INFORMING LESSON DESIGN WITH HUMAN INFORMATION PROCESSING

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Abstract

Designing effective instruction is the goal of any instructional designer. This article discusses how lesson design can be enhanced by incorporating certain fundamentals of cognitive psychology. The stages of human information processing and a typical four-step lesson are integrated in a model that can inform instructional design.

Introduction

Designing lessons for how learning experiences are mentally processed can improve instruction. It is worth considering the activities of a lesson, the flow of a lesson, and how the brain processes and retains information. This article discusses how lesson design can be enhanced by integrating cognitive theory. A typical four-part lesson will be discussed in conjunction with the stages of human information processing (HIP) in order to conceptualize a model (Figure 1) that can inform lesson design. By respecting how the mind processes and retains information a more effective and efficient lesson can be designed.

HIP in Brief

HIP is a theory of how the human mind acquires, stores, retrieves, and uses information. In Figure 1 the horizontal row of six boxes represent different stages of HIP. The *Sensory Store* box represents the major input and output stage for information. It essentially represents the

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Figure 1
Lesson Flow and HIP

Lesson Flow and Human Information Processing
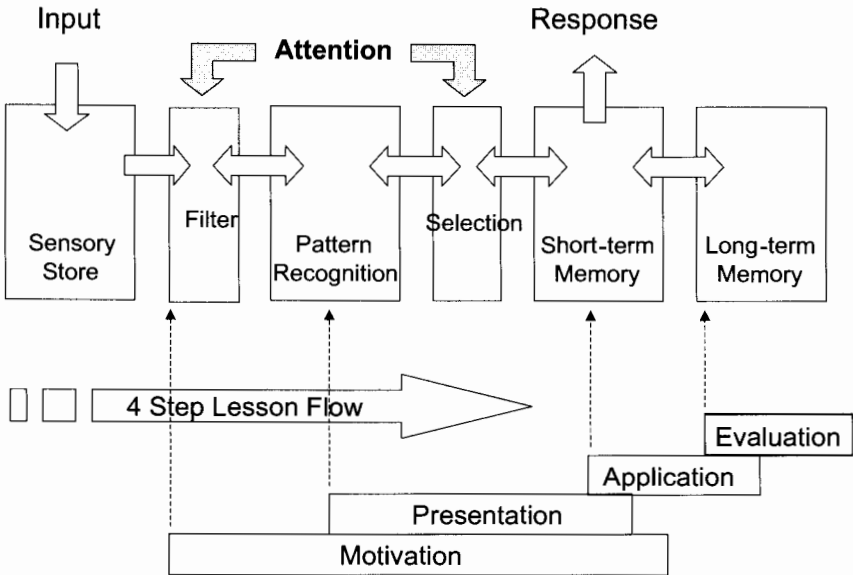
five human senses. The senses afford multiple channels into the mind. In effect, the more channels one uses in the learning process, the greater the possibility that what is learned will be retained.

The *Filter* stage focuses on attention. It represents the point at which something attracts one's attention. Once attention is gained, the stimulus is analyzed through *Pattern Recognition* to determine if it is worthy of continuation. The key to holding attention is whether or not the mind recognizes a familiar pattern in the stimulus. Regarding information, the mind searches for familiar concepts, principles, or ideas. The *Selection* stage represents the second attention filter. If the mind has recognized something familiar and/or interesting, then one is likely to continue attending to the new stimulus.

The two filters serve as a doorway into *Short-Term Memory* (STM). STM is where the real learning begins. STM, however, has many limitations: it has limited capacity, it is easily disrupted, and it is vulnerable to loss. If STM is overloaded, the learning process slows down or stops. If too much information is introduced, the mind struggles to comprehend and make associations. Then, if attention is disrupted, information may be processed piecemeal and learning is incomplete or even inaccurate.

STM serves as a pathway to *Long-Term Memory* (LTM). It takes time and effort for information to be processed into LTM. Still, once in LTM, it may not be easily available. Here one has to contend with information decay if the memory is not reinforced by use.

Informing Lesson Design

Learner-friendly lessons can be designed once we appreciate more about how the mind learns. In Figure 1 the popular four-step lesson format is illustrated along the bottom of the diagram. The four separate horizontal bars span the different stages of the HIP model. The bars illustrate when a particular step is most influential in the learning process and the lengths indicate the duration of a step's influence.

Motivation spans from the first filter to LTM. This illustrates how important motivation is to learning. In STM, attention is also maintained through motivation. However, motivation's power is limited by other factors that influence attention (e.g., background noise, uncomfortable temperatures). Motivation should come early in the lesson because that is when the learner's attention is either won or lost. Knowing why one needs to learn something is important to capturing and maintaining one's attention.

Having the foundational knowledge and skill in place, and the connections with other information explained, is the means by which the learner relates to already known information – this is the *Pattern Recognition* stage. Once the lesson progresses past pattern recognition, the real work begins. It is conceivable that the *Presentation* stage starts while the learner is in pattern recognition. Sometimes, as before, learners will not attend to a lesson until they are convinced of its value.

Once the learner has committed to the lesson, STM must be engaged. The methods the instructor employs must present the material in a relevant, contextually-based manner that agrees with the explanation of why the information is important. Note that in Figure 1 the presentation step does not run completely through STM. This is due to the need of the learner to engage the material. The instructor must allow time for one to process the new information before moving to the *Application* step.

As with motivation, application has multiple aspects. When engaging application, STM requires supervised application, while self-guided application may begin in STM and extend into LTM. Supervised practice allows the learner to process the new information with guidance present (e.g., in-class activities). Self-guided practice allows the learner more time to strengthen the learning (e.g., homework and other out-of-class activities).

The *Evaluation* step is a check or confirmation of what has or has not been learned. This step also involves two parts: evaluation and feedback. From a learning perspective, evaluation is an assessment of learning; feedback is the communication back to the learner. In actual practice, evaluation extends into STM as a formative process supporting learning. It serves to adjust the learning process to insure the intended outcome. In LTM it becomes a summative event defining what has been learned.

The integrated model that we have just explored can be a powerful tool for instructional design. It can help us keep in mind the importance of attention and motivation in the design of a lesson. It can remind us that engagement is essential for retention. It can serve to emphasize the importance of evaluation and feedback as part of a complete lesson. Moreover, it can improve instruction by putting into practice some of what we now know about human cognition.