

## Unit 7: Brainstorming, Classification, Learning Objectives



### Introduction

Once the problem has been fully understood and investigated it is important to identify how the learners will address the problem.

Steps 3 -5 in the PBL process are concerned with identifying potential solutions. This unit explains each of these steps and how to support learners during these stages.

Lesson 1: Step 3: Brainstorming solutions

Lesson 2: Step 4: Classification

Lesson 3: Step 5: Developing learning objectives and assignment

### Lesson 1: Step 3: Brainstorming solutions

This lesson focuses on:

- What is brainstorming
- Problems with brainstorming
- Overcoming brainstorming issues
- Facilitating brainstorming sessions

Brainstorming in PBL involves generating ideas or potential solutions to the problem which was defined. This step is completed by the PBL group of learners however the facilitator must be aware of the approach to ensure that the learners successfully complete this stage.

Brainstorming has been around since 1942 first identified by Osborn. However as with most it has advantages and limitations. It has been shown to enhance communication innovation and decision making but if not done correctly it can inhibit the generation of ideas.

#### Problems with brainstorming

Some research has shown that working in groups can make us less creative. Often those conducting the brainstorming session are unaware of the issues faced and the availability of structured approaches. The main issues in brainstorming are:

Group think – where individuals are under pressure to make a decision in a particular time do not correctly evaluate alternatives in favour of a unanimous decision. It is particularly prevalent in groups consisting of likeminded people that do not give different perspectives.

Social loafing -where individuals working in a group exert less effort as than they would alone. There are a number of reasons

- 1) The individual feels that their contribution to the group would not matter
- 2) Large group sizes where an individual feels lost
- 3) Lack of motivation – this has two factors that must be addressed. That the goal is easy to attain and that the goal is perceived as being valuable
- 4) Individuals feel that they will be allocated a large amount of work while others have very little and will get the same credit/reward.

Procedural issues – this is the process by which the brainstorming is conducted for example if the brainstorming process only permits one person to generate ideas at a time the 'wait time' for other participants might result in them changing their mind about voicing the idea or forgetting what they had to say. It is important that the correct procedure is used to reduce such issues.

Interpersonal issues – personal constraints such as personality, social anxiety, the mood of the individual, the presence of authority figures, gender balance and cultural issues all have an impact on the brainstorming and must be addressed.

### **Overcoming brainstorming issues**

There are a number of ways in which you can overcome these issues:

- 1) Introduce some individual idea generation

A study conducted on various approaches to idea generation in brainstorming found that asking each participant to write down their ideas individually generated more ideas than participants vocalising their ideas.

This approach can address the issues associated with wait time. If done anonymously it allows those with introvert personality types and social anxiety to express their ideas in a different manner. Electronic brainstorming has also proven to be effective. In problem based learning the ICT platform developed by the Archimedes project provides an electronic means for individuals in PBL to brainstorm ideas.

- 2) The use of a facilitator

Research has shown that brainstorming groups with a trained facilitator outperformed non facilitated groups. The facilitator recognises different personality types and ensures the correct process is followed to reduce issues. They prevent individuals from straying from the task at hand and identify 'creativity fatigue'. They can identify ideas which have not been fully discussed and can reintroduce them when there is a 'lull' in the discussion to stimulate further ideas.

- 3) Encouraging individuals to be critical and question idea.

To reduce group think putting together a multidisciplinary group which have multiple perspectives of a problem and encourage them to be critical and question ideas rather than accepting each idea. This should be done in the evaluation stage of the brainstorming

- 4) Using a structured approach

Often brainstorming is conducted in a very haphazard manner. Ideas are presented and discussed simultaneously. Time is not allocated to certain stages and often certain individuals dominate the session. Using a structured approach identified by various research can reduce these effects. We will examine this in the next session

## **How to facilitate a brainstorming session for PBL.**

The discussion leader should take this role however it is necessary to understand the main steps as you will be required to support the discussion leader if they need assistance

1. Summarise the problem definition so the learner is clear what is being brainstormed.
2. Encourage each individual to write down their solution ideas (this can be done before the meeting on the ICT platform). Generally, the time allocated to idea generation is approximately 20 minutes. Emphasise there should be no criticism of ideas until the next stage and no idea is too unusual. To stimulate ideas, you could use an idea generation checklist in such as SCAMPER (Substitute for the problem, Combine different ideas to solve the problem, Modify the process to overcome the problem, Eliminate elements of the product or process and Rearrange/Reverse) (Eberle, 1977). In which the learner can use one of these approaches to develop a solution. If there is a period in which you think the learners are struggling to come up with ideas you can use this tool.
3. Each individual should articulate their ideas. At this point learners are asked not to critique or evaluate ideas. Ideas should be recorded on a white board or a flip chart. It is important that you do not allow individuals to dominate the conversation. Individuals should be asked to state their ideas. If they deviate from the topic the facilitator should interrupt for example when the individual says the word because.
4. Each idea should be discussed to explain what is meant by that idea. Ideas should not be evaluated or critique. The facilitator should make a note of ideas that are not fully discussed/explained. These should be reintroduced when there is a quiet period in the discussion to stimulate further discussion. Individuals should be encouraged to question ideas in terms of their feasibility and to understand them better.
5. Once ideas have been fully developed they should be classified (step 4 in the PBL process)

## **Lesson 2: Step 4 Classification and evaluation**

This lesson identifies methods of how to evaluate and classify ideas.

