

The Reform of Mathematics Education in China

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Overview

- Background
- Features of Reform in Mathematics Education (curriculum)
- Challenges of New Mathematics Reform

Background

- China has:
 - A strict education system
 - Students' high achievement in international tests (Case 1)
 - Teachers with strong knowledge, especially pedagogical content knowledge
 - A strong preference for training of fundamental concepts and basic skills (Case 2)
 - A coherent curriculum with high expectations

Background (cont)

- China has:
 - A rote learning style rather than "thinking". (Case 3)
 - Excessively high stakes testing causing serious problems (Case4)
 - Much more pressure and study load for students

Education system

A simplified framework of the Chinese education system

Age	Grade	Structure	Notes
21 20 19 18		Universities, Colleges, Polytechnics	
		University Entrance Examination	End of secondary education
17 16 15	G12 G11 G10	Advanced Senior High Schools, Ordinary Senior High Schools, Vocational / Technological Schools	
		Streaming Examination (for Senior High School or Vocational School)	End of compulsory education
14 13 12	G9 G8 G7	Junior High schools	Stage3
11 10 9	G6 G5 G4	Primary school	Stage2
8 7 6	G3 G2 G1		Stage 1
5 4 3		Kindergartens, Nursery Schools	

Case 1

Mathematics Achievement of Students (13 year olds)
International Assessment of Educational Progress,
1992

Country	Correct Rate	Country	Correct Rate
China (Mainland)	80	Korea	73
Taiwan, China	73	Soviet Union	70
USA	55	-----	-----

Case 2

1996—1998

From 1996 to 1998, the National Ministry of Education conducted a question and interview survey of 16,000 students, schoolmasters, teachers and educators from nine provinces and cities\rural areas, about the situation of curriculum implementation for the 9 years of compulsory education.

From *1996-1998 Year Survey Report of Education Department (SRED)*

Case 2 (cont)

- According to the SRED, schoolmasters' and teachers' evaluation was that students were good at basic knowledge and skills. As teachers, they often focused on students' basic knowledge and how they could prepare them to pass examinations.

Case 2 Analysis

- This approach:
 - Strengthens and weakens
 - Neglects students' emotions and attitudes
 - Isolates the knowledge from society and real life

Case 3

- More focus is placed on passive learning and drills, and less on students' active exploration and creative development.
- The SRED reveals that schoolmasters and teachers believed the proportion of students' passive learning is 79% in elementary schools and 90% in junior high schools.

