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ABSTRACT

Artistic endeavors can be planned for and used wisely in ongoing science lessons and units of study. Criteria in rubric form could be developed to assess student art projects and processes, and art in science might become part of a student's portfolio. Art can be a method of learning science subject matter as well as a skills objective stressing creativity on the part of the learner. Four examples show how teachers and student teachers have used art in science instruction. Some students prefer art as a way of indicating what they have learned. Expressing knowledge through art products is a good fit with the learning styles of some students. (SLD)

Art and Assessment in the Science Curriculum

Marlow Ediger

ART AND ASSESSMENT N THE SCIENCE CURRICULUM

The Theory of Multiple Intelligences emphasizes that students possess many abilities, not verbal intelligence only as indicated in taking a paper/pencil test (See Gardner, 1993). Artistic endeavors can be planned for and used wisely in ongoing science lessons and units of study. There are a plethora of ideas in art which may assist students to indicate what has been leaned in science. These endeavors might well be enjoyable and fun for learners. Criteria in rubric form may be developed to assess student art products and processes. Art in science may also be stressed for its own sake. It might become a part of the student's portfolio. As a university supervisor of student teachers, the writer has noticed outstanding art work of learners, directly related to science, in specific teaching and learning situations. Art is a method of learning science subject matter as well as a skills objective stressing creativity on the part of the learner (Ediger, 1988, Chapter Twenty).

Art Activities and Science

A student teacher together with the cooperating teacher encouraged a set of there fourth grade pupils to plan and develop a mural on soil erosion in a science unit on "The Changing Surface of the Earth." These learners focused first on researching diverse kinds of erosion, after being involved in a classroom discussion on this topic in an ongoing lesson. A neat set of illustrations was drawn sequentially pertaining to terracing, strip cropping, as well as seeding grass and trees. One part of the mural emphasized grass waterways. Here, the farmer emphasizes seeding grass, along a specific lowland, within a an eroded ditch to carry excessive water away during a rainfall. The surrounding land of the grassed waterway is used for seeding farm crops such as wheat, oats, and barley. The grassed waterway carries the excessive rainwater from the cultivated land to a stream. The grassed waterway was neatly drawn and labeled. Subject matter content was written and attached to the mural by way of a colored piece of yarn connecting the mural with the content (See Ediger, 2000, 58-67)..

The waterway was shaded in green with the surrounding growing wheat in yellow. Each pupil had his/her role in mural development. Pupils here learned how seeding of grass in a formerly eroded area can save soil from further erosion. Pupils achieved the following science objectives pertaining to preventing soil erosion, using a variety of approaches:

1. learning how art can be used to show strip cropping of farm crops such as wheat growing along with a grassed waterway to prevent soil erosion.
2. learning how terraces and trees can be artistically drawn and

described as a means of preventing erosion of soil.

3. learning how creativity can become a major part of art endeavors to portray science concepts and generalizations.

4. learning how subject matter of soil erosion correlates well with art products and processes.

5. learning how a mural can indeed show pupil achievement about objectives achieved in the science unit "The Changing Surface of the Earth." (Ediger, 2000, 155-161).

A second art project involved two pupils making a diorama on volcanic eruptions. The pupils from a class discussion and research using a variety of reference sources, made a model volcano within a diorama consisting of plaster of paris with an empty potted meat can inserted at the top. The model was shaped and formed as a realistic volcano. Tempora paint was used to show the sides as accurately as possible with appropriate colors. Inside the diorama, the background scene contained cumulus clouds, a village, and surrounding farm land. Ammonium dichromate crystals were obtained from the high school science laboratory and safely used to see a simulated volcanic eruption in operation.

The model was assessed in terms of

1. students being able to state possible causes of a volcanic eruption.

2. neatness in developing the project.

3. accuracy in model making.

4. blending of tempera paints to make for realism in appearance.

5. creativity in decision making and working together in completing the model (See Ediger, 2000, 101-103).

A third committee of three planned a series of pencil sketches to show an earthquake. Folding and faulting were drawn to show the beginnings of an earthquake. The layers of rock, containing a fault, were drawn in a neat, realistic manner for the first scene. A second scene was drawn to indicate the widening of the fault. A third scene revealed damage occurring from the fault. A fourth scene was drawn to show how wide spread these damages can be. Pupils here seemingly could tell much about these faults and resulting damages from their drawings.

The series of pencil sketches drawn to show sequential stages of and earthquake were assessed in terms of

1. students in a meaningful manner describing causes and results of earthquakes.

2. students revealing quality in drawings related directly to causes of earthquakes.

3. students showing neatness in drawings made.

4. students using colors to show lifelike features in a developing

earthquake.

5. students working together effectively in complete the drawing experience of earthquakes (Ediger, 2000, Chapter Five).

