Using Graphic Organizers to Develop the Cognitive Domain in Physical Education

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Physical education is one of the few disciplines that can provide children with educational opportunities to develop in all three domains: the psychomotor, affective, and cognitive. Students develop in the psychomotor domain as they gain balance, eye-hand coordination, agility, muscle strength and endurance, and flexibility and as they learn individual and team sports skills. They learn cooperation, a work ethic, good sporting behaviors, perseverance, and how to be a competent team member by developing the affective domain in a quality physical education program. Physical educators traditionally have focused on these two domains (i.e., the psychomotor and affective). However, in order to affect the whole child and provide students with a comprehensive learning experience, the physical educator must be able to assist in the development of analytical, creative, and evaluative thinking skills by using strategies that are designed to develop the cognitive domain.

Physical educators can enhance the cognitive domain by providing their students with opportunities for creative expression, brainstorming, and using problem-solving skills (Bellanca & Fogarty, 1991). The cognitive domain is also improved when students practice their ability to compare, contrast, analyze, sequence, and evaluate ideas, thus enhancing their understanding and developing skills that they can use in other areas of life. Physical educators can borrow useful strategies from educational psychology in order to reinforce academic and cognitive skills by using graphic organizers for planning and teaching. Therefore, the focus of this article is on the use of graphic organizers in physical education.

The Value of Graphic Organizers

Ausubel (1960) described the learning process as an integrated system. New ideas that come into the system connect with existing concepts, which he called cognitive structures. These cognitive structures must find an existing structure to connect with or fit into in order for learning to be meaningful. This is where graphic organizers can be useful in health and physical education. If a student does not have the cognitive structure to connect new ideas together, a graphic organizer could help form the missing link. By making thinking visible, graphic organizers help students organize, reorganize, revise, and modify the connections that they make as they process information (Ausubel, 1968; Bellanca & Fogarty, 1991).

Graphic organizers are visual representations of information that show small units of information and the relationship between these units. They are also called concept maps, story maps, advance organizers, story webs, or semantic maps (Callison, 2000, 2001; Davis & McPherson, 1989; Webster, 1998). Graphic organizers illustrate ideas so that a student can see a sequence or connection, which helps to organize and enhance understanding. They can help students learn new information and integrate it into their existing body of knowledge. Graphic organizers also allow teachers to evaluate and assess a student’s understanding of a concept before, during, and after a lesson.

If teachers make abstract ideas visible and concrete, their students’ understanding will increase. By using a graphic organizer to connect prior knowledge to new concepts, physical educators can provide a structure for thinking, writing, discussing, planning, and reporting. This helps students to focus their thoughts and ideas, which leads to better understanding.

A graphic organizer, whether it is created by the teacher or student, can help students clarify their thinking, reinforce their understanding, integrate new knowledge, and identify misconceptions. Presenting information in a visual format allows a person to understand the whole concept better and to see how the parts relate to the whole.

Using Graphic Organizers in Health and Physical Education

This section will examine different graphic organizers and how they can be used in health and physical education. Each example links a particular thinking skill to a specific graphic organizer.

Brainstorming Web. Brainstorming is a strategy that encourages students to generate multiple ideas on a topic without being criticized. With this strategy, the teacher asks a question, poses a problem, or selects a topic for discussion, and then solicits ideas from students. All students, regardless of their ability, can make contributions. This process allows for the greatest
range of student responses since there is no disapproval of ideas. New ideas emerge, and the mind is exposed to new thoughts. Brainstorming may be used before or at the beginning of a lesson in order to check for prior knowledge, during the lesson to see whether students are linking the new information to the information they already have, or as an assessment tool at the end of a lesson.

An example of a brainstorming web appears in Figure 1. To construct this web, the teacher asks the students to think of all the ways in which they can move their bodies. They usually respond with ideas quickly. At first, the ideas are random. Then one idea leads to another, and patterns start to emerge. After the ideas are documented, the teacher should let students organize, categorize, and prioritize their ideas. Other topics for brainstorming include skills within a specific sport, parts of an individual skill, good sporting behaviors, strategies used in a game situation, or ways to enhance personal fitness.

**Concept Map.** Concept mapping, also known as mind mapping, is a graphic organizer that encourages the thinking skills of describing, associating, and analyzing attributes. The concept map is a special type of web that is used for gathering and sharing information on how concepts are connected to a central idea and the relationships among these ideas. The concept map has one central idea with various branches that indicate secondary concepts. The first step in developing a concept map is to brainstorm. This will produce an initial map resembling a brainstorming web. However, the concept map will become more complex as higher-order thinking skills are applied. This happens when an individual student, a group, or a class, with guidance from the teacher, decides how the ideas fit the central concept.

In a concept map, the central idea is identified by its position on the page. Mapping allows the developer to indicate clearly the relative importance of each new concept. By using a concept map, the student can see complex relationships among the ideas as well as the gaps and missing information. This provides opportunities for problem solving and convergent thinking since it requires that all ideas be connected to the main concept and that any interrelationships be shown. In an examination of research on the use of concept maps to support and enhance learning, Ruiz and O’Connell (2001) located 28 studies, 26 of which found that the application of concepts maps was associated with...
higher student performance.

