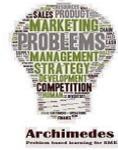## Unit 9: Synthesising a solution, reflection and reapplication

Introduction

Once the learner feels they have gathered enough information to satisfy the learning objectives we enter the closing (discussion) phase. This phase involves three steps (steps 7-9). Each lesson in this unit corresponds to one of these steps. The unit will cover:

Lesson 1: Synthesising a solution (Step 7)
Lesson 2: Reflection (Step 8)
Lesson 3: Reapplication (Step 9)

As a facilitator your job is to be aware of how to oversee and facilitate the closing phase to ensure that the students successfully reach a solution, reflect on what they have learned and identify opportunities for reapplication of this learning.

Lesson 1: Synthesising a solution.

This step involves the learners meeting to discuss the findings of their self-study and how they achieved the learning objectives. The main purposes are[1]:

- To consolidate knowledge by putting it into words and discussing it.
- To assist each other in understanding difficult concepts A student who has come to understand a difficult concept is often the best person to help a peer who is struggling with it.
- To elaborate and enhance each student's pool of knowledge. Sharing different answers to the same questions elaborates upon the learning of individual students and produces a sum that is greater than its component parts.
- To critique and correct any misconceptions. Pooling information provides opportunity for students and the PBL Facilitator to correct each other, resolve conflicts raised found during the data gathered in Self-study and add new learning.
- To identify the limits of existing knowledge through critical reflection on the answers the group has found.
- To train students in the discipline of citing and criticising resources. Students should start to be able to judge the validity of information by its source, critically appraise strength of evidence and learn 'triangulation' of information by cross checking different sources

In the closing discussion each student should come prepared to talk through and share the work they have done on each of the set learning outcomes. It is possible that during the discussion not all issues will be resolved and new ones may appear. These are dealt with in the same way as for the

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[1] from https://www.york.ac.uk/media/law/documents/pbl_guide.pdf

first session, by identifying fresh learning outcomes. These are then studied privately for the remainder of the week and the result brought back and shared with the group on the following PBL session before the new problems are seen.

How you run the recap and final feedback sessions is up to you as a facilitator There are many different methods you can adopt and you may need to experiment to find a method that works best for you.

- You could go round each team member asking an individual to lead the discussion on an outcome and the rest of the group follow.
- You may feel it appropriate for an individual or a sub-group to make a short presentation on their learning outcomes and follow it with group discussion following. This is a useful way to practice 'presentation skills' and also can be a good way of controlling time to each outcome (if you restrict the presentation and discussion to a certain length).

During the discussion phase you as a facilitator might question the thought process behind the groups discussion and the validity of their learning resources. By asking open ended questions you help to develop critical thinking. Questions you might ask may be:[2]

- What are the other possibilities that you may have not thought of?
- What is the facts or evidence to support that idea?
- What are your thought to that ideas proposed?
- What do you mean by ....?
- Would you explain that a bit more, I am not sure if I am clear what you want to explore?
- This seems a bit broad to me, would you like to explain that?
- Let's stop and review what we have now about the issue.
- Would one of you like to review what we have so far?
- Would one of you like to summarize?
- What was the date of publication of that book?
- How do you know that the information is reliable?
- How will this information help us to manage the problem?
- How does this information support or not support our original idea?
- What have we learned from this problem?
- In what way has working through this problem help with understanding (example how branding helps in positioning of the product)

It is important that you discourage conversations that result in the learner telling their own ideas and opinions without listening to others. The learner should build on others people's comments. Following the principles that guide accountable conversations allows the learner to focus on the discussion and build on what others have said.[3]

- accountability to the learning community: the talk should ''attend seriously to and build on the ideas of others'' People should listen to each other with an intent to build on each

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[2] Chye, S.H., Neo, W.K. and Chyn, K.Y., From Sage-on-the-Stage to Guide-by-the-side: Effective Tutor Skills in Problem-based Learning. *Temasek Business School< http://pbl. tp. edu. sg/Facilitation/Articles/SimWee. pdf> with a bibliography referring inter affiliato the works of Professor Howard S. Barrows*.

[3] http://www.robinalexander.org.uk/wp-content/uploads/2013/09/UKLA-http-authorservices.wiley_.com-bauthor-onlineLibraryTPS.asp_DOI10.1111-j.1741-4369.2010.00562.xArticleID7470671.pdf

other's ideas. If others don't understand what was mentioned they clarify this with the speaker.
- accountability to standards of reasoning: the talk should ''emphasise logical connections and the drawing of reasonable conclusions''
- accountability to knowledge: the talk should be ''based explicitly on facts, written texts or other . . . information that all . . . can access. Speakers make an effort to get their facts right and make explicit the evidence behind their claims and expectations. They challenge each other when evidence is lacking or unavailable'' This is done in a respectful manner. (Michaels et al., 2008, p. 283)

The discussion must summarise with a solution to the problem with a strong rationale for choosing this solution and an action plan of how to implement the solution

Or a list of learning objectives which must be further pursued in order to further explore successful solutions. An example of a solution synthesis is below

> **Example**
> **For our cash flow problem.**
>
> As forecasting requires very little data and once the data is entered the formula can be applied to several periods. Initially two types of forecasting will be used exponential smoothing and seasonal indices. We will measure the forecast using MAPE (as it is the easier of the two to calculate).
>
> Sales and order (from procurement) data for the past year will be entered into an excel spreadsheet and will be used to calculate the forecast for the next period.

