The Three Phases of Learning

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Abstract. A schema (plural schemata) is a hypothetical structure of cognition for representing concepts stored in memory i.e. a framework, plan or script. Schemata dates back as far as Plato but was formalized by Kant. Schemata are constructed in the process of learning in our interaction with people, objects and events in the natural world. Schemata can be seen as a structural organization of our knowledge-base, which in turn facilitate our construction of expectations and predictions in our interaction with discourse. When confronted with new knowledge we search through our known universe of schemata that act as stimuli to deal with this new knowledge. It is when we encounter such stimuli that our minds race to make connections to prior knowledge and call upon them in our construction of new knowledge in to process to make "sense" of it all i.e. to comprehend or interpret what is at hand. In this process of construction we either alter or expand current schemata or we construct new schemata thus schemata are dynamic structures that provide for both creativity and flexibility. This paper proposes to re-invent these principles as well as change theories for the purpose of learning as: **Learning occurs through processes of change and when learning occurs it compels the learner to change to a new state of equilibrium.**

Keywords: Managed Learning Environment, Learning Strategies, Constructivism, Discovery Learning, Global Learning, Active Learning, Evaluative Learning, Reflective Learning, Critical Thinking, Texlet.

1. Introduction

In our endeavours, as facilitators of learning, to reach the top of Bloom's taxonomy [1], we need to understand the factors that influence an individual to learn. Learning relies on several things: Language, Motivation, Cultural Influences, Actions of Change, Goals, Incentives and Interaction with Peers and Learning Agents i.e. **Learning depends on the character of the learner and their behaviour and attitude towards change, on their journey to reaching a specific goal.**

Language, or on a broader scale communication, is an active process of construction as described by Vygotsky in his book **Thought and Language** [2]. Any presentation of information is a process of construction first by the "transmitter" in the **encoding** of thought, or inner (internal) language, into an agreed upon communication language or outer (external) language. Secondly the "receiver" of this communication needs to **decode** (translate) the outer language into an inner language of the self and **constructing** (creating) meaning. These are active processes of interpreting and assigning values and truths in accordance to a set of internal beliefs, self values and truths.

In 1943 Maslow [3][4] wrote a couple of articles in which he highlights 13 propositions to understand motivation. In these papers he proposes that motivation relies on higher or ultimate goals rather than short-term, interim goals. He further proposes that one needs to understand the driving forces behind the motivation of an individual. We need to see the individual as a whole within their field as well as understand that higher needs can only be satisfied once the lower ones have been dealt with.

In his article about change, Schein [5] capture the three stages to change in Kurt Lewin's Change Theory proposing the dynamic balance of forces, driving and restricting, the current state in equilibrium of being. Change Theory is based on Lewin's model of the three stages unfreezing, changing (learning) and refreezing. Schein describes it as dynamic model in which change (learning) will take place without the loss of self-identity. Furthermore he states that it is an active cognitive attempt to restructure one's thoughts, perceptions, feelings and attitudes. This paper proposes to re-invent these principles and other change theories [6] for

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learning as **Learning occurs through processes of change and when learning occurs it compels the learner to change to a new state of equilibrium.**

Herein lays the lecturer's ultimate goals, as one of the learning agents, to facilitate and even coerce the learner into a mode of critical thinking. There is a "problem" however as learners do not just accept these persuasive "messages" as they are in a process of constructing their own values and truths. Using an experimental managed learning environment, breaking complex technical texts into more manageable texlets, a three phased approach to learning is proposed.

2. Three Phases of Learning
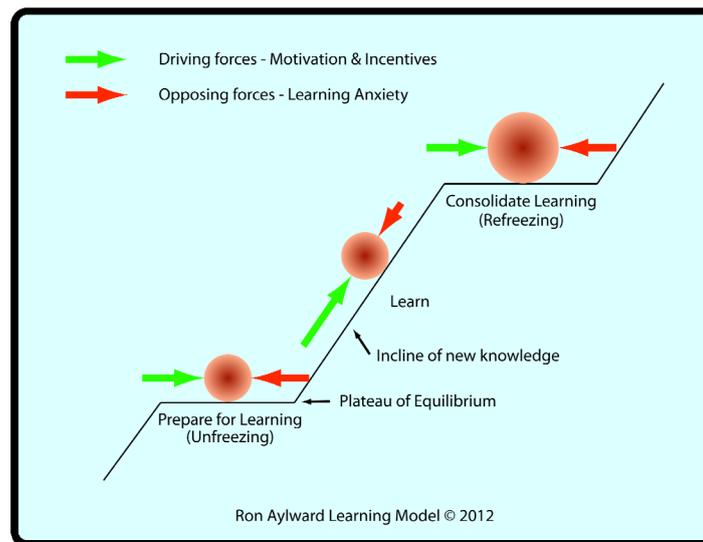
2.1. Preparatory (Frozen and Defrosting)

Fig. 1: Learning Model.

