



MARBLES IN MOTION

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Reprinted from *The Hoosier Science Teacher* 1999 24(3), 94-96.

Marbles, toys of children, were used successfully to help primary students develop concepts relating to motion. Our marble unit of activities began with the shaking and rattling of inference bags. Students were instructed to shake each lunch bag, by the top only, and predict by listening, how many marbles were in each bag.

Realizing younger students often determine number answers by feeling unseen objects, the teacher placed a selected number of marbles into plastic lunch bags, then added air to the bags and sealed them shut. The puffy, plastic, air filled bags were inserted in to paper lunch sacks, labeled A, B, C, or D, and stapled shut. All "A" bags had two marbles, all "B" bags had one marble, all "C" bags had four marbles and the "D" bags had three marbles. When using this activity with young children, the teacher prepares the lunch bags prior to class time. However, older children could do the assembly of the bags. Every small group of students could decide on the number of marbles for each bag. Then the groups could exchange bags with other groups and proceed to predict the number of marbles in each inference bag.

Four children were grouped together for this first activity; each child had an inference bag to shake. Bags were exchanged within the group and predictions were made. Although we intended this inference bag activity to demonstrate motion may involve sound, we noted some groups also used inference relating to weight. Whole class discussions followed the small group investigations. Students shared verbally what they found; older children could record their



observations. This activity ended with children opening their inference bags to check their predictions. Smiles appeared when success was experienced.

For the next hands-on activity, each child selected one marble to observe. Measuring tapes, rulers, and balance scales were provided so students could record on paper both qualitative and quantitative observations. Younger students did this activity orally, sharing ideas. The teacher encouraged each child to state an observation that was different from other given answers. The class quickly identified a dozen different observations.

Older students proceeded with the next activity. Younger students did not proceed until the following day. The subsequent activity involved manipulating marbles with a partner. To prevent dropping marbles, the student sat on the floor facing the partner. Sitting close together the students rolled, bounced, and spun the marbles back and forth. After a few minutes the students moved farther from their partners and continued the marble movements. The children discovered pushing hard, easy, slow or fast caused different types of movement. The teacher introduced the term "energy." "Energy," human energy, caused the beginning movement of the marbles. Before this activity began, students were instructed to keep their marbles within their own spaces.

RAMP ROLLS

Length of Rolls				
Trials	A	B	C	D
one block				
two blocks				
three blocks				

The fourth activity conducted on a carpeted section of the classroom, was to investigate movement of a marble inside a rope ring. Twenty inches of clothes line rope was taped together to form a ring for each pair of students. Working in pairs, the students manipulated marbles by pushing, pulling, bouncing, and



spinning. Observations revealed marbles moved in many ways: straight line, zig-zag line, curving around the rope circle, rebounding back and forth, spinning, and bouncing. Noted was- the observation that the marbles moved differently on the carpet as compared to the movement on the tiled floor. Class discussions followed the activity allowing additional exploration time to try student suggestions and to draw some conclusions.

The fifth activity using marbles was done with rulers. We selected rulers that had a grooved track on the top. We found rulers that had no holes in them worked better than those that had holes. Students rolled one marble on the track; movement and speed noted. A class chart worked well for recording these activities. Then one end of the ruler was placed on a small block - - by raising one end of the ruler the student had a ramp. The marble was placed at the high end of the ramp and allowed to roll down and off the ruler. Students measured the length of each roll. The lengths were charted. After several tries the students placed an additional block on the first one, raising the ramp higher than before. Further investigations were made noting the length of roll and the speed of the roll. Some students, even at the primary level, knew gravity was affecting the marble motion. Investigations continued with the addition of more blocks, raising the slant angle of the ruler.

To conclude the unit of motion, the ruler was placed flat on the desk. Working with a partner, each student placed one marble in the center of the track. (On a 30 cm ruler the marble would be placed at 15 cm.) Then one marble was rolled against the first marble. This was repeated several times. A class discussion of observations ensued and the teacher introduced the vocabulary term, "transfer of energy." Next, students placed two marbles at the center of the track and then rolled one marble to the group of two. Discussions of observations came next. Students were asked to predict what would happen if three or four marbles were in the center on the track and one marble would be rolled into the group. Investigations followed the predictions. The lesson proceeded with predictions about what would happen if more than one marble were rolled to meet the groups. What if two, three, or four marbles were rolled into the groups. Needless to say the children were still involved with this activity when class time ended.

A unit of marble activities was constructed so students could develop concepts relating to motion. Inference bag activity demonstrated motion may involve



sound or the lack of sound. Observations and manipulations of marbles led the class to investigate shape and movement made by pushing, pulling, bouncing, and spinning. Activities showed how marbles moved in a straight line, zig-zag line, circling, rebounding back and forth, spinning, and bouncing. Marbles rolled down ramps illustrated motion at different speeds and lengths. Further investigations led students to observe the transfer of energy between marbles. The interest of children during the marble activities revealed the concepts relating to motion had been successfully developed through concrete examples.

Reference

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APA reference for this reprinted article:

Brown, H., Meyers, B., and Schmidt, W. (1999). Marbles in motion. *The Hoosier Science Teacher*. 24(3), 94-96.