Study in Biology in the Netherlands

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1. Introduction

This ‘national document’, is presented by request of the EU Task Force Human Resources, Education, Training and Youth for a conference on the future of Biology in Europe, to be held at Madrid/Toledo in March 1995. It was written with the aim of giving the interested reader, be they academic or politician, a useful overview of University level biology teaching in the Netherlands. As professional biology is organised into independent institutions in the Netherlands, a separate chapter is dedicated to this kind of education. The author has written this document in his capacity as chairman of the National Committee for Higher Education in Biology, and as the representative of the Deans Association of Biology in the organising scientific committee for the Madrid conference. It is however written from a personal point of view, as requested by the Task Force.

2. Organisation

2.1 The faculties of biology

Seven out of the 15 universities in the Netherlands have a biology faculty or department:
• University of Amsterdam
• Free University Amsterdam
• University of Groningen
• University of Leiden
• Catholic University of Nijmegen
• University of Utrecht
• Agricultural University of Wageningen.

For historic reasons parts of biology can also be found within other faculties or departments. This is the case for Molecular Biology and Biotech-
nology (found in chemistry departments e.g. the Technology University of Delft and the University of Wageningen) and Human or Medical biology (in the medical departments of the Free University, the Universities of Amsterdam, Groningen, Leiden, Nijmegen, Utrecht and the Erasmus University of Rotterdam).

This report is restricted mainly to biology education mentioned in the above biology departments. The institutes for Higher Professional Education with biology related programs are discussed elsewhere (3.2.3).

Financing

All universities are financed in the same way by the National Government. This direct finance constitutes about 90% of the universities' and the professional high schools budgets. About 65% of research funds are part of this central grant. About 10% of research activities are financed on the basis of projects selected by the governmental funded Netherlands Organisation for Scientific Research (NWO), and about 25% is obtained on a contract basis from national or provincial authorities, industry or the E.U. etc.

Table 1 – Number of students, graduates and academic staff (September 1994)

<table>
<thead>
<tr>
<th>University</th>
<th>students*</th>
<th>Graduates**</th>
<th>Staff***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amsterdam</td>
<td>250</td>
<td>25</td>
<td>110</td>
</tr>
<tr>
<td>Amsterdam (Free University)</td>
<td>265</td>
<td>45</td>
<td>85</td>
</tr>
<tr>
<td>Groningen</td>
<td>705</td>
<td>135</td>
<td>65</td>
</tr>
<tr>
<td>Leiden</td>
<td>415</td>
<td>65</td>
<td>110</td>
</tr>
<tr>
<td>Nijmegen</td>
<td>500</td>
<td>75</td>
<td>65</td>
</tr>
<tr>
<td>Utrecht</td>
<td>950</td>
<td>110</td>
<td>95</td>
</tr>
<tr>
<td>Wageningen</td>
<td>550</td>
<td>90</td>
<td>85</td>
</tr>
</tbody>
</table>

* Biology undergraduate students only (not including environmental sciences, human biology, biotechnology, if these are separate studies)
** Graduate in a Ph.D. programme (as ‘AIO’ or ‘OIO’)
*** Academic staff (formation, permanent and temporary, including governmental and science foundation funded research, as well as contract research)

2.2 Organisation of biology

The universities in the Netherlands form the Association of co-operating Universities in the Netherlands (VSNU). The VSNU deals with the national government, particular the Ministry of Education, Sciences and Culture in matters of organisation and budgets.
The Deans of the Biology Faculties are organised into a sub-group of the VSNU, called the Association of Deans in Biology. The deans consult each other about research and educational policy in their faculties or departments. In matters of education, curriculum affairs and teaching the Association is advised by the independent National Committee for Higher Education in Biology. Each faculty or department of biology is represented by one staff member and one senior student on this committee.