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Lesson 2: Reflection

One of the key aspects of problem based learning is reflection and reflective learning. We discussed this in Unit 3. In the problem design the learner is asked to conduct some formative and summative evaluation. Formative evaluation was conducted prior to the self-study stage and at its completion.

Summative reflection can be done as part of the closing discussion or each learner can reflect individually using a reflective learning diary. A combination of both is recommended as often individuals will not reflect truly in a group situation.

For summative evaluation it is recommended that you ask the learner to examine (Hung, Hmelo Silver, 2004)

1. What were the main difficulties you had during the PBL process and how did you address them?
2. How confident are you using PBL? How well do you understand how you learn?
3. What did you learn and what skills did you develop specific to the problem and not specific to the problem?

4. What was the process you used to research the information related to this problem?
5. Did you have any difficulties during this process and how did you overcome them?
6. What key points you linked together to develop a solution? Why did you feel linking these was necessary? Do you have alternative hypotheses and solutions?
7. Why did you select the solution?
8. Was the solution successful or not and why?
9. What impact has the solution had to the business?
10. How you would solve this problem differently if given a chance to start over" in the PBL problem)
11. What were the main challenges dealing with other learners and what was your strategy for overcoming them?
12. What did you do well?
13. What do you think could be improved?

An example of student reflection is below

Example
For our cash flow problem.

What I learned specific to the problem
- The different forecasting methods
- What data is required for forecasting
- How to calculate a forecast using these methods
- How to use excel to implement these forecasting methods

What I learned which was not specific to the problem
- How to collaborate with customers
- How to find information to help me solve a problem
- How to apply this information to a business problem

Rational for decisions made
I chose two methods of forecasting as once the data is gathered and input into excel the formual are fairly easy to apply. Also the accuracy of the forecasting techniques can vary depending on the company. As we are not sure if the change in sales is due to seasons or other factors I decided to use two approaches and measure the accuracy of the most appropriate one.

I chose excel as there is no cost associated with it as we have it here in our company. Also there are a lot of templates and guides in how to use this software for forecasting. There would be no benefit in purchasing specific software for this function.

I decided to include collaboration with the customers in addition to the quantitative methods of forecasting as there may be other factors that quantitative data may not be able to capture which may influence the forecast.

What I would do differently
If I was to do this process again. I think I would approach the customers differently. I only managed to get a response from three customers. I think I would perhaps accompany one of the sales people as they have more experience in dealing with the customers. I would have all of my information gathered before I would speak to anyone externally so I appear more organised and professional.
Also the number of products sold by each of our customers will gathered from the relevant customers to get a picture of how much of each product was sold over the 12 month period and we can derive seasonal indices. Exponential smoothing and seasonal

Lesson 3: Reapplication

To facilitate continuous learning and reduce the issue of drop off mentioned by a number of companies in our research, it is necessary to encourage the learner to look for opportunities to apply their learning. This can be done by prompting the learners through questions in the closing discussion. Questions which may be used are:

- Outline future problems which the PBL process could be applied to. Why would this problem be suitable for PBL?
- What other solutions could be further explored and why are they worthwhile exploring?
- Could the solution be applied to other problems in the organisation? How can it be adapted to do this?
- Does your solution impact on other work areas and if so how can this be addressed?
- How can use what you have learned in the PBL process to other aspects of your job?
- Develop a plan of how you plan to use PBL of what you have learned from PBL in the future.

Example
For our cash flow problem.

I found a number of self-study resources that provided a lot of learning material that could be applied in other areas. For example, the SME toolkit contained a lot of resources. For example I found some resources on low cost market research that might enable us to increase our domestic customers fairly easily.

I plan to use this information to examine how we might increase our sales to the domestic customer market. In particular I plan to examine
- The size of the market in Ireland (in terms of revenue)
- The number of customers
- Who are our competitors and what products they offer?
- Research the 5 Ps our customers have preference for.

Assignment

1. Synthesise the information you have created in unit 8 (self-study) into a comprehensive solution
2. Reflect on what you have learned throughout the PBL process using the question set in lesson 2
3. Identify opportunities for reapplication of what you have learned.