

Title of the PAC Programme (PAC NO. 18.26 TN 02)

**EFFECTIVENESS OF PROJECT BASED APPROACH TO
TEACHING OF SCIENCE AT SECONDARY LEVEL (TAMIL NADU)**

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(National Council of Education Research and Training)**

2011 – 2012

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SCHEDULE OF THE ACTIVITIES OF THE PROGRAMME (2011 – 2012)

Sl. No.	Activities organized	Date of the activity
1.	In-house of RIE faculty to Plan the Format for Project Based approach and Identify Areas in Science at secondary Stage	17 th June, 2011 (1 day)
2.	Preparation and Presentation of the Sample Modules for Training	26 th September, 2011 (One-day presentation)
3.	Training of KRPs on Project Based Approach	7 th – 9 th December, 2011 (3 days)
4.	Preparation of the Report of the Training Programme	January-March, 2012

PROJECT BASED TEACHING OF SCIENCE AT SECONDARY LEVEL

The various methodologies of teaching science in a classroom include lecture method, demonstration method, lecture-cum-demonstration method, experimental method, project method, ICT, field trip, PBL method etc. Students exposed to lecture method only have shown scoring consistently less than those who have some form of active engagement. The methodology selected for instruction should enable students learn how to learn and should sow the seeds for motivation to continue learning, leading to meaningful learning.

A project is a sequence of tasks, which involves planning from the beginning to the end. Bounded by time, resources & required results, a project has a deadline for completion taking care of the budget involving number of people, supplies and capital.

In conventional project method, teachers usually assign projects to students that are related to different topics or concepts to make them self learning. Teachers select a number of topics found in science textbook and assign them to the students by forming different groups. In this kind of project method, only the group or individual learners of the group are able to explore and master the assigned topics, and others are not aware of the work executed by their class mates. Moreover, it is very difficult and time consuming for the teachers to monitor and supervise several projects assigned to the class of many groups.

Project Based Learning (PBL) is an alternative strategy which is effectively used to enhance the learning capacity of the students. It needs an in-depth investigation of the topic. As an alternative to the conventional one, in a typical PBL setup the entire class is involved on a common project or it can be assigned to a group with different PBL tasks selected by the class teacher on a theme.

PBL: Systematic Teaching Method – PBL is a systematic teaching method that engages students in learning essential knowledge and life-enhancing skills through an extended, student influenced inquiry process structured around complex authentic questions and carefully designed products and tasks. It is the use of classroom projects, intended to bring deep learning skills, where students use technology and inquiry to engage with issues and questions that are relevant to their day to day incidents of life, an approach for classroom activity that has an extensive learning which emphasizes learning skills. It involves all time learning out comes, that distinguish the components of PBL are:

- 1) “A driving question that serves to organize the activities” and,
- 2) “A concrete product or multiple representations that meaningfully address the driving question”:

These skills include communication skills, presentation skills, organization and time management skills, research and inquiry skills, self-assessment, group participation and leadership skills.

In PBL students work in groups and learn about a subject by addressing a problem and issues connected with it. The peer group students create knowledge share among themselves what they have acquired during the process of project based learning.

Unlike conventional teaching approaches, which rely on the teacher to direct learning and control information flows, project-based learning gives students the freedom to explore a subject depth in various ways that suits their learning needs, PBL believe that this form of learning enables students to:

- Develop greater knowledge about a subject and become more motivated to learn.
- Improve their research and problem-solving skills, what they are learning at school can be used in real life.
- Independent decision making and related knowledge analysis with which they can solve real life applications.

The theme of the project to be developed by the learners rests on a suitably framed **driving question**. The answer to the question will provide students opportunities for interdisciplinary learning. For instance, a driving question could be, “**Why is life evolved only on earth?**” Students are likely to probe and understand several concepts in many areas when they carry out the following:

- ✚ Comparing physical features of all planets in the solar system,
- ✚ Classifying planets into inner and outer planets; terrestrial and gas giant,
- ✚ Analyzing atmosphere, hydrosphere, lithosphere, green house effects, protective blankets like Ozone layer, Van Allen belts, Magnetosphere and building blocks of life.
- ✚ Analyzing the role of atmosphere in regulating global temperature.

