity
- Clarify objectives
- Outline the procedures
- Give examples if needed
- Remind groups of ground rules for group interaction
- Set time limits – Provide the prompt, task or problem
- Field questions before starting
- Observing, monitoring, interacting

Grading/Evaluating Students in Collaborative Learning Situations

How can/should you grade students in collaborative learning situations? How can grading promote or impede collaboration?

- Whether to grade, what to grade.
- Group grade vs. Individual accountability

Example of a DISCUSSION EVALUATION FORM

[The form conveys to students the characteristics of effective discussion. It could be given to students before group discussion to help guide their participation, and used following discussion to evaluate the discussion.]

Name: Date:

How much did you

- learn from the group discussion
  A. a lot B. a little C. nothing
- participate in the discussion
  A. a lot B. a little C. not at all
- enjoy the discussion
  A. a lot B. a little C. not at all

What, if anything, should the teacher do or not do to improve the quality of whole- class discussion?

Resource

- Collaborative Learning Techniques: A Handbook for College Faculty by E. Barkley, P. Cross, & C. Major. Jossey Bass Publisher.
- wikipedia