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Critical Study on 5E Learning Cycle Model

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ABSTRACT

The 5E Learning Cycle Model is a systematically structured cycle that includes hands-on practice, reading science texts, guided conversation, and problem solving to provide real science activities that contribute to the creation of knowledge. Learning happens in the 5E Learning Cycle Model through active contact with objects and concepts, rather than passive receipt of transmitted knowledge.

1. Introduction

The 5E Learning Cycle Model, which was developed as a part of the “Science for Life and Living curriculum” generated by the Biological Sciences Curriculum Study (BSCS), is an effective way to address the constructivist methodology, philosophical reform, and inquiry learning in a humanistic classroom environment (Bybee & Landes, 1990). This model was inspired by the work of German philosopher Johann Friedrich Herbart, as well as John Dewey and Jean Piaget (Bybee, 1997).

The five stages of the 5E Learning Cycle Model are Engagement, Exploration, Explanation, Elaboration, and Evaluation. Each process serves a distinct purpose, assisting the instructor in providing consistent guidance and the learners in developing a greater understanding of science and technical knowledge, attitudes, and skills. The paradigm establishes the order and structure of systems, groups, and lessons. Once internalized, it will also guide the many split-second choices that Science teachers must make in the classroom.

The 5E Learning Cycle Model is a systematically structured cycle that includes hands-on practice, reading science texts, guided conversation, and problem solving to provide real science activities that contribute to the creation of knowledge. Learning happens in the 5E Learning Cycle Model through active contact with objects and concepts, rather than passive receipt of transmitted knowledge. The learner is the one that develops new knowledge for himself or herself, and the instructor introduces exercises that engage the child's mind as well as his or her hands, resulting in cognitive learning. This learning cycle model's humanistic perspective sees instruction as experiential and is focused on the premise that learners construct their own experience in socially ordered settings.

The 5E Learning Cycle Model is a constructivist model that aims to maximize students' research interests by focusing on the exploration and interaction of new ideas with prior experience. Students form their own information about a particular issue with the help of designed and implemented teaching-learning events.

As a constructivist approach, the 5E Learning Cycle Model is useful in helping students enjoy research, appreciate information, and relate scientific processes and ideas to real-world contexts. Students were given disequilibrium with their original conceptions at the beginning of the learning period, forcing them to reconsider, fix misconceptions, and rebuild their information. This approach ensures more rapid and concrete philosophical improvement and idea attainment. This model encourages a greater understanding of the essence of research and scientific research by fostering student interest in science and improving scientific thinking skills.

For teachers and instructional planners, each stage of the learning cycle serves as a pre-planner. The study's results are intended to be beneficial to students, instructors, coaches, and curriculum planners. The research in this field will contribute to the creation of rigorous and pedagogically sound science teaching strategies. The study's results will aid curriculum designers and others involved in the world of education in comprehending the necessity and usefulness of this relatively recent form of science teaching. It is hoped that the study's results would aid instructional designers in making necessary revisions to the Physics text book by incorporating more learner-centered topics in a more unified manner.

The use of this model gives coherence to various instructional methods, establishes relations between instructional experiences, and aids science teachers in making decisions regarding student experiences. The research provides options for a diverse variety of learning experiences based on student interests, as well as a natural way to encourage imagination in thinking and behaviour.

2. 5E Learning Cycle Model

The learning period, according to Beisenherz and Dantonio (1996), allows students to create discrete science concepts on their own. It consists of three phases: an exploration process where students are subjected to hands-on experiments, an introduction phase where the idea is officially presented, and an implementation phase where the concept is validated and extended by new interactions. Teacher prompts are used to direct learning experiences at all stages of the learning cycle.

The learning cycle was not originally a 5E model, but with the focus on constructivism and measuring prior experience, the Engagement stage was introduced, making it a 5E model.

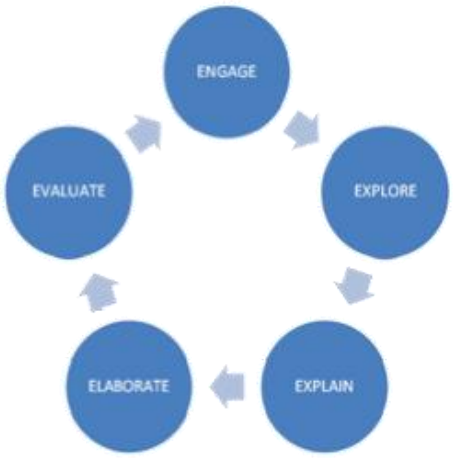

Figure 1: Phases of 5E Learning Cycle Model

The Table 1 given below gives a brief summary of the 5 stages of the learning cycle model.