Sl. No.	Conventional Project	PBL
1	It is one mode of Curriculum transaction	Connecting curriculum to daily life
2	One or simple task/activity	Series of tasks/activities
3	A means of scientific inquiry	The driving question drives them to meaningful answers
4	Different Topics assigned to different groups	Same topic assigned to all groups
5	Only the group explores to the particular topic	Students work on various concepts of the topic
6	Monitoring and supervision becomes difficult and time consuming	Students themselves decide how to approach the problem

The main aim of putting a driving question is to motivate the learners to inquire into the world around them and drive their own explorations. It helps them to ask meaningful questions among themselves and conduct their own scientific activities to find out the answers. In the PBL method, the teacher serves as a facilitator, but let the students analyze the information collected by them in their own ways. Thus the PBL approach is a social activity and its takes place within the context of culture, community and past experiences. Moreover, in PBL students discuss the project among themselves and it is through these social interactions the learning occurs.

PBL means learning through experience, establishing connections to life outside the classroom and addressing real world concerns (NCF, 2005). This gives learners the chance to identify with the project based tasks, to explore the connections of the curriculum to their own life. In PBL method, students decide themselves how to approach a problem and what activities to pursue to solve it. During the process they gain valuable experience in setting their own goals and standards of excellence.

Throughout this process, the teacher's role changes – the teacher guides the students work, he or she becomes the advisor initially and later as a moderator. While gathering the information from a variety of sources, students learn to synthesize, analyze, and incorporate in sequence the data at the end; they learn to demonstrate their newly

acquired knowledge, skills. PBL encourages problem solving, communication, collaboration, planning, and self- evaluation skills.

STAGES IN PBL

The project based learning consists of three phases.

Phase 1 – Identification of topics: In the first phase the teacher identifies a topic from the curriculum that should be suitable for the study by the whole class. The selected topic should be based on the prior knowledge of the learners in the content area. Further, the selection of the driving question should make all students aware of what they are going to learn and explore.

Phase 2 – Grouping: Students are divided into viable groups and each group is assigned to different aspects of the project work. (For instance, field work, activities/experiment, analysis of result, computation etc.).

Phase 3 – Presentation: During the third and final stage of PBL, the completed work of each group is presented in the class in the presence of the teacher, if needs be experts are invited in the relevant area. During the presentation sessions, students are encouraged to ask questions. The teacher and experts may also elicit some information on the project from the students.

EVALUATION OF THE PROJECT

A total of 50 marks can be earmarked for the evaluation of PBL. The following criteria may be used to evaluate the projects when completed by the student:

- 1. Learners' participation: 10 Marks** – Student's participation, interest and cooperation in the task assigned to the groups can be observed and evaluated. Self confidence and leadership quality in students can also be considered.
- 2. Group presentation: 20 Marks** – The following criteria can be considered while presenting. How well each group can present their assigned task using a) the data collected, b) the experiments performed, c) chart, d) models/pictures and e) resources used and interviews.

3. Questioning skill: 05 Marks – Questions posed by the other groups during presentation can be evaluated for a maximum of 5 marks.

4. Answering: 05 Marks – Answers provided by each group when teachers asked questions on the work done by the group to test whether the students have understood the concepts related to the topic or not, can be taken as a criterion.

5. Written test: 10 Marks – A written test can be given at the end of the project for 10 marks.

ADVANTAGES OF PBL

- 1. Motivation to learn:** Passive children in the class will be highly motivated to participate in the activities of the project work with great enthusiasm.
- 2. High performance:** PBL can inculcate certain values in students such as curiosity, quest for knowledge, courage to question, tolerance, search for perfection and leadership quality.
- 3. Communication skills:** Collaborative learning will improve communication skills both written and oral, as well as the ability to work with others and acceptance of personal responsibility.
- 4. Joyful learning:** This method will make science learning an interesting and a pleasurable activity.

CONCLUSION

Is PBL possible for all topics? No. Planning for PBL must take into account what is possible in a classroom. Not all topics are amendable for teaching through the PBL method. Moreover time factor to transact the topics in the curriculum in a given academic year has to be kept in mind by the teachers. For good education less is more. Teachers have to take a decision as to which topics have to be taught in depth against those which require direct instruction. Hence, in PBL method, the role of the teachers is to identify topics and select a topic with which students can learn on their own with suitable inputs. Thus PBL is one of the strategies through which learning of science can be made very

interesting. Besides, students will be motivated to produce a superior product by facilitating learning.

