

## Unit 6: Supporting clarifying terms and defining the problem



### Introduction

Einstein famously said “If I was given 1 hour to solve a problem I would spend 55 minutes thinking about the problem and 5 minutes thinking of solutions”

The first two steps in the PBL process are concerned with understanding the problem. This unit explains each of these steps and how to support learners during these stages.

Lesson 1: Clarifying terms

Lesson 2: Defining the problem

Lesson 3: Supporting clarifying terms and defining the problem and assignment

Without clarifying ambiguities and understanding why the problem exists it can lead to the implementation of solutions which are short term and do not address the real cause of the problem. These two steps are important to the success of PBL

### Lesson 1: Step 1: Clarifying terms

In the opening meeting and the first step of the PBL process the trigger (problem description) is read out to all the students.

The students then discuss if they understand the meaning of the trigger and if there are any items or terms that might be interpreted differently or not understood.

For the below problem

#### Example

Company X has problems with cashflow. Some months there is a shortfall and they find it difficult to pay suppliers, other months there is no problem and there is sufficient funds to pay suppliers and other debts. It is becoming more difficult to receive overdrafts from the banks due to new financial rules. In the past 12 months our overdraft has reduced by 20%. In the past year they have had to rely on overdrafts for 8 out of the 12 months. As a result of the Problem Based Learning process we would like to

1) Reduce our dependence on overdraft facilities from 8 months to 2 months

For example if a company is having problems with cash flow. The group might want to clarify what is meant by the term cash flow in the context of the problem. Is it income?

Shortfall seems to mean the deficit between income and expenditure (there is not enough money to pay suppliers) Therefore in this context cash flow seems to be a shortfall between income and expenditure. If so what is meant by income and what is meant by expenditure.

- Income is all moneys received into the company as a result of sales, it does not include shareholder investments
- Expenditure relates to all short term costs. It does not relate to any long term costs e.g. salary, stock, rent, light and heat etc.
- Debts relates to any monies owed on a monthly basis e.g. suppliers, rent, bank loans

This step can be relatively short depending on the complexity of the problem.

## **Lesson 2: Step 2: Defining the problem**

The second step involves understanding the problem. The learner must be encouraged to explore the problem. Novice learners generally do not try to understand the underlying principles of the problem before applying their knowledge (Jonassen, 2003). Traditionally learners are taught to apply a procedural approach which cannot be applied to all situations.

Therefore learners must be taught to question and inquire before reaching a solution. During defining the problem the learner must be encouraged to think in terms of needs rather than solutions. The learner should be encouraged to ask the relevant questions such as (note the types of questions asked will depend on the problem)

1) What does the learner know about the problem. Information can be in the form of

- Facts – are definite pieces of information that cannot be disputed. For the cashflow example in lesson 1 facts might be that 20% of our sales are cash sales
- Inferences - are assumptions we make on the basis of reasoning. For the above example inferences we might make may be that domestic customers do not require credit and bring in immediate income. We have a higher rate of business customers because we offer better credit terms
- Speculations or opinions – are assumptions we make based on gut feeling or experiences and there is no reasoning behind making them. For the above example speculations might be the reason for the cash flow problem is due to poor forecasting.

2) What is relevant - Often a lot of information is presented not all of which is relevant. Therefore the learner needs to filter out what information is relevant to the situation and what is not.

3) What do you need to know to help you to understand the problem more (what is missing) – For the above example we might need to know what is the procedure for managing and ordering inventory and how does it relate to customer demand.

4) Why does this problem exist?/What are the potential causes of the problem and what effects do they display. The potential causes of the problem discussed in lesson 2 may be due to our low level of domestic sales (which results in a delay in receiving cash), our credit terms (as they longer than those offered by our suppliers there is a deficit), our forecasting techniques (lack of planning often results in ordering too much inventory), our inventory management (impacted by lack of planning

results in excess inventory) or our sales terms (customers might be expected to bulk by which might not be conducive to domestic customers)

5) How does the problem impact other areas of the organisation? For the previous example cashflow might be seen to be a finance issue however it also impacts purchasing, warehousing and sales.

6) Why do people operate in this manner? You might need to understand why inventory is managed in a particular way and why the procedures do not encourage forecasting or customer collaboration

8) Frequency of the problem? How often does the problem occur. From our example we can see that the company had a cashflow problem 8 out of 12 months in the financial year. Why does the problem arise so frequently. What happened differently in the 4 months that did not require an overdraft to the other 8 months? What months was an overdraft required and where there any events that could relate to the need for an overdraft in these months?

