Discovery learning describes situations where learners engage in self-directed, process-oriented, reflective inquiry in a scaffolded, exploratory environment. At its core, the theory is based on the Constructivist school of thought as developed by John Dewey, Jean Piaget and Leo Vygotsky; however, it was Jerome Bruner that laid the groundwork for discovery learning (Bruner, 1961). Bruner based the theory on his observations of children and adults engaging in similar patterns of “rearranging and transforming evidence” to build new understanding at varying levels of complexity.

As defined by Bruner, discovery is the building of knowledge “by the use of one’s own mind” (1961). Often, discovery learning is misinterpreted as unguided exploration, but Bruner has clarified six essential components to discovery learning (1977):

1. **Attitude**: Learners will recognize opportunities to actively apply, extend and make connections with knowledge and persevere when faced with failure.

2. **Compatibility**: Educators will provide scaffolding in a way that allows students to assimilate knowledge in a way that suits their own processes and schema.

3. **Activation**: Learners should receive positive feedback to reinforce motivation for learning.

4. **Practice**: Learners should apply knowledge in context-based activities.

5. **“Self-loop” problem**: Since children are often able to complete tasks at a higher level than they are able to articulate verbally or summarize concisely, modeling language can help students develop reflective practices.

6. **Information flow**: Learners need to manage and apply the knowledge they have acquired effectively.

Bruner also outlined three “modes of representation”, or forms that information takes when stored in the mind: enactive representation (i.e. muscle memory), iconic representation (i.e. mental im-
agery) and symbolic representation (i.e. language-based thought) (Jarvis & Chandler, 2001). In contrast to Piaget’s stages of development, these modes coexist and are not strictly sequential.

An extension of this theory is scientific discovery learning, which leans away from conceptual inquiry and aligns more with the scientific process of hypothesizing, experimenting and drawing conclusions (De Jong & Joolingen, 1998). De Jong and Njoo identified essential skills required for learners to be successful in self-directed hypothesis creation and experimentation (1992). These “discovery skills” include “hypothesis generation, experiment design, prediction, and data analysis” (Joolingen, 1998, p. 386). According to De Jong and Joolingen, a lack of these skills inhibits the learner’s ability to build new knowledge (1998).

In terms of implementation, Bruner also defined the “spiral curriculum”, which has students revisit the same overarching concepts through problems and situations that increase complexity over time. The implications here are that there should be ongoing continuity and context in active learning and “any subject can be taught to any child in some honest form” (Bruner, 1960).

Discovery learning has informed many current classroom practices, including simulation-based learning. Simulation-based learning is a role-playing opportunity in an artificial environment that allows students to practice or witness the application of complex skills and concepts (Castronova, n.d.). Through individual or collaborative activities, learners apply their knowledge to various scenarios, and it through this process, and the subsequent collection of new information, reflection and consolidation, that new understandings are created. Other advantages of using simulations in learning include connecting learning to global issues, working with phenomena that occur on different timescales and engaging students with realistic scenarios. The virtual environment also lets educators scaffold and learners fail; both of which are essential elements in effective discovery learning.
References