SAMPLE MODULE 1: PBL in a school situated in an urban area

A 3 column format may be used for the PBL. The driving question should be carefully framed, to begin the project, for which answers have to be searched by the learners. For example, “Deficiency diseases” is the project topic. The concepts that are developed and hence are to be mastered by the students are shown in the following table:

Project Topic	Concept to be mastered	Driving question
“Deficiency diseases in children”	1. Food and its importance	“How do we stay healthy?”
	2. Balance diet	
	3. Food adulteration and preservation	
	4. Diseases	
	5. Deficiency diseases	
	6. Causes of deficiency diseases	
	7. Symptoms of deficiency diseases	
	8. Preventive measures	

Considering class strength of 30 students, 5 groups of 6 students each can be formed for the project work. It is ensured that each group consists of students from different abilities. The groups should be given specific activities related to the concepts identified in the table and their tasks must be finished within a stipulated time (say a week) so that the entire project could be completed as per plan.

Work assignment

Group 1: The class teacher can show a few photographs/pictures of children with malnutrition in the class. This group can be motivated to collect information on various

diseases and record the causes and symptoms that usually accompany them. They can be encouraged to visit a local hospital or health clinic and interact with a doctor, preferably with a paediatrician, if possible.

Group 2: This group can be assigned the task of collecting data regarding different items that are used to prepare food items and their calorific value. The calorific values for the ready to eat food items can also be collected. The teacher can explain to the students the terms such as calorie, carbohydrate, calorific value and energy.

Group 3: The group can record the types of food items their classmates consume everyday for a period of 7 days in a tabular form and study the data carefully:

Day	Breakfast	Lunch	Dinner	Carbohydrate	Proteins	Fat	Mineral/Vitamin
1							
2							
3							
4							
5							
6							
7							

Teacher can cite examples of food items containing a) carbohydrates: Bread, pasta, rice, cereals, biscuits, cakes, chocolate, table sugar, fruits, vegetables, juices, most dairy products, honey, jams, sauces, beans, grains, ice cream and even cracker breads. b) Proteins: vegetables, beans, fish, meat and dairy products - milk, eggs, sweet potatoes and pumpkins. c) Fats: meats butter, ice cream and cheeses, fried foods, fast food. d) Minerals: Milk, eggs, cheese, beans, nuts, green leafy vegetables. e) Vitamins: Fruit, Vegetable, Nut/Grain, Meat, Legume.

Group 4: Collecting data and pictures on adulteration of food items can be the task of this group. If possible, they can record the health of children who have consumed adulterated food items.

Group 5: This group can be assigned to collect information about which food can be preserved. If possible, they can interview experts in food science.

SAMPLE EXAMPLE 2: PBL in a school situated in a rural area

A 3 – column format may be used for another PBL module as shown in the following table:

Project Topic	Concept to be mastered	Driving question
“Storage of food grains through scientific method”	1. Nature of the food grains	“Why should food grains be stored through scientific method?”
	2. Healthy food	
	3. Importance of storage of food grains	
	4. Traditional methods of storage	
	5. Recent/modern methods of storage	
	6. Economic importance of storing	
	7. Effects of climatic conditions on food grains	

Work assignment

Group 1: Collection of information on various aspects of food and nutrition, and also various traditional/local methods of storage.

Group 2: Visit to neighbouring villages and collection of informations on various types of food grains and their storage methods.

Group 3: Visit of Food Corporation of India (FCI) go-downs and interview of the staff personnel about various strategies adopted in storing food grains.

Group 4: Conduct of survey to whole sale grocery shops, and interaction about food storages.

Duration of the project work may be scheduled within 10 days, outside the normal working hours of the school. Presentation of each group work may be done at the end of the project period.

