

Strategic Utilization of Student-Selected Media to Encourage Reflection in General Education Science Classes

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Abstract

Allowing students to participate in their assessment has been known to increase student motivation and achievement. Students may be involved in their assessment by choosing the time, type, weight, number, area and criteria. Student autonomy in one or more of these assessment factors makes assessment student-centered and moves away from the one-size-fits-all paradigm. This shared autonomy of assessments empowers students, and it has the potential to increase self-efficacy, engagement with course content and positive behavioral changes. This paper relates the results of encouraging students' reflections on the role of social, economic and environmental sustainability in their society. Students were allowed to choose the medium of expression for their reflection, though they were assessed based on teacher-formulated rubric criteria. Media utilized by students included art, music, video, infographics, physical models and essays. The results showed that allowing students' autonomy over the means of expression of their cognitive models encouraged deeper engagement with content material and reflection on science in their personal space, which may later translate to positive environmental behavior changes.

Keywords: Assessment, General Science Education, Student Autonomy

Introduction

General Education Science classes are normally taken by non-science majors in the early years of their university academic careers. Many of these students, though highly talented in other areas, exhibit little or no interest in science as a subject. They resort to memorizing a few facts in order to obtain a passing grade in the course(s), and it is doubtful that the information gathered results in meaningful behavioral changes or attitudes towards current global scientific issues. This mindset defeats the aims of most General Education Science programs, which include widening students' interest and understanding of the world around them, and increasing students' awareness and knowledge of global scientific issues (McConnell, Steer, & Owens, 2003; Solas & Wilson, 2015).

One of the ways in which teachers can motivate students to learn science is to allow them to participate in how they are assessed. The ability to express oneself according to one's strength is enabling. Traditionally students who do well at logical-mathematical thinking and linguistic intelligence are successful in scholastic activities, probably because these skills are easily tested using multiple choice and short answer responses.

...the ability to fashion a product – to write a symphony, execute a painting, stage a play, build up and manage an organization, carry out an experiment – is not included... (Gardner & Hatch, 1989)

Allowing students to participate in their assessment has been shown to increase student motivation and achievement. Students may be involved in their assessment by choosing the time, type, weight, number, area and criteria. Student autonomy in one or more of these assessment factors makes assessment student-centered and moves away from the one-size-fits-all paradigm.

Just because one standardized test is fair for all, does that make it the right thing to do for all? Different students have different abilities and those types of things cannot be standardized. How is it fair to measure performance of a student if they do not perform well in that way? (Fleet, 2016)

The rationale behind students having a choice in how they are assessed stems from having each individual learner's needs being met. According to the theory of multiple intelligences (Gardner & Hatch, 1989) we all have different cognitive strengths and weaknesses and this influences how we learn, how much we learn and how we showcase what we learn. If we learn differently then we also communicate our knowledge and understanding in different ways, based on our experience, culture and natural abilities. We should therefore be assessed on our learning using different methods. Equity in assessment does not mean that we all are assessed in exactly the same way. As figure 1 suggests, using standardized tests in order to ensure equity in assessment may result in alienating those who do not possess particular skills (Fleet, 2016). As such, instructors who are interested in having a holistic picture of student learning, need to allow students to illustrate their cognitive models in ways that are comfortable and reflective of the intelligence of the student. This shared autonomy of assessments empowers students, and has the potential to increase self-efficacy, engagement with course content and positive behavioral changes.

