Sound School Mathematics Integration Goals

Integration of Mathematics into Structured Educational Exercises For the District Evaluation Process Classroom/Laboratory Examples

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The development of instructional goals for mathematics involves the use of associated instruction or applied lessons. Associated instruction can be implemented in several different ways that lend themselves to higher order or thinking instruction. The classroom instructional exercise can be shaped to elicit certain outcomes or act as a diagnostic indicator for previous learning/material. The ability for students to combine several lessons and provide measurable responses (non traditional) in assessments is key to one of our evaluation goals for 2006-2007. One of the measurable responses is the use of thematic applications that relates to the course content. This is a very different instruction/assessment process.

Direct Applications

A. Responds to a single skill based activity to which the student replicates or performs an assessment

   Example - Water pump replacement - after numerous trials, demonstrations, each students gets a water pump to replace. Certain prerequisite skills are required. Most have protocols, operations and best or safe practices.

A different and more intricate approach to assessment is to ask (create) situational or open ended questions about performance. This new type of assessment fosters critical thinking/problem solving activities. Instead of a direct assessment (factual) a more combined approach relies upon several skills including prior knowledge. The assessment itself begins to function as an educational exercise in its own right. Instead of single skill responses, students are asked to demonstrate skills associated with many different cognitive levels.

For example, if the laboratory assessment (practical) above was not just a routine water pump replacement but rather a situation of the water pump not functioning and "why." The "why" creates a measured response of "solving the problem" and should trigger a checklist of organizational "tasks" of thinking about this situation. It also enables (forces) students to describe the problem and offer solutions and describe indicators that the proposed solution is appropriate. One of the solutions may in fact include the replacement of the water pump and could be related to

volume flow over time. But what about the process that led to the decision to replace it? That is why many assessments today focuses upon the process of decision making – thus the "show your answer" or describe and justify the decided outcome. This type of assessment seeks to measure these instructional embedded tasks we call higher order thinking. This is different from the factual or direct response assessments of the past.

Associated Applications – Mathematics Embedded into the Writing Prompts

B. Responds to several skill based activities or associated activities – each related but must be taken as an entire skill set to obtain a desire response or series of responses.

Example – At the end of July 2006 the price of fish meal on world markets reached an all time high of $1600 per ton (Last year July 2005 – $600 to $700 per ton). World production of fish meal averages about 6.5 million metric tons each year. As fish meal formulators turned to soy protein concentrate as a substitute the price of soy concentrate jumped to $2,600/ton. China stepped in and purchased one million metric tons of fish meal to protect its developing Aquaculture industry.

This caused the world fish meal market to reach record high prices. Please respond to the following questions.

- Since large fish consume more feed per unit wet weight gain, you can expect such aquaculture producers to: (provide your response).

- The increase of fish meal price can be explained by the economic law of: (provide your response).

- Feed formulators and those who provide fish meal to make chicken formulated feed will look to other sources for potential replacements. But prices will remain high. What do you expect the price of formulated chicken feed to do and why (provide your response).

The increase in the fish meal price can impact how other food industries compete. For example the poultry (broiler industry) produces inexpensive chickens (broilers) by using formulated feeds.

Please refer to the statements below,

In 1925 it took 112 days and 4.70 pounds of feed to produce a 1 lb chicken.

In 2000, it only took 36 days and 1.95 lbs of feed to produce a 1 lb chicken.

Much of this improvement was made possible by using formulated feed – and the use of the outstanding amino acid content of fish meal. No other protein substitute has been found to equal fish meal. If the price of fish meal remains high you could expect the price of chickens to ___. Please explain.

The formulated feed industry had to overcome several shocks in the last 18 months. Peru which is a leader in fish meal production has lower production from a greatly reduced anchovy resource (El Nino event). The Menhaden processing facilities on the Gulf Coast were severely damaged by Hurricane Katrina and China stepped up purchases on the world fish meal markets. Soybeans have been found to be a good protein supplement to the formulated feed industry.

If fish meal prices remain high you would expect soybean farmers to: (provide your response).

A number of large poultry (broiler) companies have purchased Menhaden processing facilities including Perdue. Why do you think they did this? Will fishing companies try to catch more Menhaden? What are some of the fishery management implications?

If for some reason fish meal production suddenly increased would chickens become more expensive or less expensive.

A ten pound bag of chicken feed contains about 2 pounds of fish meal. At $1,600 dollars per metric ton how much did the 2 pounds of fish meal cost the feed formulator? If a pound of chicken feed costs 20 cents per pound, how much did the fish meal contribute to the total cost?

Several recent management studies indicated that the Menhaden fishery is beyond a sustainable fishery harvest. In the future you can expect supplies of Menhaden to ___ and why.

The above illustrates several examples of structured integration of mathematics and writing tasks. The application components speak to "real world" situations that should be part of classroom instruction. It is therefore also possible to expand mathematics applications by graphing the price of fish meal on world, commodity markets or looking at worldwide producing countries (metric tons) and production trends.