PBL OUTLINE

I. Target Group : Class VIII, IX or X

II. Subject : Bio/Chem/Phy

III. PBL Guideline

1. Topic: Analyze the content/ write the suitable topic/theme
2. Driving question:
3. Write the standards – Understanding Concepts/skills/HOTs:
4. Planning of the project/Identifying the tasks/Data Collection:
5. Activity schedule:
6. Assessment (Formative and/or summative):
7. Write rubrics

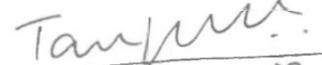
REGIONAL INSTITUTE OF EDUCATION (NCERT), MYSORE – 570 006

Title of the Programme: “Effectiveness of project based approach to teaching of science at secondary school level (Tamil Nadu)” On 7th – 9th December, 2011

TIME TABLE

Date /Time	9.15-10.15	10.15-11.15	11.15-11.30	11.30-1.00 PM	1-2 PM	2.00-3.15 PM	3.15-3.30	3.30-5.00 PM
07/12/2011 Wednesday	Registration	Inauguration & About the programme	TEA	Introduction to PBL (VT)	LUNCH	NCF-2005 & PBL (KAK)	TEA	Outline for developing Project modules for PBL (MPR)
08/12/2011 Thursday	ICT & PBL/ Identification of areas for PBL in Biology/ Chemistry/Physics(Group work) (MUP/GRP/VVA/SPK/CP)			Presentation (GroupWise)(MUP/PTS/GR P/VVA /SPK/CP)		Developing draft modules for PBL in different subjects (GVG/MPR/GRP /SPK/CP)		Developing draft modules for PBL in different subjects (GVG/MPR/GRP/SPK/CP)
09/12/2011 Friday	Presentation of draft modules (GroupWise) (MUP/MPR/GRP/VVA/SPK/ CP)			Finalization of Modules (GroupWise) (MUP/MPR/GRP/VVA/SP K/CP)		Action Plan for Implementation (KAK/VT)		Development of Action Plan for Implementation (KAK/VT)

MPR–Prof. Manjula P Rao, GVG–Prof. GV Gopal, KAK–Dr. K Anil Kumar, MUP–Dr. MU Paily, GRP–Dr. GR Prakash, VVA–Dr. VV Anand, SPK–Dr. SP Kulkarni, CP–Dr. C Padmaja


 Dr. Vareishang Tangpu 03.12.2011
 Programme Coordinator

TRAINING OUTCOME

Need and Justification:

Science teaching-learning requires observation, exploration, experimentation, invention, pulling information which can be brought in through project based methods. At present, schools are using chalk-talk/lecture methods. Hence, this project may help improve teaching learning of science and this is the requirement of the state government (TN).

(a) Specific Objectives:

The following are the objectives of the programme:

- To train the KRPs on project based approach of teaching science;
- To enable teachers to identify and use project based approach in their regular teaching; and
- To study the effectiveness of project based approach to teaching of science.

(b) Methodology:

The project is a plan to be carried out in two phases. During the first phase, identified KRPs from the state of Tamil Nadu were given 3 days training in project based approach to teaching of science. During the training, sample areas in Science at the secondary level were identified and demonstrations/discussions/ on the approach were explained to the KRPs. The trained teachers were asked to use this approach in their regular teaching.

In the second face (2nd Year), the effectiveness of this approach will be studied. For this a suitable a research design will be prepared. The data will be collected through a specially designed research tool from a sample of identified teachers. The data will be analyzed for studying the effectiveness.

Following are the modules (6 BPL samples) developed by the participants during the training session.

PBL MODULE – 1

Target group:	Class IX
Subject:	Biology
Topic:	Healthy Lifestyle
Driving Question:	How do we live healthy?

- Standards:**
1. Students know different sources of food materials
 2. Students know different kinds of nutrition
 3. Students know healthy food habits
 4. Students differentiate healthy food and unhealthy food items
 5. Students classify different type of diseases
 6. Students analyze food items
 7. Students analyze the causes of diseases

Skills: Communication and enquiry skills, Comparing and analyzing skills

Planning of the project:

Project Topic	Concepts to be mastered	Driving question
Healthy lifestyle	<ul style="list-style-type: none">✓ Types of food sources✓ Essential food for living✓ Healthy and unhealthy food habits✓ Deficiency diseases✓ Types of disorder✓ Diagnostic procedures✓ Preventive measures	How do we live healthy?

Work Assignment

Group 1:

The teacher shows a few photographs of persons affected by different types of diseases. This group is motivated to collect information about different kinds of food sources. They can be encouraged to visit a local market and classify food items and also collect climatic conditions and measure the physical nature of plants.

