

## **Alaska Science Consortium**

# **LEARNING CYCLE MODEL**

<b>GEAR- UP</b>	Mentally engages and motivates students. Excellent time to gain information on students preconceptions. Similar to “anticipatory set” or “engagement”.
<b>EXPLORE</b>	Hands-on, minds-on activities that provide an opportunity for the students to discover a newer explanation for an event or concept.
<b>GENERALIZE</b>	Questioning strategies help students to verbalized their new discoveries and identify questions to be tested.
<b>EXPERIMENT</b>	Students design and conduct an experiment (fair test).
<b>INTERPRET</b>	Students display and interpret the data that they have collected.
<b>APPLY</b>	Students apply newly learned concept. Activities should help the students to recognize the universal nature of the concept (i.e. How does this concept operate in a context different than the one we just explored?)

## **Stages of the ASC Learning Cycle Model (LCM)**

### **GEAR-UP**

*Mentally engages and motivates students. Excellent time to gain information on student preconceptions. Similar to “anticipatory set” or “engagement”.*

#### **Teacher Behaviors**

- Presents a stimulating experience that will engage the students interest and help them to focus on this instructional moment
- Assesses student preconceptions (what do the students know or think they know about the concept or topic) by asking students questions that include what, where, when, and why about the science concept
- Documents student preconceptions and/or knowledge by using a check list, sticky note, whole class chart, etc
- Provides for transitions into explorations

#### **Student Behaviors**

- Engages in activities
- Verbalizes or shows evidence of preconceptions
- Accepts others preconceptions as valid

#### **Examples**

- Discrepant Event
- Concept map (webbing)
- Puzzles, games
- Current events
- Mysteries
- Poems, stories, movies, readings
- Environmental issues
- Invention/design challenges
- KWL, KWHL charts

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### **EXPLORE**

*Activities to help the students become familiar with the materials, Test out their preconceptions, conjecture, “mess around with” cause/effect ideas. There provide an opportunity for the students to discover a newer explanation for an event or concept. It is important for the teacher to value and protect ample time and opportunity for personal explorations by the students.*

#### **Teacher Behaviors**

- Provide activities that start with the students current level of understanding (may involve multiple starting points for your wide range of students)
- Acts as a facilitator in a variety of activities that target skills and the target concept
- Observes and listens to students as they interact
- Encourages varied observations and conjectures
- Asks inquiry oriented questions
- Provides time for students to think and reflect
- Encourages cooperative learning
- Documents successes for assessment

#### **Student Behaviors**

- Asks clarifying questions
- Uses a variety of methods to interact
- Works cooperatively with peers and gains insights from their activities
- Makes careful observations, recordings, measurements, and classifications
- Identifies and seeks to expand personal understandings of the concept or phenomena
- Shares conjectures and suspends judgment while discussing tentative alternatives

#### **Examples**

- Materials based, open ended manipulations
- Guided discoveries
- Simulations, creative drama
- Internet search or other research

## **Stages of the ASC Learning Cycle Model (LCM)**

### **GENERALIZE**

*Questioning strategies that help students to verbalize their new discoveries and identify questions to be tested.*

#### **Teacher Behaviors**

- Uses at least two open ended questions (not yes or no answers) to encourage students to explain their observations and findings in their own words
- Provides definitions, new words, and explanations after students develop a need for the technical terms and definitions
- Listens and encourages students to discuss ideas among themselves
- Asks for clarification and justification
- Helps students to compare their new understandings to their original preconceptions
- Documents new understandings of concepts (conceptual growth)
- Determines if additional time should be spent exploring
- If moving to the experiment phase, assists students in refining their testable question

#### **Student Behaviors**

- Interact in a positive, supportive manner
- Describe their observations and discoveries
- Listen and question other students' ideas
- Distinguish between observations and inferences
- Identify other questions that arose during the questions

#### **Examples**

- Revisit concept maps
- Use convergent questions to help student verbalize their newly discovered concepts. Avoid yes or no questions
- Make “our laws” charts or finish KWL or KWHL charts
- Identify testable questions

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### **EXPERIMENT**

*Students design and conduct an experiment (fair test). This stage is distinguished from the conjecturing that occurs during the EXPLORE stage by the nature of the testing that occurs. Students are out to develop proof of their hypotheses, so that they can say with conviction “under these circumstances, this will happen”.*

#### **Teacher Behaviors**

- Assists students as they refine their testable questions
- Helps students design effective data collection and display plans
- Helps students recognize if they need to go back and explore the phenomena (do they need to know more about it so they can better predict the range of responses that will occur)

#### **Student Behaviors**

- Refine their testable question until it is fair (all variables except one are controlled; repeated tests occur)
- Accurately record all data
- Accept all data that have been collected with sound techniques; don't reject data if it doesn't match their predictions

#### **Examples**

- Test one manipulated variable
- Reduce the number of uncontrollable variables
- Conduct repeated tests/experiments
- Collect and record all data
- Have data collection or display charts

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## **INTERPRET**

*Students display and interpret the data they have collected*

### **Teacher Behaviors**

- Helps students use the data to answer their original testable question
- Provides models of data display alternatives (appropriate graphing forms, concrete vs. abstract graphs, two or three dimensional, etc), which automatically explain the question and experiment
- Questions students about how the results compare to their predictions; probe for bias
- Document students' mastery of graphic interpretation
- Encourages students to respond to each other's interpretations

### **Student Behaviors**

- Organizes information logically and honestly
- Uses data to determine the answer to the testable question; compares results to predictions
- Modifies views in the face of new evidence
- Reflects upon the successes of mistakes of the new experimental design; shares insights with others
- Designs new testable questions as spin off or for further verification
- Is willing to have others offer different interpretations of data

### **Examples**

- Data Chart/Graph production
- Data analysis
- Conclusions
- Review for bias

## **Stages of the ASC Learning Cycle Model (LCM)**

### **APPLY**

*Students apply the newly learned concept. Activities should help the students to recognize the universal nature of the concept (i.e. .how does this concept operate in a context different than the one we just explored?)*

#### **Teacher Behaviors**

- Provides opportunities for students to apply new concepts and skills and to extend them to other contexts
- Provides opportunities for students to use new terms and definitions
- Documents students ability to use concept outside of original context; determine if additional explorations and generalizing sessions are needed

#### **Student Behaviors**

- Uses previous information to probe, to ask questions, and to make reasonable judgments
- Connects concepts to new applications
- Offers to apply new knowledge to positive benefit to society

#### **Examples**

- Inventions
- Models
- Write a story that includes the concept
- Illustrates the concept
- Role play, dramatize the concept
- Venn diagram
- Concept map
- Write a report
- Reflection in science journal
- Power point presentation
- Apply new concept in new context