To construct figure 2, the students analyzed the different ways to manipulate a soccer ball. The teacher can lead the activity by asking open-ended questions such as these: “What are the different skills a person might use in a soccer game?” “What parts of the foot can a person use to dribble or pass?” “What parts of the body can a person use to trap the soccer ball?”

When students review for a test, they can use this web to help themselves learn by integrating old and new knowledge. In order to assess a student’s understanding of a particular concept, the teacher could ask each student to create a concept map that the teacher would evaluate.

Mapping also can be used to analyze the different characteristics and qualities of any concept. For example, mapping might be used to analyze the characteristics of a good athlete, the qualities of a team player, or the positions of team members in a particular sport.

**Venn Diagram.** A Venn diagram will help students to compare and contrast two or more concepts, ideas, positions, or skills. In Figure 3a, for example, a Venn diagram shows the similarities and differences between skipping and galloping. Figure 3b compares and contrasts carbohydrates, proteins, and fats.

Venn diagrams are helpful for clarifying and understanding concepts involving objects, organisms, people, places, institutions, and ideas. Such comparisons enable individuals to relate a new concept to what they already know. The more similarities that students recognize, the more they will be able to understand a new concept. A Venn diagram also might be used to compare athletes, sports, skills, rules, dance or gymnastic positions, muscle types, or exercises.

**Matrix.** A matrix can enhance students’ ability to classify ideas or information. For example, a matrix could be used to organize information about five team sports—number of players per team, equipment used, necessary skills, and time periods (Figure 4a). The learning process that students usually follow in order to create a matrix is to research and gather information, mentally organize and analyze it, and use their knowledge to place the information into the matrix. Figure 4b shows a movement chart in the form of a matrix, in which concepts are classified under four categories: locomotor, nonlocomotor, mani-
### Figure 4a. Classifying Using a Matrix

#### Study of Team Sports

<table>
<thead>
<tr>
<th></th>
<th>Basketball</th>
<th>Football</th>
<th>Soccer</th>
<th>Baseball</th>
<th>Hockey</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Players</strong></td>
<td>5</td>
<td>11</td>
<td>11</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td><strong>Per Team</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Equipment</strong></th>
<th>Basketball</th>
<th>Football</th>
<th>Soccer</th>
<th>Baseball</th>
<th>Hockey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basketball</td>
<td>Helmet</td>
<td>Soccer ball</td>
<td>Baseball</td>
<td>Hockey sticks</td>
</tr>
<tr>
<td></td>
<td>Basketball hoops</td>
<td>Shoulder pads</td>
<td>Goals</td>
<td>Bat</td>
<td>Hockey puck</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hip and thigh pads</td>
<td></td>
<td>Gloves</td>
<td>Protective gear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kicking tee</td>
<td></td>
<td>Bases</td>
<td>Skates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Goal post</td>
<td></td>
<td>Protective gear</td>
<td>Goald</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Skills</strong></th>
<th>Dribbling</th>
<th>Passing</th>
<th>Tackling</th>
<th>Tackling</th>
<th>Batting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dribbling</td>
<td>Passing</td>
<td>Tackling</td>
<td>Tackling</td>
<td>Fielding</td>
</tr>
<tr>
<td></td>
<td>Running</td>
<td>Throwing</td>
<td></td>
<td></td>
<td>Catching</td>
</tr>
<tr>
<td></td>
<td>Goalkeeping</td>
<td></td>
<td></td>
<td></td>
<td>Checking</td>
</tr>
</tbody>
</table>

| **Time Periods** | 4 Quarters | 4 Quarters | 2 Halves | 9 Innings | 3 Periods |

### Figure 4b. Classifying Using a Matrix

#### Movement Chart

<table>
<thead>
<tr>
<th></th>
<th>Locomotor</th>
<th>Nonlocomotor</th>
<th>Manipulatives</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
<td>Nonanchored movements</td>
<td>Anchored movements</td>
<td>Using equipment</td>
<td>Relationships to object, body part, or other person</td>
</tr>
<tr>
<td><strong>Skills or Concepts</strong></td>
<td>Walking</td>
<td>Stretching</td>
<td>Catching</td>
<td>Over, Under</td>
</tr>
<tr>
<td></td>
<td>Jumping</td>
<td>Curling</td>
<td>Passing</td>
<td>Near, Far</td>
</tr>
<tr>
<td></td>
<td>Hopping</td>
<td>Twisting</td>
<td>Striking</td>
<td>Beside, Next to</td>
</tr>
<tr>
<td></td>
<td>Skipping</td>
<td>Turning</td>
<td>Kicking</td>
<td>Around</td>
</tr>
<tr>
<td></td>
<td>Galloping</td>
<td>Rotating</td>
<td>Throwing</td>
<td>On top of</td>
</tr>
<tr>
<td></td>
<td>Sliding</td>
<td>Shaking</td>
<td>Trapping</td>
<td>Below</td>
</tr>
<tr>
<td></td>
<td>Leaping</td>
<td>Swinging</td>
<td>Spiking</td>
<td>Through</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Swaying</td>
<td>Rolling</td>
<td></td>
</tr>
</tbody>
</table>

