

The Pendulum

Materials Needed:

- a piece of rope or heavy string
- a lightweight bag, for example, a net vegetable bag or the toe end of a pair of panty hose
- a bean bag or a small ball to be used as a bob
- a target of some kind, for example, cardboard blocks, bowling pins, milk jugs, etc.

Purpose of Activities:

As they act on the different objects, children make hypotheses (guesses) about what may happen and then observe the results. While interacting with pendulums, children have the opportunity to develop their reasoning about movement and trajectory. Sometimes the results confirm their predictions. However, frequently objects do not act in the expected way and children are surprised. Children are then led to vary their action and see what happens. They can shorten or lengthen the rope, or they can vary the point of release (higher, lower, to one side, in the middle), the direction of the aim, the force with which it is released, or the size of the object used for the bob. During this activity children are stimulated to reorganize their thoughts to make sense of their experiences.

How to Set up the Activity:

Tie the rope to a point on the ceiling so that it can swing freely. To make the bob, place an object in the bag and tie it to the end of the rope. Set a target (cardboard blocks, bowling pins, etc.) under the pendulum.

Beginning the Activity:

Invite children to experiment with the pendulum. To stimulate reasoning, the target can be placed a little out of range, beyond the length of the rope or too far to the right or the left. When the bob misses the target, the children will need to figure out how to change the arrangement so the pendulum will knock over the target. The teacher can stimulate reasoning by asking "Can you hit the cardboard block with the pendulum?" From time to time, the teacher can ask for a turn to aim with the pendulum, and ask the children, "Where do you want to put the target?" so that the pendulum would hit it when released from a specific point. The children usually push the bob rather than release it. The teacher can demonstrate, "I'm just going to let go of it without pushing it." and also ask, "If I let go of the pendulum from here, do you think I can hit the block?" The teacher can pose problems such as, "Where would you have to let go of the pendulum to knock down the block here?" "Where could you put the block so you can knock it down with the pendulum?" or "What would you have to do to be able to knock the block down?"

Extending the Activity:

1. Put a sponge ball in the mesh bag at one end of the rope. Children can hit the ball back and forth to one another with their hands or paddles. They can change their standing position as they predict where they need to stand to hit the ball. Children can count how many times they hit the ball.
2. Provide children with 5-10 plastic bowling pins. Children can take turns setting up bowling pins for one another and keeping score of how many pins they knock down. This can also be played as a group game (see activity sheet on Group Games for more information on using group games in an early childhood classroom).

Goals:

1. For children to notice the trajectory of the pendulum bob and the effects of aiming at the target.
2. For children to figure out how to change the trajectory of the bob by varying different aspects of the pendulum.
3. For children to notice when the bob goes over the target, and figure out how to lower the bob to hit the target.
4. For the children to notice that the force with which the bob is released has no effect on hitting the target.

Constructivist Education

Constructivist education promotes learning and development by engaging children in interesting activities that inspire active experimentation with all its groping and error. These activities stimulate children to invent new problems and new solutions. Teachers foster cooperation between adults and children and among children themselves in a classroom atmosphere based upon mutual respect. This educational environment promotes children's self-regulation, assumption of responsibility, and a feeling of community among children and teachers.

Socioemotional Objectives

- To become increasingly autonomous (that is, capable of making choices and decisions in an environment where adults are supportive of children's efforts and respectful of their ideas and their rights);
- To respect the feelings, desires, and ideas of others and begin to co-operate (through decentering* and coordinating different points of view);
- To be alert and curious and use initiative in pursuing interesting problems, to have confidence in their abilities to figure things out, and to speak their minds with conviction.

Cognitive Objectives

- To exercise reasoning and develop intelligence;
- To develop an attitude of questioning and critical evaluation, and motivation to think about causes, implications, and explanations of physical, logical, and social events;
- To put objects and events into relationships and notice similarities and differences.

Physical Knowledge Activities

One type of physical-knowledge activity involves the movement of objects. When choosing activities involving movement, it is important to keep these four criteria in mind.

1. The child must be able to produce the movement by his or her own action;
2. The reaction of the object must be observable;
3. The reaction of the object must be immediate;
4. The child must be able to vary his or her actions in order to observe variations in reactions.

* Decentering: Most young children can think of only one point of view or aspect of a problem at a time. For example, when building a tower, they think only about the blocks they are adding to the top, not about how sturdy they have made the base. Decentering happens when the child is able to think of both aspects at the same time. They have in mind the blocks being placed on top as well as the sturdiness of the base. Social decentering involves being able to see things from another person's point of view and reconcile different points of view, as in conflict resolution.

For more information about constructivist education:

Kamii, C., & DeVries, R. (1978/1993). *Physical Knowledge in Preschool Education: Implications of Piaget's Theory*. New York: Teachers College Press.

DeVries, R., & Zan, B. (1994). *Moral Classrooms, Moral Children: Creating a Constructivist Atmosphere in Early Education*. New York: Teachers College Press.

Kamii, C., & DeVries, R. (1980). *Group Games: Implications of Piaget's Theory*. Washington, DC: NAEYC.