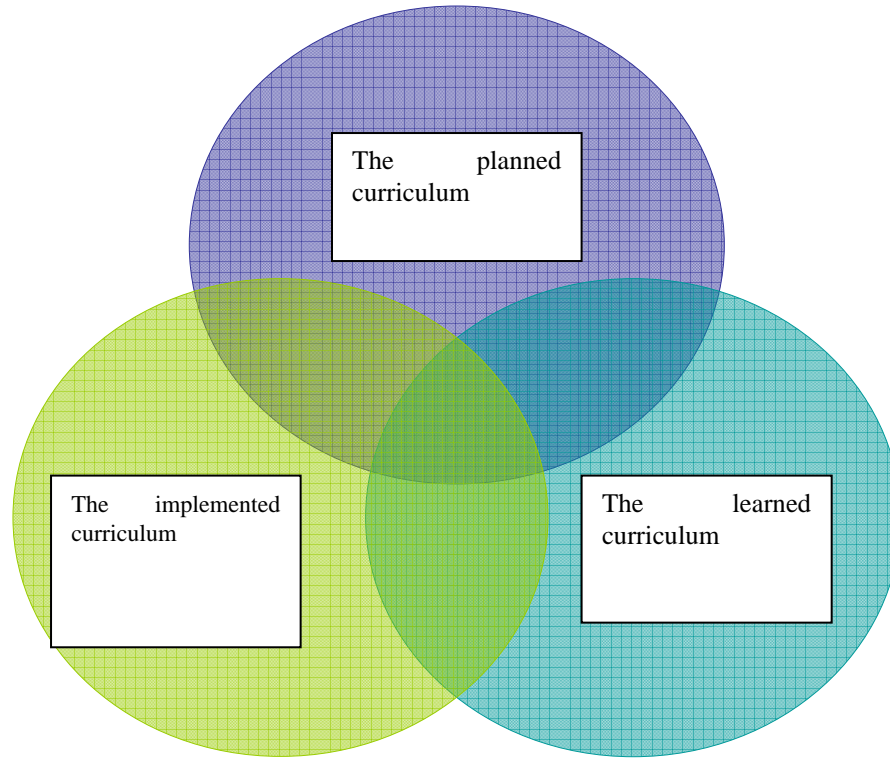
Case 4

- Exams are given for discriminating and selection purposes rather than for student development

Reform of Mathematics Curriculum

- New ideas about mathematics curriculum
- Events of reform
- Features of the new mathematics curriculum

Standards\
textbooks



Teaching
in
classroom

Learning
results

New Ideas about Mathematics Curriculum (cont)

- Considerations for school Mathematics
 - Breadth and depth of curriculum
 - Catering for individual differences
 - Provide flexible teaching style in the curriculum
 - Different learning pathways within the subject

Events Related to Reform

1. In 1999, hundreds of educational experts participated in designing 18 subject curriculum standards. This task was completed in June 2000.
2. From June 2000 to February 2001, the new curriculum standards of compulsory education were drafted.

Events Related to Reform (cont)

3. In May 2001, the National Ministry of Education invited 75 academicians and experts to deliberate on the curriculum standards.
4. In July 2001, the National Ministry of Education issued eighteen subject curriculum standards for experiment.

Events Related to Reform (cont)

5. In September 2001, 38 national experiment areas, each of which included a number of schools, adopted the experimental textbooks.
 6. In 2002, 18-20% of all schools nationwide participated in the experiment. By 2003, the proportion reached about 50% of schools throughout the country.
 7. Starting in 2005, all schools of grades 1 to 7 are adopting the new textbooks.
- The magnitude of the reform is tremendous -- at an amazing speed

Features of the New Curriculum

- The ultimate goal of the math curriculum:
Students' overall development.
- “knowledge and skills,”
- “process and methods” (Case 5)
- “emotional development and values”

Case 5: To conduct a survey of after school activities at your school

- Question 1: What does your survey include? (e.g., time, activity title, category and other?)