9) When did the problem occur? When did the problem first arise? From our example when did the company first start experiencing the problem does it coincide with anything that changed within the company at that time? Was it when sales started increasing/decreasing? Was it when the ratio of business customers versus domestic customers increased? Was it when our suppliers changed their credit terms? Was it when new financial regulations were introduced?

### **Lesson 3: Supporting clarifying terms and defining the problem.**

When a learner is presented with a problem they aim to make sense of the problem in their own minds, this is known as internal representation (also known as personal or mental representation) This is often done in a simplistic manner such as making inferences and assumptions (see the ladder of inferences by Peter Senge in Unit 2). The internal representation forms an input into the groups external representation.

Successful problem representation is key to enabling problem definition. Problem representation involves identifying how one or a group of people perceive or interpret the problem. To do this it is important to use qualitative (as well as quantitative methods of required) to represent problems as it allows the learner to represent their knowledge (structure, procedural, reflective and images and metaphors) in different ways which allows them to transfer their skills the problem (Jonassen, 2003)

As a facilitator you must encourage the learners to represent their knowledge and problems in multiple ways using a variety of tools this encourages the learner to apply domain knowledge to the problem by . These tools can vary (and also applied to the brainstorming). They encourage the learner to express the problem in different forms (written/numerical/pictorial) and organise it differently (groups and hierarchies) this facilitates information acquisition and the combination and evaluation of concepts. (Jonassen 2003) Main tools are:

- Questioning the students by using the question types outlined in Lesson 2 and asking the learner to explain why they define the problem in that particular way.
- Concept maps and causal mapping – these can facilitate organisation through building patterns and relationships. To build a concept map you put the main problem in the center. For the above example this may be cashflow and the things that might contribute to it in circles around it e.g. forecasting, credit terms, inventory management, purchasing terms, sales terms, customer type. You can expand each of these issues e.g. forecasting might be

down to poor customer and supplier collaboration, lack of expertise. This can be done manually or you can download software to facilitate this one example is CMAP (available for free)- <http://cmap.ihmc.us/>

- Matrix or tabular representations – these are useful to classify relationships between concepts or show how two factors/variables interact e.g. the risk assessment matrix in project management classifies risks in terms of the probability they will occur and the severity if they occur. These can be created in tools such as MS word or drawn on a whiteboard.

| RISK ASSESSMENT MATRIX  |                     |                 |                 |                   |
|-------------------------|---------------------|-----------------|-----------------|-------------------|
| SEVERITY<br>PROBABILITY | Catastrophic<br>(1) | Critical<br>(2) | Marginal<br>(3) | Negligible<br>(4) |
| Frequent<br>(A)         | High                | High            | Serious         | Medium            |
| Probable<br>(B)         | High                | High            | Serious         | Medium            |
| Occasional<br>(C)       | High                | Serious         | Medium          | Low               |
| Remote<br>(D)           | Serious             | Medium          | Medium          | Low               |
| Improbable<br>(E)       | Medium              | Medium          | Medium          | Low               |
| Eliminated<br>(F)       | Eliminated          |                 |                 |                   |

Figure 1: Example of a risk assessment matrix <sup>1</sup>

- The use of flowcharts – these tools are useful to articulate processes or procedures to enable the learners to identify potentially where there may be problems.

Encouraging learners to represent the problem in a variety of ways increases their understanding of the problem and their ability to interpret and apply their prior knowledge. In addition asking the students to articulate their reasoning behind defining a problem enables them to express their internal representation (mental models) and enhances their understanding of how they define the problem.

### Assignment

For the problem you have identified in Unit 3 and set up an opening meeting for in Unit 5. Do your own PBL preparation.

- 1) Clarify any terms you might think be an issue
- 2) Define the problem, create your own internal and external representation of the problematic
- 3) Explain how you will support the learners to complete these two steps in the opening meeting.

<sup>1</sup> <http://www.advanceddivingsystems.com/>

When you facilitate the opening meeting for the problem, do not participate. However provide support to the learners as much as possible by questioning them when needed and asking them to represent the problem in different ways.

Please read the below resource for more information.

**Supplementary reading**

Using cognitive tools to represent problems