Table 1: Description of the stages of the 5E Learning Cycle Model

Engagement	An object, a case, or a query that is used to pique students' interest. Students were able to make connections between what they learned and what they would do because of the connections.
Exploration	Various objects and phenomena are investigated. Hands-on games and supervision
Explanation	Students describe how they comprehend ideas and systems. As a means of achieving intellectual consistency and continuity, new ideas and skills are added.
Elaboration	Students may use activities to put ideas into perspective and expand on or broaden their knowledge and abilities.
Evaluation	Students may use activities to put ideas into perspective and expand on or broaden their knowledge and abilities.

1. Engagement

- Students are involved in the learning task during the first step. Students concentrate emotionally on an idea, a challenge, a circumstance, or a case. This phase's tasks can help to reduce cognitive disequilibrium by making correlations to previous encounters and exposing students' assumptions.
- Students can be engaged and focused on the instructional challenge by asking a question, identifying an issue, demonstrating a discrepant occurrence, or acting out a difficult situation. The teacher's job is to present the situation and determine the educational mission. The rules and procedures for determining the mission are often defined by the instructor.
- When the teacher is engaged, he or she takes centre stage. The instructor introduces the issue, assesses the pupils, assists them in making associations, and advises them of their next steps.

The aim of interaction is to:

- Keep students' focus on the subject at hand.
- Conduct a pre-assessment of the students' previous experience.
- Explain the learning goals to the pupils.
- Remind students of what they already learned and how to adapt it to understanding the current subject.
- Offer the students a problem to solve in the next step of the learning cycle.
- Students who are successfully engaged are puzzled by the learning experience and strongly encouraged to participate in it. The term "action" here refers to both mental and physical activity, and it includes things like,
- Look out at something that pique your interest
- Ask questions about the natural world
- Consider potential answers to questions
- Take note of unusual occurrences
- Identify instances where students' expectations differ

2. Exploration

- Students have a social desire to revisit the concepts until the activities have piqued their interest. Exploration exercises are intended to provide a general, realistic environment for all students in the class, allowing them to begin formulating ideas, procedures, and skills. Disequilibrium is created by engagement; discovery begins the process of equilibration. This should be a practical and hands-on step. During this method, educational software can be used, but it must be specifically programmed to aid in the initial step of formulating adequate and scientifically sound concepts.
- As they gather data to solve the dilemma, the students are now at the heart of the action. In order to

solve a problem, the teacher ensures that the students gather and arrange their results. Active participation is required of the students.

- The aim of discovery is for students to gather data that they can use to solve the problem.
- Exploration exercises are designed to provide opportunities that teachers and students can use to formally implement and explore ideas, procedures, or skills later on. The students have time during the exercise to investigate objects, activities, or circumstances. Students create associations, analyse patterns, classify factors, and challenge activities as a function of their mental and physical presence in the practice.
- In the experimentation process, the instructor serves as a facilitator or mentor. The instructor starts the activity and allows the students to explore objects, artefacts, and circumstances based on their own interpretations of the phenomenon. The instructor may mentor or direct students as they begin to rebuild their explanations if needed. It is important to use tangible materials to provide meaningful interactions.
- Engage in focused play
- Brainstorm possible alternatives
- Experiment with materials
- Observe a certain phenomenon
- Design a model
- Collect and organise data
- Employ problem solving strategies
- Choose appropriate resources
- Discuss solutions with others
- Design and conduct experiments
- Evaluates choices
- Participates in debates

3. Explanation

The act or method of making ideas, systems, or capabilities plain, comprehensible, and understandable is referred to as "explanation." The interpretation method establishes a shared vocabulary for students and teachers in relation to the learning activity. The instructor guides the attention of the students to particular facets of the interaction and exploration activities during this process. The teacher begins by asking the students for their explanations. Second, in a direct, explicit, and systematic way, the instructor presents scientific or technical explanations. Explanations are a means of putting the exploratory interactions in a logical order. The instructor should focus the first part of this process on the students' interpretations and make direct connections between the explanations and interactions from the instructional model's interaction and discovery phases. The trick to moving on to the next step is to present ideas, procedures, or abilities briefly, plainly, explicitly, and specifically.

