UNIT 8 LEARNING RESOURCES IN SCIENCE

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8.2 Objectives
8.3 Identifying Appropriate Learning Resource
8.4 Various Learning Resources
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8.1 INTRODUCTION
At elementary level, the child gains knowledge of scientific concepts by experience and observation but in higher classes they need more knowledge, therefore learning resources play a vital role in the process of learning. We all know that text books were the most widely used learning resource for science teaching for a long time; but in the present era, there has been a vast growth in each and every field and therefore the curriculum of science is reframed and restructured. With the explosion of new knowledge, new concepts and theories have emerged in science. These can be transacted in an effective manner with the help of appropriate learning resources. The child, members of the community and different resources available in immediate environment can be utilized as effective learning resources. Out of all available resources, a competent science teacher is expected to have the ability to identify appropriate learning resource for a specific content. In this unit, we will discuss the role of leaning resources in teaching-learning process of science and the process of developing learning resource center that suits the needs of the school.

8.2 OBJECTIVES
After going through this unit, you will be able to:

- explore learning resources from immediate environment,
- elaborate the concept of classroom learning resources,
- explain the nature and scope of science resource centre,
- describe the importance of various activities, organizing activities like field trips, quizzes, excursions, exhibitions, fair, lectures, etc,
• describe the role of Science express, mobile science laboratory, virtual laboratories in science,
• explain the role of innovation and Research in Science, and
• elaborate the nature and scope of Professional Development of Science Teacher.

8.3 IDENTIFYING APPROPRIATE LEARNING RESOURCE

Before discussing the role of learning resource in science, it is relevant to understand the process of appropriate learning resources. Let us discuss this issue in detail.

It is the responsibility of all the teachers to select resources-

a) that will enrich and support the curriculum, taking into consideration the diversity of interests and perspectives and the variety of abilities, learning styles and maturity levels of the learners served;

b) that will stimulate growth in factual knowledge, literary appreciation, aesthetic values, and knowledge of societal standards;

c) that positively and accurately reflect diverse perspectives on controversial issues, ensuring that learners have an opportunity to develop, under guidance, the practice of critical analysis and the ability to make informed choices/judgments in their daily lives;

d) that represent gender, appearance, sexual orientation, ability/disability, belief system, family structure, race and ethnicity, and socio-economic status

According to the **ROLE Psycho-Pedagogical Integration Model** (The ROLE PPIM) any learner centred teaching learning strategy will involve the following four phases:

1) Information of the learner is defined or revised.
2) The learner finds and selects learning resources.
3) The learner works on selected learning resources.
4) The learner reflects and reacts on strategies, achievements and usefulness.

The diagrammatic representation of this model is as follows:

![Fig. 8.1: The ROLE Psycho-Pedagogical Integration Model](image-url)
Now the question that arises is what may be the criteria of selecting a learning resource. In selecting the learning resources, a teacher should evaluate available resources and curriculum needs and consult reputable, professionally prepared selection of tools/aids and other appropriate sources. The actual resource should be examined whenever possible. Selection is an ongoing process which should include the removal of materials no longer appropriate and the replacement of lost and worn materials still of educational value.

**Criteria for Selecting A Resource**

One should take care of following criterion for selecting a resource of learning-

1. Learning Resources should support and be consistent with provincial and local pilot/program curriculum outcomes.
2. Learning Resources should be developed by competent teachers and meet high standards of quality in factual content and presentation.
3. Learning Resources should be appropriate for the subject area and for the age, emotional development, ability level, learning styles, and social development of the learners for whom the materials are selected.
4. Learning Resources should have aesthetic, literary and/or social value
5. Learning Resources should have a physical format and appearance suitable for their intended use.
6. Learning Resources should be one of a variety of media presentation modes.

