

Learning and Teaching Theory considerations in the design of an online learning intervention

The objective of this paper is to identify the key factors that need to be considered in the design of a new online learning intervention. The particular emphasis is from a learning and teaching theory perspective.

To help to identify the factors, let's start by posing a number of questions:-

1. Does personality and self-perception affect learning?
2. Do people learn in different ways?
3. What are the practical considerations in the design of a learning intervention?

Does personality and self-perception affect learning?

It appears that personality plays a very important role in learning. Research has identified the 'Big 5' personality traits and there appears to be a direct relationship to one's personality profile and the way one learns. Costa and McCrae list the big 5 personality traits as:-

1. **Openness to experience** – (inventive/curious vs. consistent/cautious). Appreciation for art, emotion, adventure, unusual ideas, curiosity, and variety of experience.
2. **Conscientiousness** – (efficient/organized vs. easy-going/careless). A tendency to show self-discipline, act dutifully, and aim for achievement; planned rather than spontaneous behaviour.
3. **Extraversion** – (outgoing/energetic vs. solitary/reserved). Energy, positive emotions, surgency, and the tendency to seek stimulation in the company of others.
4. **Agreeableness** – (friendly/compassionate vs. cold/unkind). A tendency to be compassionate and cooperative rather than suspicious and antagonistic towards others.
5. **Neuroticism** – (sensitive/nervous vs. secure/confident). A tendency to experience unpleasant emotions easily, such as anger, anxiety, depression, or vulnerability

It is perhaps unsurprising those personalities which are particularly conscientious and agreeable will take a different attitude and approach to learning to those who are of a particularly neurotic disposition.

Personality may not be such an important factor though as self-perception. Albert Bandura has undertaken extensive and well acclaimed work in this area. He has found that 'one's belief in one's own ability to succeed in specific situations' (self-efficacy) is probably the fundamental factor in determining learning success.

Self-efficacy is 'developed from external experiences and self-perception'. If one has high self-efficacy one tends to perform well and rise to a challenge rather than avoid it. Self-efficacy is a

similar idea to confidence, but is much more specific and identifiable. Confidence is a more general feeling of trust.

How can we use the concept of self-efficacy in the design of a learning intervention?

Rather helpfully Bandura identifies four sources that affect self-efficacy:-

1. Mastery experience
2. Modelling
3. Social persuasion
4. Physiological factors

He tells us that his research has identified the factors in the above order of importance. So the key to self-efficacy is to experience direct feedback from an activity. It is the direct positive or negative feedback from attempting the activity that is the most powerful. This leads to the formation of belief in one's capabilities (in a particular situation). The more the activity is both authentic and accessible (to the learner), the better.

Secondly is modeling. That is considering the performance of a perceived peer group. If they can do it, so can I!

It is interesting that social persuasion has a relatively small impact; an example might be to suggest 'You are good. You can do it'.

Finally Bandura tells us that, to people with high self-efficacy, physiological factors such as sweating or nausea can be seen as normal and not a sign of poor ability.

So it would appear that personality and self-perception play a very important role in learning.

In terms of designing a new learning intervention we should focus on

- offering authentic activities with carefully designed feedback to build self-efficacy
- help students see that if their peers can perform, there is no reason that they cannot
- be sensitive to the range of personalities that will be involved in any diverse group

Now let's consider if people learn in different ways?

There is certainly a strong body of research literature to suggest people do. The discussion is based around different learning styles.

An important consideration in learning styles is the idea of a deep or surface approach to learning and is probably one of the most used bits of educational research in higher education (Marton and Saljo 1976). It is a very powerful and useful principle.

Simply stated, deep learning involves the critical analysis of new ideas, linking them to already known concepts and principles, and leads to understanding and long-term retention of concepts so that they can be used for problem solving in unfamiliar contexts. Deep learning promotes understanding and application for life. In contrast, surface learning is the tacit acceptance of

information and memorization as isolated and unlinked facts. It leads to superficial retention of material for examinations and does not promote understanding or long-term retention of knowledge and information.