To evoke and improve student explanations, teachers may use a range of techniques and tactics. Educators mostly use auditory presentations, although there are a variety of other options, including animations, documentaries, and instructional courseware. The following are some of the most famous techniques used in this phase:

- Disseminate facts and concepts
- Create and describe a blueprint
- Create a different interpretation
- Review and criticize responses
- Use peer evaluation
- Assemble various answers/solutions
- Determine acceptable closure
- Integrate a response with prior expertise and practise

This step continues the conceptual ordering process while still including jargon for interpretations. Finally, students should be able to describe exploratory events and interactions that have captivated them in everyday terms, since they would not be able to articulate and apply theories in empirical terms right away.

4. Elaboration

It's critical to include students in additional interactions that expand or elaborate ideas, procedures, or abilities after they've been given an overview of terminology for their learning activities. This stage aids the transition of ideas to unfamiliar yet closely connected contexts. Students may still have misconceptions or only understand a concept in terms of their exploratory experience in some cases. Elaboration exercises offer additional time and opportunities that aid in the understanding of a definition.

Champagne (1987) gives a detailed account of this point. Students participate in meetings and knowledge gathering exercises during the elaboration process. The group's mission is to find and implement a limited number of promising solutions to the problem. Students present and defend their contributions to the educational challenge during the group dialogue. This dialogue leads to a clearer understanding of the mission, as well as the assessment and collection of evidence needed to complete it successfully. The teaching time is not cut off to outside input. Students learn from one another, the author, written texts, experts, computer libraries, and their own tests. These are referred to as learning knowledge bases. Individual students are able to expand on the task conception, knowledge bases, and alternative task fulfilment solutions as a result of their inclusion in the group conversation.

Students may share their knowledge of the topic and get input from people who are also close to their level of understanding in group conversations and mutual learning scenarios, which is what collaborative learning is all about. The key techniques used in the elaborate process can be summarized as follows:

- Make choices
- Transfer experience and expertise
- Share facts and ideas verbally and in writing
- Ask new questions
- Develop goods and spread ideas
- Use examples and ideas to elicit debate and approval from others
- Conduct further inquiries
- Conduct exercises across other fields

This stage also provides an opportunity to immerse students in unfamiliar circumstances and challenges that necessitate the transition of related or equivalent explanations.

5. Evaluation

This is a valuable chance for students to put their newly learned talents to work to assess their comprehension. Students should also get input on the quality of their interpretations. Informal assessment will take place at any time during the 5E series. After the elaboration process, the instructor may complete a standardized assessment. Teachers must evaluate educational results as a realistic educational issue. Teachers conduct tests to evaluate each student's level of comprehension during this period, and the main evaluation techniques are listed below.

- Logs and journals etc.
- Portfolios are a type of portfolio.
- Create conceptual and physical versions of yourself
- Student information sheets
- Evaluations of performance
- Create a commodity
- Rubrics and scoring instruments
- Exams

Table 2: Summary of the 5E Learning Cycle Model

Phase	Summary
Engagement	Through the use of brief tasks that encourage interest and evoke prior information, the instructor or a curriculum challenge accesses the learner's prior knowledge and helps them become interested in a new topic. The task should make correlations between previous and current learning experiences, reveal prior assumptions, and coordinate students' thought about current activity learning outcomes.
Exploration	Exploration interactions offer students a shared set of exercises to identify existing ideas (misconceptions), procedures, and abilities, as well as promote conceptual progress. Learners can perform lab experiments that help them develop new ideas, discuss questions and hypotheses, and plan and execute a tentative inquiry using prior experience.
Explanation	The interpretation period directs students' attention to a specific feature of their interaction and discovery activities and allows them to demonstrate their intellectual comprehension, process abilities, or attitudes. This step also allows teachers to present an idea, method, or skill directly to students. Learners explain how they grasped the idea. A teacher's interpretation can lead to a deeper understanding, which is an important part of this process.
Elaboration	Teachers push students' intellectual awareness and knowledge to new heights. Students gain a deeper and broader awareness, more knowledge, and adequate skills as a result of new experiences. Students put their knowledge of the idea into use by participating in additional events.
Evaluation	The assessment process allows students to measure their knowledge and skills while also allowing teachers to assess student success in meeting instructional goals.

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