Seven Principles of Learning

Summary of Seven Principles of Learning (Based on the Cognitive Science of How People Learn) **National Research Council**

1. **Learning with understanding is facilitated when new and existing knowledge is structured around the major concepts and principles of the discipline.** Knowing disconnected facts is insufficient to produce deep learning or develop expertise. Expert strategies for thinking and problem-solving are linked to the expert's understanding of important core concepts of "big ideas". This suggests that courses should be organized around helping students understand these big concepts and instructors should focus on helping students understand, explain, and apply these concepts rather than focusing on memorizing large amounts of content.

2. **Learners use what they already know to construct new understandings.** Learners construct interpretations of new information and problems in ways that agree with their own prior knowledge and misunderstandings. Effective teaching involves engaging what learners already know about a subject and finding ways to build on that knowledge. It also involves detecting student misconceptions and addressing them.

3. **Learning is facilitated through the use of metacognitive strategies that identify, monitor, and regulate cognitive processes.** Metacognitive strategies include: a) connecting new information to former knowledge, b) selecting thinking strategies deliberately; and c) planning, monitoring and evaluating one's own thinking processes. Students need to reflect on what they already know and what they need to know for situations. They must consider both factual knowledge and strategic knowledge (how and when to use what procedures to solve the problem). Instructors should provide explicit instruction in the use of such skills and opportunities for students to observe others solving problems (including experts) and by making their thinking available to observers.

4. **Learners have different strategies, approaches, patterns of abilities, and learning styles that are a function of the interaction between their heredity and their prior experiences.** Useful concepts here include Gardner's model of Multiple Intelligences, different learning styles, deep vs. surface approaches to learning, etc. One size does not fit all. Some students respond favourably to one approach, others to another. Educators should be alert to these differences and match curricular material to students' developing abilities, knowledge bases, preferences, and styles. Students with different learning styles need a range of ways to demonstrate their knowledge and skills. One form of assessment will advantage

some students and disadvantage others; multiple measures of learning will provide a better picture of how well individual students are learning what is expected of them.

5. **Learners' motivation to learn and sense of self affect what is learned, how much is learned, and how much effort will be put into the learning process.** Internal and external factors motivate people to learn. Learners' level of motivation strongly affects their willingness to persist in learning difficult material or challenging assignments. When students perceive learning tasks as interesting and personally meaningful, and presented at an appropriate level of learning, they develop intrinsic motivation. Tasks too difficult are frustrating; tasks that are too easy are boring. There are strong connections between learners' beliefs about their own abilities in a subject area and their success in that area [attribution theory]. Instructional strategies should encourage conceptual understanding; this tends to increase students' interest and enhance their confidence about their abilities to learn.

6. **The practices and activities in which people engage while learning shape what is learned.** The way people learn a particular area of knowledge and skills and the context in which they learn it becomes a fundamental part of what is learned. This means that when students learn a subject in a limited or narrow context, they often miss seeing the applicability of using that information to solve new problems encountered in other situations. Course assignments and tasks that ask students to encounter the same concept in various situations, help students develop a deeper understanding of the material. Coursework should engage students in learning experiences that draw on real-world applications or exercises that foster problem-solving skills and strategies that are used in real situations. Two examples of this approach are problem-based and case-based learning strategies.

7. **Learning is enhanced through socially supported interactions.** Learning is enhanced when students can interact and collaborate with others on learning tasks. Learning environments that encourage collaboration, similar to those of real-world scientific, mathematical, clinical, or business work, gives students the chance to test their ideas and learn by observing others. By providing opportunities for students to express their ideas to their peers and hear and discuss others' ideas, learning can become particularly effective. Social interaction is also critical to development of expertise, metacognitive skills, and enhancing the learner's sense of self.