Therefore, it is important to understand that learning resources should be activity-based rather than lecture-based because these are tools of interactive learning and involvement of learners in teaching learning is a prerequisite for ensuring optimum level of learning. The objective of using these resources is to encourage learning into group and cooperative learning, as well as to provide an opportunity for individual growth. It helps in applying knowledge of theory into practice and promotes hands-on experiences through various activities and an applied approach to learning. In addition to this, it encourages learners to question, think, react, reflect, and decide ways that develop critical-thinking and decision-making skills and offer choice and flexibility, as appropriate, to meet the needs related to individual aptitudes, abilities, learning styles, multiple intelligences, and interests.

Learning resources should be supportive of continuous learning by the individual and provide both formative and summative assessment and evaluation as appropriate.

**Social Consideration for Selecting the Learning Resources**

Some social considerations are also important while selecting the appropriate learning resources. These are as follows:

1. Learning resources should reflect sensitivity toward gender and sexual orientation, the perspective of aboriginal people, and cultural and ethnic heritage.
2. It should promote equality by enhancing learners’ understanding of a multicultural and diverse society and should be chosen to help learners understand the many important contributions made to our civilization by minority groups and people/groups with a variety of ethnic backgrounds.
3) It should be designed to motivate learners and staff to examine their attitude and behaviour, and to comprehend their duties, responsibilities, rights, and privileges as participating citizens in our society and support/promote learners’ self-esteem and respect.

4) It should recognize the integration of learners with special needs (as part of the class) and reflect good safety practices in texts and visuals (e.g., use of helmets, seatbelts).

5) It should portray positive role models and use language appropriate for the intended audience, and exclude slang, vernaculars, or expletives that detract from meaning.

From the above discussion we can conclude that the following four criterion should be kept in mind while selecting an appropriate learning resource along with academic, psychological and social considerations:

a) ** Appropriateness of learning resources**- It is important to select an appropriate learning resource for ensuring optimum learning among the learners.

b) **Availability**- It is always suggested that a teacher should prefer the locally available learning resources rather than resources from external sources. The resource room with all required learning resources should be readily available to the learners and teachers so that they can utilize it as and when required.

c) **Economic**- It is very important to use the learning resources that are cost effective because in a developing country like India where finance is a major issue we should construct low cost learning resources. Classroom learning resources, improvised learning resources and locally available learning resources may be better option.

d) **Safety**- The learning resources should be safe and secure for users (teachers and learners).

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**Check Your Progress**

**Notes:**

a) Write your answers in the space given below.

b) Compare your answers with those given at the end of the unit.

1) What are different social considerations while selecting a learning resource?

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2) Elaborate different criterion for selecting a learning resources.

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8.4 VARIOUS LEARNING RESOURCES

Before discussing the use of learning resources, it is important to define the learning resource. Various agencies described learning resources in a different manner. Some relevant explanations are as follows:

According to Department of Education, Canada “Learning Resources” refer to any person(s) or any material (whether acquired or locally produced) with instructional content or function that is used for formal or informal teaching-learning purposes. Learning resources may include, but are not limited to, print and non-print materials; audio, visual, electronic, and digital hardware/software resources; and human resources.

This can be interpreted from the discussion above that in a broader perspective learning resources includes human resource as well as physical resources. In this section of the unit, we will discuss a child’s ideas, ideas of community members and Resources from immediate environment.

Child’s Ideas as Learning Resources

This is one of the most important components of learning. Ideas of children can be learning resources for a teacher. Children develop abstract ideas from their physical surroundings and they select the idea relevant to them based on their objects/needs.

It is important to understand that learning involves abstract thinking and the children have the ability to develop abstract concepts from their world. They develop this ability by interaction with the environment during games and other activities. They find new ways to represent objects and experiences and generalize those experiences; that’s how children learn to think abstractly. This skill allows the children to build theories about their world.