The Royal Netherlands Academy of Arts and Sciences (KNAW) is the Government’s advisory body in all fields of science. Other functions of the Academy include: peer review, promotion of science and provision of a platform for communication and collaboration of Dutch and foreign scientists. The Academy also manages 20 institutes for fundamental research, 6 of them in life sciences. In its advisory role, the Academy is supported by standing committees one of which is the Biological Council. Over all, the representation of biology profession to the public, society and the government is performed by the Netherlands Institute for Biology (NIBI). All scientific and educational organisations active in the field of biology and environmental sciences have their representatives on the board of the NIBI association. Moreover, NIBI plays an important role in employment information and job recruitment for biologists in all fields. NIBI is an active member of the European Communities Biologists Association. The bimonthly biology newspaper ‘BIONews’ is also linked to NIBI.

3. Studies in biology

3.1. University teaching in general

Under law all academic and higher professional studies in the Netherlands have to offer a four year curriculum (discussion is now occurring into the diversification of this system). Students are currently allowed to extend their registration for two years and to use this extra time for retaking exams or undertaking extra courses and traineeships, etc.

The annual fee for academic enrolment in all universities is 980 ECU, this will rise substantially in the near future.

A national basic grant (75 ECU per month for residents at home and 220 ECU for non-residents) is available for all students and is available for up to 5 years, provided a certain number of credits were obtained. In some cases the grant can be supplemented with a loan up to a certain maximum.

A special feature of Dutch universities is the presence of permanent local student advisers for each study (working separate from the general student deans), who are in charge of controlling study results for the continuation of the national basic grant, advising on all matters of study and curriculum, possibilities courses elsewhere, career planning, etc.
In the Dutch university system, there are two different levels of advancement, the above mentioned four-year program, called ‘doctoraal’, and a number of ‘postdoctoraal’ advanced training and research programs. This latter type includes the highest possible academic achievement, the ‘doctoraat’ or ‘promotie’ (‘doctoraal’ and ‘doctoraat’ are confusingly similar words signifying however two very different levels of academic achievement comparable to the international M.Sc. and Ph.D).

The first year of all academic and professional studies is called the ‘propedeuse’ and aims to be a year of orientation, selection and reference. The year is concluded by an official examination which decides the continuation of study.

<table>
<thead>
<tr>
<th>Nominal year</th>
<th>Academic Programme</th>
<th>Official examination</th>
<th>Dutch title</th>
<th>International level</th>
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<tr>
<td>8</td>
<td>Doctoraat</td>
<td>Promotie</td>
<td>Dr.</td>
<td>Ph. D.</td>
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<tr>
<td>7</td>
<td>Doctoraat</td>
<td>Doctoraal examen</td>
<td>Drs./Ir</td>
<td>M. Sc.</td>
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<tr>
<td>6</td>
<td>Doctoraal examen</td>
<td></td>
<td></td>
<td>B. Sc.</td>
</tr>
<tr>
<td>5</td>
<td>Propedeuse</td>
<td>Propedeutisch examen</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nominal year</th>
<th>Academic Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Secondary School</td>
</tr>
<tr>
<td>5</td>
<td>(Pre-university</td>
</tr>
<tr>
<td></td>
<td>program)</td>
</tr>
</tbody>
</table>

Table 2 - Schematic representation of academic study in the Netherlands

When combined, the ‘propedeutic’ program and the first year of the ‘doctoraal’ program are equal to the B.Sc. in the UK.

Graduates of the ‘Doctoraal examen’ use the title ‘Doctorandus’ or ‘Ingenieur’ (Technical and Agricultural Universities), which is abbreviated to ‘Drs’ or ‘Ir’. It has recently been permitted for candidates to use the internationally more familiar title of M.Sc after their name instead.

