Quality of Secondary Preservice Mathematics Teacher Education Programs

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Granada, November 29, 2005

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A research project

- Characterizing the quality of teacher education programs and courses
- Supported by the Ministry of Science and Technology
- Working for three years
- Three universities working on secondary mathematics pre-service teacher education
- Almeria, Cantabria and Granada
- With a common model
The HEES and professional competences

- The need for quality assessment and assurance
  - Given a set of standards or competences for teacher education, how to characterize the quality of teacher education programs?

- Tuning Education Structures in Europe project
  - Generic and specific competences of first and second cycle graduates

- Model for designing, planning and implementing curricula

- Itermat: competences for secondary mathematics teacher education programs and courses in Spain
Research questions

- How to characterize the quality of a teacher education program or course?
- What instruments might enable us to produce such characterization?
- How does instruments work in practice on specific teacher education programs?
- What implications might the results have for the improvement of those programs?
Quality dimensions

Program is implemented in a context that determine relevance (social expectations, competences).

Objectives impose conditions on efficacy.

Pre-service teachers' learning take into account final state, allowing the attainment of efficiency.

Resources available for attainment.
Considering one dimension: relevance

- Focus on relevance

- A meaning for relevance

  - Conceptual
    - As a function of the fitting of the program's design to a given set of standards

  - Methodological
    - Through dimensions in which one can characterize how a syllabus contributes to the development of a given list of competences
Assumptions for the instrument's design

- A program is composed by a set of courses.
- The social expectations for the program are expressed in a list of specific competences for the corresponding professional profile.
- The program is designed in such a way that the conjunction of the different courses’ competences produces the global achievement of the corresponding program’s competences.
- The program design identifies the specific competences to which the course is expected to contribute.
- A course is described by its syllabus, which is composed by a set of objectives, a content, a planning structure describing when, and how and for how long each content’s topic is treated, and an evaluation scheme describing the criteria and instruments for assessment.
**Instrument: data collection I**

The Competences-Objectives matrix

Which objectives contribute to which competences and in which extent

<table>
<thead>
<tr>
<th>Competences</th>
<th>O₁</th>
<th>O₂</th>
<th>O₃</th>
<th>O₄</th>
<th>O₅</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₁</td>
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<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>C₂</td>
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<td>0</td>
<td>1</td>
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<td>1</td>
<td>1</td>
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<tr>
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<td>0</td>
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</tr>
</tbody>
</table>
Instrument: data collection II

- Time devoted to objectives
- On the basis of objectives-contents and contents-calendar
- Objectives weight in the assessment scheme
- On the basis of objectives-contents and contents-assessment instruments or criteria
Characterizing the relevance of a teacher education program

- Competences for which there are no objectives contributing to them
- Objectives that do not contribute to any competence
- Objectives richness: number of competences an objective contributes to
- Objectives concentration: measure of the strength with which the objective contributes to the competences it is linked to
Characterizing the relevance of a teacher education program II

- Concentration-richness map

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Richness</th>
</tr>
</thead>
<tbody>
<tr>
<td>(00k)</td>
<td>(0kl)</td>
</tr>
<tr>
<td>(lmn)</td>
<td>(0kl)</td>
</tr>
<tr>
<td>(lmn)</td>
<td>(0kl)</td>
</tr>
</tbody>
</table>

- Total time devoted to competences

- Time and assessment indicators
## Time and assessment indicators

- **Computation**
- **Design coherence**
- **Competences ordering**

### Computation

\[ t_{C_i} = \frac{\sum_{j=1}^{n} t_{j}C_{ij}}{\sum_{i=1}^{l} \sum_{j=1}^{n} t_{j}C_{ij}} \]

### Design coherence

\[ a_{C_i} = \frac{\sum_{j=1}^{n} E_{Oj}C_{ij}}{\sum_{i=1}^{l} \sum_{j=1}^{n} E_{Oj}C_{ij}} \]

### Competences ordering

<table>
<thead>
<tr>
<th>Competences</th>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₁</td>
<td>O₁</td>
</tr>
<tr>
<td>C₂</td>
<td>0</td>
</tr>
<tr>
<td>C₃</td>
<td>0</td>
</tr>
<tr>
<td>C₄</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Competences</th>
<th>Time indicator</th>
<th>Assessment indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>C₁</td>
<td>14.81%</td>
<td>11.76%</td>
</tr>
<tr>
<td>C₂</td>
<td>40.74%</td>
<td>41.18%</td>
</tr>
<tr>
<td>C₃</td>
<td>44.45%</td>
<td>47.06%</td>
</tr>
<tr>
<td>C₄</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Instrument implementation on a course

- The instruments have been implemented on secondary preservice mathematics teacher education courses
- We have developed the computation tools for obtaining the results automatically
In the near future

- A new project supported by the Science and Technology Ministry
- Linking secondary mathematics teachers’ competences and students mathematics competences (PISA)
- Proposing teacher education design guidelines for those purposes
- Exploring current teacher education programs adaptation to those guidelines
- Assessing those programs’ quality