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Concept Attainment: Instruction Suitable for All

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Abstract

Myriad instructional strategies promote critical inquiry, reasoning skills, and higher-level thinking but few are applicable across content areas as well as a range of learners from pre-kindergarten to higher education. Concept Attainment, a pedagogical approach that capitalizes on stimulating inductive thinking processes, is one exception.

Introduction

This paper first provides a brief overview of related research which highlights the effectiveness of the Concept Attainment instructional strategy. Next, a general discussion of inherent constructs of the instructional model and guidelines for implementation are presented. Then, two lesson examples are outlined (one for secondary and one for elementary learners) with hypothetical responses included to elicit context for internalizing the instructional process. The paper ends with concluding discussion.

Related Research

Concept Attainment, described by Bruner, Goodnow, and Austin (1967), is an inductive thinking process where learners discover characteristics or attributes of a category/concept by comparing and contrasting data presented as exemplars, with those that do not represent the attributes of a concept, presented as non-exemplars. It serves multiple pedagogical purposes in that it is designed to 1) teach specific concepts, 2) support learners' inductive reasoning skills and knowledge building strategies, 3) create awareness of differing viewpoints and flexible thinking, and 4) develop tolerance for ambiguity (Joyce, Weil, & Calhoun, 2014). Over the years, researchers have conducted studies which tout and validate its effectiveness as an instructional model (Gagné, 1965; Hammer, 2009; Johnson & Carlson, 1992; Kumar & Mathur, 2013; Marzano, Pickering, & Pollock, 2001; McKinney, Warren, Larkins, Ford, & Davis, 1983; Merrill & Tennyson, 1977; Twyman, McCleery, & Tindal, 2006). Of significant note, Tennyson and Cocchiarella (1986) found that learners' analysis of exemplars prior to discussion of characteristics or definition of concepts helped them develop clearer conceptual understandings that would sustain over longer periods of time. Most importantly is the utilitarian aspect for educators in that Concept Attainment is an instructional strategy that can be used in multiple content areas (See Bilica & Flores, 2009; Boulware & Crow, 2008; Freeman, 2005; Horton, 2007; Kumar & Mathur, 2013; McKinney et al., 1983; Reid, 2011; Riordan, 2012; Twyman et al., 2006) and is effective with learners across a range of age, grade, and developmental levels (Erickson, 2002; Gallenstein, 2005; Joyce et al., 2014; Silver, Strong, & Perini, 2007; Vantassel-baska & Brown, 2007).

General Discussion

The Concept Attainment processes structure inquiry through positive examples (exemplars) that provide characteristics, properties, and attributes which are distinctive to a concept and negative examples (non-exemplars) as clues which help eliminate characteristics that do not apply to the concept (Joyce et al., 2014). Exemplars presented must meet all the defining characteristics of the concept, where non-exemplars can be totally random, trivial, silly or at times present partial characteristics of the concept; but the non-exemplars help to set parameters of the concept to be discovered. Ideally, both exemplars and

non-exemplars are strategically posed to spawn learning disequilibrium or influence decision-making processes as data are categorized. This inductive, pattern-generating thinking process helps anchor in-depth understanding of the concept as learners identify attributes of a variety of mental categories (Bruner et al., 1967). As an instructional strategy and learning process, Concept Attainment assists learners in identifying and naming concepts through categorization of relevant features or common elements, where learners must discriminately compare and contrast data that are systematically presented.

Guidelines for Implementation

Define Concept and Select Exemplars/Non-Exemplars

The first step is to identify and define the concept. A strong definition helps in selecting the exemplars that possess and effectively demonstrate the attributes of the concept. Lessons generally need a minimum of 12 sets of exemplars and non-exemplars (with a purposeful, strategic selection of solid examples). More complex concepts may require more. Exemplars must match the definition of the concept, although when presenting exemplars, characteristics of the concept may not be initially evident to the learners. Additionally, exemplars may elicit non-relevant characteristics from learners during initial brainstorming. It is important to encourage learners to note all ideas that come to them as this supports the inquiry process for identifying the concept. Selection of non-exemplars can be random or whimsical at first, since the intention is to help learners eliminate broad concepts. Later introduction of non-exemplars must be more selective and strategic in assisting learners to narrow identification of the concept.

Present Exemplars/Non-Exemplars

There are two approaches for how to present the exemplars and non-exemplars. This is important to mention because different learners utilize different strategies to analyze and attain conceptual understanding. Some concentrate on specific aspects of data and this is a partistic strategy, where others consider a collective or big picture view of the information, identified as a holistic strategy (Joyce et al., 2014). So, one way to present a lesson is to bundle all exemplars together in one grouping or pile and non-exemplars in a separate grouping or pile. This generates a partistic view for examining the data and will therefore name a handful of guesses from which to proceed. A second, more systematic approach, produces a holistic strategy for viewing multiple potential hypotheses at one time where sets of exemplars and non-exemplars are presented one at a time. As each set is presented, learners process data as described in the next section.