The official national credit point system for academic as well as professional education is based on 42 credits a year. One credit point is defined as one week or 40 hours net study. The academic year and the curriculum start early in September. Final exams are in July or August. Breaks at Christmas and Easter are short. All curricula are adjusted to 42 weeks (breaks and retaken exams are not included).
3.1.1 The basic study year ('propedeuse')

3.1.1.1 Contents

The one year ‘propedeutic’ program builds on the thorough pre-university biology program undertaken in secondary school. It enlarges knowledge and experience in different biology disciplines and gives an additional biology oriented training in chemistry, mathematics, statistics and computing. As usual for the Dutch situation, the biology teaching at this stage covers all biology subjects (plants, animals, micro-organisms) and levels of integration (from molecular to ecosystem).

3.1.1.2 Organisation

Admission
To qualify for admission to the university, students must have a diploma from a secondary school which offers a pre-university program (‘vwo’) with at least 7 subjects at the examination level. Secondary school examinations are based on a combination of national and school tests. Students with a diploma containing at least biology and chemistry are automatically allowed to register for biology at the university (most students entering also have mathematics, physics and one or two foreign languages). Only in special cases are entry examinations requested.

The program
The ‘propedeutic’ program is organised into two semesters or three trimesters. Knowledge of all subjects is tested by separate examination and the results are taken into account in the final (only formal) examination. All biology students follow the same program offered by the faculty or department, irrespective of their subsequent choice of study. Practical work takes about half of the total time spent at university. Due to past agreements between different departments there is a certain uniformity in the programmes, this facilitates mobility of students within the Netherlands.

Efficiency and drop out
Whilst the program is intended to be selective, there is still a substantial number of drop outs. However, the overall efficiency of the program is above 70% (mean for the seven biology faculties or departments over the last five years, including one final re-examination at the end of a second year).

3.1.1.3 Impact of European Programmes

The impact of European Community Programmes is low or absent at this initial stage of a student’s study. In general, participation in exchange programmes is not recommended at this early stage.
3.1.2 The post propedeutic or ‘Doctoraal’ programme

3.1.2.1 Contents

Following an agreement within the National Committee for Higher Education in Biology (see 2.1) all biology faculties and departments in the Netherlands have their ‘doctoraal’ programme organised along the following lines:

Part 1 Differentiation (one and a half years, although it is one year at some universities).
Courses, lectures and laboratory work in a chosen field or direction. Programs in premedical biology, biotechnology, environmental sciences are also offered.

Part 2 Specialisation (one and a half years, two years at some universities)
Participation in one or two research projects (in general for a total of 12 months, including the theses) are normally included as well as specialised theory courses, a seminar and professional preparation.
A research project or other subject can be undertaken, at another university or a governmental or private research institute.

3.1.2.2 Organisation

The nominal length of the ‘doctoraal’ program is 3 years. There is no numerus clausus. Students need the official ‘propedeutic degree’ to be accepted for part one (‘differentiation’). Before entering part two (‘specialisation’) the students results are checked. Those who do not satisfy certain levels are excluded from this part of the program.
Specialisation brings the student up to the ‘Doctoraal’ level, a degree equivalent to the M.Sc. (UK) or Licencié (France).

3.1.2.3 Impact of European Community Programmes

The impact of European Community Programmes on curricula is currently rather low. A substantial group of senior students are taking part in a European ICP, mainly in the second part of the doctorate (‘specialisation’). At this level students can be placed or received as research trainees in university laboratories, this avoids most language problems. In general Dutch students have a very good knowledge of English, and so can be placed in any European laboratory where the supervisor can use English.
Receiving students in this way provides no problem as English is the second language in every laboratory in the Netherlands.
The European programmes ERASMUS and COMETT have changed the mind of biology students in such a way that they no longer regard the U.S.A. as
the only example of teaching and science abroad. Due to these pro-
grammes Dutch students are now fully conscious of the opportunities
that Europe has to offer and have learned to use these opportunities.
At both a faculty and university level there is a growing awareness of the
‘European dimension’ in science and teaching.