The main emphasis during this phase is the presentation of both adequate and appropriate pre-reading texts to remind learners of historic knowledge schemata and prepare the learners for learning. There are two outlooks on reading and comprehension. The first view centres on the text and the meaning it contains. This is referred to as a Product Oriented approach in which it is proposed that meaning exists within the text itself and text-based factors determine this meaning. The second view is centre on the reader and the successful interaction between the reader and the text that leads to the construction of meaning. Here the prior knowledge-base forms the basis for schema-based reading and comprehension in the process of activating the cognitive processes and constructing the platform to build the newly improved future knowledge-base. The following sections table the main ideas in facilitating the pre-learning phase.

To assist the learner in the process of **unfreezing** the learning agents need to:

- Build Trust.
- Create a safe learning environment.
- Encourage the taking of risks through discovery and discourse.
- Establish a sense of self efficacy.
- Invoke the senses of curiosity.
- Motivate the learner.
- Unlock prior knowledge.

Furthermore the process of unfreezing is activated by the following senses:

- The realization of dissatisfaction with and frustration generated by beliefs, values, truths and knowledge that disconfirm our expectations. The greater the gap between what is known and what needs to be known the less likely learning will take place.

- The realization of guilt or survival anxiety due to the acceptance of disconfirming beliefs, values, truths and knowledge and their relevance. The learner's world is shaken with this confrontation of opposing forces invalidating current beliefs, values, truths and knowledge. It is in dealing with these that could lead to learning anxieties which is key to a learner's motivation and ability to learn.
- The realization of learning anxiety that triggers defensiveness and resistance in being receptive to new knowledge or activate the motivational drives to effect shift (move towards realizing goals).

How do we facilitate unfreezing:

- Create a safe environment that will improve self-efficacy within the learner free of prejudice and ridicule.
- Provide adequate, appropriate and relevant pre-learning material to serve as a reminder to learners as well as unlock their own knowledge-schemata in preparation for learning and ultimately enable them to learn.
- Stimulate their belief in their capacity to perform the behaviour required by learning and they must perceive that there is an incentive to do so.
- This is true for all three the phases of learning.

This phase ultimately leads to create a keen learner in activating the learners' knowledge-base to actively prepare the learner for learning. This phase stimulates the learner to rediscover existing knowledge and skills as well as opening doors into new discoveries. Here there is no attempt to cover the material from the upcoming lecture per se, but merely to prepare the learners so they would be receptive for the new knowledge presented during the upcoming lecture. The learner is now motivated, has a need to know more and is ready for **Cognitive Reconstruction and/or Redefinition** i.e. learning.

In summary: The **state** of **unfrozen** is achieved through a **process** of **active participation** in **preparation** for **learning** within a **safe environment**.

2.2. Lecture (Unfrozen and Transforming)

So what is learning? As mentioned above learning is the process of cognitive reconstruction and/or redefinition and is an active movement into a new sate of equilibrium. **Learning is behaviour and attitude**. From Social Cognitive Theory and Operand Conditioning an individual can learn by direct and directed experience, human dialogue and interaction and observation (monkey see – monkey do) and has four processes:

- Attention process.
- Retention process.
- Motor-neuron reproduction.
- Reinforcement process.

Learning has the following elements:

- Semantic redefinition.
- Cognitive broadening.
- Construction of a new framework for critical judgement or evaluation.
- A change in behaviour by imitation of positive role-models.

Learning is facilitated through:

- Providing clear instruction through progressive instruction.
- Providing opportunity for skills development and training.
- Modelling of the desired behaviour.