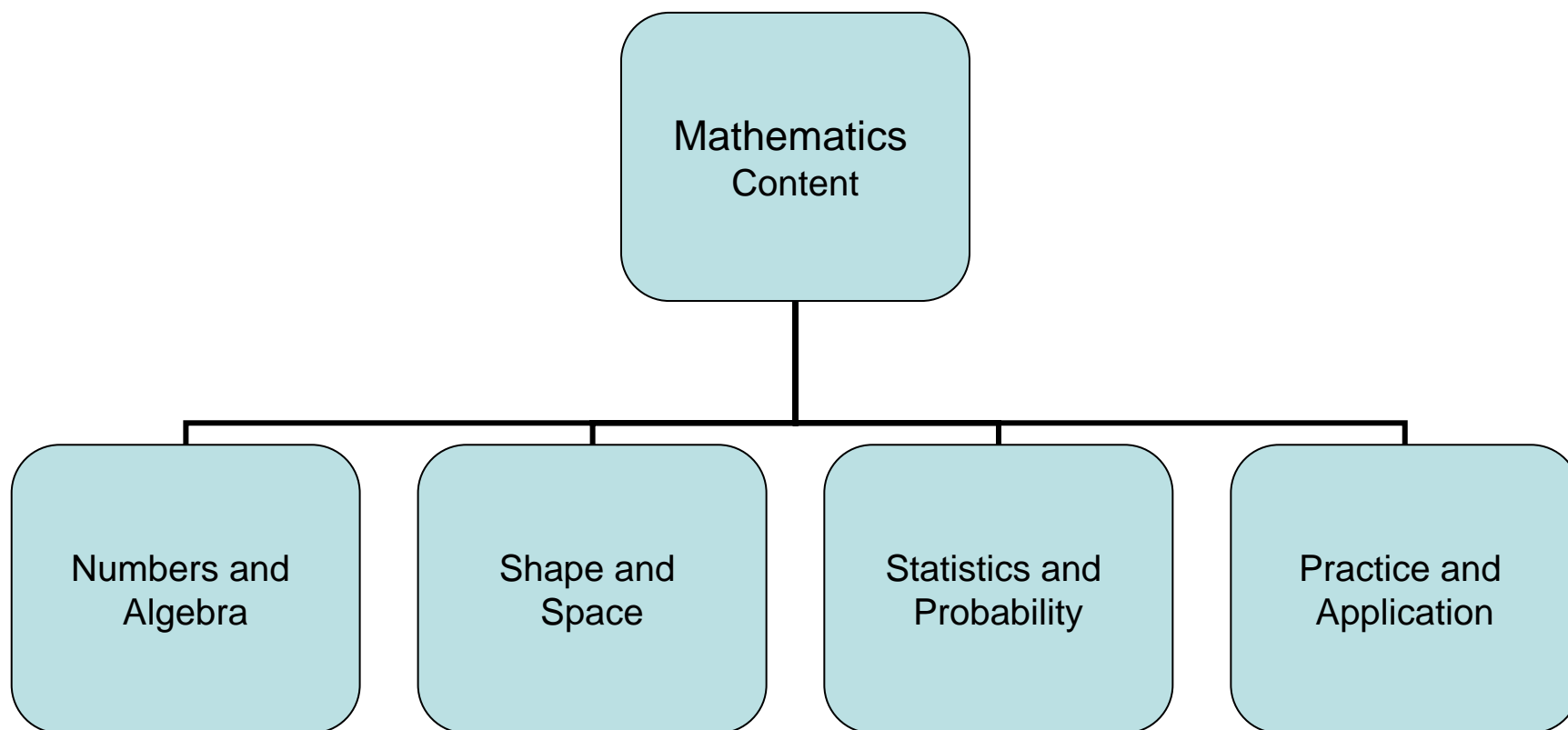
Question 2: What kind of data do you want to collect? What type of samples do you want to select?

Question 3: What do you conclude based on the data? (to develop reasoning skills)

Features of the New Curriculum (cont)

- Reconstruct mathematics content
- Transition from Algebra and Geometry to “Number and Algebra,” “Shape and Space”, “Statistics and Probability”, and “Practices and Application”

Features of the New Curriculum (cont)

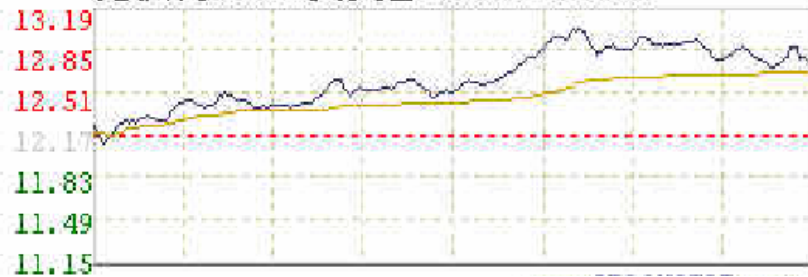


Features of the New Curriculum (cont)

- Delete some complex, difficult and eccentric content
- Reduce the requirements in computation
- Reduce the requirements in logical proofs
- Add “Problem solving tasks”, “Data analysis”, “Probability”, “Transformation”, etc. (Case6)

Case 6 How to judge from the stock quote?