3.1.3 Postdoctoral programmes, including Ph.D (‘Doctoraat’)

Graduates from universities and Professional Higher Institutes are eli-
gible for admission to doctoral programmes. In biology these programmes
can be grouped into the following categories:
(1) one year university teacher training programmes (first degree, 15-18
year pupils).
(2) four year research programmes, leading to the Ph.D (‘doctoraat’, also
known as ‘promotie’).

3.1.3.1 Content of the Ph.D programme

The main activity within the Ph.D program is undertaking research
which leads to a thesis. Following lectures, seminars and specialised
courses form a minor part of the Ph.D program. Up to 25% of the time can
be used for teaching this is mainly via training and supervising one or
more senior students during their research traineeship on the same topic.

3.1.3.2 Organisation of the Ph.D programme

The nominal length of the Ph.D program is 4 years. Graduates selected for
the Ph.D program are not regarded as students but as junior staff mem-
ers. They have to compete for the available places and have a (minimal)
salary. Only those selected for the teachers program (first degree) are allo-
wed to stay as a student for another year (and will therefore continue to
receive the basic grant).
Depending on the source of funding for salaries and equipment either
from the university or from other institutes, the junior staff member on
the Ph.D programmes are referred to as ‘AIO’ (‘Assistant-in-training’), or
‘OIO’ (‘Researcher-in-training’).

Most research programmes are organised in registered national Graduate
Schools (‘Onderzoeksscholen’). If one includes the biomedical schools,
there are 35 officially registered schools most of which are recognised by
the Royal Netherlands Academy of Arts and Sciences KNaw. The Gradu-
ate Schools play an important role in organising many courses at the Ph.D
level.
3.2 Professional education

3.2.1 Job recruitment

The Netherlands Association for Biologists NIBI (see 1.2) collects data concerning vacancies and the employment situation in general, more specifically for recently graduated biologists. NIBI plays an active role in informing students and every year produces several brochures covering job recruitment and the employment situation in science, teaching and other sectors where biologists are active. NIBI manages a special Office for Recruitment of Biologists.

Data from a 1994 report indicates: 51% of the students who graduated in 1991/1992 were active in cellular or molecular biology, 22% in organism biology and the remaining in population biology. Within one year of graduation 82% were at work and 75% had a paid job. The university itself is still the greatest employer (57%). The increasing unemployment of post-docs is recognised as a new problem.

The situation for biologists from the professional technical schools is generally better, especially for the biomedical, biochemical and environmental sectors.

3.2.2 Permanent or Continuous education

Postgraduate courses are offered by a number of Biology Departments mostly based on co-operation between two or more universities. High fees restrict participation to those sent (and paid) by their university, institute or company.

The Open University in Heerlen offers a number of theoretical courses in biology and environmental sciences.

3.2.3 Biology at the professional (vocational) High Schools

Teachers Schools (second degree, 12-15 year old pupils) and Schools for Technicians (biomedical, biochemical and environmental) are part of large scale Polytechnics ('Hogescholen') which are organised separately from the university system.

The following 'Hogescholen' are worth mentioning here (L = Biological or biotechnical laboratory work, T = teachers programme biology, second degree):

- Hogeschool Amsterdam, Amsterdam (T,L)
- Hogeschool Gelderland, Arnhem (T)
- Hogeschool Holland, Diemen (T)
- Noordelijke Hogeschool Leeuwarden, Leeuwarden (T,L)
- Hogeschool Katholieke Leergangen, Tilburg (T)
- Hogeschool Rotterdam en Omstreken (T,L)
As a rule, credits from universities and professional schools are mutually acceptable. All university biology departments offer special programmes for incoming professional students, leading to graduation after one or two years.

3.2.4 The role of the national scientific associations and societies

From the main national scientific associations active in the field of biology the following are important:

- Royal Dutch Botanical Society (KNBV)
- Dutch Zoological Society (NDV)
- Netherlands Society for Microbiology (NVVM)
- Netherlands Society for Biochemistry and Molecular Biology (NVBMB)
- Netherlands Biotechnical Society (NBV)
- Netherlands Society for Developmental Biology (NVOB)
- Dutch Society of Cell Biology (NVCB)
- Dutch-Flemish Association of Ecologists (NEVECOL)

The societies or associations mentioned offer a forum for the consultation and presentation of research results. Their role in curricula organisation and undergraduate teaching is restricted to their area of interest.