Critical to our understanding of this principle is that we should not identify the student with a fixed approach to learning, but it is the design of the learning intervention that encourages students to adopt a particular approach (see constructive alignment)

Further developments have evolved from work undertaken by Kurt Lewin and later made popular by David Kolb (1984) called the Kolb 'Experiential Learning Cycle'.

The four stages of the Experiential Learning Cycle are:-

1. Concrete experience
2. Observation and Reflection
3. Abstract Conceptualisation
4. Testing concepts in new situations

The cycle is a continuous process with the current 'concrete experience' being the basis for observations and reflections, which allow the development of a 'theory'. The 'theory' is then tested in new situations to lead to more concrete experience.

Kolb developed from the Lewin model the idea that students have a dominant phase of the cycle during which they prefer to learn and therefore will have preferred modes of learning. In order to identify the preferred study and learning styles, Kolb developed a Learning Style Inventory that identified student's preference for the four modes corresponding to the stages in the learning cycle.

Subsequently Honey and Mumford (1986) developed a Learning Style Questionnaire building upon Kolb's work. They felt that the learning style inventory was not accessible to managers with whom they worked. They identified four styles of learning, which had much in common with Kolb's work and had strong correlations with the learning cycle, (See Figure 1).

Work in the United States has looked at learning styles and engineering and the impact of students' approaches to the effectiveness of learning. Richard Felder and colleagues developed The Index of Learning Styles, a self-scoring instrument that assesses preferences for learning in four dimensions.

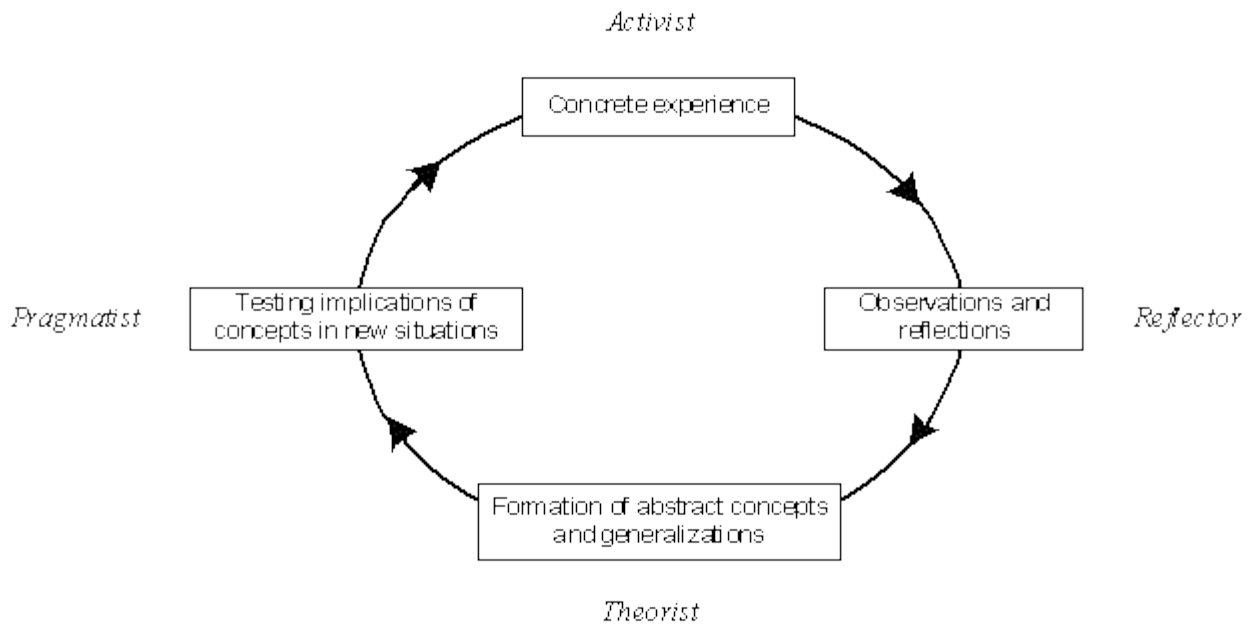


Figure 1. The Lewinian Experiential Learning Model (after Kolb, 1984) with the linked Honey and Mumford Learning Styles in italics (Honey and Mumford, 1986)

Felder and Silverman (1988) develop their models' dimensions through student preferences to the following aspects to learning:

- What type of information does the student preferentially perceive: sensory (external)
 - sights, sounds, physical sensations, or intuitive (internal)
 - possibilities, insights, hunches?
- Through which sensory channel is external information most effectively perceived: visual - pictures, diagrams, graphs, demonstrations, or auditory - words, sounds?
- How does the student prefer to process information: actively - through engagement in physical activity or discussion, or reflectively - through introspection?
- How does the student progress toward understanding: sequentially - in continual steps, or globally - in large jumps, holistically?"