Step 4 involves evaluating ideas and determining how they can be improved. Or also examining how different ideas can be combined together to form a more complete solution. This again is the responsibility of the PBL learners. However there are different ways this can be approached

- 1) Are there any ideas which can be combined: Ideas may be classified according to different types of solutions. They are examined in terms of how they can be combined to provide a more robust/holistic solution.
- 2) Are there any ideas which need to be clarified or are not fully understood: If so a possible approach is expressing the idea in terms of an analogy to allow the learners to explain and draw comparisons to explain the idea better. For example, in the case of a desktop on a computer is an analogy of a person's desk in an office and everything they need regularly is on the top of their desk.
- 3) Evaluating ideas. This involves examining the feasibility of different ideas. It is important to do this in a positive manner. Ideas which are not feasible are discussed in the context of how they can be adapted/improved to make them feasible. To do this the group examine what is good about the solution and what are the shortcomings or the improvements that need to be made (similar to synectics). Nolan 2003 emphasised that this approach maintained a positive and safe environment for idea generation that individuals feel that each idea will be considered.
- 4) These ideas can then be developed into learning outcomes for future exploration. The inventor of the idea assumes responsibility for the learning outcomes associated with their

idea.

For the below problem

### **Example**

**For our cash flow problem. The brainstorming session may be classified as follows**

**Reduce Credit Sales:** The main reason for the company's success in attracting business customers are the close relationships between sales representatives and their customers and the credit rate offered to the business customers thus the solution to reduce credit terms and sales staff is not feasible.

**Improve Credit terms from lending institutes:** The bank cannot increase its credit terms more than it has and this avenue has already been pursued.

**Marketing:**Increasing domestic customers takes a significant amount of marketing the company has no marketing expertise and marketing consultants can be extremely expensive.

**Increase customer collaboration:** The company has an excellent relationship with business customers and so collaborating with these customers to forecast potential orders is a feasible solution and should be pursued.

### **Lesson 3: Developing learning objectives**

Learning objectives have the potential to provide learners with an understanding of what is to be accomplished. This is done prior to the self-study stage in PBL so the learners have a clear idea of what is required of them during this period.

Traditionally in third level the tutor develops the learning objectives and presents them to the students at the start of the module. However, in PBL the learner is responsible for developing their own learning objectives together with the facilitator. This provides a learning in itself as it “provides models so that the students can write their own objectives and thus helps develop an important lifelong learning skill; ‘the setting of objectives.’”( <http://www.oucom.ohiou.edu/fd/writingobjectives.pdf>)

A learning objective describes what the learner will know or will be able to do once the period of self-study is over. For example: The learner will be able to develop a forecasting tool to allow the company to predict future sales.

By specifying learning objectives, it guides the learner and keeps them focused on what they are required to achieve. It also allows the learner to set priorities. It also provides a means for the learner to self-assess themselves during the period of self-study i.e. have they achieve the objectives they set out to do. It is important that learning objectives are: (<http://www.oucom.ohiou.edu/fd/writingobjectives.pdf>)

- Consistent with the goals of the curriculum (for PBL problem focused0

- Clearly stated
- Clearly measurable
- Realistic and doable
- Appropriate for the level of the learner
- Worthy

Benjamin bloom provides the most comprehensive guide to writing learning objectives and his taxonomy is widely used in higher education. He states that there are six levels of knowledge in the cognitive (knowing) domain.

Level	Explanation	Verbs associated	Sample learning objective
<b>Knowledge</b>	The student must be able to remember/recall the knowledge	define, repeat, record, list, recall, name, relate, underline	e.g. Name the different types of forecasting techniques
<b>Comprehension</b>	The student must be able to explain ideas or concepts	translate, restate, discuss, describe, recognise, explain, express, identify, locate, report, review, tel	Explain what is meant by time series forecasting
<b>Application</b>	The student must be able to use the knowledge	interpret, apply, employ, use, demonstrate, dramatise, practice, illustrate, operate, schedule, sketch	Apply the relevant techniques to calculate the accuracy of your forecast
<b>Analysis</b>	The student must be able to break the components into parts, distinguish between these parts and their relationships	distinguish, analyse, differentiate, appraise, calculate, experiment, test, compare, contrast, criticise, diagram, inspect, debate, question, relate, solve, examine, categoris	Distinguish between the different forecasting methods  Examine which methods are appropriate for our organisation
<b>Synthesis</b>	The student must be able to create something new e.g. a new product/process	compose, plan, propose, design, formulate, arrange, assemble, collect, construct, create, set-up, organise, manage, prepare	Design an excel spreadsheet to calculate the forecast for the next 6 months
<b>Evaluation</b>	The student must be able to justify their reasoning for making a decision or choosing between different ideas.	judge, appraise, evaluate, rate, compare, revise, assess, estimat	Evaluate the different forecasting approaches  Explain your preferred method

Some tips for assisting the learners to write their learning objectives ([http://www.tcd.ie/teaching-learning/academic-development/assets/pdf/Kennedy\\_Writing\\_and\\_Using\\_Learning\\_Outcomes.pdf](http://www.tcd.ie/teaching-learning/academic-development/assets/pdf/Kennedy_Writing_and_Using_Learning_Outcomes.pdf))

- Begin each learning outcome with an action verb, followed by the object of the verb followed by a phrase that gives the context.
- Use only one verb per learning outcome.
- Avoid vague terms like know, understand, learn, be familiar with, be exposed to, be acquainted
- with, and be aware of. These terms are associated with teaching objectives rather than learning
- outcomes.
- Avoid complicated sentences. If necessary, use more one than one sentence to ensure clarity.
- The learning outcomes must be observable and measurable
- Bear in mind the timescale within which the outcomes are to be achieved.

Furthermore, once the learning objectives have been developed they must be assigned to an individual(s). The discussion leader/facilitator must finish the meeting ensuring that all learners are clear of what they need to achieve during the period of self-study.

### **Assignment**

For the problem you have identified worked on in unit 6. Conduct the below:

- 1) Brainstorm solutions
- 2) Evaluate and classify these solutions
- 3) Develop learning objectives