Why Should We teach Sience for Understanding?

By Alex Assefa

Introduction

- The dominant paradigm in science teaching in most class room in United States is as follows.
- The teaching is a means of **transmiting** information to students who are **passive** participants.
- Learning is percived by both teachers and students as **memorizing** rather than understanding this information.

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- Assessment is veiwed as **submatve** (for grading) rather than **formative** (for improvement).
- This means assessment comes at the end of an instractional unit to detrmine which students remembered the information for the sake of **grading purpose**.

A New Paradigm for Science Teaching and Learning

- Currently in most nations, *new paradigm* is viewed as providing students an arry of experiences that enables **understanding** and then guiding students towards understanding and use use of science knowledge.

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- In this paradigm, students must be **active participants** in doing science and constracting meaning from their experieses.
- Assessment does not just come at at the end of instruction, but it is acontineous process used by both the teacher and students **to guid** both teaching and learning.

Why Is a New Paradigm Essential?

- In 1983, an American auther issued a report titiled ***A Nation at Risk*** which explains the decline in quality and effectiveness of schools.
- The auther identified reasons for problems of old paradigm
  - Diluted (unfit) carriculum in science and in mathematics.
  - low level standards for learning, and poorly prepared teachers.

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- students were not required to study science and mathematics in secondary schools.
- shortage of qulifed teachers.
- teachers frequently were assigned to teach course out side of their field of experience.

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- The important results this reportreport:-
- Most states strengthened state wide testing programs to raise **standards** for both teaching and learning.
- Most state developed new curricular and instructional standards to guid teachers, students and test makers.
- Mony schools responded with new carricula, text books, laboratory materials, and staff development.

Formulating a New Paradigm Science Education

- In 1985, Project 2061 was developed by leaders at the American Association for Advancement of science.
- This began with the creation of of a series of panels of specialists aimed at changing science teaching and learning.

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- This activity extended over two years and result publication of an important book titled ***Science for All Americians***.
- The book emphesis on:
  - nature of science
  - **Integration** of science with mathematics, technology and design.
  - teaching science for **understanding** insead of only memorizing information.

Emrgency of New Standards for Science in Schools

- Bigenning in 1993, three large working groups were formed to prepare standards for teaching, assessment, and science contents.
- Several drafts of the *National Science Education Standards* were prepared and disseminated widely to gain national consesnsus.

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- Daft of *National Science Education standards* was published in 1996 containing chapters on standards for teaching , teacher professional development, assessment, and science contents.
- The content standards included eight content dimensions:

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- Unified concept and Processes
- Science as inquiry
- Physical Science
- Life science
- Earth and Space Scienc
- Science and Techonology
- Science in personal and Social Prospectives
- History and Nture of Science

Impacts of Project 2061 and the National Science Education Standards

- Byeyond generating an agenda of reform in the USA, the project influences other nations' educational system.
- For example Japanese, Korea, Czech Republic Netherlands etc… reduced the number of science concepts included in the science. This steps enables them science teachers to *provied more depth of understanding* rather than much coverage of science knowledge.

A New, Long-Term approach to Change in Science Carriculum, Teaching and Assessment

- The concept of long-term change, intially promoted by Project 2061.
- Changing in teaching, learning, and assessment dosen't occur easly and quickly. It needs long time.
- Because new carriculum materials, instractional resources and testing need to be developed and teachers need to learn how to use them.

How Have New Ideas about Learning Science Changed Our Thinking

- For decades, scholars who study learning and teaching had increasingly recoginized that learning is understanding and the application of knowledge.
- Factual knowledge can be easly transmited but understanding and application are more complex.

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- Learning with understanding requires that students make sense of ideas and experiences and connect them with other related ideas and experiences that from the prior knowledge.
- Applcation of knowledge also requires that students see the connection between kowledge and its application which comes through practice.

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- Constractivist belives that knowlege is socially constracted, meaning that understanding of science knowledge depends on intraction with both the real world and people.
- This interaction allows students to clarify their understandings by comparing and contrasting their thoughts with those of others.

What Does Teaching for Science Understanding Look Like?

- In teaching for science understanding look like:-
- students and teachers engaged in laboratory.
- Students are engaged in demonstrateing physical processes, and practice in doing physics while the teacher is present to give feedback.
- Student and teacher should be out doors to study the natural and they constracted world beyound the class room.

Thank you