Community Members as Learning Resource

The role of community is very vital in creating a conducive learning environment. The families begin to create the kinds of connections that address both intellectual and emotional needs of children. The subjects taught in school are related to our daily life and therefore the concepts that a child learns, are not only in the class but outside the class too. A child interacts with his/her siblings, parents, guardians and other members of the community. These interactions are vital learning resources. For example, village children get information about the crops from their elders. They develop the ability to identify different types of crops and crop cycle. It is easy to understand that the ideas and thoughts generated from
community and its members may be used as important resource of learning to optimize the learning experience of the learners.

**Resources from Immediate Surroundings**

Teaching-learning of scientific concepts is highly correlated with surroundings. The process of learning cannot be far removed from the immediate surroundings of the children. Different resources from immediate surroundings/environment are an essential part of the teaching-learning process. The relevant content available locally should be well utilized by the teachers. This content should be a part of the teaching-learning process ideally, to transact through activities drawn from the local resources. As a teacher, we should accept the importance of community members because most of the time children interact with them and there is a great impact of neighbours, friends and family members on their thought processes. Their daily life experiences help in developing a scientific attitude towards life. Children critically observe and explore the social reality around them while simultaneously enabling them to experience human and scientific values. The ideas given here demonstrate how the learning of science can be enjoyable and exploratory and how the science class can help in raising the awareness of learners about issues related to their environment, encouraging them to be instruments of change.

**Check Your Progress**

**Notes:**

a) Write your answers in the space given below.

b) Compare your answers with those given at the end of the unit.

3) Explain the role of child’s thoughts in the teaching-learning of science.

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**8.5 CLASSROOM LEARNING RESOURCES**

Classroom is a place where we organize the teaching learning process and it is responsibility of a teacher that s/he should develop educational atmosphere with the help of learning resources available in the classroom. Classroom learning resources are an important tool that can be used by the teacher to present the concept before the learners effectively and learners use these resources for better understanding and to gain hands on experiences for the concept. It can also be used to stimulate learners or relieve anxiety, fear or boredom since many learning resources are like games. Some of the most common learning resources include visual aids like the blackboard, pictures; audio aids like cassette tapes or CDs; and audio visual aids such as video tapes and so on”, even the teachers are a learning resource. In this section of the unit, we will discuss different learning resources available in the classroom. According to Grubb(2008), the school resources can be categorized as follows:
### Summary of Grubb (2008) taxonomy of school resources

<table>
<thead>
<tr>
<th>Type of classroom Resource</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Simple</td>
<td>Resources that are physical objects (e.g. textbooks) or classroom factors (e.g. teacher experience and expertise) that can be directly bought, adjusted, and measured</td>
</tr>
<tr>
<td>Compound</td>
<td>Two or more resources that are jointly necessary for success (e.g. class size reduction and adequate teacher preparation)</td>
</tr>
<tr>
<td>Complex</td>
<td>Resources that are not easily bought, measured, or adjusted (e.g. instructional approaches and teaching philosophies)</td>
</tr>
<tr>
<td>Abstract</td>
<td>Resources that are difficult to discern and measure, and often embedded in a web of relationships and practices within a given school (e.g. collegial decision-making practices, internal teacher accountability, and distributed leadership roles)</td>
</tr>
</tbody>
</table>

Now we can understand that different resources may be used as per the demand of the topic and level of the learner. There is no any definite strategy for using these resources but teacher can use these resources as per the requirement to attain the objectives of ensuring optimum learning. This can be better understood by the ecosystem model of classroom resources given by Zhao & Frank (2003) as given below:

![Classroom as Ecosystem Model](image)

Classroom as Ecosystem Model (drawn from description provided in Zhao & Frank, 2003)

This model indicates that the kind of the resource to be utilized by the teacher is dependent on the teacher, learners and environment. Some of the frequently used classroom resources may be enlisted as follows:

- Teacher’s thoughts
- Children’s thoughts
- Thoughts of community members
- Blackboard and other writing boards
- Books/textbook/worksheets
- Herbarium and other relevant equipments
- Audio resources like radio, tape recorder, mobile phone, etc.
• Visual resources like charts, pictures, models, epidiascope, micro-projector, film strips, etc.
• Audio visual resources like television, motion pictures, video films, living objects, etc.
• Interactive ICT resources like internet, computer, mobile and tablet, etc.
• Improvised and localized resources.