Group 2:

This group is asked to collect data regarding i) body building food items, ii) energy providing food items, iii) body regulating food items, iv) analyzing the chemical composition of essential food materials.

Group 3:

This group is assigned the task of collecting data regarding healthy and unhealthy food habits followed by their classmates and or parents. They can also find out the benefits of healthy food and defects of unhealthy food.

Group 4:

This group will collect different types of pictures and articles about deficiency diseases prevailing in their locality/library.

Group 5:

This group is assigned to collect various types of diagnostic instruments used in the nearby medical centres. The students can interview yoga master/doctor/health club trainer in order to know the preventive measure that can be followed to maintain good health.

This group can prepare a chart showing an age-wise requirement of nutrients.

Summative Assessment

1. If you are a vegetarian, how will you get protein?
2. What will happen if protein is deficient in our diet? Name the deficient disease. How can it be prevented?
3. What are the unhealthy food habits?
4. What are the problems caused by unhealthy food habit?
5. What is BMI?
6. How will you keep your health fit?

Resources: Library, Internet

Rubrics:

Criteria	Excellent	Good	Average	Need improvement
Collection of data	Collected all relevant data	Collected but not all data	Collected but very few data	Collected but not subject relevant
Identification of different kinds of food materials	Identified all relevant food materials	Identified but not all relevant food materials	Identified very few relevant food materials	Identified same kind of food materials
Presentation	Presented using all relevant materials – Audio/video, charts, written etc.	Presented with few materials	Presented with only written materials	Presented but need more improvement

PBL MODULE – 2

Class: 8th Chemistry

Project Topic	Concepts to be mastered	Driving question
Elements and Compounds around us	i. Elements and its role in human body ii. Acids in fruits iii. Metals used as a utensils iv. Elements in atmosphere v. Compounds in food stuff vi. Elements in ICT vii. Elements and compounds in plants	How essential are the elements for life?

STANDARDS:

- ❖ Students know elements and its role in human body
- ❖ Students recognize the acid and minerals present in fruits as they see it or heard the name of it
- ❖ Students understand why copper and aluminium are used to make utensils while iron is not? (in a pure form)
- ❖ Students know what are all the chemical compounds present in food materials in the form of nutrients - Carbohydrate protein, fat, minerals, etc
- ❖ Students understand how essential water and carbon dioxide are for the growth of a plant.
- ❖ Students know the product of the photosynthesis and the byproduct which gives life to human and animals.

Planning of the Project:

1. Whole class is divided in to small groups consisting of 6 members.

2. Asking the students to visit their own kitchen at home and ask them to find out the metal which used to make utensils with the help of their parents.
3. Visiting a metal mart and getting the information from a shop keeper
4. Why commonly utensils are not made of Gold, Silver and Platinum.
5. Why Utensils are not made of a pure iron while they make from Aluminum, Copper.
6. Study the properties of metals like Copper, Aluminium, Iron, etc.
7. Collecting the pictures of different types of utensils which made of different metals.
8. Is stainless steel a metal? If not what it is? What it made of?
9. Why copper vessels are not used to store pickles?
10. When food is cooked in the aluminium vessel over a period of decade it causes kidney problem. Why?

Time Schedule: 3 days

1st Day:

3 members of the group may visit one of their friends home and collect the name of the metals. Other 3 members may visit metal mark and got the data.

2nd Day:

3 members can sit at library or website or they can approach a science teacher and collect the information regarding iron, aluminium, copper, gold, platinum etc.

3rd Day

Another 3 members can collect the pictures of different utensils which are made of different metals.

Students can arrange all the collected data, pictures; make chart, open for discussion regarding their project.

