Mathematics Education and Teacher Education in Iran

Zahra Gooya

*Sahid Beheshty University of Tehran*
Facts on Iran
(All Statistics Are Approximate)

- **Location**: Middle East/Persian Gulf
- **Area**: 1,567,000 km²
  - (Long border with Iraq, Afghanistan, Pakistan, and Soviet Republics)
- **Population**: About 65 million
  - more than 52% under 25 years of age
- **Climate Variation**:
  - From –30°C to 40°C in winter
  - From 10°C to 57°C in summer
- **Official language**: Farsi (Persian)
- **Cultural and Ethnical Diversity**:
  - 7 languages (More than 10 dialects)
  - At least 12 ethnic groups with their own cultural heritage (dress, music, food, tradition.)
Facts about the Education System in Iran

• About 18 million students
• About 1 million teachers hired and paid by the government
• About 300,000 teachers work under short-term contracts
• Elementary teachers are mainly females
• Secondary teachers are about 60% male, 40% female

Centralized and segregated
• National Textbooks
  – 90% government subsidization of textbooks to make them available for every pupil in school
  – 180 million volumes of textbooks are published by Ministry of Education per year
• National examination
• National University Entrance Examination
• Number of females going to University is rising
  – in 2002, females were 62% of students entering Post-secondary education
Educational Structure

• **Kindergarten** (optional)

• **General Education** (Grades 1-8, mandatory)
  - 5 years of Elementary School
  - 3 years of Intermediate School

• **3 years of Secondary School** (Grades 9-11)
  - Tracking at the end of Grade 9 into one of 3 strands:
    - **Academic** (70%), **Technical** or **Vocational** (30%)
      - Each strand has a number of tracks
      - 70% of Tracking take place in the Academic strand:
        - **Math and Physics** (30%)
        - **Natural Sciences** (30%)
        - **Humanities** (about 38%)
        - **Art** (about 2%)
          » Islamic Theology (Recent program)

• **1 year of Pre-University** (Grade 12)

• **National Exams at the end of Secondary School and Pre-University**
Secondary Level Mathematics courses (Academic Track)

Grade 9

• **Math I**
  - obligatory for every student in all 3 strands

• **One of the following is mandatory:**
  a) Supplementary Math
     - for students who need help with math
  b) Art of Problem Solving
     - for students with a high math average
Secondary Level Mathematics courses (Academic Track)

Grade 10

- **Math and Physics:**
  - a) Math II
  - b) Geometry I
  - c) Statistics and Modeling

- **Natural Sciences: Math II**
  - Geometry I*

- **Humanities, Art, Islamic Theology:**
  - a) Math II
  - b) Statistics and Modeling

* indicates that the textbooks used were co-authored by Dr. Gooya
Secondary Level Mathematics courses (Academic Track)

Grade 11

• Math and Physics:
  a) Algebra and Probability*
  b) Geometry II*
  c) Calculus

Natural Sciences:
  a) Calculus for Natural Sciences
  b) Statistics and Modeling

• Humanities, Art, Islamic Theology:
  a) Math for Humanities*

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Pre-University Level Mathematics courses (Academic Track)

Grade 12

• Math and Physics:
  a) More advanced Calculus
  b) Linear Algebra
  c) Discrete Math (Graph Theory, Number Theory, Combinations, Probability)

• Natural Sciences:
  • More advanced Calculus

• Humanities:
  • Basic Math
Facts About Elementary Teachers

- **Elementary teachers**
  - Work half a day either morning or afternoon
  - Their teaching load is about 27 hours per week
  - They have 15 days off in the spring and 3 months off in the summer with full salary
  - They are mainly females (for both boys and girls schools). Low salary does not attract males to become elementary teachers
  - Their educational background is mainly the Humanities

- More than 60% of practicing Elementary Teachers have no further education after graduating from high school except in-service training (which is paid for by the Government and can lead to a College or University degree).

- CHALLENGE: Those who get a higher degree, usually don’t stay at Elementary Schools
Facts About Secondary Teachers

- **Secondary teachers**
  - Mostly specialized in either math or engineering
  - Teaching load is 24 hours per week for beginners and 20 hours after 20 years of teaching
  - Same days off as elementary teachers
  - Teachers are not responsible for any administrative work. If they do, their teaching load is reduced.
  - Secondary teachers are not full time in one school. Many of them work in private institutions and do private tutoring after school. This is causing a great problem.
Teacher Training

• For Elementary (Gr. 1-5)
  – 2 years of College or BA in Elementary Education
  – With only Math Method course and review of Elementary School Math textbooks

• For Intermediate (Gr. 6-8):
  – 2 years of College for Math or BSC. In Math with emphasis on teaching

• For Secondary
  – BSC. In Math with emphasis on teaching or In-Service Education Leading to BSC. For practicing teachers during the Summers and partly by correspondence.

