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Learning Science and Mathematics

CONSTRUCTIVIST APPROACH

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Meaning of Constructivism

- Construct: to build.
- Constructivism is the theory which states that knowledge cannot exist outside the mind of the pupils but it is built in the mind based on real experiences.

Constructivism emphasis

- Constructivism emphasizes the importance of building knowledge actively as a result of interaction between prior learning and new learning
- Comparing the new information with his existing understanding.

Process of constructing knowledge

- Takes place in the social context which each pupil exchanges his ideas with his friends.
- The development of metacognitive processes is given importance.
- The pupil need to learn to plan, evaluate and reflect on his learning, conscious of his learning strategies and think of ways to further improve his learning process.



How children learn?

- Children gain knowledge of their surroundings as soon as they are born.
- They develop ideas which enable them to understand what is happening around them.
- They bring these informal ideas to the classroom.



What science education should do?

- The aim of science education is to explain further so that these ideas become concepts which are meaningful.
- It is important for teacher to consider prior ideas of the pupils to ensure that any change or development of ideas is registered by the pupils themselves.

Implications on teaching-learning

- Constructivism helps pupils understand science better.
 - Teaching by exposition- explaining and showing everything- has to be minimized.
 - Each pupil has his own unique understanding.
 - The teacher cannot force the pupil to believe in a certain thing, unless the pupil himself understand the subject.
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The roles of the teacher

- Presenter- not lecturer but a person who demonstrates, provide examples and presents activities or alternatives to pupils so that they will experience the process of learning.
- Observer- a person who identifies the pupils' ideas, interacts with the pupils and provides learning alternative formally or informally.

The roles of the teacher

- Question master and problem initiator- one who stimulates the formation of ideas, testing of ideas, and building of concepts by asking questions and posing problems that are related to the observation made.
- Organizer of environment- a person who organizes carefully and clearly what needs to be done.

The roles of the teacher

- Public relations coordinator- a person who encourages co-operation, development of public relations.
- Learning assessor- a person who engages the progress of each children constructivist development in terms of knowledge construction and development of scientific skills.



The roles of the teacher

- Theory builder- a person who helps pupils to make associations between ideas and build meaningful patterns to represent the knowledge constructed.

Constructivism teaching

- Teaching-learning resources: can be manipulated and used to interact with the environment.
 - Teaching learning activities: emphasizing observation, collection of data, testing of hypothesis, study trips, etc.
 - Teaching-learning process: using co-operative learning, discussion and exchange of ideas, and curriculum integration: organizing thematic project that integrate science and mathematics, reading and writing.
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Constructivism and objectivism

Aspect	Objectivism	Constructivism
Knowledge	The truth can be obtained by every person, reality is objective	Meaning is obtained through experience, reality is personal
Learning	Look for knowledge that is already known and decided generally	Interaction between prior and new knowledge, importance of social interaction to build meaning
Teaching	Teacher presents knowledge to the pupils	Teacher provides relevant experiences and holds dialogues with pupils in search of meaning
School curriculum	Importance set of information needs to be learnt by pupils	Set of incidents and learning activities to be followed by pupils and teacher together

Needham's Five Phase

Phase	Aim	Example of activity
Orientation	Attracting attention and interests pupils. Motivating pupils.	Demonstration of discrepant events; Posing of problem for thinking.
Elicitation or generation ideas	Identifying pupil's prior ideas.	Concept mapping; Question and answer session to stimulate thinking
Restructuring of ideas	Further developing or modifying prior ideas by comparing with scientific ideas; investigating by using scientific skills	Hands-on and minds-on activities; activities using science process skills; communicating in groups; obtaining new experience of the world and technology through suitable learning resources



Needham's Five Phase

Application of ideas	Application of ideas in new situations	New problem-solving; invention; projects
Reflection of reviews change in ideas	Conscious of how prior ideas have changed	Reflective questioning; helping pupils in self-evaluation on the change of ideas and process skills achieved