**Bridging Snapshots.** Bridging snapshots is a graphic organizer that can help students understand a correct sequence of movements, events, or ideas. Figure 5a illustrates the use of bridging snapshots in order to develop the thinking skill of sequencing in a gymnastics forward roll. This type of graphic organizer also can supplement written descriptions with graphics, as
Teachers and students can create graphic organizers by using a number of available software programs, such as MindGenius for Education, MindManager, Thinksheet, Kidspiration, Smart, EDGE Diagrammer, SemNet, and IHMC (Institute for Human and Machine Cognition), or Inspiration. However, specialized software is not needed to create a graphic organizer. The figures in this article were created using Microsoft Word, PowerPoint, and Publisher, in addition to Inspiration.

**Conclusion**

There are a couple of advantages to using graphic organizers to aid in the teaching process: visual symbols are quick and easy to recognize and they can help students develop a holistic understanding that words alone cannot convey. Jonassen (1995) suggests that students do some of their best thinking (and therefore learning) when they are required to represent their ideas graphically.

A graphic organizer is an optimum learning and communication tool. When one person produces a graphic organizer, it represents the way that individual structures information and ideas. When used by small groups or an entire class, the potential for evoking and structuring ideas is increased. If the teacher introduces the graphic organizer as a tool for learning, it can guide the students through a process that will enhance their understanding. Teachers can also use a graphic organizer after a lesson in order to assess how much students have learned. Students, in turn, can use the graphic organizer to display their understanding of a concept or skill.

Teachers and students can use a graphic organizer in planning, during instruction, and as an assessment tool after a lesson. Whether the teacher provides the graphic organizer or asks the students to create their own, thinking skills such as brainstorming, analyzing, comparing and contrasting, and sequencing are enhanced.

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**Figure 5a. Correct Sequencing Using Bridging Snapshot**

Gymnastics Forward Roll

- Begin in a stretch position
- Pike body, placing hands in front of the body in a supported squat
- Tuck chin to chest and push with feet, keeping body in tuck position
- Keep back rounded and feet tucked
- Using momentum and body control, push with feet into a squat, then a stand
- Finish in a balanced stretch position

**Figure 5b. Correct Sequencing Using Bridging Snapshot**

Gymnastics Backward Roll

- Stretched-body stand—Arms overhead
- Bend knees and descend through tuck—Place hands
- Seated tuck
- Inverted tuck—Chin to chest—Hands on floor by shoulders, palms down and fingers pointing toward shoulders
- Stay in tuck—Extend arms, lift legs and push with hands to supported tuck
- When feet touch floor, extend legs and stand

Figure 5b illustrates. Such graphics can be personalized with the use of student photographs. Bridging snapshots can also be used to show the timeline of a sport or athlete, a sequential process in the body, or the sequence of a lesson plan.

**Fish Bone.** The fish bone is a thorough and in-depth organizer for analyzing a skill. The example in figure 6 provides the correct sequence of the components used in a tennis forehand and lists helpful cues for each part of the skill. The fish bone can accommodate as many components as needed.

Teachers may want to give their students a fishbone that is already complete in order to enhance their learning process while learning a skill. Once students understand how to use a fish bone, teachers can give them a blank one to fill out in order to check their understanding as a unit progresses.

**Technological Enhancements**

The advent of technology makes graphic organizers easier to develop.
Figure 6. Analyzing Attributes Using the Fish Bone

Tennis Forehand

<table>
<thead>
<tr>
<th>Ready Position</th>
<th>Racquet Back</th>
<th>Get in Position</th>
<th>Contact</th>
<th>Follow Through</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head up</td>
<td>Raquet back</td>
<td>Position to</td>
<td>Watch ball into racquet</td>
<td>Raquet head stays perpendicular to ground</td>
</tr>
<tr>
<td>Eyes on ball</td>
<td>Raquet low</td>
<td>hit at waist</td>
<td>Hit on sweet spot of raquet</td>
<td>Keep eyes on ball</td>
</tr>
<tr>
<td>Feet moving</td>
<td>Keep eyes on ball</td>
<td>Stay ready to adjust</td>
<td>Keep ball on racquet long as possible</td>
<td>Keep eyes on ball</td>
</tr>
</tbody>
</table>

References


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nonverbal feedback given. For additional practice, refer to the checklist provided (figure 1).

Conclusion

Observation has several purposes. Dance educators use observation to make informed choices about structuring dance content in developmentally appropriate ways with logical progression. Observation is required in order to give instructional feedback to students in regard to the accuracy or inaccuracy of their movement. Observation assists educators in determining not only what content they should teach, but also the conduct and safety of the students. Dance educators realize that every day, every student, and every class is different. Developing effective observation strategies will make the dance educator's daily life easier and his or her teaching more successful.

References


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