Processing of Data

With the holistic strategy, learners are directed to make observations of the data, examine and analyze clues (e.g., What are the attributes of this example? What do the exemplars have in common?), autonomously brainstorm ideas (note – all possible ideas are encouraged where learners are enticed to think divergently), and predict, guess or hypothesize potential concepts as individual notes. As the series of data is presented, the instructor directs learners to add to or amend their notes, list new hypotheses with each set, and remove those guesses that no longer fit based on each new set of exemplars and non-exemplars. Some hypotheses may be modified or tentatively retained on the list as new data are presented. Learners will more sharply define or draw conclusions for identifying the concept justified through their observations that move from specifics to more general principles in a typical inductive, discovery process. An alternative process involves class discussion and sharing of thoughts, hypotheses and guesses with each round of examples. This “shared” approach runs the risk of some learners shutting down once a reasonable hypothesis is posed (Joyce et al., 2014), but for initial use of Concept Attainment, discussion helps scaffold learners’ comfort level with the process. For the purpose of this paper, a whole-class shared discussion is utilized in the two lessons described and outlined. During the process, some learners grasp the concept earlier than others. If this happens, the instructor can solicit those learners to share their own exemplars and non-exemplars without identifying the concept. The instructor would confirm if the examples are correct. This ensures involvement of all learners throughout the lesson.

Concept Attainment Lessons

To best model the process for experiential understanding of the Concept Attainment instructional strategy and how it can be applied across a range of learners, two lesson examples are provided. The first one

designed for secondary learners presents a holistic approach and the other for elementary learners (approximately 4th grade) presents a partistic view for examining exemplars and non-exemplars. The first example has been presented to in-service teachers pursuing a master's degree in curriculum and instruction to model the process. If teachers experience this model, they gain insightful understanding of the thinking processes employed and therefore are more likely to implement it in their own practice. The latter example has been successfully used with 4th and 5th grade students as an introductory discovery lesson of a concept to be covered in-depth in a follow-up lesson. It has also served as a model of Concept Attainment for pre-service and in-service teachers in courses that focus on exemplary instructional strategies. Historical evidence of the author's own practice indicates these illustrations are effective in teaching the concepts to all levels of learners as well as generating an understanding of the model to novice and veteran educators. In both examples, for purpose of discussion, the concept is not defined until after examples have been given. This omission invites the reader to experience inquiry through exemplars and non-exemplars with explanation of the delivery strategy. This should simulate a discovery process for the reader as well as model the instructional strategy. To provide a visual for collecting information and presenting a Concept Attainment lesson, a simplified list format is presented in the lesson for elementary learners.

Lesson for Secondary Learners

In order to simulate the process as students would experience it, in the following discussion, each exemplar and non-exemplar will be presented one set at a time with a listing of possible student responses and explanation of how to proceed through the sharing of each set of exemplars and non-exemplars. Exemplars will be noted in bold text and non-exemplars will be presented through underlined text. To begin the activity, the instructor would present the first exemplar and non-exemplar:

Julius Caesar - Caesar Salad

The instructor would then ask for student input on what the potential concept could be, based on characteristics and attributes of the exemplar, reiterating that all possible responses are to be shared to fully explore individual and collective thinking processes. The instructor would write down all ideas shared (bulleted list provided below). Hypothetically, students could provide the following thoughts or ideas for the concept:

- o Roman Dictator
- o Famous/infamous male leader or ruler
- o Person with power
- o Individual who fought in battles
- o Individual who killed others
- o Individual who was murdered
- o Calendar named after him

Remember, non-exemplars do not possess any attributes of the concept. As students more sharply define the concept through characteristics of the exemplars presented, non-exemplars can help to eliminate erroneous hypotheses of concepts. The first few non-exemplars rarely provide substantive data from which to narrow one's thinking process. After exhaustive discussion, the instructor would then present the next exemplar and non-exemplar:

The Earl of Salisbury - Salisbury Steak

Again, all ideas would be written down, but through discussion the instructor would mark through or remove those that no longer applied to the concept based on the most recent exemplar (e.g., ~~Roman Dictator~~) and mark tentative ones that may or may not apply with question marks (e.g., Dictator ???) dependent upon learners' limited knowledge regarding the exemplars presented. Lack of learner knowledge regarding some exemplars is acceptable in the process and can work within this instructional strategy, especially if intended as an introductory lesson. Additional exemplars and non-exemplars would later assist in clarifying the concept, so some concepts would be retained provisionally. Discussion would be encouraged to fully consider all possibilities. Additional ideas shared via discussion to identify the concept (*noted by italics*) would be based on both the previous exemplars shared and the new exemplars and non-exemplars added in each round. Based on the second exemplar and non-exemplar, the following could be identified as the potential concept:

- o ~~Roman Dictator~~
- o Famous/infamous male leader or ruler ???
- o Person with power

- Individual who fought in battles ???
- Individual who killed others ???
- Individual who was murdered ???
- ~~Calendar named after him~~
- *Royal male*
- *Individual with a title*
- *Individual of wealth*

After discussion has exhausted guesses or hypotheses, the instructor would then share an additional exemplar and non-exemplar.

Richard, Duke of York - Dukes of Hazzard

Through discussion, learners would again eliminate concepts that no longer apply and add additional ones that could apply. The following extends hypothetical class discussion:

- Famous/infamous male leader or ruler ???
- Person with power
- Individual who fought in battles ???
- Individual who killed others ???
- Individual who was murdered ???
- Royal male
- Individual with a title
- Individual of wealth

In this example, possible ideas shared are saturated based on the last exemplar and no new ideas are presented; therefore, exemplars and non-exemplars that open up the thinking process, add clarifying characteristics that eliminate constructs and/or disrupt equilibrium of learners' thinking process must be presented. The following exemplar and non-exemplar would then be presented:

Queen Katherine of Aragon - Queen Latifah

Immediately, the male characteristic of the concept is discarded but others are tentatively retained. Also, the non-exemplar in this set assists learners to clarify one potential characteristic regarding titles (i.e., birth or marriage acquired). Modifications to the ideas shared by the learners could include:

- Famous/infamous male leader or ruler ???
- Person with power ???
- ~~Individual who fought in battles ???~~
- Individual who killed others ???
- Individual who was murdered ???
- Royal male
- Individual with a birth or marriage acquired title
- Individual of wealth

Again, after all new ideas are added, the next exemplar and non-exemplar would be provided:

Lady Macbeth - Lady Sarah Ferguson

Discussion would continue as the instructor amends or compresses the brainstorming list. The non-exemplar in this case does not necessarily eliminate Royal titles but substantiates the added construct regarding characters in Shakespearean plays. Additional clarification is provided regarding the character's death (i.e., or dies since Lady Macbeth was not murdered).

- ~~Famous/infamous leader or ruler ???~~
- Person with power
- ~~Individual who killed others ???~~
- Individual who was murdered or dies ???
- Royal Individual with a birth or marriage acquired title
- Individual of wealth
- *Character in a Shakespearean play*

The next exemplar and non-exemplar would then be presented.

King Lear - Sir John Falstaff

- Person with power
- Individual who was murdered or dies ???
- Royal Individual with a birth or marriage acquired title
- Individual of wealth
- Character in a Shakespearean play ??? (non-exemplar may counter this guess)

All of the previous exemplars are characters in Shakespearean plays, but the non-exemplar, Sir John Falstaff, is also a character of Shakespearean plays, so an issue is raised on how to differentiate the non-exemplar from the exemplars. Therefore, learners must now draw more specific characteristics that discern characters in the plays (i.e., what do the exemplars possess that the non-exemplar does not). The next exemplar and non-exemplar further assist learners in narrowing the concept.

Ophelia - Hamlet

- ~~o Person with power~~
- o Individual who was murdered or dies
- o Royal Individual ~~with a birth or marriage acquired title ???~~
- o Individual of wealth ???
- o Character in a Shakespearean play ???

This exemplar and non-exemplar help solidify the characteristic of some form of death as part of the concept that continues to hold true where others are in question. Some non-exemplars are Shakespearean characters, and the “royal” characteristic may hold true, but not the “title” with respect to Ophelia. As the instructor notices learners grasping the concept, it is recommended that without stating the concept, participants are asked to share what they believe are other potential exemplars and non-exemplars. Correct examples can then be added to the list. The process would continue with the following:

Desdemona - Othello

- o Individual who was murdered or dies
- o Royal Individual???
- o Individual of wealth ???
- o Character in a Shakespearean play ???