Assessment:

Criteria	Marks
i) Collecting data	10
ii) Picture collection	10
iii) Presentation/ effective the project	20
iv) Answering for the beer group question	05
v) Written test	10

Rubrics:

(i) Collecting data:

Sl. No.	Criteria	Grade
1	Collected maximum number of metal names which are used in our daily life	1
2	Collected enough	2
3	Collected few	3

(ii) Picture collection:

Sl. No.	Criteria	Grade
1	collecting maximum number of coloured pictures	1
2	Collected maximum numbers pictures, and few in black and White	2
3	Collected few colour, And majority black & white	3
4	Collected pictures all black and white	4
5	Collected only few pictures	5

(iii) Effectiveness of Project Design:

Sl. No.	Criteria	Grade
1	Presented all the collect information and pictures and arranged it in a proper way	1
2	2. Presented all the collected information but the Pictures are few	2
3	3. Given information but the picture are not appropriate	3
4	4. Collected information but not presented.	4

PBL MODULE – 3

Project Topic: Forces in Daily Life

Target Standard: VIII Physics

Time duration: 1 week

Project Topic	Concepts to be Mastered	Driving question
Forces in Daily life	Gravitational force Frictional force Electrostatic force Electromagnetic force Magnetic force Nuclear force	What are the applications of forces in our daily life?

Work assignment:

Group I: The class teacher can show a few pictures of student in the class. This group can be assigned the task of collecting data and information electrical materials along with relevant pictures.

Group II: This group can be assigned the task of collecting the name of the equipments working under the frictional forces. Then collect the information about frictional force and along with relevant photos.

Group III: This group can be assigned to collect some materials and then construct working modules and demonstrate the types of forces.

Group IV: This group can be assigned to collect the information and pictures of nuclear reactors located in India.

Evaluation of the Project (SA)

1. What are the types of forces?
2. How skidding occur?
3. What are the touching forces?

4. What are the non-teaching forces?
5. In generator what types of forces used?
6. In cycle dynamos what types of forces is produced?
7. Which way the current is produces in submarines?
8. What force is used in lifts and bullet trains?
9. Why things fall down? Why it not go upwards?
10. How the match stick let fired?
11. How the fast moving things will be stopped?

Rubrics

Criteria	Grade A	Grade A	Grade C
Presentation	Presentation of data and information are effectively	Data information and presentation is good	Few data & informations presentations to need to improve.
Observation	Observing the things is fully involved	Partially involved	When ever the students involved this project their directions are scattering
Data collecting pictures / information	Identifying the tasks and data collections of pictures	Identifying the tasks and data are good but few information in collected	Lacking of information and data are poor
Questioning skill	Asking a lot of relevant questions about the topic	Asking few questions	Asking irrelevant questions
Participation to Answering skill	Answering correctly	Some students only are ideal	Most of students Don't give answers
Demonstration	Demonstration by the group on relevant topic	Demonstrations by the group are relevant and irrelevant	Demonstration to be improved
Use of Library	Collecting more informations from books and internet	Very little bit use of library	No usage of library

PBL MODULE – 4

Target Group:	IX (Measurements)	
Subject :	Physics	
Topic	Concept to be mastered	Driving question
Concept of length	1) Identify the portion of length in an objects 2) Need to measure the length of classroom, book etc. 3) Importance of length 4) Traditional method of measuring length 5) Modern methods of measuring length	Why should we measure length in day to day life?

Group 1

Ask the student s to measure the length of various objects in class room (activity)

Group 2

Ask the students to measure the household things.

Group 3

Ask the student s to measure different shapes of the objects

Group 4

Ask the students to collect different dimension of length. (Breath, radius, height depth, circumference etc.)

Group 5

With the help of physical educator measure the length of school campus, long jump, high jump activities.

Group 6

List out the places and absorbed the methods and tools are used for measuring length

Group 7

Ask the students to collect, unit conversion, smaller unit into longer and aware of BMI

PBL MODULE – 5

1	Target Group	:	Class VIII
2	Subject	:	Biology
3	Topic	:	Microbes
4	Driving Questions	:	What is the Role of microbes in living being?
5	Standards to be attained	:	Scope of microbes, classification of microbes, virus – bacterial disease, mode of infection, fungi- characteristic- disease- Role of microbes in food preservation, interaction between microbes- human being.
6	Task to be done by student		

<p>Group 1</p> <p>The teacher can show a few slides with help of Microscope in the class. This group can be motivated to collect infected plant parts and pictures</p>
<p>Group 2</p> <p>This group can be assigned the task of collection data regarding different item. That are used to prepare slide picture and type of disease</p>
<p>Group 3</p> <p>Student collect information regarding structure shape and classification of bacterial disease and usefulness</p>
<p>Group 4</p> <p>Collect information regarding structure, shape and classification of virus, harmful effect and benefit.</p>
<p>Group 5</p> <p>Collect information regarding structure harmful effect and benefit of fungi. Design activity for yeast culture and brad mould.</p>

