Concept Attainment Model (CAM) & Concept Development Model (CDM)

Training prepared for BDU Faculty Members
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THE CONCEPT ATTAINMENT MODEL
Definition

• How do you define “Concept”?
Why do we want students to “attain” concepts?

• Knowing a word and its definition does NOT guarantee that students really know the concept.
  • A child may call a neighbor’s dog “cat” because “it is a four-legged furry thing”
  • High school students may think there was no one living in the American continents before Columbus “discovered” America.
  • University students may understand research as “reporting what other people said.”
• Concepts are building blocks of understanding.
What are Concepts?

• Concepts, according to Jerome Bruner (1966), are the formation of any group or category.
  • It can be a word or symbol that represent any group or class.
• Vygostky (1986) commented “A word does not refer to a single object, but to a group or to a class of objects. Each words is therefore already a generalization.” (p. 6)
  • A concept should have more than one examples that share common essential attributes.
More definitions…

• Munn defines concept as “the process which represents the commonness in different things or events” (1967, 350).

• Dececco (1968) defines concept as “a class of stimuli which have common characteristics”

• Tennison (1980) defines concept as “the group of specific things, symbols, or events having similar characteristics and can be denoted by specific name or symbols.”
Types of Concepts

- **Abstract** (intelligence, love, happiness, gravity, culture, etc.) or **Concrete** (book, phone, house, wind, plant)
- **Primary** - not dependent on other concepts (rock, language, economy) or **Secondary** – dependent on other concepts (soil, Amharic, mixed economy)
- **Structured** – meaning same for all (science related concepts) or **Unstructured**- meaning different for different people (social science related concepts)
EXAMPLES OF CONCEPT:

Two Types of Attributes

- A concept is defined by its attributes—distinguishing features of an object or idea.

- Two kinds of attributes:
  - **Essential attribute** – the feature/quality that defines an object/item as belonging to the category of a certain concept.
  - **Non-essential** – a feature/quality an object/item may have but is not necessarily shared by other examples of the concept.
Concept Attainment Model

• It is “the process of defining concepts by finding those attributes that are absolutely essential to the meaning and disregarding those attributes that are not” (Gunter, Estes, & Schwab, 2003, p. 81)

• Is a product of students’ engagement in the process of defining concepts inductively – by “comparing examples and non-examples of the concept until definition is derived” (p. 82) Thus, students become “authorities” in what they are taught.

• Information processing model.
“A ‘table’ is a four-legged piece of furniture.”

Example

Aren’t these “tables”?
The definition also ambiguously applies to other furniture.

“A ‘table’ is a four-legged piece of furniture.”

Are these “tables”?

Having four legs is a **non-essential attribute** of a table.
So what is the **essential attribute** of a table?

“A ‘table’ is a piece of furniture people use to dine or to work on.”

But, are all tables used for dinning or “working on”? 
The definition also ambiguously applies to other furniture.

“A ‘table’ is a piece of furniture people use to dine or to work on.”

Being used for dinning or working is a non-essential attribute of a table.
Features of the Concept Attainment Model

• It can be done with the whole class; no need of forming small groups.
• It is applicable across ALL grade level, ALL content areas; also works BOTH for advanced students and students that are lagging behind academically.
• CAM can be designed to involve ALL levels of thinking in Bloom’s taxonomy.
• The CA strategy focuses on the meaning or understanding of a concept rather than on what the concept is called.
• It is an instructional strategy used to promote critical inquiry, reasoning skills, and higher-level thinking.
Steps in the Concept Attainment Model

• Steps to be completed by the teacher prior to instruction:
  1. Select and define a concept
  2. Select the attributes
  3. Develop positive and negative examples
Steps… (Cont’d)

• Steps to be applied during instruction
  4. Introduce the process to the students
  5. Present the examples and list the attributes
  6. Develop a concept definition
  7. Give additional examples
  8. Discuss the process with the class
  9. Evaluate
Step 1 – Select and Define a Concept