8.6 ICT AS LEARNING RESOURCE

Nowadays, it is being observed that there is a paradigm shift in the teaching-learning process and therefore in the support system that we use for effective teaching and learning. Information and communication technology is going through rapid and continuous change and therefore use of ICT is highly common in the teaching learning process. These changes are reflected by the change in the learning strategy of learners. Different researches proved that new generation of children are using these resources extensively and they share, use, develop and process information and technology for different purposes.

According to Meiers (2009), the teachers are required to possess all the skills that are essential to utilize ICT resources effectively. In this digital age, there is a growing body of evidence that use of ICT in the classroom can enhance learning. It is essential that the contemporary teacher has good ICT skills and is able to integrate ICT into the teaching and learning processes. It is highly recommended that after a good teacher education programme, the newly appointed teacher demonstrates current knowledge and proficiency in the use of ICT in the following areas:

• Basic operational skills
• Information-technology skills
• Effective use of the internet
• Software-evaluation skills
• Pedagogical skills for classroom management.

Different ICT resources includes-

1) ICT based learning objects- It refers to any digital resource that can be reused to support learning.

2) Multimedia Learning Resources- Computer-based multimedia learning environments - consisting of images, text and sound offer a potentially powerful setting for improving learner understanding.

3) Mobile Learning- The terms “M-Learning” and “Mobile Learning” are usually used to refer to teaching and learning with mobile technologies. It has following characteristics:

1) Spontaneous
2) Personal
3) Informal
4) Contextual
5) Portable
6) Ubiquitous (available everywhere)

7) Pervasive (so integrated with daily activities that it is hardly noticed)

4) The Internet and Social Networking – Internet is a rich resource for teaching and learning. Web 2.0 refers to a more recent 2nd generation collection of web-based tools, usually involving social networking (sites like facebook) and amateur publishing (like blogs and YouTube).

5) Interactive whiteboards, slide/PowerPoint presentations – In most of the schools, interactive whiteboards is used to deliver multimedia presentations in a classroom environment. Presentation software, such as Microsoft PowerPoint or Apple’s Keynote, plays an important role in many fields, especially in learning.

8.7 DEVELOPING LEARNING RESOURCE CENTRES

In the changing world in ICT era, it becomes a very big challenge to provide answers to the most educational questions through traditional resources. Learners use internet services and social media for different purposes and they get information flow from a dedicated review of most educational questions, whether from theoretical frames or material facilitations. Libraries and laboratories of the school were treated as most vital educational resource but in the changing scenario, it is important to develop these traditional resources as per the growing demands of the children and it is also important to develop new resources.

It is, also, a fact that there is urgent requirement to develop a centre that can cater to the need of learners and provide information via a wide diversity of technologies and resources. This kind of centre will be helpful for teachers and learners. Most popular term used nowadays for these kinds of centres is ‘Learning Resource Centre’. These centres can be used by institutions for multiple purposes. The prime objective of developing such centre is advancement in the learning experiences of the learner and teaching experiences of teacher.

Any school has many resources such as teachers, learners, community members, library, etc. This kind of centre may be a collection of different kind of information and techniques. Therefore, learning resource centre is essential for the teacher to utilize acquired information. This information is analyzed and evaluated by teacher to build a new knowledge and experience and develop them using several learning methods.

Need of Learning Resource Centre

As we know that any content can only be transacted to the learners only when the concepts are supported with practical knowledge. This will be only possible when different learning resources are readily available to be utilized in an appropriate way. Information provided by the book and printed material should be supported by different other learning experiences for concept clarity and hands on experiences.