To fully reveal the concept, the following exemplar and non-exemplar would be presented:

Romeo - Macbeth

- o Individual who was murdered or dies
- ~~o Royal Individual ???~~
- ~~o Individual of wealth~~
- o Character in a Shakespearean play

At this point, nearly all learners have identified the concept as “characters in Shakespearean plays that have been murdered or died” as part of the story line. But, to ensure successful identification of the concept, multiple additional examples must be generated for use when/if needed. Generally, instructors should plan for no less than twelve sets of exemplars and non-exemplars. So for this concept attainment lesson, other exemplars and non-exemplars can include:

Guilendstern and Rosencrantz - Penn and Teller

Cleopatra - Imelda Marcos

Juliet - Lady Capulet

Pericles - Lady Montague

Duncan - Dunkin Doughnuts

This Concept Attainment lesson is designed as an engaging introduction to the reading of Shakespearean plays where students can be grouped by specific plays to identify characters who have died, how they have died (e.g., murder, suicide or natural death) and the impact of those deaths on the overall plot.

Lesson for Elementary Learners

This example is presented in a list format without discussion. It is strongly suggested instructors use graphics or pictures and NOT words. In this lesson, if the words for exemplars and non-exemplars are used rather than illustrations, learners could more quickly jump to the correct hypothesis of the concept (since they could “see” the concept rather than discover it). This would not produce an in-depth inquiry and inductive thinking process as one would experience going through the lesson with pictures. The list as a bundle presents the partistic approach for presenting this lesson. From the list, exemplars and non-exemplars can be presented one pair at a time with discussion of hypotheses to follow before showing the next set. This would present a holistic approach. For illustrative purposes if using the latter approach, attributes (hypothetically provided from students) for exemplars 1-6 are included.

EXEMPLARS/Yes

1. Celery
2. Cereal
3. Cinnamon
4. Cigarette
5. Centipede
6. Cell phone
7. Cemetery
8. Cylinder
9. Circus
10. City
11. Cymbals
12. Centaur

NON-EXEMPLARS/No

1. Lollipop
2. Hot dog
3. Apple
4. Carrot
5. Caterpillar
6. Calculator
7. Cow
8. Cat
9. Calendar
10. Cucumber
11. Coat
12. Cactus

ATTRIBUTES

1.

- Vegetable
- Healthy foods
- Something leafy
- Something that grows
- Something green

2.

- Vegetable ???
- Healthy foods
- Something leafy ???
- Something that grows
- ~~Something green~~
- Part of four food groups*
- Fiber*

3.

- ~~Vegetable~~
 - ~~Healthy foods~~ *
 - ~~Something leafy~~
 - ~~Something that grows~~ *
 - ~~Something green~~
 - ~~Part of four food groups~~ *
 - ~~Fiber~~ *
 - Grows but not from a tree*
 - Words that begin with "C"*
- * Non-exemplar counters guess

4.

- ~~Grows but not from a tree~~
 - ~~Words that begin with "C"~~ *
- * No new guesses at this point.

5.

- Words that begin with soft "C" sound

6.

* This pair of exemplar/non-exemplar confirms guess. At this point, you can continue with other exemplars and non-exemplars to confirm concept or ask students to provide their own exemplars and non-exemplars that would support the concept.

This lesson would be used to introduce learners to the phonics rule that words beginning with "C" followed by the vowels – "e, i, and y" make the soft "C" sound (like the letter "S") where words beginning with "C" followed by the vowels – "a, o, and u" make the hard "C" sound (like the letter "K"). Therefore, part of the lesson is focused on the sound a letter makes rather than just visual word recognition. The

illustrations assist with thinking about letter sounds. Lastly, this lesson can extend discussion to the letter “G” which follows the same soft (“J”) and hard (“G”) sound pattern when chased (respectively) by the vowels listed above.

Conclusion

The purpose of this paper is to demonstrate through two specific examples the effectiveness of the Concept Attainment instructional model. Additionally, explanations were provided so that practitioners can easily create and implement their own lessons using this strategy. From the author’s own practice, testimonial evidence throughout the years has reinforced research regarding the effectiveness this model and its impact on enhancing learners’ inductive thinking skills (Boulware & Crow, 2008; Freeman, 2005; Kumar & Mathur, 2013; Marzano et al., 2001; Silver et al., 2007; Tenneyson & Cocchiarella, 1986; Twyman et al., 2006; Vantassel-baska & Brown, 2007). Young and secondary learners alike are enthused with the process of utilizing their own existing knowledge to identify concepts. Teachers can embrace this instructional approach with confidence that regardless of age of learner, developmental level or content area to be presented, concepts will be effectively explored and mastered. In conclusion, Concept Attainment is an instructional model that promotes inductive-thinking processes. It is an instructional method that can be applied to a range of learners and effectively utilized across myriad content areas; thus, a necessary strategy for inclusion in any pedagogue’s repertoire.

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