- Use this model to teach concepts that have clear criterial attributes.
  
e.g., part of speech,
  classification system in biology,
  abstract concepts in physics such as “gravity,” or “pressure”
  concepts such as “freedom” or “slavery” in history,
  shapes in geometry,
  different artistic styles in fine arts, etc.
Step 1 … (Cont’d)

• Consider related concepts which are superordinate, coordinates, and subordinates to the target concept.
  
  e.g.,  
  Concept = Table
  
  Superordinate = Furniture
  
  Coordinate = Chair, cupboard
  
  Subordinate = Coffee table
Step 1 …(Cont’d)

• Write a definition that is satisfactory to you, comprehensible to the learners, and relevant to the lesson at hand.
  • Do not rely solely on textbook or dictionary definition.

• Think of other definitions of the concept which you will introduce students at the close of the activity.
  • E.g., table may mean a platform, a discussion, a matrix with rows and columns, or a plateau (mountain tables).
Step 2- Select the Attributes

• Then select the **essential attributes** of the concept according to the definition you would like the students to gradually arrive at. Think…
  
  e.g. tables should be ….
  
  table should have…
  
  tables should do…

• Also think of and prepare about other features, such as the number of legs the furniture has, which are **non-essential attributes**.
Step 3 – Develop Positive and Negative Examples

• Create/prepare as many examples as possible.
  • The positive examples should have all the essential attributes.
  • The negatives should lack one or some of the attributes.
• The examples can be pictures, vignettes, three-dimensional objects, verbal examples, etc. depending on the concept you are trying to teach.
  • For Table- pictures
Step 4- Introduce the Process to the Students

• Begin the class by stating that the goal of the activity is to define a concept and to identify its essential attributes.

• Introduce the purpose as students arriving at the definition of the concept in their own words.

• You may keep the name of the concept to be taught a secret until students come up with their own definition at the end of the activity.

Name of Concept  Definition
Step 4 – Cont’d

• Write two column headings on the board, one for positive features (of examples) and the other for negative features (of non-examples).
• Tell the students that you are going to show them positive and negative examples of the concept they are going to learn, and that their job is to formulate a list of features that distinguish the positive examples.
Step 5 – Present the Examples and List the Attributes

• Start presenting the positive and the negative examples one by one.
  • Begin from a positive example and ask students to mention any attributes they note.
• Write all the attributes students mention on the board.
  • Do NOT reject any answer.
• When presenting them a negative example, tell them it is a negative example (non-example).
• When students recognize an attribute they listed as non-applicable to some of the examples, strikethrough the attribute. Do NOT erase.
Examples for Step 5

1. Rectangular
Made of wood
Four-legged
Bench-like
Flat surfaced
Surface fixed on legs
Slab connecting the legs
Examples...

2. Rectangular
   Made of wood
   Four-legged
   Bench-like
   Flat surfaced
   Surface fixed on legs
   Slab connecting the legs
   Has drawer under the surface
Examples...

3. Rectangular
   Made of wood
   Four-legged
   Bench-like
   Flat surfaced
   Surface fixed on legs
   Slab connecting the legs
   Has drawer under the surface
Examples...

4. Rectangular
Made of wood
Four-legged
Bench-like
Flat surfaced
Surface fixed on legs
Slab connecting the legs
Has drawer under the surface
Non-Examples...

5. Rectangular
   Made of wood
   Four-legged
   Bench-like
   Flat surfaced
   Surface fixed on leg(s)
   Slab connecting the legs
   Has drawer under the surface
   A furniture to place objects on
Examples...

6. Rectangular
   Made of wood
   Four-legged
   Bench-like
   Flat surfaced
   Surface fixed on leg(s)
   Slab connecting the legs
   Has drawer under the surface
   A furniture to place objects on
Step 6 - Develop a concept definition

- Ask the students to try to develop a definition for their new concept that incorporates all the essential attributes remaining on the board.
  