Learning resource centers focus on incorporation of resources, information and communication technologies with educational practices inside the class. Learning resource centre’s universal purpose is to guarantee learning educational suitable environment that allows learner to take advantage from any kind of learning resources. It also encourages self-learning among the learners.
Components of Learning Resource Centre

There may be many components of learning resource centre. Some of the important components are as follows-

1) **Self-learning area:** Self-learning auditorium should enable access to all kind of information resources: printed, learning instruments, computerized and ICT resources.

2) **Group-learning area:** It has various equipments and uses, whereas available projectors depend on computer, radio or live presentation through digital camera. There is available, also, flexible furniture which can be reshaped to suit all kind of group and cooperative learning.

The most important elements of a good learning resource centre are different educational resources. In addition to these resources a good learning resource centre will have well defined policy made which will be adapted to satisfy the objectives of the learning resource centre. This policy should ensure the building and development of an integrated collection that can help and enrich educational curricula.

The learning resource as a teacher works with learners and other members of the learning community to analyze learning and information needs, to locate and use resources that will meet those needs, and to understand and communicate the information the resource provides. Learning resource centre is supposed to be successful when it is fully engaged in implementation of modern learning methods. A good learning resource helps in the learning process and evaluation.

There are following two methods of utilizing learning resource centers-

a) **Cooperative Learning:** In this type of learning strategy a teacher has to take at least one class in learning resource centre.

b) **Self-Learning:** In this type of learning strategy the learner is allowed to learn by themselves. The role of teacher is a facilitator.

Many activities are organized in the learning resource centre. These can be diagrammatically represented as follows:

![Diagram of activities in a learning resource centre](image-url)
Through these activities Learning Resource Centers provide the services of Guiding readers, References services, Borrow out along with Copying and scanning and bibliographical services.

These activities and services develop the learning resource centre as a necessary place where teachers arrive to help them to implement their tasks and achieve their educational aims.

### 8.8 IMPORTANCE OF VARIOUS ACTIVITIES IN SCIENCE TEACHING-LEARNING

Science cannot be taught through books alone. It is always experimented with, observed and experienced through a number of practical activities done inside and outside the school by the learner themselves. For effective science teaching it is needed that co-curricular activities and after various other approaches like organization of field trips along with different activities. Let us discuss different activities that help in learning scientific concepts effectively:

**Field Trip or Excursion**

Field trips are an important part of the science curriculum because it provides opportunities of hands on experience of science. It is a visit to a place outside the regular classroom which is designed to achieve certain objectives, which cannot be achieved as well by using other means. We can understand by taking example of interdependence of plants and animals. The textbooks provide conceptual knowledge but cannot provide hands-on experience; that may create difficulty in achieving educational objectives. In such a lesson, this strategy is required. Field trips give opportunity for learners to get out of the classroom and experience many new things. The located place for field trip can be zoo, collage, museum, theater, school, science park, botanical garden, etc.

The use of the term ‘field work’ emphasizes some of the formal exercises which are done outside of the classroom, usually in biology and geology at senior high school and tertiary levels. These activities may be considered to be a subset of field trips or excursions.

The benefits of field trips can be summarized as follows:

1. It helps in clarifying subject matter.
2. It creates interest in the subject.
3. It has entertainment value and makes the learning enjoyable.
4. It helps the learners in establishing contact with outer world.
5. It develops scientific attitude and scientific temper among the learners.
6. Filed trips or excursions are very useful in collecting useful material.
7. Excursions help in developing the spirit of cooperation among the learners.
8. It provides opportunity for the selection of the projects.