• All paid for by Government
BSC. In Math with emphasis on teaching
(135 hour credit units)

- 22 hours credit unit: General Courses
- 5 hours credit unit: Elective
- 12 hours credit unit: Physics and lab (8) and Computer Science (4)
- 56 hours credit unit: Math (obligatory core)
- 18 hours credit unit; elective courses in Math (depending on the 3 tracks of Pure Math, Applied Math or Teaching Math)
- 22 hours credit unit: Education including;
  - Math Method course (3 units)
  - Review of secondary Math textbooks (3 units)
  - Counseling (2 units)
  - Philosophy of Education (2 units)
  - Measurement (2 units)
  - Developmental Psychology I and II (4 units)
  - Educational Technology (2 units)
  - Introduction to curriculum development at the secondary school (2 units)
  - Educational Management (2 units)
  - Educational Economy (2 units)
BSC. In Math (continued)

- **General Math Core Courses Includes:**
  - Calculus I, II, and III
  - Foundations of Math
  - Linear Algebra
  - Differential Equations
  - Algebra I
  - Analysis I and II
  - Number Theory
  - Graph Theory
  - Discrete Math
  - Statistics and Probability I
  - Stochastic Processes
  - Geometry
New Trends

- Research Findings
- Moving from quantity to quality
- Teacher as researcher
  - within last 2 years, Ministry of Education, has initiated more than 460 in-service training sessions regarding Action Research and IT and ICT
- Negotiating with Universities to move teacher training from teacher’s colleges to the Ministry of Education.
  - The Ministry of Education has closed down more than 90 colleges, and has recently launched several research projects at the national level to make decisions for the rest of them.
- Developing math courses specially designed for elementary and intermediate teachers
  - following what D. Ball is suggesting
- Teaching Pedagogy and Method via math content
- Emphasis on Real World Math
- Giving full scholarships to those teachers who are able to get into the Master program of Math or Math Education
- Designing study leave for teachers (in progress)
Support Structure

- Facilitating in-service education leading to higher degree
- Providing workshops, training sessions, and teaching material
- Providing problem solving workshops
- Annual Mathematics Education Conference since 1996 at the national level with more than 1200 participants
- Regional conferences
- Lesson plans and Teaching Models Festivals
- **Roshd Publications including:**
  - Roshd for Elementary Teachers
  - Roshd for Intermediate Teachers
  - Roshd for Teachers
  - Roshd for Math Teacher Education
Example of Problems for Teaching Both Content and Pedagogy

• In an arbitrary triangle, draw a line parallel to one of the sides to divide the area into two equal parts (Schoenfeld, 1995). (To be solved in small groups)

• In your opinion:
  – In order to solve this problem, what kind of mathematical knowledge is needed by students?
  – For what grade level, this problem is recommended?
  – For teaching which math concept(s), this problem is appropriate?
  – Do you know a problem relevant to this one? Please provide one if it is possible.
  – What heuristics did you use to solve this problem?
Comments by a Math Teacher at the end of a Training Session for Geometry I and II textbooks.

I enjoyed when I saw how the math concepts were formed, where they came from, and how were they constructed. The book provides the opportunity for students to think, and this is very important for students’ future and the future of our nation.
Challenges of Pre and In-service Teacher Training Programs

- How might we support beginning or intending teachers’ understandings of math for teaching?
- What kind of mathematical content and pedagogical structures needed to help pre-service teachers develop their knowledge of math?
- What kind of mathematical knowledge teachers need in order to teach well?
- What math content teachers need to know? How they should develop that knowledge, and how their understanding of math relates to teaching practices?
Research on Professional development of teachers shows that we should provide opportunities for practicing teachers to:

- Examine students’ thinking (Franke, et al., 2001)
- Reflect on teaching practices (Shifter, 1996)
- Develop or discuss teaching cases (Barnett and Tyson, 1999)
- Participate in teachers’ study groups (Stigler and Heibert, 1999)