  “A table is a flat surface with a support below it on which we place objects.”

- The name of the concept may be revealed to the students before or after they develop their definition.
Step 7 – Give Additional Examples

• Show them a few more positive and negative examples to test whether they can identify examples of a concept.

• Ask the students to provide their own examples, and then to explain why their examples fit the concept definition.
Step 8- Discuss the Process with the Class

- Ask students to identify the point at which they understood the essential attributes.
- Ask them to tell which examples were the most helpful.
Step 9 - Evaluate

- Ask them to develop additional examples of the essential attributes on their own
  - E.g., instead of “A table is a flat surface with a support below it on which we place objects.”

They may recognize “furniture” as one essential attribute of table as opposed to a sports equipment.

- Therefore: “A table is a kind of furniture that has a flat surface with a support underneath on which we place objects.”
More Examples

• Teaching the definition of “research” as “a **systematic** investigation (including development, testing, and evaluation) designed to **discover or contribute to** a body of **generalizable knowledge**.”
  • Character- systematic
  • Purpose – to discover or contribute to a body of knowledge
  • What kind of knowledge? – Generalizable knowledge
Exercise

• **Identifying Research:** which of the following do you think are research studies? Which ones are not research?

Case 1: A certain school director wanted to know the gender composition of the school staff. Then, he asked his secretary to count on a meeting how many of the school staff are female and how many are male and bring him back the report.

Case 2: The uncle of a school girl follows up the academic and personal development of the girl throughout school. He notices very well what kinds of issues she faces each year, what effect this has on her, and which issues are happening recurrently so that he can look for solution and help her be successful and happy.
Case 3 – A manager faced a difficult administrative situation in his organization in relation to salary increase. Many employees in the organization started demanding different and conflicting measures be taken, and the issue became even more chaotic. The manager left the scenario, went alone for a three day retreat, and tried to clear up his mind and focus. He started reading different books on management and leadership and tried to understand his context in light of the literature. On the third day, he came up with a final decision on the matter and came back to town to execute it.
Things to Note

• The focus of this teaching model is not on the accuracy of the definition students come up with but the **process** of identifying attributes and forming concept which is essential for students’ cognitive development.

• The model aims to acquaint the students with **pre-existing concepts**. It does not aim to challenge students to create new concepts.

• Not every concept needs to be taught by this method even if they can be teachable by this model. Keeping variety of teaching methods is essential.

• Students must be guided **carefully**. When the teacher/instructor selects the concept, the attributes, and the examples, he/she should be most accurate in terms of what he/she wants the students to understand.
Benefits of the Concept Attainment Model

• The model highly encourages transfer learning as students engage in identifying examples from non-examples.
• Reduces “cognitive overload” by helping students see commonness rather than uniqueness among various phenomena.
• Develops their inductive reasoning skill.
• It is a structured inquiry for pattern-generating thinking process.
• The model has room both for individual thinking and collaborative thinking.
• Develops students’ sense of agency in the construction of their own knowledge.
Exercise -1

**Direction**

1. Select a concept that is central to the course/unit you teach.
2. Define the concept (write a definition that is relevant to your course/unit).
3. Specify the essential attributes of the concept.
4. Write down a couple of non-essential attributes of the concept.
5. Write down two positive and two negative examples for the concept.
THE CONCEPT DEVELOPMENT MODEL
Why “develop” concepts after attaining them?

- A concept must be experienced and conceptualized in order to become part of an individual’s mental framework.

- Our grasp of a concept becomes more meaningful and more permanent when we have “thick file” about it in our brain.
The Concept Development Model

• A strategy used to extend, enrich, and refine information in our individual files.