Concluding our discussion you will get to know that the scientific excursions or trips when organized in a systematic and proper way prove to be quite effective and useful from the point of view of the realization of the aims and objectives of teaching science.
Teaching-Learning of Science

Quiz

Organizing Quiz is a very important activity to make the learning of scientific concepts more enjoyable. Organization of quiz promotes the learning directly in the context of classroom instruction and it reduces the rate of forgetting after the instruction. Quiz helps in learning the learners in two ways:

a) Using “pre-questions” to activate prior knowledge and focus learners’ attention on the material that will be presented in class.

b) Using quizzes to re-expose learners to key course content. Recommendation includes a third way to use quiz for making decisions about allocating study time.

Quiz may be organized as a part of instruction and it can also be used as a co-curricular activity to promote scientific temper among the learners.

Science Fair, Exhibition and Talk on Science

These are one of the most popular ways of making the learning of science enjoyable. Different national and state level organizations like NCERT and state departments of education are working together for the promotion and encouragement of science fairs at the district, regional and state level. They provide required financial assistance and expert guidance to schools for organization of such fairs. These fair provide a forum for interaction among science scholars and learners on the issues of scientific enquiry. Many formal and informal activities related to the teaching and learning of science are organized by coordination among participants and holders. Many other programmes are organized by the host club or some other agency.

Some of the major activities may be undertaken in the science fairs are as follows-

1) Debates, declamation and paper reading contests
2) Essay competition on different events and concepts of science.
3) Group discussions, seminars and workshops
4) Lectures and talks of science teachers or scientist
5) Science quiz contest
6) Completion for developing teaching aids of science.
7) Film shows and plays on scientific concepts.

Science fairs and exhibitions are very useful and it has a social value along with its educational value.

8.9 INNOVATION IN SCIENCE LABORATORIES

Now days, the world is experiencing a lot of development in the field science. For example, a new element becomes the part of periodic table. Many new concepts and many new theories arrive at the doorstep of the learner and laboratory play a vital role in providing hands on experience to the learner. You can easily understand the fact that establishing these laboratories are an essential part of the school infrastructure but at the same time it is very costly and impractical to establish a well-equipped laboratory for each and every school. Therefore, the concept of alternative laboratory arrived to cater to the needs of the learners.
Some of the major innovations in this area are Science Express, Mobile Science Lab and Virtual Laboratories. In this section of the unit we will discuss these laboratories to gain a better understanding of the same.

**Science Express**

This is a concept coined by the Department of Science and Technology and Ministry of Environment and Forests, Government of India. It is a train with AC coaches and it travels across India with a view to sensitize the people to different issues of science and to develop scientific attitude and temper among learners. For example, ‘Science Express - Biodiversity Special’ (SEBS) is an innovative mobile exhibition mounted on a specially designed 16 coach AC train, travelling across India from 5 June to 22 December 2012. SEBS was the fifth phase of the iconic and path-breaking Science Express.

**Mobile Science Lab**

It is a well known fact that it is very difficult to establish science labs in each school of India. Mostly in rural areas, most of the schools do not have this kind of laboratory and this has an adverse effect on learning of scientific concepts. This leads to learning of science without performing or even observing a single experiment. Mobile Science Lab (MSL) is one of the best alternatives and initiatives to cater to the needs of the learners. It gives the learners in secondary schools a chance to learn science by performing experiments, thus giving them not only the pleasure of “learning by doing” but also rendering the subject enjoyable and easy to understand.

Mobile Science Lab emphasizes to learners that in general, statements should not be accepted as facts just because they are stated in a book. Instead, they should be verified by observations and rational conclusions drawn from such observations. It is through such an attempt, we hope to inculcate and nurture a scientific attitude among the school children. A good mobile lab possesses all the essential equipment, materials and infrastructure. It should possess all the safety features for conduction of the experiments safety and the materials should be kept safely so that movement of the science lab should not have any adverse effect on the equipment and materials. First aid box and doctor on call facility should also be provided in these kinds of labs.

