Initial Mathematics teacher education in Portugal: Shortcomings and challenges

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The impact of the Bologna process

The main aim of the Bologna process was to foster students’ mobility and to facilitate the comparability of academic degrees within the European space.

The process was complex and lead to a variety of outcomes.

In some scientific areas, in particular, a number of side effects were produced, which are still to be fully assessed and understood.
From (2 scenarios)

A. five year integrated degree programs, created in the Seventies and comprised all the relevant teacher education components, including teacher training in schools

B. after a two year degree in the subject area the students may opt an educational profile, pure or applied maths. The educational profile included courses in pure maths, education, and mathematical education, followed by a professional training. However, due to the scarcity of lecturers in mathematical education, those courses were often replaced by extra pure maths ones.

To

• bi-staged programs consisting of a first degree (180 ECTS) on the subject area, followed by a second degree (120 ECTS) on its teaching
The case of Mathematics

<table>
<thead>
<tr>
<th>Before Bologna</th>
<th>After Bologna</th>
</tr>
</thead>
<tbody>
<tr>
<td>A course – a <em>licenciatura</em> – 5 years</td>
<td>First degree (180 ECTS) – 3 years</td>
</tr>
<tr>
<td>including courses:</td>
<td>exclusively on</td>
</tr>
<tr>
<td>• mathematics</td>
<td>• mathematics (180 ECTS)</td>
</tr>
<tr>
<td>• mathematics education</td>
<td></td>
</tr>
<tr>
<td>• education</td>
<td></td>
</tr>
<tr>
<td>• teaching practice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Second degree (120 ECTS) – Masters’ programme – 2 years</td>
</tr>
<tr>
<td></td>
<td>including courses:</td>
</tr>
<tr>
<td></td>
<td>• mathematics education (30 ECTS)</td>
</tr>
<tr>
<td></td>
<td>• education (25 ECTS)</td>
</tr>
<tr>
<td></td>
<td>• teaching practice (45 ECTS)</td>
</tr>
<tr>
<td></td>
<td>• mathematics (20 ECTS)</td>
</tr>
</tbody>
</table>

Example (Scenario A): UMinho
Main objective:
To find out how lecturers in mathematics education assess the implementation of the Bologna process in mathematics teacher education in Portugal, and how they anticipate their impact and evolution.

Actually, when the Bologna process was being implemented, the political and demographic context also changed, introducing an additional challenge.
Demographic and political context

- decrease in the number of students
- increase in the number of students per class
- reduction of lecturing support schemes (involving an additional teachers in some Math classes)
- ...

reduction in the number of candidates to mathematics teacher education MSc programs

teacher unemployment
methodology

• An online open-ended questionnaire was applied to lecturers in mathematics education from all Portuguese universities offering degrees on teaching mathematics.

participants:

15 university staff members
(14 in active and 1 retired)

experience as a teacher trainer:

<table>
<thead>
<tr>
<th>Group</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td></td>
</tr>
<tr>
<td>[10, 20)</td>
<td></td>
</tr>
<tr>
<td>[20, 30)</td>
<td></td>
</tr>
<tr>
<td>&gt;30</td>
<td></td>
</tr>
</tbody>
</table>
Some results

Pre-Bologna

pre-Bologna teacher training

good (53%)

very good (33%)

no opinion (7%)

(he had no experience in teacher training in the pre-Bologna period)

Great quality, not only in terms of knowledge, but also in what concerns the integration of the future teacher in the teaching practice. I think the training that was provided to future teachers before Bologna was at the level of the best (F6)
Some results

quality of the human resources involved

- good (33%)
- very good (20%)
- average (7%)
- weak (7%)
- did not value their opinion (13%)
- did not know (13%)
- did not respond (7%)

Pre-Bologna

The quality of human resources [in the universities] varied, but I think that no-PhD lecturers did a remarkable job. I know some cases in which the practical training allowed future teachers to learn Didactics up to a level they have not achieved during their [formal classes]. (F8)

In my institution, where I graduated and where I work, the quality of the human resources responsible for the training of mathematics teachers has always been very poor in what concerns training in didactics. Actually, there wasn’t any lecturers specialized in mathematical education, and the lecturers in mathematics had no concern with didactics or even with the professional career of their students (F14)
Some results

Factors responsible for the reduction of candidates to degrees in Mathematics teaching:

- Unemployment among teachers (80%)
- Social devaluation of the profession (73%)
- Characteristics of mathematics (53%)
- Volume and type of work expected (13%)
- Disinvestment in teacher training courses (7%)