Evaluative Question:

1. What are microbes?
2. Describe the structure and types of bacteria
3. How fungus prepares their food?
4. Describe viral disease
5. What is the economic importance of microbes?
6. Explain fermentation
7. What is pasteurization?
8. Compare the size of bacteria and virus

Rubrics:-

	Excellent	Good	Fair
a) participation	All are participated in the activity	Some are not interested not co-operated	Participation required many are not interested
b) Interest	Shows much interest	Interest to some extent	Need more interest
c) leadership quality	Has commanding co-ordinating	To some extent only	Need to have more qualities
d) presentation	Expressed well, answered all questions clearly	Answered some questions only explanation not concerned All aspect-some data-pictures are relevant	Explanation of the project needs improvement Data not sufficient Picture not sufficient
f) Group working	Group had co-ordination co-operation, all are participated	Some data are not relevant	Poor co-ordination and poor co-operation among members
g) experiment performed	Experiments were performed correctly more effort have been taken	Experiment complete with less effort	Need more effort
h) questioning	Questions were relevant	Some questions are not relevant	Asked only a few questions
i) answering	Answered correctly to all questions concepts understood	Some questions were answered. Concepts understood to some external	Answers partly correct, few questions were answered. More understand requires

PBL MODULE – 6

Target Group: **Class IX**
Subject : **Chemistry**
Time : **One week**

Project Topic	Concepts to be mastered	Driving question
Water	1. Physical and Chemical properties 2. Importance of pure water 3. Causes of Impure water 4. Agricultural usage 5. Storage and uses of water 6. Political issues	Why is water the most valuable compound in this world?

Work assignment:

Group 1:

The teacher motivates the students by asking some questions like why the ice cream is cool in nature. When does it melt? What do you see in the surface of the plants in winter season at dawn? Then the teacher gives some activities to find out how they occur?

Group 2

This group can be assigned the task of collecting the information regarding different uses of pure water. Then they are encouraged to find the range of pure water through the chemical testing.

Then they must collect the photographs and short films regarding this topic, the teacher asks the students to visit a nearby small scale industries

Group 3:

This group can record the problems and diseases which are accrued while using impure water. The teacher said the student said the students to list out the diseases using tabular column.

Sl. No.	Name of diseases	Nature symptoms of disease	Incubation period	Precautionary measures

For this they are encouraged to collect the data from library, parents, relatives and neighbours. The teachers ask them to visit the nearby hospital and collect all information about the diseases which are caused by water.

Group 4:-

The students are encouraged to visit their garden and agricultural fields. Then they are advised to find out how the plants grow, how much of water is essential for the growth of a particular plant. Then the teacher asks the students to watch their growth in stage by stage with in a week and report their observations.

Group 5:-

The students are asked to visit a dam which is nearer to their area. Why the dams are made? How the dams are useful in our daily life either directly or indirectly? Now a day we are suffering a lot due to scarcity of water. The teacher advises the students and reports their suggestions to eradicate the scarcity of water.

Group 6:-

What is the dispute between Kerala and Tamilnadu? Students are instructed to collect the information regarding the dispute. Collect the various informations from different sources like newspapers, magazines and media communications. The students are asked to analyze the matter regarding and report their ideas.

Assessment Summative

1. What are the factors of hardness of water?
2. Why water is slightly acidic in nature?
3. How is malaria caused?
4. How can we prevent diarrhoea?
5. Differentiate hard water and soft water?
6. Can pure water conduct electricity? Why?
7. Can we use rain water for our daily use?

8. Why is water considered as a major political issue now a day?

Rubrics:

Sl No	Content	Grade				
		1	2	3	4	5
1	Observation					
2	Planning					
3	Data Collection					
4	Discussion					
5	Presentation					
6	Questioning Answering Demonstration					



Regional Institute of Education, Mysore 570 006
Department of Extension Education

Title of the Programme: "Effectiveness of project based approach to teaching of
Science at secondary school level"

Programme Co- Ordinator:

Dr V Tangpu

Date/s 7th -9th December
2011

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SC-2 ST-1

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SC - 2

ST - 1

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SC - 2 ST

SC = (9)

ST = (2)



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