Following activities may be performed in Mobile Science Laboratory-

- Technology classes
- Science laboratories
- Hands-on workshops
- Video presentations
- Job skills training classes

**Virtual Lab**

The whole world is growing as virtual world and therefore education now has more virtual components. Virtual labs are an innovative concept where a laboratory experiment is possible without real laboratory with its walls and doors. It allows the learner to link the theoretical and the practical aspects of any scientific concepts, without papers and pens. It is based on a software Programme that can create virtual environment of lab. To understand the concept of virtual lab, we will try to explore the definition of virtual labs.
Teaching-Learning of Science

According to Harry & Edward (2005) virtual lab may be defined as “A virtual studying and learning environment that aims at developing the lab skills of learners. This environment is located on one of the internet pages. Usually, this page has main page & many links, which are related to laboratory activities & its achievements.

From this definition, we can conclude that the virtual lab can be defined as virtual platform for studying and learning science that stimulates the real lab. It provides the learners with tools, materials and lab sets on computer in order to perform experiments subjectively or within a group at anywhere and anytime. These experiments are saved on CDs, Pen drives, Hard disks or on a web page.

Any virtual lab may have following components-
1) **The lab sets & equipments**: These are required because virtual lab is complementary not alternative of real lab
2) **Computer devices**: they are represented in personal computers connected to an intranet and internet connection
3) **Communication network & the related hardware**
4) **The Programs of the Virtual Lab**: These programs are represented in the simulation programs, which are designed by professionals.
5) **Co-operation Programs & Management**
6) **Technical Staff**: It is important to have a technical team to support educators in preparing and assessing scientific materials.

Concluding our discussion, we can state that virtual labs are very useful in enhancing the learning experience of the child. Through virtual labs, experiments can be done quickly and easily and it allows observation and safe measurement where as the experimental process is very slow and / or complex and not compatible with the teaching time available.

8.10 ROLE OF INNOVATION AND RESEARCH IN SCIENCE

Innovation and research in science education is one of the important prerequisites for the development of sciences. As is known, the researchers conducted in the area of science aims to achieve advancement in economic growth, social development and protection of environment.

The major areas of research are Science curriculum, Pedagogy of science, Misconceptions in Science, Evaluation techniques and many more. In addition to this, as the science scholars conduct researches for innovations and new concepts, theories and inventions are arriving. Therefore, researches and innovations are a boon for the development of Science and science education. These researches may be on two levels – school level and at the level of scientists and institutions working in the area of science.

The curriculum of science should be need based and it should be in tune with national and international demands to fulfill the objectives of scientific era. The innovations and researches in the science should focus on making the concepts more interesting and enjoyable so that the learners gain an understanding of
Learning Resources in Science

8.11 PROFESSIONAL DEVELOPMENT OF SCIENCE TEACHERS

Professional development refers to informal and formal methods that help develop professional skills of teachers in a formal or informal way. Staff-development and in-service training programmes are widely used for professional development for teachers. Teacher-training and professional development of science teachers is another thrust area and the focus here should be on studying the curricula of both pre-service and in-service science teacher-training programmes. Teachers need to learn to create a suitable environment and employ approaches that boost active questioning and identification of issues and answers by learners. They need to be able to encourage learners, to test the information presented and discuss its personal significance. These abilities cannot be established through traditional programmes of professional development. To cater to the need of teachers for training a carefully designed, sustained, professional development Programme is the need of the hour that actively involves teachers in the learning process of science.

Professional development for teachers should be analogous with professional development for other professionals. Becoming an effective science teacher is a continuous process that stretches from pre-service experiences in undergraduate years to the end of a professional career. Science has a rapidly changing knowledge base and expanding relevance to societal issues, and teachers will need opportunities to build their understanding and ability. Teachers also must have opportunities to develop an understanding of how learners with diverse interests, abilities, and experiences make sense of scientific ideas and what a teacher does to support and guide all learners. And teachers require the opportunity to study and engage in research on science teaching and learning, and to share with colleagues what they have learned.

Check Your Progress

Notes: a) Write your answers in the space given below.

b) Compare your answers with those given at the end of the unit.

