Problem Solving Methodology[*]

Thinking is a natural ability we use in our daily lives for various purposes like solving a problem, while dealing with people, when buying items from a supermarket, etc. Effective utilization of this ability ensures a quality life. The good thing is, quality in thinking can be cultivated through a systematic effort. In this article, we describe a five step procedure on how to think effectively, while solving a problem. This is inspired from the article "On the role of scientific thought" by Dijkstra [1]. The essence of this procedure is the powerful concept of "separation of concerns" [1], based on the realization that we humans have very small heads.

There are two major phases in solving a problem: *problem understanding* and *problem solving.* Let us discuss these one by one.

Problem Understanding

The first step in solving a problem is to define the problem precisely. Trivial it may seem, a problem well defined without any ambiguities gets our job half done. On the other hand, an ill defined problem statement invariably leads to incorrect solution.

The essence of effective thinking is the powerful concept of "separation of concerns". It is, that one is willing to study in depth one aspect (or concern) of a problem in complete isolation of the other aspects. This is based on the realization that we humans have tiny heads. Hence conscious effort must be made not to clutter our heads with many aspects at the same time. The next two steps are based on this powerful concept.

Once the problem is stated, various aspects related to the problem are identified. From the problem definition, we can understand whether we are concerned about efficiency of the solution, its simplicity, ease of use, etc. Identifying various aspects related to the problem is important as it helps to get a clear idea of what to think on.

Prioritization of the various aspects identified is done next. This helps us to have a focused attention on the more serious aspects of the problem.

Problem Solving

The problem can now be solved by addressing the various aspects, one aspect at a time, according to its priority. This does not mean ignoring the other aspects, it is just doing justice to the fact that from this aspect's point of view, the other is irrelevant.

Once all the aspects are addressed, examine the solution holistically.

Summary

Effective thinking can be cultivated through a conscious application of the powerful concept of "separation of concerns". This concept is based on the realization that we humans have tiny heads. To sum up, the steps to cultivate effective thinking are:

1. State the problem **precisely**.

2. Identify the **various aspects** related to the problem.

3. **Prioritize** the aspects identified.

4. Address these aspects **one at a time**.

5. Examine the solution **holistically**.

References

[1] Dijkstra, Edsger W. EWD447 : On the role of scientific thought. in *Selected Writings on Computing: A Personal Perspective*, Springer-Verlag, 1982.