From answers to these questions, they developed four dimensions of learning:

1. Visual
 - Verbal Learners
2. Sensing
 - Intuitive Learners
3. Active
 - Reflective Learners
4. Sequential
 - Global Learners

For the student it may be important to recognise their own learning preferences. Students should not be labelled as having one fixed learning style; instead we need to recognise that individuals will

have particular modes of learning that are more dominant than others. We need to adopt approaches to teaching that enable students who have different learning styles to learn effectively. This means that we need to design our learning with different learning opportunities and appropriate assessments to ensure that the learning is accessible to the largest number of students.

Learning-style theories have been criticized by many.

Some psychologists and neuroscientists have questioned the scientific basis for and the theories on which they are based. According to Susan Greenfield the practice is "**nonsense**" from a neuroscientific point of view: "Humans have evolved to build a picture of the world through our senses working in unison, exploiting the immense interconnectivity that exists in the brain."

Many educational psychologists believe that there is little evidence for the efficacy of most learning style models, and furthermore, that the models often rest on dubious theoretical grounds. According to Stahl, there has been an "utter failure to find that assessing ... learning styles and matching to instructional methods has any effect on their learning." Guy Claxton has questioned the extent that some learning styles are helpful, particularly as they can have a tendency to label students and therefore potentially restrict learning.

So what should we consider in the design of a new online learning intervention from a perspective of learning styles?

It is difficult to discern specific factors and perhaps even unnecessary. Probably the ideal is to offer learning activities that could appeal to all learning styles; and are sufficiently multi-sensory in nature that would even meet the challenge of Susan Greenfield!

So what might be a type of learning activity which is multi-sensory?

An interesting area to consider is Game Based Learning. There is much discourse on the merits or otherwise of games in education (especially computer based games). They can undoubtedly be multi-sensory. They can offer learning activities which can be both engaging and mapped onto intended learning outcomes. Perhaps most important of all is to understand how a multi-sensory game could support Learning and Teaching theory?

Earlier in this paper we postulated that in designing a new learning intervention we should focus on

- offering authentic activities with carefully designed feedback to build self-efficacy
- help students see that if their peers can perform, there is no reason that they cannot
- be sensitive to the range of personalities that will be involved in any diverse group

Recent work by Paul Howard-Jones ('a scientific view on learning games') focused on the role of reward (a type of feedback) and learning. He summarises:-

'Education may benefit from revising the constructions around reward and learning that presently characterize its discourse. In particular, the potential of uncertain reward to increase motivation provides insight into an important aspect of how games, including learning games, engage their

players. Moreover, computational modelling of reward system activity during gaming can help educators and developers understand how gaming events influence educational learning'

Research into game based learning has also shown the power of unexpected rewards and how 'disproportionate feedback' can be hugely rewarding. Keeping opening levels brief can flatter the participant as they feel they are making good progress. Failure can be more acceptable in a game based learning environment as participants do not feel they are necessarily being judged as in the real world. Indeed research has shown enjoyable animations can help to balance negative feedback. All these techniques used with an understanding of learning and teaching theory can help to support those with low self-efficacy and build those with high self-efficacy.

Combining classroom and online computer based learning (Blended Learning) has created a new 'toolkit' for educators. Educators have an opportunity to design a new generation of learning interventions.

But what does Learning and Teaching theory tell us about the practical considerations in the design of a learning intervention?

A key insight in the literature is that '**assessment is the curriculum**', as far as students are concerned (Ramsden 1992). In other words students will learn what they think they will be assessed on, not what is in the curriculum, or even what necessarily has been covered in lectures, workshops and practicals. Much research supports this common sense insight.