• Created by Hilda Taba who used it to develop students’ knowledge of concrete objects such as “apples” and “baseballs.”
  • Proficiency in extending and refining concepts of simpler objects increases proficiency in extending and refining concepts of abstract ideas

• Compared to the Concept Attainment Model, it provides more agency to the students in the knowledge construction process.
The Concept Development Model (Cont’d)

• “The process of creating categories by grouping similar objects and ideas” (Gunter, Estes, & Schwab, 2003, p. 81)
• The steps in the CDM involve generating data about the concept, organizing data, and synthesizing data to make generalizations.
• The steps give students the chance to begin from more concrete objects/categories and progress to more complex ideas.

“Understandings are built, not acquired.”
Steps in the Concept Development Model

1. List as many items as possible that are associated with the subject.
2. Group the items because they are alike in some way.
3. Label the group by defining the reasons for grouping.
4. Regroup or subsume individual items or whole groups under other groups.
5. Synthesize the information by summarizing the data and forming generalizations.
6. Evaluate students’ progress by assessing their ability to generate a wide variety of items and to group those items flexibly.
Step 1 - List as many items as possible that are associated with the subject/concept.

- Ask students to name anything related to the subject/concept.
  
  “Tell me everything you know about tables.”

- Data can come from personal experiences or classroom materials previously covered.

- Can be words or phrases; but the idea should be specific.

- Can be generally recognizable or meaningful only to them in its connection with the subject/concept under study.
Step 1 – Cont’d

• Keep record of the list where it is visible to all.
• Students may come up with this list first individually, and then together in small groups or as a whole class.
• Encourage students to keep listing, even after they seem they have run out of ideas.
• Keep recording until the list becomes comprehensive and exhaustive.
Step 2 – Group the items because they are alike in some way

• Ask students to begin grouping when sufficient number of items are listed.
  
  ‘Which of the items/words or phrases/ we have listed go together because they are alike in some way?’

• Students begin examining relationship among items.

• Try to elicit several groups. Do not lump many items together simply to minimize number of groups.
Step 3 – Label the groups by defining the reasons for grouping

• Ask students to give labels to the newly formed groups.

• Ask students to explain the reason for their choices in this step (even if the reasons for the grouping seem obvious).

• Do not correct students’ judgment; neither do try to teach particular inferences and generalizations. Instead, let students make their own inferences and generalizations.

• Maintain a recorder role and allow students to dialogue among themselves.
Step 4 – Regroup and Subsume Individual Items or Whole Groups under Other Groups

- Ask the group: “Are there items now in one group that could be put in another group?”
- And later, ask: “Are there whole groups that could be placed under one of the other labels?”
- For both questions, the teacher should ask the students’ reasoning: “Why do you think _____ belongs under _____?”
- Students can still add new items under this step, or restart the process of grouping if reasoning for grouping is superficial.
- The idea in this step is that students will begin to see that every person, object or idea has many characteristics and may be grouped in many different ways.
Step 5 – Synthesize the Information by Summarizing the Data and Forming Generalizations

• At this step, ask the class to look over the entire chalkboard, consider all the groups and labels, and try to make general statement about the topic in one sentence.

• Help students focus on complexities in the idea.
Step 6 – Evaluate students’ progress by assessing their ability to generate a wide variety of items and to group those items flexibly.

- Try to assess without necessarily associating grades to “correctness.”
- Assess, instead:
  - Number of items they come up with in a short period of time (can be competition among groups or with a ticking timer)
  - Originality of the groups they come up with in the grouping and labeling steps.
  - Complexity of the generalizations they make (whether the generalization contains contradictory aspects of the concept studied)
Benefits of the Concept Development Model

- **Extending and refining knowledge** – flexible thinking (relieves constrained thinking), sharing with others
- **Generating original ideas** – adept at going through the steps by themselves
- **Reading and extracting meaning** – understand the concept deeply
- **Problem solving** – clarify their thinking to see solutions for real life problems
- **Writing unified paragraphs and papers** – groups as paragraphs and labels as topic sentences.
References