A fourth committee of three pupils, as a part of the science unit, "The Changing Surface of the Earth," researched from a variety of reference sources to determine how mud slides come about. Extensive reading and viewing of audiovisual aids helped learners to understand the relationship of floods and mudslides. Pupils studied the water cycle, causes of floods, and possible sequence of a mudslides. The writer, when serving as a teacher and relief worker in the Middle East, observed first hand several mudslides occurring twenty kilometers west of Amman, the capitol city of Jordan. In one case, a small crop of wheat on hilly land had "slid" from the owner of one hilly field to the adjacent field. The problem then occurred, "Who was the owner of the field of wheat?" Mudslides are mentioned rather frequently in the news reports when heavy flooding has occurred in a given area or region. Pupils were highly interested in pursuing the topic of mudslides and did depth learning. In the pencil sketching, pupils revealed understanding of mudslides by

1. developing several drawings of stages in the occurrence of mudslides including an original field of land, very heavy rains, followed by the actual mudslides. Assessment was done in terms of detail which needed to go in to the stages of mudslides occurrence.

2. creativity drawing the different phases of mudslides occurrence. At the same time tidiness and reality based drawings needed to be in the offing.

3. using color in a meaningful way to indicate what was involved in a mudslides.

4. telling abut the pencil sketches to classmates. Each of the committee projects such as on erosion, volcanic eruption, and earthquakes, also made for communication of ideas orally on science phenomenon that occurred.

5. objective information pertaining to mudslides being portrayed in art form (Ediger, 2000, 503-505).

Values of Art in Science Activities

There are numerous values in having pupils portray science learnings in art form. Selected pupils prefer art as a way of indicating what has been learned. These pupils tend to have considerable artistic intelligence. Art products may be the major way of indicating what has been learned. Inherent in these art projects are a plethora of additional intelligences which may be revealed such as oral communication of

ideas within a committee and to the total class when explaining an ongoing or finished product, as well as writing about each science phenomenon drawn. There are construction items which have been made by learners which might be used in a dramatic activity such as when learners have studied a unit or partial unit on "Famous Scientists in Society." Certainly, dramatizing the life and times of a scientist tends to breathe life into what is being studied.

Many pupils enjoy art in its diverse manifestations. Art work, along with other leaning opportunities, make for a change in providing a variety of experiences for learners. Learning styles of individuals might more adequately provide for with diverse learning experiences. Learning styles might also stress using individual as well as cooperative endears in teaching pupils (See Dunn and Dunn, 1979, 238-244).

The Psychology of Learning

Art in the science curriculum might well stress the use of the psychology of teaching and learning. Pupils do tend to like art work when they select the topic and media to use within a science unit. Teacher input is very important since there needs to be leadership, guidance, and direction in encouraging, helping, and motivating learners as they pursue different art projects. Second, pupils engage in depth learning when pursuing art objectives in science. By noticing details of a science phenomenon which is to be portrayed in art form, pupils revise their thinking to a higher level of cognition. Problems and questions arise when seeking to portray science ideas in art. These problems/questions provide a spring board for new learnings to be achieved. Third, sequence resides within the learner when pursuing an art project individually or cooperatively. There are no measurably stated steps to follow, but rather creatively the pupil moves forward on ordering his/her experiences with teacher assistance. Qualitative assessment will be involved in the final art project. Fourth, art in science tends to provide for the interests of learners, especially when they are wholeheartedly involved in planning a project. With interest in a learning experience, pupils put forth more effort than would otherwise be the case.
Thus, perseverance in planning and completing art work might well be in the offing. Fifth, meaning in learning is important. As pupils pursue an activity, they attach meaning to what is being accomplished in art in science units. Sense needs to be made of art endeavors to the learner. Science facts may be memorized with little/no understanding, but artistic endeavors cannot be memorized pertaining to a fact clarified which adds adds understanding. Sixth, purpose in learning assists in guiding more optimal achievement within the pupil. There are reasons then for being engaged in a project. The teacher may state the purpose deductively or better yet lead pupils to discover the purpose inductively such as when

pupils volunteer to do a project individually or within a committee. The stage generally needs to be set with adequate background information for purposeful learning to take place. Sixth, individual differences can well be provided for. Each pupil may be involved in selecting a project and working toward its completion. The selected art project pertains to the ongoing science unit being emphasized. Pupils may then achieve optimally according to their developmental level. Goals should not be set too high to make for preordained failure, nor excessively low whereby boredom and a lack of challenge sets in for the pupil. Seventh, pupils need encouragement to pursue, achieve, and develop. The art in science projects need careful monitoring by the teacher and help provided as needed.There is a delicate balance here between jumping in to give pupils help too soon as well as waiting too long to provide learner assistance; learners need to move forward in goal attainment. Eighth, a caring, relaxed environment for learning needs to be stressed. The learner needs adequate time to pursue and persevere in an art project in order to achieve related objectives in science. Adequate motivation must be there for the pupil to achieve as optimally as possible (Ediger, 2000, 35-40).

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