4) Enlist different types of classroom resources and categorize them.

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<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>5) Enlist ICT resources that can be used as learning resource of science.</td>
<td></td>
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<tr>
<td>6) What are different essential components of Learning Resource Centre?</td>
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</tr>
<tr>
<td>7) How are science fairs and exhibitions helpful in making the teaching-</td>
<td></td>
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<tr>
<td>learning of science enjoyable?</td>
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<tr>
<td>8) Discuss limitations of virtual laboratory in your words?</td>
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</table>

### 8.12 LET US SUM UP

For effective teaching-learning, use of appropriate learning resource is very important. This unit has discussed various criteria which will help you in selecting the appropriate resource. You will agree that an effective teacher can utilize his/her class as resource if s/he is aware of the dynamics of classroom. Physical resources in the classroom as well as learners with diverse experiences both can be used as effective resources. Unit focuses on developing learning resource and resource center at your school as many schools are still not equipped with state of the art laboratories. Apart from this, activities like field trip, science fair, exhibitions, talks on science, etc. can be used effectively as learning resource for facilitating teaching-learning in science. As a science teacher you should be read for your professional development, for which unit sensitizes you.
8.13 UNIT END EXERCISES

1) As a science teacher how will you identify appropriate learning resource for science? Answer with a relevant example.

2) Briefly describe the concept of learning resources.

3) What are different Classroom learning resources? Describe with the help of some examples.

4) Indicate the need and scope of ICT to be used as learning resource. How is it useful for teaching-learning process?

5) Discuss the need of science resource centre. Give a brief overview of a good science resource centre.

6) What is the relevance of co-curricular activities in teaching science? Describe with the example of field trip.

7) Discuss different innovations in science teaching and science laboratories.

8) Briefly describe the concept of professional development with respect to science teachers of secondary level.

8.14 ANSWERS TO CHECK YOUR PROGRESS

1) Your answer should include following points:
   - Learning resources should not cater to the needs of a single category of children.
   - It should have equal effect for all the learners of the class.
   - While selecting a learning resource, a teacher has to ensure that it is not biased to anyone based on gender, race, color or socio-economic background.
   - It should have ethical consideration.

2) Your answer should include following points:
   - Learner’s abilities should be the deciding factors.
   - Learning environment is important aspect of this strategy.
   - Learning resources are an important part of the learner centred teaching strategy.

3) Your answer should include following points:
   - Relevance of learning resource based on the topic to be taught.
   - Low cost teaching aids should be selected.
   - Safety and availability are other considerations.

Check Your Progress 2

1) Your answer should include following points:
   - These are resources that help the learners in understanding different concepts of science.
   - Teachers Thoughts, Child’s Thoughts and all other teaching aids, libraries and laboratories are apart of learning resources.
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2) Your answer should include following points:
   • In a learner centred strategy of teaching science the role of learner is important.
   • Children learn from their environment and their experiences may be utilized to develop different scientific concepts.

Check Your Progress 3

1) a

2) According to Grubb, the teaching resources may be categorized in four categories namely simple, compound, complex and abstract.

3) Different ICT resources include ICT based learning objects, Multimedia Learning Resources, Mobile Learning, Internet and Social Networking. In addition to this Interactive whiteboards and Slide Presentations are also used as learning resources in science.

4) Learning Resource Centre should have all kind of information resources: printed, learning instruments, computerized and ICT resources along with projectors depend on computer, radio or live presentation through digital camera.

5) These are one of the most popular ways of making the learning of science enjoyable. These provide forum for interaction among science scholars and learners on the issues of scientific enquiry. Many formal and informal activities related to the teaching and learning of science is organized by coordination among participant and holders.

6) Virtual laboratories are not a replacement of the real labs but they act as support for the tradition experimentation at school level.

8.15 SUGGESTED READINGS AND REFERENCES


http://en.wikipedia.org/wiki/learningresources-