Virtual Laboratory Experiment Design Guidelines (VLEDG) Set V- Design an effective virtual laboratory experiment with Discovery or Guided Inquiry instructional strategy

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Discovery Instructional Strategy

The discovery approach, like inquiry, is inductive.

SDL is a knowledge construction approach that is based on scientific discovery activities. Three main interlocked spheres exist in the processes of effective SDL:

- Problem representation and hypothesis generation, which heavily relies on the activating and mapping of prior knowledge and the meaning-making activities
- Testing hypotheses with valid experiments
- Reflective abstraction and integration of the discovery experiences.

Four phases in Discovery Instructional Strategy

Phase I – Initiation

Phase II – Exploration

Phase III – Experimentation

Phase IV – Presentation

Four phases in Discovery Instructional Strategy

Phase I – Initiation

The Initiation Phase is the first phase in all levels of inquiry. It is primarily designed to stimulate and motivate students' curiosity through questioning.

Phase II – Exploration

In this phase, questions are eliminated or narrowed down to those types of questions students can actually physically answer through experimentation or research.

Four phases in Discovery Instructional Strategy

Phase III – Experimentation

In this phase students form into groups to conduct an experiment. Students collect data and information, and then formulate a method of presentation.

Phase IV – Presentation

The last phase of inquiry is the Presentation Phase. Groups or individuals take the information gathered in the experiment and put it into some form of presentation. PowerPoint presentations or project display boards are types of presentations that may be used.

Four phases in Discovery Instructional Strategy

Phase I – Initiation

The Initiation Phase is the first phase in all levels of inquiry. It is primarily designed to stimulate and motivate students' curiosity through questioning.

- In this phase provide students with an opportunity to experience a phenomenon or something new that challenges a previous belief or assumption. You may ask questions such as
- Have you ever seen…?, Did you notice…?, What did you observe…?

Four phases in Discovery Instructional Strategy

Example from BAE:

Have you seen these components?

Can you identify them?

What are these used for in Electronics?

Four phases in Discovery Instructional Strategy

Phase II – Exploration

In this phase, questions are eliminated or narrowed down to those types of questions students can actually physically answer through experimentation or research.

In this phase assign tasks to the students to identify the relevant variables.

Students can be asked to identify controlled and uncontrolled variables. Assign tasks in which students will design the procedure or reduce the procedure to the essential parts. If the procedure cannot be designed safely, then the students might be asked to explain why certain steps in the procedure are done in a certain way.

Four phases in Discovery Instructional Strategy

Phase II – Exploration

In this phase, questions are eliminated or narrowed down to those types of questions students can actually physically answer through experimentation or research.

Assign tasks where students make predictions and explain them before the lab. Having students make predictions creates interest in the outcome. In addition, have students explain the basis for their predictions using their present ideas. Ideally, the problem presented will be one, which creates dissatisfaction with their present understanding. Challenge students to come up with alternative hypotheses. In this phase ask questions such as: What happened when…?, What did you…?, What could we do to find out…?, What questions do you have…?

Four phases in Discovery Instructional Strategy

Example from BAE: Find out one application of these components. Design the circuit for the particular application. Select the appropriate inputs to be given to the circuit.

- What output do you expect from the circuit?
- What did you do to find the application of the component?
- What happened when you gave the chosen input?
- What could we do to find out the change in output if a different component is used?

Four phases in Discovery Instructional Strategy

Phase III – Experimentation

In this phase students form into groups to conduct an experiment. Students collect data and information, and then formulate a method of presentation.

Make the students come up with tasks and corresponding assessment questions for data collection and tabulation, data analysis, reporting the results, analysis of the obtained results, drawing conclusions from the obtained analysis of results. Ask relevant questions and provide hints so that the students are guided towards the solution. What did you find out about…?, How is it the same as or different from…?, What do you know about the characteristics of…?

Four phases in Discovery Instructional Strategy

Example from BAE: Construct the designed circuit in the virtual lab. Apply the chosen input to the circuit and observe the output.

- What output did you obtain?
- How is it the same as or different from your predicted output?
- What do you know about the characteristics of the chosen component?

Four phases in Discovery Instructional Strategy

Phase IV – Presentation

The last phase of inquiry is the Presentation Phase. Groups or individuals take the information gathered in the experiment and put it into some form of presentation. PowerPoint presentations or project display boards are types of presentations that may be used.

Make the group or student to share the data with an audience and allow time for questions concerning procedures, data, information, etc. Can you explain why…?,Why do you think…?,What other factors may be included in…?,Can you find a way to…?,How did you arrive at a solution to…?

Four phases in Discovery Instructional Strategy

Example from BAE: Share the details of your experiment with your peers. The details such as the application you have designed, the circuit construction, the details of the functions of other components used, input applied, output obtained.

- Can you explain why your results do not match with your peers?
- Why do you think the peers have a better design than yours?
- What other factors you should have considered while designing the circuit?
- Can you find a way to come up with a better solution?
- How did you arrive at the new better design?

What next?

- Start your virtual lab experiment design with Scientific Discovery Learning.
- Set VI – Design experiment with Well Structured Problem Solving Instructional Strategy