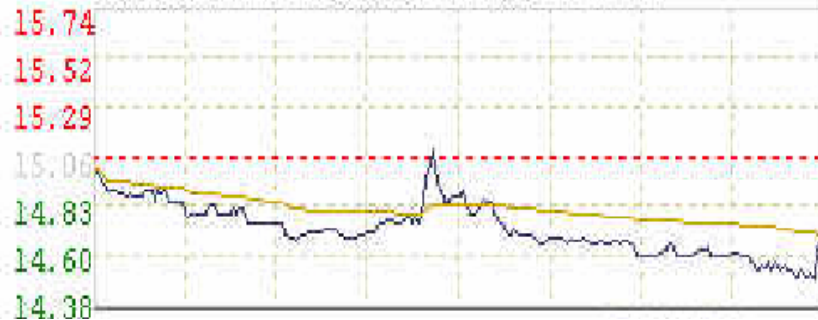
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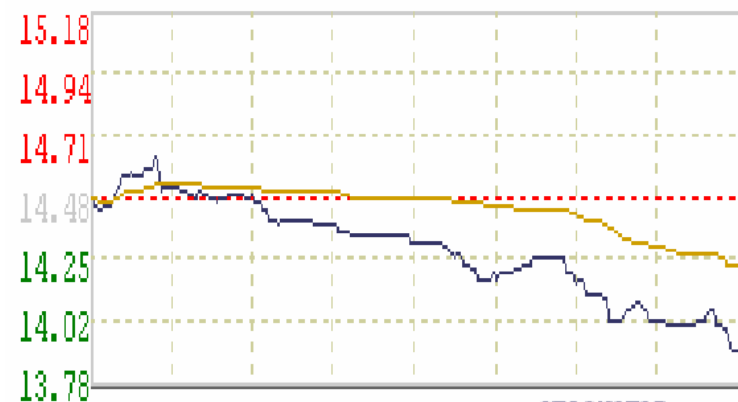
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Features of the New Curriculum (cont)

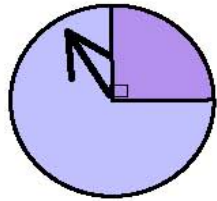
- Teaching and learning requirements:
 - (1) teachers as the organizers, guides and collaborators.
 - (2) students as activates learner with inquiring, cooperating study
- A new relationship between teachers and students -- discussion

Features of the New Curriculum (cont)

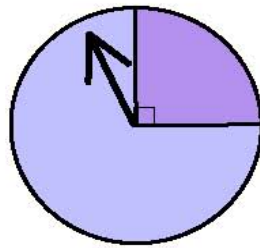
- Comprehensive assessment of students' learning:
 - *Students' performance in mathematical tasks and activities (Case 7, probability)*
 - *Students' abilities of problem solving, innovation and application of knowledge (Case 8)*

Case 12 Probability

Spin each spinner's arrowhead as hard as you can. Suppose you want the arrowhead to stop in the blue part. Which spinner will give you more chance to be successful?



spinner A



spinner B



Consideration the following two responses given by students:

- (a) Spinner B gives a greater chance because the spinner is bigger and has more blue part.
- (b) The two spinners give the same chance because there are only two possible outcomes: land on red or blue. Each spinner has 50% chance to be successful. So it doesn't matter whether you choose the big one or the small one.

Case 8

- If (3, 8) represents the location of the green horse, please use order numbers to represent several locations that the green horse can pass?



Features of the New Curriculum (cont)

- *The emphasis of using new technologies :*
 - *for complex computations.*
 - *deepening their understandings Show the content intuitively*

Challenges for Mathematics Curriculum Reform

- Dilemmas:
 - “basic knowledge and skills” vs. “mathematics thinking and emotion”
 - “Mathematics context” vs. “Pure mathematics”
 - “Teacher’s ideas” vs. “their teaching” (Case 9)
 - “passive learning” vs. “discovery learning”
- Examination culture-----

Case 9

Possible Pitfall : Losing control.

Teachers would do or teach anything that students ask for. Below is the dialogue between a teacher and students in the learning of the concept of a circle:

Teacher (T): What do you want to learn about a circle?

Student (S1): The definition of a circle.

(S2): How to draw a circle.

(S3): How to calculate the diameter and radius of a circle^o

(T): OK, we'll study these topics in this class.

Of course, the teacher or anyone else was unable to cover all of the above topics

Challenges for Mathematics Curriculum Reform (cont)

- How to change 11 million teachers' ideas?
- How to use cooperative learning in a 50~60 person class?
- How to meet individual requirements with different teaching methods?

Conclusion

- The problem with every reform in education is that they have all stopped at the classroom door -- longititude, stuff , arborous way to go
- Together hand by hand make our students upgraded in math!

Further Information

- http://hjzx.btvu.org/cz/ad_login.asp
- <http://math.cersp.com/Index.html>



Thank for your attention !