In 1987 Chickering & Gamson [7] described "the Seven Principles for Good Practice in Undergraduate Education", the third of which is **Active Learning.** It follows that learning is not a passive or spectator sport. A sport per se calls one to action and in particular Active Learning calls the learner to assimilate what they learn into the greater self. They and others go on to give examples of how to implement the concept of Active Learning in the lecture room, Bonwell & Eison [8] and more recently Felder, R.M. & Brent R [9].

It is in this phase that first contact real is made between new materials, the lecturer and the learner. It is here that the action of interaction is called for as these three, material-lecturer-learner, start their journey to

understanding through exploration, debate, taking risks, taking sides, critical evaluation, etc to finally arrive at an intrinsic agreed upon truth. The learners have to integrate the new found knowledge into their own set of internal beliefs, truths and knowledge. This could mean that the learners have to adjust or even replace some of their current beliefs, truths and knowledge to accommodate the new ones.

After this phase the learner should have a sound foundation of the new material, not necessarily fully mastered, and at the very least have a clear picture of what it entails. During the next phase this foundation is used to move the leaner from knowing about the material to mastery of the material. It is only after much time spent with the material that one could hope that the learner would acquire a higher sense of understanding. It is only then that the creative processes of analysis and synthesis can take place.

In summary: Learning requires critical thinking and active participation to effect change or movement into a higher state of equilibrium.

2.3. Evaluation (Stabilizing and Refreezing)

Once new material has been covered the learner must now internalise it i.e. become one with it. This is the **Refreezing** phase of learning where short term learning needs to be transformed into permanent learning. The learner needs to be stabilized within the new state of equilibrium through developing of, integration of and actualizing of new beliefs, values, truths and knowledge.

Refreezing involves:

- Providing clear instruction through progressive instruction.
- Providing opportunity for skills development and training.
- Modelling of the desired behaviour.

Once more this is achieved through active participation using formal and informal mechanisms including exercise, assignments, journal write-ups, discussions and evaluation. Learning become more permanent when integrated with current beliefs, values truths and knowledge.

This phase is founded on the principles of Socratic Dialogue or Method and aims to stimulate the learner into **Critical Thinking** as introduced by Jürgen Habermas in the 1970's. Critical Thinking invokes the learner to clarify goals, examine assumptions, discern hidden values, evaluate evidence, accomplish actions and assess conclusions in a bid to not merely know about something but to formulate personal or internal beliefs, truths and knowledge concerning the new material covered during the lecture. Others like Gibbs in 1988 [10] and Bartlett in 1990 [11] discussed Critical Thinking in another form in which they refer to **Evaluative** or **Reflective Learning.**

It is during this phase where the real change or transformation takes place as the process of learning ultimately transforms the learner. The learner grows personally becoming more confident in taking risks, exploring new areas. It is only once the learners can critically evaluate their own beliefs, truths and knowledge that they can transcend into the creative arena and become active contributors to knowledge in their own right rather than standing on the kerb observing.

3. Application

The methods described above have been successfully implemented in an experimental on-line managed learning environment (MLE). Students studying Electrical Engineering use the MLE as part of their curriculum. The MLE assists and guides students in managing their studies. The MLE monitors students during all three phases of learning.

During the first phase students are supported through a preparation repository serving material that forms part of the prerequisite knowledge, e.g. field specific vocabulary, as well as establishing a wider view and application relations for the new knowledge to be obtained during the second phase. During the second phase the MLE serves material related to the new knowledge being presented. These include texts, videos, simulations, examples etc. In the final phase the MLE supports the students with further examples, videos, simulations, experiments etc not covered during the second phase.

During all phases the MLE monitors the progress of individuals and groups in the form of reading assignments, problem-based assignments, diaries, written reports, short tests (multiple-choice), etc. The MLE monitors whether these assignments and reporting has been done and alert students and lecturers to completion dates and problem areas. Students are taken back to material from the preparation repository and with the related problem areas highlighted to emphasize the relation between support material, the problem to be addressed and the final solution. Should any further problem areas arise the lecturer involved would be notified to address these issues during contact classes. These problem areas are also used to build and update the current MLE repositories.

4. Conclusion

The experimental MLE has shown great improvement in student performances. Both students and lecturers involved find the system beneficial and supportive of the learning process. On the "down" side the development of the MLE system is a very intensive process. The MLE is based on a relational database and all documents and support materials are broken down to very small units. This is done to support the feedback and highlight part of the MLE. The next step in the development is the lecturer development tools for the MLE to smooth the development process.

5. Acknowledgements

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