Chapter 3 Teacher Preparation Program for Secondary Math/Science Teachers

Purpose: Information
Submitted by: United States
CHAPTER 3 TEACHER PREPARATION PROGRAM FOR SECONDARY MATH/SCIENCE TEACHERS

ZHUANG Yu & ZHU Yan
East China Normal University

Introduction

- How to recruit
- How to train
- How to monitor
Aim and Research Questions

- How to recruit student teachers?
- What are the entrance requirements?
- Are Incentives offered to candidates?
- What is the location of math/science content courses?
- What is the quantity and composition of the math/science content courses required to graduate?
- Does pedagogical course refer to general pedagogy or subject-related pedagogy or both?
- What is the typical math/science student’s practicum experience?
- Does your institution have a process for monitoring the quality of your teacher preparation program?

Methodology

- First developed Questionnaire-2012
- "APEC Survey of Curriculum for Upper Secondary High School Mathematics/Science Teacher Preparation Programs"
- In-depth Questionnaire-2013
  
  A number of open questions are developed to invite the respective institutions to give more informative details rather than merely providing some factual numbers and simple descriptions.
Findings and Summary

1. **Recruitment Strategies:** Two main strategies were identified for recruiting/attracting qualified student teachers among economics, including financial support and job/further degree study offer.

2. **Special-Need Students:** The USA tends to focus more on low performers and P. R. China pays more attention to high achievers.

3. **Teacher Preparation coursework:** There is subject-oriented student teacher training model in P. R. China.

4. **Practicum Organization:** There is a three-phase practicum system in P. R. China (ECNU case).

5. **Feedback Providers:** Student teachers receive feedback about their practicum performance from different parties, including universities, schools, and/or a combination.

6. **Quality Controllers:** Different parties take charge of monitoring the quality of teacher education, including universities or a third party.

---

Case-Real-world solving courses

- Problem-solving and mathematical competition
- Mathematics teaching design
- Panorama of Mathematical Methods
Math-Related Courses

<table>
<thead>
<tr>
<th>Pure Mathematics</th>
<th>Mathematics Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytic Geometry</td>
<td>Modern Mathematics &amp; Secondary School Mathematics</td>
</tr>
<tr>
<td>Higher Algebra (I) (II)</td>
<td>Culture &amp; History of Mathematics</td>
</tr>
<tr>
<td>Mathematical Analysis (I) (II) (III)</td>
<td>Introduction to Mathematics Education</td>
</tr>
<tr>
<td>Ordinary Differential Equations</td>
<td>Assessment &amp; Tests in Mathematics Teaching</td>
</tr>
<tr>
<td>Classical Geometry</td>
<td>- Panorama of Mathematical Methods</td>
</tr>
<tr>
<td>Complex Analysis</td>
<td>- Problem Solving &amp; Mathematics Competition</td>
</tr>
<tr>
<td>Probability &amp; Statistics</td>
<td>- Mathematics Teaching Design</td>
</tr>
<tr>
<td>Abstract Algebra (I) (II)</td>
<td>- etc.</td>
</tr>
<tr>
<td>Differential Geometry</td>
<td></td>
</tr>
<tr>
<td>Number Theory</td>
<td></td>
</tr>
<tr>
<td>Real Analysis</td>
<td></td>
</tr>
<tr>
<td>Combinatory &amp; Graph Theory</td>
<td></td>
</tr>
<tr>
<td>etc.</td>
<td></td>
</tr>
</tbody>
</table>

Panorama of Mathematical Methods

- **Aims and Tasks**
  This course aims to sort out mathematics methods at different levels to help students to gain an overview of mathematical methods so as to appreciate mathematical methods as well as the value of education from various perspectives.

- **Contents**
  Various mathematical methods are introduced from five different layers: basic and important mathematics thoughts, mathematical methods corresponding to general scientific methods, common mathematical methods used for the construction of mathematical knowledge, common mathematical methods in math application, and principles and rules in school mathematical methods, together with ample concrete examples.

- **Suggestions for Instruction**
  This is an elective course for normal students. The course is run in a combination of lectures and students’ theme-based discussions.
Problem Solving and Mathematical Competition

- Aims and Tasks
  This course aims to introduce various problem solving methods so as to broaden students’ views, enhance problem solving ability as well as mathematics literacy.

- Contents
  The focus of the course is various problem solving methods with majority of the examples from world-wide famous school mathematics journals (problem sections), mathematics competition problems from various countries, and IMO test problems.

- Suggestions for Instruction
  This is an elective course for normal students. The course is run in a combination of lectures and students’ theme-based discussions. Each lecture will begin with a problem, followed by the instruction on the specific methods, complemented with views from experts and background information. At the end, students will be advised to have further discussions, explorations, extra reading, as well as some exercises for consolidation.

Mathematics Teaching Design

- Aims and Tasks
  “Mathematics Teaching Design” utilizes systemic methods to turn principles in mathematics learning theories and instruction theories into mathematics instructional aims, contents, methods and strategies, as well as evaluations with detailed planning and creation of the system of teaching and learning “procedures”.

- Contents
  This course covers basic philosophy and principles about mathematics teaching design skills in mathematics teaching design, and writing and evaluating design plans. The focus will be on how to analyze teaching materials and learning context, design mathematics teaching according to different types of lessons, contents, instructional phases, as well as students’ prior academic levels, etc.

- Suggestions for Instruction
  The course is run in a combination of lectures, discussions, watching videos followed by analyses and discussions.