Present

- i) Social devaluation of the teaching profession, which reduces the demand for the profession; ii) the myth that mathematics is difficult and not for everyone; iii) the reduction of teaching positions in schools and the increase of the number of students per class; iv) The difficulty of a teacher to be placed in the school of his/her choice (...); v) The difficulty in working with teenagers. (F15)
Some results

Who is responsible?

government (and the political power in general) (87%)
social devaluation in general (13%)
education system and profession (47%)
universities which do not invest in teacher training courses (13%)
Some results

Consequences

**Consequences for universities**

- discontinued degrees (53%)
  (visible in some universities)
- need for teacher retraining (13%)
- unemployment (13%)
- need for collaboration between institutions (7%)
- reduction of the quality of prospective students (13%)

**Moreover, these students are (or continue to be) considered the "worst", who opt for teaching because they do not have the ability to follow other MSc degrees. The MSc in teaching is sometime is often seen as "scrap" (F14).**

- reduction of the quality of the students because the offer is greater than the demand;
- reduction of the visibility of the importance of didactics of mathematics (F10)
Some results

Consequences

consequences for the lecturers in Mathematics education

need for retraining of educators (33%)

loss of qualification of professionals (13%)

need to focus on the continuous training of teachers (13%)

There are no favorable conditions to the professional development of teachers accompanying initial teacher education in schools (F10)

unemployment or unwanted mobility (F14)
<table>
<thead>
<tr>
<th>Some results</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consequences for schools</strong></td>
<td><strong>Consequences</strong></td>
</tr>
<tr>
<td>lack of math teachers (73%)</td>
<td>qualified teachers may be replaced, as happened in the past, by other colleagues from other areas of knowledge (F6)</td>
</tr>
<tr>
<td>Need for hiring other professionals (40%)</td>
<td>Resorting to other professionals will result in an enormous loss of the quality of mathematics teaching and impoverishment of learning. (F4)</td>
</tr>
<tr>
<td>aging of the teaching staff and reduced innovation practices (20%)</td>
<td>Aging of the faculty, aging of schools and their dynamics, reinforcement of traditional teaching, reduced innovation practices, resistance to curricular changes. (F7)</td>
</tr>
</tbody>
</table>
Some results

Consequences

consequences for society

- less students interested in scientific and technological areas (13%)
- weaker development of critical thinking (20%)
- diminished reasoning ability (7%)
- lower literacy levels (20%)

Mathematics is essential to the development of society at several levels. The lack of adequately trained mathematics teachers (...) will naturally result into the reduction of consistent learnings and, consequently, the lack of willingness for pursuing careers in science and technology, essential for the development of today's society. (F14)

Since Mathematics is a fundamental area for several other disciplines in our society, the lack of qualified personnel in its teaching will compromise all the others. (...) An engineer with a poor mathematical training will not be as prepared as one with a solid background in Mathematics. (F5)
Some results

Reversal of the situation

Yes (87%)
Consider that it is not necessary (13%)

what should be done

The initiative is up to all of us, of course. (...) **Maths teachers**, for example, may take individual and collective positions, particularly within their socio-professional associations, **denouncing the conditions** in which they work (e.g. the exaggerated number of students per class), taking position about the very **syllabus** that they are required to minister (e.g. its extension, or the depth with some aspects are covered), (...) and **demanding continuous training**, with quality and without excessive financial burden. (F15)

**who is in charge of this initiative**

- government or ministry (73%)
- institutions of higher education responsible for training (40%)
- their trainers (13%)
- professional associations and teachers (20%)
- schools (13%)
- society in general (7%)
Universities should claim their right to offer initial training courses in Mathematics teaching, and act as promoters of continuing education, by presenting new projects and initiatives (F15).

Universities play an important role in publicizing their courses and attracting students. (F6)

The ministry is expected to recognize how important a proper initial teachers training program is, specially in mathematics, and to foster such degrees within the Universities. In parallel, the ministry will have to assume that classes with excessive students do not benefit the quality of their training. Similarly, it should recognize the importance of suitable working conditions, and stable professional careers. It is very difficult to have a quality product when professionals do not have a suitable working environment and career evolution perspectives. (F15)
prospects for future work

The data collected in this study identified concrete problems in the implementation of the Bologna process in Portugal.

Going broader and deeper will provide further data to define measures aiming at reinvigorating mathematics teachers’ careers and promoting the social recognition of the teaching profession.

The results obtained will be compared with:
- results collected with similar instruments in different knowledge areas
- results collected in other countries

leading to a better understanding of the area and helping to develop suitable educational policies.
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