**Lecture Notes on Problem Solving**

**DEVELOPMENT OF LIFE SKILLS-II (T.W.)**

*4th Semester: Electrical Engineering*

*Subject Code: 1620411*

*F.M.-25: [7 Internal Marks + 18 External Marks]*

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**Lecture Outcomes**

**After this session student will be able to:**

- List the steps of problem solving.
- Explore the problem.
- Gathered the information related to Problem,
- Evaluate the evidence on the basis of gathered the information.
- Suggest the alternative solutions to the problem.
- Apply an appropriate technique to solve the existing problem.

> “Problems are nothing but wake-up calls for creativity” — Gerhard Gschwandtner

> “All life is problem solving.” — Karl Popper

* Engineers are problem solvers. *

Before we talk about the stages of problem solving, it is important to have a definition of what it is. Let’s look at the two roots of problem solving — **problems and solutions**.

**Problem** – A state of desire for reaching a definite goal from a present condition.

**Solution** – The management of a problem in a way that successfully meets the aims set for treating it.

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1 Ramun Prasad, Lecturer, Humanity (Economics), Govt. Polytechnic, Gaya
Thus, Problem solving is a purposeful goal-oriented action. It is a process that involves finding, analyzing, and solving those problems.

I. Steps in problem solving\(^2\)

1. **Identify and clarify the problem:**
   Ask yourself what the problem is. There may be multiple issues within a single situation. Make a list of these issues and define why each one is a problem for you or for your societies.

2. **Information gathering related to problem:**
   To solve the problem we need to gather information. This gathered information tell us “is really any problem exist or not?????”
   
   **Stakeholders:** Individuals, groups, industries or other organizations that are affected by the problem, or its solution. Begin with yourself. Decision makers and those close to us are very important to identify.
   
   **Facts & data**
   - Research
   - Results from experimentation and studies
   - Interviews of "experts" and trusted sources
   - Observed events, past or present, either personally observed or reported

   **Boundaries**
   The boundaries or constraints of the situation are difficult to change. They include lack of funds or other resources. If a solution is surrounded by too many constraints, the constraints themselves may be the problem.

   **Opinions and Assumptions**
   Opinions of decision makers, committees or groups, or other powerful groups will be important to the success of your decision. It is important to recognize, truth, bias, or prejudice in the opinion.

   Assumptions can save time and work since it is often difficult to get "all the facts." Recognize that some things are accepted on faith. Assumptions also have a risk factor, must be recognized for what they are, and should be discarded when they are proven wrong.

3. **Evaluate the Evidence:**
   We evaluate it, on the ground of gathered information. Evidence provides justification for beliefs. Evidence can be quoted as a purpose for believing, or not believing some claim. Each person’s beliefs reflect their total assimilation of evidence over time (प्रत्येक व्यक्ति का विश्वास समय के साथ साक्ष्य के कुल आत्मसात को दर्शाता है).

4. **Consider alternative solution and their implications:**

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\(^2\) [https://www.humorthatworks.com/learning/5-steps-of-problem-solving/](https://www.humorthatworks.com/learning/5-steps-of-problem-solving/)

\(^3\) [https://www.virtualsalt.com/crebook3.htm](https://www.virtualsalt.com/crebook3.htm)
But when you try to build toward desired results, it’s very difficult to collect good information about the process. Due to this, we have to see towards alternatives which can significantly enhance the value of your final solution.

Once the team or individual has decided the “what should be” model, this target standard becomes the basis for developing a road map for investigating alternatives. Brainstorming and team problem-solving techniques may be proved useful tools in this stage of problem solving.

5. **Choose and implement the best alternative:**
   Skilled problem solvers use a series of considerations when choosing the best alternative. They consider the extent to which:
   (i) A specific alternative will solve the problem without causing other unexpected problems.
   (ii) All the individuals involved will accept the alternative.
   (iii) Implementation of the alternative is likely.
   (iv) The alternative fits within the organizational constraints.

   The application of a solution requires planning and execution. It is often iterative, where the focus should be on small implementation cycles with testing and feedback, not trying to get it “perfect” at the first time.

6. **Review:** What did you do? To know you successfully solved the problem, it is important to review what worked, what didn’t and what impact the solution had. It also helps you to improve long-term problem solving skills and keeps you from re-inventing the wheel.

Once you understand the six steps of problem solving, you can build your skill level in each one. Often we’re naturally good at a couple of the phases and not as naturally good at others. Some people are great at generating ideas but struggle to implement them. Other people have great execution skills (निष्पादन कौशल) but can’t make decisions on which solutions to use. Knowing the
different problem solving steps allows you to work on your weak areas, or team-up with someone who’s strengths complement yours.

II Problem Solving Technique (any one technic may be considered)

I. Trial and Error
II. Brainstorming
III. Lateral thinking

I. Trial and error (परीक्षण एवं त्रुटी):

- Trial and error technique can be used to solve the some complex problems. This is typically good for problems where you have multiple chances to get the correct solution. However, this is not a good technique for problems that don’t give you multiple chances to find a solution.
- Trial and error does not require you to have a lot of knowledge.
- It plays an important role in the scientific method as well.
- Trail and error is also an excellent tool for inventors.

II. Brainstorming (विचार-मंथन):

- Brainstorming is a group method for obtaining new ideas and business solutions. The groups are organized for sitting together and stimulate greater creativity by exchange of mutual experiences and participating in the discussions.”
- Brainstorming is supposed to be about harnessing the power of thinking (सोच की शक्ति का दोहन) outside the box to solve that impossible problem. It’s the magic that helps you find amazing, unique ideas.
- Brainstorming can be an effective way to generate lots of ideas on a specific issue and then determine which ideas is the best solution.
- It is most effective with groups of 8-12 people and should be performed in a relaxed environment. If participants feel free to relax and joke around, they will stretch their minds further and therefore produce more creative ideas.
- It is an easy and simple technique which encouraged and stimulate for creative thinking.
- For example: It is commonly used for advertising, the development of new products, process management and business planning.

There are four basic rules in brainstorming:

1. No Criticism: Criticism is reserved for the evaluation stage of the process. This allows the members to feel comfortable with the idea of generating unusual ideas.

2. Welcome unusual ideas: Unusual ideas are welcomed as it is normally easier “tame down” (निचे गिराना) than to “tame up” (शुरू करना) as new ways of thinking and looking at the world may provide better solutions.
3. Quantity wanted: The greater the number of ideas generated the greater the chance of producing an effective solution.

4. Combine and improve ideas: combine ideas in order to make them better.

III. Lateral Thinking (पार्श्व सोच):

- Later thinking is the mental process of generating ideas and solving problems by looking at a situation or problem from a unique prospective. It is ability to think creatively.
- It involves breaking away from traditional modes of thinking and discarding established pattern and preconceived notions (पूर्वायुक्त विचार).
- This technique provides a deliberate, systematic process that result in innovative thinking.
- To understand lateral thinking, it is necessary to compare lateral thinking and critical thinking. **Critical thinking** is primarily concerned with judging the true value of statements and seeking errors. **Lateral thinking** is more concerned with the "movement value" of statements and ideas. A person uses lateral thinking to move from one known idea to creating new ideas.

**Conclusion**

Thus, in this unit we have learned about the different steps and techniques of problem solving.

**Assignment**

Solve assignment 3 & 4 of your curriculum (syllabus)