Education: from master student to tenure

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Higher education in Europe

• Education in Europe has been restructured following the 1999 Bologna declaration.
• This has led to the European Higher Education Area (EHEA).
• ApPEC/ECFA/NuPECC countries are part of the EHEA.

• Members must sign the 1954 European Cultural Convention (under the authority of the Council of Europe).
• The EHEA currently has 48 members (+ the European Commission): All 47 Council of Europe members + Belarus.
The Bologna process

- Studies in the EHEA are organised according to a 3 cycle system: 3+2+3.
- This follow suit to the 1998 Sorbonne declaration to uniformize higher education in Europe and the 1998 Bologna declaration.
- It is often called the “Bologna process”.
- In the EHEA students are awarded credits for successfully attending a course.
- These credits are called ECTS (European Credit Transfer and Accumulation System).
- Emphasizes Academic Freedom and Institutional autonomy.
Common grading scale

- To allow an easier exchange of marks between countries, a common grading scale has been defined (to be used in exchanges of Marks between countries).
- This gives the relative performance of a student within a group but does not allow comparison of two students examined at different Universities at the reference groups are then different.
- Universities retain their grading procedures.
- This scale can be replaced by given the statistical distribution of the local grades.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
<th>Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>B</td>
<td>25%</td>
<td>35%</td>
</tr>
<tr>
<td>C</td>
<td>30%</td>
<td>65%</td>
</tr>
<tr>
<td>D</td>
<td>25%</td>
<td>90%</td>
</tr>
<tr>
<td>E</td>
<td>10%</td>
<td>~100%</td>
</tr>
<tr>
<td>FX</td>
<td>Fail: additional work required</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>Fail: considerable work required</td>
<td></td>
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</table>
The three cycle system

- One academic year corresponds to 60 ECTS credits, equivalent to 1,500–1,800 hours of study.
- At the end of the first cycle, “bachelor program” (3 years of studies) they will have earned between 180 and 240 ECTS.
- They will then earn 60-120 credits in the second cycle “master program”.
- The third cycle is called the “Doctoral program” there is no set number of ECTS to earn during that cycle.
Education to our fields across Europe

- During the first cycle (Bachelor program) students learn general physics.
- In research intensive universities they will usually have the opportunity to get some initiation courses to some advanced topics.
- The master program is the time when they really specialise in advanced physics topics and thus is when they have solid courses in our topics.
- The availability of specific courses depends on local research groups working on these topics.
Specialization in the master program

• Most students arrive in the master program unspecialized.
• They will specialize during the master program by taking speciality courses.
• Specialization can occur:
  • At the beginning of the master, with all courses oriented toward a specific topic.
  • During the second year of master with the first year being generic and the second highly specific.
  • At the end of the master with a general physics courses and a few specialisation courses during the master {this seems to be less and less frequent}.
• Most research masters include a master thesis during which the student joins a research group for several months (up to a year).
• In some cases the master course is generic with specialization courses and in other cases the master course is already partly specialized.
• Given the autonomy of the universities, this is university/faculty specific.

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Education during the doctorate

• The Bologna process does not require formal courses at the doctorate level.
• However almost all universities require students to attend some courses. They can take several forms:
  • Research seminars/paper discussion
  • Classroom courses without examination
  • Classroom courses followed by an examination
• In addition to courses in the field of specialization, most universities require students to take other courses:
  • Thesis writing
  • English
  • Ethics
  • Pedagogy
  • ...
Specialization schools

• Most universities don’t have specialists in all topics of our fields.
• Hence students are often encouraged (required) to join specialized schools organised by leading institutions in the field.
• Examples:
  • CERN Schools (HEP, accelerators, computing,...)
  • ESI’s schools (JUAS, ESIPAP)
  • Schools organised by local groups
Example: The accelerators education landscape

- As an illustration we can look at the landscape for accelerators education.
- Accelerators have the specificity that there are very few lecturers in the field and thus few universities giving courses.
- This reinforces the need for joint schools at master and doctorate level.
• Modern students spend a significant time on screens.
• It is tempting to use screens to teach them.
• Massive Online Open Courses (MOOC) are a good way to reach students in universities where some specialities are not given.
Teaching with MOOCs

• With MOOCs one can disseminate courses to a large number of students.
• The interaction with students is different than with conventional classroom courses.
• There is a wide range of feedbacks (from students and teachers) from highly positive to more sceptical.
• In experimental fields there is still the need to provide hands-on experimental training.
• In all fields the MOOC can help to attract students to a given topics.
• They also give more time to the teachers to focus on more difficult concepts.
Doctorate examination are also very different from university to university or from country to country...

<table>
<thead>
<tr>
<th>Country</th>
<th>Step 1</th>
<th>Step 2</th>
<th>Public defence</th>
<th>Questions scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>2 external reviewers</td>
<td>Public defence with 4-8 examiners</td>
<td>Yes</td>
<td>Manuscript</td>
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<tr>
<td>Germany</td>
<td>Reviewers (supervisor + externals)</td>
<td>Defence with committee (can be public)</td>
<td>Yes/No</td>
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<tr>
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<td>Manuscript</td>
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<tr>
<td>Sweden</td>
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<td>One to one examination in front of committee</td>
<td>Yes</td>
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<td>Italy</td>
<td></td>
<td>Defence with committee, same for all students of the faculty</td>
<td>No</td>
<td>Faculty</td>
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</table>
From doctorate to tenure

• Although some institutions used to appoint young doctors to a tenured position immediately after the doctorate (or even before), this is no longer the case.
• In most research intensive institutions the average age to get a tenured position is beyond 30.
• European regulation prevent anyone renewing a temporary contract with an employer for who they already worked 6 years ⇒ most institution have stricter regulations.
• Some institutions have tenure track positions where a temporary contract will lead more or less certainly to a permanent contract.
• Other institutions operate on an open competition basis.
• In some institutions local candidates are not allowed to compete to open competitions.
Tenured positions

• The characteristics of the research in our field has some impact on the type of tenured positions.
• Most countries have national research institutions (IN2P3, INFN,...) or research labs (CERN, DESY,...) giving non-teaching positions to a large fraction of our community.
• Hence the fraction of lecturers and university staff in our community is lower than in communities using smaller research infrastructures.
• The balance between research staff and lecturers varies widely from countries to countries.
• Our community also uses more engineering staff and the boundaries between engineers, research engineers and research staff can sometimes be blurred (both in duties and in status).
Beyond tenure: habilitation

• Some countries (France, Germany, Austria, Italy,...) require an additional degree either to reach the rank of professor or to supervise students.

• This degree is called “Habilitation”.

• Here also the examination procedure varies a lot from faculty to faculty.
  • Compilation of papers or a separate manuscript.
  • Oral examination
  • Hearing on the teaching capabilities of the candidate
Chemistry Eurolabels

• In chemistry universities across Europe have created a “Eurolabel” at bachelor and master level.
• A label committee ensures of the quality at a European level of the degrees given under the label.
• Requires close collaboration between the awarding institutions.
Outlook

• The Bologna process has created a common framework across universities.
• However it also supports large autonomy of the universities.
• Master and doctorates are still very different from University to University.
• The Bologna process itself does not ensure uniform quality of the degrees.
• Some fields have created common degrees.
• Digital teaching can also help us to reach a broader student audience and to pool teaching resources in specialised courses.