**Building Connections**

Constructivism is based on the concept that individuals actively construct or create their own knowledge and their learning experiences determine the nature of reality. Learners use their prior knowledge as a foundation and build upon it as they acquire new information. The teacher acts as a guide in the learning process; therefore, constructivism supports student-centred learning. In a constructivist classroom, learning is viewed as constructed, active, reflective, collaborative, inquiry-based, and evolving. Dewey (1980) states “Give the pupils something to do, not something to learn; and the doing is of such a nature as to demand thinking; learning naturally results.” (p.161).

The psychological theory of constructivism originates from the rapidly expanding field of cognitive science, primarily from the constructivist perspectives of Jean Piaget, the socio-historical work of Lev Vygotsky, and the constructivist account of discovery learning by Bruner (Fosnot & Perry, 2005; Gruber & Voneche, 1977). Jean Piaget’s (1896- 1980) work on educational psychology influenced the initial idea of constructivism (Larochelle et al., 1998). Piaget's work focuses on how humans create meaning when their experiences and ideas interact. The fundamental tenet of constructivism is that students learn through engagement rather than observation.

**The Automata**

Students in the classroom are being given a group project (end of term project) by their teacher to visit the ongoing school cafeteria building construction in the school premises and make a model themselves.

The project's automata refers to students’ self-directed learning process, where they manage their progress, make decisions and solve problems. This autonomy fosters a dynamic, student-centred environment.

The automata "Building Connections" exemplifies the constructivist learning theory, incorporating the following key principles:

* Scaffolding techniques
* Collaborative/Cooperative learning
* Participatory learning approach
* Knowledge construction
* Cognitive construction
* Reflective learning
* Experiential Learning

By incorporating these principles, the automata "Building Connections" provides a comprehensive and interactive learning experience that fosters deep understanding and lasting knowledge retention.

**Implementation**

Fifteen diverse students visits the construction site, observes real builders at work. Driven by curiosity, they ask questions, brainstorm and discuss ideas. Through trial and error, peer feedback, and reflection on classroom lessons, their ideas evolves. Noticing the recycling truck on site, they decide to incorporate recycled materials to supplement resources.

“The essential functions of the mind consist in understanding and in inventing, in other words, in building up structures by structuring reality.” (Jean Piaget) "Homage to Jean Piaget (1896 - 1980)" ( Ernst von Glasersfeld).

**Scaffolding in the "Building Connections" project**

Scaffolding techniques are instructional strategies used to support students' learning, particularly during complex or challenging tasks. The goal is to provide temporary guidance and structure, gradually releasing responsibility to students as they become more confident and proficient. The teacher employed these instructional support strategies to facilitate students' understanding.

Specifically, the teacher employed the following instructional support strategies:

1. **Visual aids:** He used pictures and videos to illustrate the foundation and wall construction process.

2. **Chunking**: He broke down the construction process into manageable segments, starting from the foundation to the roof.

**3. Modelling**: He demonstrated each stage before having students apply it in the field.

Teachers provide scaffolding to help students acquire knowledge and skills that are within their reach. In student-centred learning, the responsibility for the learning process is transferred from the teachers to the students (Boekaerts, 2002), and learning is assessed through both product and process reflection (Black &William, 2009).

By implementing this strategy, the teacher created a supportive learning environment, enabling students to develop a deeper understanding of the construction process and its sequential nature, thereby building their confidence and problem-solving skills. This approach by the teacher facilitated constructivist learning by providing initial guidance, feedback, peer review, and modelling critical thinking, gradually fading support as students demonstrated mastery. This method fostered a supportive learning environment, building confidence and self-efficacy among the students. Their critical thinking and problem-solving skills were enhanced, they collaborated and communicated with better understanding of the project, became more independent.

By incorporating scaffolding techniques, educators can create supportive learning environments that empower students to take ownership of their learning.

**Collaborative/cooperative learning**

Constructivist theory emphasizes learning as a process where individuals interact with their environment to collectively construct knowledge (Topolovčan, 2023). Under this theoretical framework, teachers transition from being mere transmitters of knowledge to assuming roles as guides and facilitators. Students, likewise, shift from passive recipients of knowledge to actively constructing and accumulating knowledge through interactions with their environment and peers. This interaction encompasses not only student-environment interactions but also exchanges and collaboration among students and between students and teachers. Such instructional approaches encourage students to exhibit agency and initiative, fostering their interest and creativity to enhance learning outcomes. Cooperative learning methods also emphasize collaboration and interaction among students, fostering active engagement and mutual learning through activities such as group discussions and collaborative inquiries.

**Participatory learning approach**

These are designed to engage learners actively in the learning process. These apps use various shapes and interactive elements to facilitate participation, collaboration, and knowledge construction. Participatory Learning Approach incorporates several opportunities for learning in designing problems, answering them, grading them, disputing results, and in observing/reading what everyone else does. It can help a student to view a given subject from different points of view. The designing of problems by students can improve their grasp on the subject and can begin to focus their attention on the assessment of knowledge on the subject. The input of students can also help the instructor or teacher improve the course materials. The progress of the PLA process through problem design, solution design, solution evaluation and dispute arbitration can facilitate a thorough internalization or absorption of the given subjects by the students.

The scaffolding technique like the use of visual aids in showing examples to the students before the field work made the students engaged and involved in the building connections process.

**Knowledge construction**

Shared knowledge construction is also emphasised in the building connections project, whereby the practise of sharing individual perspectives results in learners jointly constructing understanding that would not have been possible otherwise (Greeno et al., 1996). Therefore, according to constructivism, learning is not constructed in isolation but in a social setting with peers and teachers.

**Cognitive construction**

According to Bruner (1996) being able to "go beyond the information" given to "figure things out" is one of the few untarnishable joys of life”. Learners actively build their own mental models and frameworks to understand complex concepts.

**Reflective learning**

Students engage in introspection and self-reflection, analysing their own thought processes and learning strategies.

**Experiential learning**

Experiential learning, an educational approach that involves hands-on, direct experience and active participation in real-world scenarios. As Kolb (2014) emphasizes, "learning is the process whereby knowledge is created through the transformation of experience" (p. 51). The hands-on experience provided to the students exemplifies experiential learning in action, and it will have a lasting impact on them.

To succeed, students must learn to navigate complex information, integrate diverse perspectives, and collaborate effectively with individuals from varied backgrounds, expertise, and experiences (Fenves, 2018).

**Benefits and Significance:**

This project promoted:

1. Student autonomy and self-regulation

2. Social interaction and collaboration

3. Contextual learning and problem-solving

4. Creativity and critical thinking

5. Cross-cultural understanding and empathy

The research questions posed are:

1. To what extent does the project enhance students' critical thinking, problem-solving, and analytical skills?

2. How does the project facilitate communication among students, and what are the outcomes of this communication on their learning?

3. To what extent does the project promote a sense of community and shared responsibility among students?

4. How can the project's effectiveness be evaluated, and what metrics can be used to measure its impact on students' learning?

Conclusion:

By incorporating these principles, the automata "Building Connections" provides a comprehensive and interactive learning experience that fosters deep understanding and lasting knowledge retention.

This student-centred approach encourages active participation, creativity, and innovation, ultimately preparing learners for real-world challenges. As educators continue to refine their instructional methods, embracing constructivist principles will remain essential in unlocking students' full potential.

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