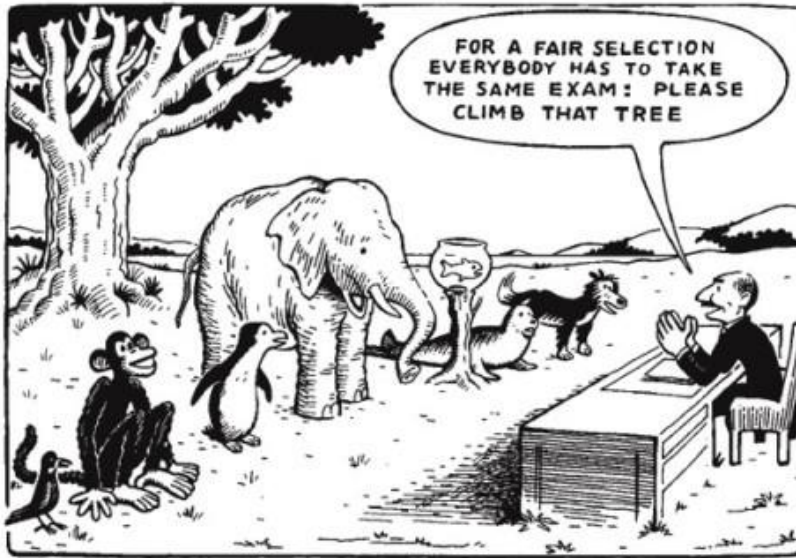


Figure 1: https://breakthestandard.files.wordpress.com/2012/05/testing_cartoon.jpg?w=479

This paper describes the deliberate use of student input in the selection of assessment media in order to accomplish what Gardner and Hatch (1989) describe as “intelligence fair” assessment – assessment which endeavors to give credence to the different modes of thinking and performance which differentiates each intelligence.

Method

A class of twenty (20) male students majoring in information technology and applied communications were invited to choose their most comfortable medium to reflect on the content of a sustainability course. This assessment comprised 30 % of the total course grade. The grading rubric was common to all students and selected by the teacher. Submissions were graded according to the following categories: Reflection- management of learning through reflection; Organization- organization, structure and style; Subject knowledge- understanding and application of subject knowledge and underlying principles; Explanation, description, and/or justification- logical reasoning, supported backup and critical thinking; compare and contrast.

Each student was invited to reflect on what he considered the most salient aspects of the course, using either videography, photography, infographics, physical models, music, essay, art, animation or mixed media. In creating the exercise, the instructor hoped answers to the following questions would be revealed: 1. What knowledge have students gained from the course on Sustainability? 2. How much of this knowledge results in change of attitudes towards environmental concerns? 3. How can students’ cognitive models best be represented? 4. How can critical thinking and innovation be encouraged using the subject matter? 5. How can student centered assessment be incorporated into student-centered teaching/learning?

Results

The projects collected from the students included videos, physical models, infographics, essays and a song with both original music and lyrics. Although almost half the class submitted videos, the videos ranged in type from time lapse drawings to animations, documentary films and news reports. Despite the fact that no quantitative study was made of the data, it was noticed that students who were more detailed and had higher quiz scores produced better quality projects. Students obviously enjoyed doing their projects and were eager to see their scores. Most students saw the project as a reflection of their individual capability and were proud of their achievements. The instructor noticed that the final exam scores, which came in after the projects were submitted, were significantly better than the midterm scores, before the project. This was unusual as most classes do better on coursework exams than on final exams. It is possible that student understanding of the material increased after carrying out the reflective assignment. Figures 2 and 3 provide examples of students' work.