If students are to learn desired outcomes in a reasonably effective manner, then the teacher's fundamental task is to get students to engage in learning activities that are likely to result in their achieving those outcomes... It is helpful to remember that what the student does is actually more important in determining what is learned than what the teacher does.' (Shuell, 1986)

This has led to an often cited principle of 'constructive alignment' Biggs 2003. That is the learning outcomes themselves, the activities to achieve the learning outcomes and the assessment of the learning outcomes all need to be aligned. Certainly it is difficult to find any criticism with that line of reasoning.

When considering the learning outcomes / objectives, it can be helpful to classify them into 3 categories:-

1. Cognitive – i.e. knowing / head
2. Affective – i.e. feeling / heart
3. Psychomotor – i.e. doing / hands

Cognitive sub processes have been further classified from remembering through to synthesising / and making a judgement. Bloom (1956)

Chickering and Gamson offer us 7 principles of good education in HEI. The 7 principles convey the importance of interaction, co-operation, active learning, respecting diversity, taking personal responsibility, prompt feedback and communicating high expectations.

Good assessment and feedback drives learning (Race *et al.*, 2004). Gibbs and Simpson 2004 reinforce this view with 4 conditions under which assessment supports students' learning:-

1. Capture sufficient study time and effort
2. Spread evenly across topics and weeks
3. Leads to a productive learning activity (deep rather than surface)

4. Communicates clear and high expectations

It is very clear from Learning and teaching theory that determining learning objectives carefully is very important (Bloom 1956) and assessment is vital (Race et al...).

However it is the learning activity and the feedback the student receives which determines self-efficacy. Self-efficacy is the key to learning. (Bandura)

We have determined many of the most desirable characteristics in the design of a learning activity, but do we understand the power of feedback?

John Hattie and Timperley have made a notable contribution in his research work 'The power of feedback'.

'Feedback, defined as information about one's performance given by an agent (including teachers, peers, books, computers, parents, etc.), is an integral aspect of instruction and learning. Hattie and Timperley synthesized the results of 12 previous meta-analyses (of 196 studies) that included feedback as an instructional strategy'. They concluded that feedback was found to have a more powerful effect on achievement than students' prior ability, socioeconomic status and 'homework'.

More specifically they determined 4 levels of feedback in the following order of importance:-

1. Task level
2. Processing level – for deep learning
3. Self-regulation – personal internal feedback
4. Self – comments from other people at the level of the 'self' e.g. 'good boy', 'good try'

They also related 4 issues to feedback:-

1. Timing
2. Frequency
3. Whether positive or negative
4. The role of assessment as feedback

And they proffered 3 questions that are critical when considering feedback:-

1. Where am I going? (goals) **FEEDUP**
2. How am I going to progress to those goals? **FEEDBACK**
3. Where to next? (What must be done to achieve progress?) **FEEDFORWARD**

Measures that show an *AIMLINE* between the current level of attainment and the goal illustrate very effective feedback at both the task and process level. Done well they should encompass the 3 critical questions above.

In other words a student should focus on his or her attainable goals and get effective feedback in terms of what needs to be done to get there. This could be a 'customised personal development pack' and supported with appropriate feedback could be an important contribution to building self-efficacy and learning.

Summary

Belief in one's abilities to be able to be successful in specific situations is critical in learning. We know this as self-efficacy (Bandura).

How do we nurture self-efficacy?

Self-efficacy develops from within the person mostly through direct feedback from a specific authentic activity. As educators we must determine learning objectives and learning activities that are at a level appropriate for the student. We need to understand the power of feedback and with great sensitivity allow the student to build belief in his or her capabilities from success, with carefully crafted and appropriate feedback.

The work of Albert Bandura, John Hattie and laterally Paul Howard-Jones has highlighted what a great opportunity there is to design a new generation of online and blended learning interventions.

“People are at their most mindful when they are at play; their senses are fully engaged, their physical and mental prowess is at its highest. If we find ways of enjoying our work – blurring the lines between work and play – the gains will be greater.”

Ellen Langer, Professor of Psychology, Harvard University

Learning and teaching theory has given us the background. Online game based learning has given us the tools.

The rest is up to us!