

ECE4020

Lecture #1

Course Examiner:

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Course Outline

Assessment

Textbook

“Early Childhood Mathematics”

by Susan Sperry Smith

NCTM

National Council of Teachers of Mathematics

NAEYC

National Association for the Education of Young
Children

Continue reflection on

CREATIVITY * Functioning creatively as mathematical thinkers

PROBLEM SOLVING * Thinking about how to use mathematics

PROBLEM-CENTERED LEARNING

* Classroom environment that encourages thinking about mathematics

Mathematics is everywhere

Mathematics is part of our daily lives



Six myths about teaching mathematics

Myth 1: Some people are good at maths and some aren't

- TIMSS – Trends in International Mathematics and Science Study (N=46) x 4th & 8th grades
- PISA – Program for International Student Assessment (OECD) at age 15 years
- NCTM Standards - Principles and Standards for School Mathematics (2000)
- UK – Numeracy Statement (the numeracy hour)
- Australian National Statement (new moves – COAG/MERGA)
- EQ Mathematics syllabus (2004-2005)

It's not the *mathematics*.... but it's the *way*
it's taught – (therein lies the challenge)

The past versus a futures outlook

- Speed
 - - over meaning
- Rote
 - - over rational
- Procedural
 - - over conceptual
- Instrumental
 - - over Relational
- (Skemp, 1976)

Myth 2: Mathematics anxiety isn't real. (Not True!)

- Inverse relationship between maths and anxiety
- More females suffer math-phobia
- Attitude counts

Maths anxiety

GOLDEN RULE:

Never admit that you fear mathematics or that you are “no good” at it – attitude counts

Mathematics anxiety..... not all areas are the same

- Maths is **NOT** just **number** – there are other areasincluding
- Geometry (Space),
- Measurement,
- Chance and Data,
- Patterns and Algebra

Myth 3: You need a textbook to really teach mathematics

- Textbooks can do more damage than good
- School districts in USA adopt a single text
- Teacher's manuals are a better reference – the manuals are sources of lots of ideas and content (“how to” and “why”) not just “what to”
- Integration over-rides the textbook approach
- “New Basics” by Education Queensland

New Qld Maths syllabus the heart
and soul of the new curriculum is
problem solving –
investigation...complex thinking...
deep understanding...responding...
communicating...reflecting

Myth 4: Calculators belong in the upper grades

- children use technology
- facilitating the learning is the role of ICT
- saves time to concentrate on other thinking
- extends exploration of maths ideas
- provides another tool for problem solving
- 21st century operation

Myth 5: Manipulatives have few drawbacks

- discrete materials – beans, blocks, counters
- continuous materials – rods, MAB, number lines
- proportional materials (models)– bean sticks, MAB, Unifix tens
- non-proportional materials (models) – abacus, money, colour code

Myth 6: There isn't enough time to do assessment in a real classroom

- instruction time is precious with so many admin demands
- assessment should not be static
- on-going assessment is vital – always looking for vital signs – recording progress
- collecting observations, records, lists, notes, documentation, artifacts – profile of child
- evidence – accountability ->> progress
- monitor and assess in order to plan and modify

Success for every child

- low representation of female maths (and science) graduates at university
- indigenous students are under represented in achieving mathematics outcomes
- other cultural groups are under represented in achieving mathematics outcomes

Success for every child

- “Think-Pair-Share” strategy to encourage communication
- use “English Experts” strategy involves translating ESL thoughts amongst children to teacher
- gifted children need extra attention too

Success for every child

- very few children are disabled in mathematics – most children can comprehend concepts
- teaching rather than “thinking ability” is the culprit for under achievement in maths
- special needs children require more patience, involve more time, and more opportunities to engage with others in a non-threatening environment

Success for every child

- NCTM Standards (2000) has CONTENT and PROCESS standards.....but common characteristics exist across syllabuses, organisations and continents...
- 1) developmentally appropriate approaches
- 2) inclusive and equitable practices for all children
- 3) well-prepared teachers – content and process
- 4) problem solving curriculum (pose problems, involve precise language, foster communication)

Success for every child

- 5) integration of maths with other subject areas (not subject isolation)
- 6) inclusion of technology
- 7) professional disposition towards being a reflective practitioner (“lifelong learning”)

Success for every child

- AP – age appropriateness (physical, emotional and cognitive development in each age span)
- IP – individual appropriateness (interests, abilities, prior knowledge, home and culture)

Constructivism – exploring and building “knowing”

- a way of knowing – explains how knowledge is gained.
- an epistemology – an explanation of what it means to know something.
- knowledge is created ...not transmitted.
- meaning is developed from within - not from without.
- mathematical knowledge is recreated and reinvented every time a child makes meaning.

Jean Piaget (1896 – 1980) was a constructivist

- from Switzerland – Geneva.
- stages of development (stage 2 – preoperational thinking – ages 2-7) a time of rapid development in language and use of symbols.
- how a child thinks – how meaning is accommodated and assimilated – how sense emerges – the process as much as the product is important.

Learning requires: (Piaget)

- self initiated propositions
 - active involvement
 - rich environment
 - developmentally appropriate propositions
 - child-centered (not adult-centered) focus
 - constructing ideas (not ingesting others')
- (transmission of ideas is not feasible)

Lev Vygotsky (1896 – 1934) was a **social-constructivist**

- from Russia
- has come into prominence in the last 30 years
- learning takes place in the Zone of Proximal Development (ZPD)
- talk to your “self” (private speech) and talk to your “others”
- the culture of a dialogic community
- scaffolding – support by an “other” to explore so that the unknown merges into the known – not spoon feeding **but** sharing and exchanging viewpoints and perspectives to make sense collectively

Teachers are always:

- (1) looking to ascertain the child's thinking, and
- (2) searching for what makes sense to the child to know what to explore next
- David Hawkins – “You don't want to cover a subject; you want to uncover it.”

Zoltan Dienes – USA

- Free play
- Generalisation
- Representation
- Symbolization
- Formalisation

Jerome Bruner (1915 -) USA

- Intellectual capacity develops from enactive to iconic to symbolic modes of knowing

Levels of knowing

Concrete

-----→ Iconic

-----→ Symbolic

(-----→ Abstract)

Levels of knowing...

- **For example.....**
- **3000rpm \sim 100bhp in 2nd gear.**
Is 3000rpm in 3rd gear \geq 100bhp?