Motivation in Science Education

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Issues in Science Education

Science teaching is -

- Abstract
- Not interesting - boring
- Not relevant in the eyes of students

Osborne et al., 2003.
Addressing this issue

- One consequence of the poor image of school science teaching is the poor uptake of science studies in higher education and in science and technology careers (EC, 2004).

- A key aspect is to address the need for better Student Motivation.

EC = European Commission
Addressing Motivation

In simple terms, we can reflect on motivation in terms of

(a) Extrinsic Motivation (external to the student)
(b) Intrinsic Motivation (coming from the students themselves)

(Deci and Ryan, 2002 - related to Self Determination Theory)
Extrinsic Motivation

This is the most common form of motivation in school teaching.

It is the motivation that comes from the learning environment:

• The classroom atmosphere generated by the teacher
• The school expectations
• The science curriculum expectations
• External examination pressures
• Parental expectations
Intrinsic Motivation

This has been shown to be extremely powerful.

- It is the motivation coming from the students ‘wanting to’
- It is the self directing efforts and involvements
- It is the internal self-determination of students, generated by the student; it is interrelated with interest and relevance.
More on Motivation

Which comes first –

• the chicken or the egg?
• extrinsic or intrinsic motivation?
• student motivation, student interest, or relevance for the student?
Stimulating Intrinsic Motivation

• Obviously the teacher can play a role – this is the *extrinsic to intrinsic route*
• But what about the textbook?
• And what about examinations and rewards?
• And what about Olympiads?

• WHAT ALSO about carefully developed teaching materials (teaching modules) focussing on student motivation as a major intention?
The Module Approach

A module can focus on Student Motivation in terms of RELEVANCE.

It can do this by paying attention to:

• FAMILIARITY to the student (context-related)
• RELATING TO AN IMPACT ON STUDENT (for example raising an issue, a concern or a situation of relevance)
• BY LOOKING AT SCIENCE IN A SOCIETY SETTING - A socio-scientific introduction
Using a Scenario

• Science Teaching begins by taking RELEVANCE (and INTEREST, but more importantly RELEVANCE) as the major focus?

• A teaching module (lasting for maybe 4 lessons, 5 lessons, maybe 6 lessons, etc) starts by means of a motivational scenario?

• THIS IS THE PROFILES APPROACH
WHAT IS THE LEARNING?

If the scenario is motivating, do you agree
• it will impact on the students?
• It is going to stimulate the students to interact
  • interact among themselves
  • Interact with the teacher
  • Interact with the scenario

AND IT IS THIS INTERACTION (INVOLVEMENT) THAT IS IMPORTANT.
WHAT ABOUT THE SCIENCE LEARNING?

We want the interaction to be enjoyable for students. It can be fun. It needs be meaningful.

• BUT THAT IS NOT ENOUGH IF WE NEED SERIOUS LEARNING !!!

• FOR THE TEACHER, THE SCENARIO HAS TWO IMPORTANT CONSIDERATION
THE TEACHING GOALS FOR THE SCENARIO

1. *Prior Learning is determined*

   We do not want to try to teach to students that which is already known (that is as boring as undertaking revision – revising is boring !!)

2. *Student recognition that NEW science is needed to better interact with the scenario.*

   That is the scenario is actually an introduction to the conceptual science learning. The scenario is NOT a separate entity.
The Science Learning

• Especially for the more able (gifted students), but nevertheless a target for all, is multidimensional scientific literacy (Bybee, 1997).

• This definitely means higher order cognitive abilities, but ALSO science process skills (where thinking and doing come together – UNESCO 1996) and ALSO personal development (including attitudes) and social development (interacting with others) (Holbrook and Rannikmae, 2007)
Inquiry-based Science Education (IBSE)

In PROFILES the conceptual science learning is promoted through IBSE.

- The goal is OPEN INQUIRY in which students suggest the scientific question and procedures.
- But this target cannot be achieved without experiences at the GUIDED INQUIRY level;
- And for beginners (but not really gifted students), the start is STRUCTURED INQUIRY.
GIFTED STUDENTS

• The key to educating gifted students is surely motivation to be self-directing and self-determination.

• Gifted students do not take kindly to “spoon-feeding”

• Gifted students (as do all students) need a CHALLENGE. And clearly the challenge needs to appropriate for the students (it varies with student ability). For that the teacher MUST be the decision making – never, never the textbook or workbook (or teaching module).
Where does IBSE take us?

IBSE is not an end in itself. It provides a solution to a problem - the investigation (IBSE) was undertaken for this purpose.

• The solution provides the opportunity for conceptual gains.
• But this needs to be CONSOLIDATED. HOW?
Consolidation of the Science Learning

Two consideration

1. Conceptualising the new science but interrelating this with other concepts (eg through a concept map)

2. Consolidation by transferring the science ideas to another (new) situation.

(In PROFILES this is by incorporating the new science in the original scenario and arriving at socio-scientific decision making through reasoned argumentation, making sure the science ideas are conceptually correctly portrayed).

Who are the leaders? Why the teacher? Why not the students (especially the gifted? After all Scientific Literacy is more than conceptual gains
Student Learning

• Students go to school to be educated. To learn.
• Student learning is the key for teaching.

The learning is NOT the teacher covering the curriculum, or covering the textbook. The learning is the students attaining the highest levels of scientific literacy.

THIS MUST BE THE CHALLENGE!!
(especially for gifted students)
THANK YOU

You are welcome to ask questions or make comments.