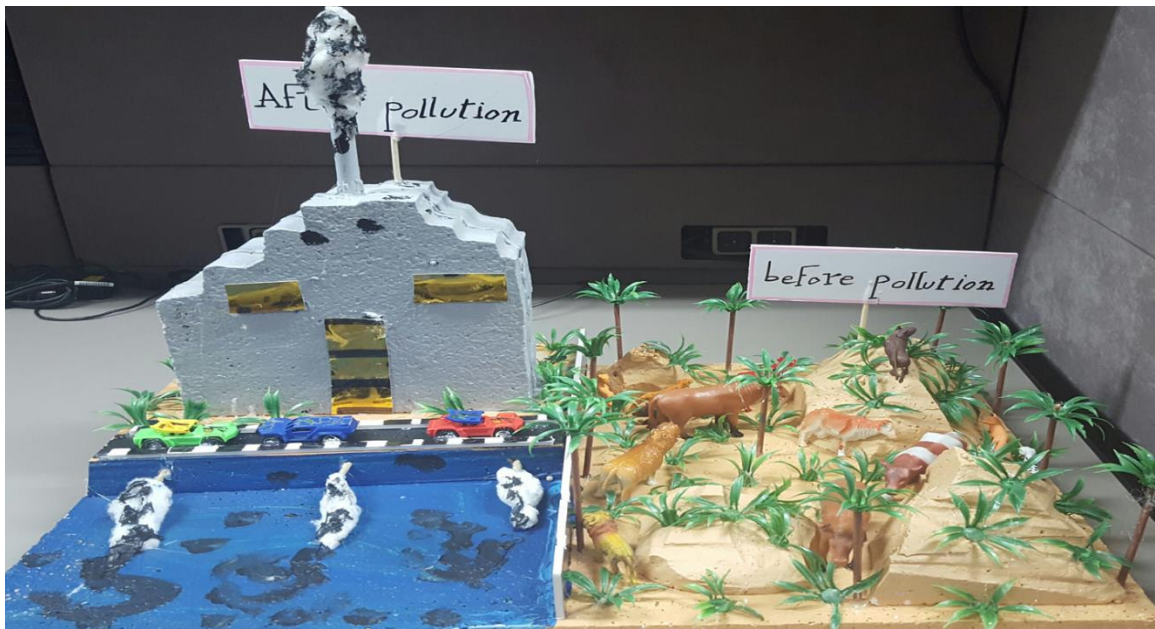


Figure 2: Sample of student model

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Classes

Verse 1

Money, power, greed, words contradicting sustainability
Our world's depleting, resources are finite
We've become poison just like cyanide
Listen just picture this
Most of us living not knowing s**t
7 billion people on this planet you don't need to be calculating its obvious man
how all we just keep consuming, with the media looking for a bigger audience
man I'm calling this out
Let me explain in more detail put it in frame for you to inhale
With three pillars turned upside down... I've been thinking now
I've been thinking how we've been living how we keep on taking but not giving
They extract, obliterate the environment, pollute and annihilate while we're
sitting in silence
Produce the chemicals and who's to tell them no?
Refuse? Unacceptable. Consume and just let it go
And consume we do leaving our lives screwed
We abuse our world, our people and thus the economy
And it bothers me

Chorus

Have you seen what life can be?
Have you seen it from my eyes?
Oh have you seen what life can be?
Oh can't you see it with your mind?

Verse 2

The statistics are clear, our world is troubled
Leaving many of us confused, worried and puzzled
But there ain't no problem that can't be solved
This is our home and we're all involved
The answer is quite simple; we turn a linear system into a cycle
Changing our ways is vital here's the answer if you're asking me how though
Don't kill for no reason or hunt out of season
Recycle the pieces of paper don't leave it
Reduce the pollution the air that we breathe in
Not wasting no water no power till feeling
We give rights to the people till divers and equal
It sucks to be treated unfairly of evil
Its time to wake up raise our voice now we're screaming
Together for a better world we believe in

Figure 3: Student sample – lyrics to song

Conclusion

The instructor noticed several benefits as a result of the exercise. These included 1. Students exhibit greater self-efficacy when expressing themselves through a medium they select and feel comfortable with. 2. Students relish the opportunity to make a contribution towards their method of assessment. 3. Organization and deep reflection on main ideas that is, proper planning and critical thinking, needs to take place for a student to properly represent his cognitive model. The assignment encouraged more and deeper reflection on content rather than regular lectures. Students were forced to engage the content fully to express themselves through the chosen medium properly. 4. External representations of students' mental models made formative assessment easier for the instructor, in assisting in the evaluation of the quality of student learning. 5. Students' level of engagement with course material was reflected in their output (more engaged students expressed greater content knowledge, synthesis of ideas and knowledge application).6. Students were forced to engage the content to fully express themselves which resulted in increased effort on tasks and greater focus on the significant points of the course.

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