The role of the Royal Netherlands Academy of Arts and Sciences (KNAW) is mentioned elsewhere (2.1)

The Netherlands Organisation of Scientific Research (NWO), and especially its sub-organisation ‘Life Sciences’ have to be mentioned because of their regulating role in the distribution of additional research funds.

4. New needs in the study of biology

4.1 Shortcomings, gaps, perspectives

4.1.1 From the point of view of changes of biological topics

The movement of students and teachers between different departments of biology within the Netherlands is at present low and can be increased. The success of European exchange programmes emphasises what can be
done to promote mobility within the country itself. An improved information and education policy should encourage students to use the possibilities elsewhere in the Netherlands.

Gaps in the curricula can be solved by inviting staff members and teachers from sister departments in the country. Regional co-operation between the Netherlands and the Flemish speaking parts of Belgium (Flanders and Brussels) can be explored more thoroughly than is currently the case.

The co-operation between the faculties and departments of biology can be improved, e.g. with respect to the initiation and continuation of professorships, improved coordination will lead to an increase in opportunities across different departments and sites of study. Local experience in curriculum building and teaching should be used more efficiently at the national level. The Association of Deans in Biology and the National Commission for Higher Education in Biology (see 2.1) have recently reopened a discussion on this subject.

4.1.2 From the point of view of new professional situations

Quality assessment

Increasing the quality of graduates and postdocs is one factor which could improve the present job market situation. This quality is in turn influenced by both the quality of teaching and the quality of the (entering) students.

Quality assessment of education is an accepted method to improve the output of teaching. An elaborate system of quality control, using external committees, has been developed by the Association of Co-operating Netherlands Universities (vsnu). Each discipline is evaluated once every five years and a public report is published which includes conclusions and recommendations. The last report about biology (and medical biology) was published in 1991. A ministry commission has recently examined the present evaluation system and the way in which conclusions and recommendations are implemented (Report ‘Kwaliteitszorg Wetenschappelijk Onderwijs 1993’, Inspection report in 1994-4).

In the author’s view the next round of evaluations by the vsnu should lead to a clearer more consumer orientated type of report.

The quality of the (entering) students has to be improved. The free entry to university of all secondary school graduate students is now the subject of national discussion. Biology (like other natural sciences) should be allowed to set additional and distinct requirements for enrolment.

Employment

The employment situation deserves continuous attention. One solution, though minor, would be to improve contact between universities and business. This will improve curricula and so enhance the prospects of
Biologists in the national and European job market. A recent report of the Biology Council of the Royal Netherlands Academy of Arts and Sciences ('Aansluiting Universitaire Curriculum Biologie op Werkplekken in het Bedrijfsleven', 1994) is a good example of this approach but should be broadened to cover more sectors of industry and administration.

Teachers education
The educational programme for first degree teachers in biology (i.e. for 15-18 year old pupils) has been subject to reduction and fundamental reorganization, this has not improved programme quality. Institutions should be given financial scope to improve their programmes and to anticipate the arrival of a more open European market.

4.1.3 From the point of view of European structures
There is still a strong need for adequate information about different educational structures and qualifications in the E.U. A recent publication of the European Communities Biologists Association / Nederlands Instituut van Biologen 'Biology Curricula at universities' (ECBA/NIBI 1993) is a good example of the work that has to be done. The ECBA Headquarters can be extended to form a centre for European consultation and hence bring the European dimension, in all its aspects (public relations, scientific policy, secondary and higher education), to Biology.

5. Ways to satisfy the new needs

5.1 At the university and departmental level
At the university and departmental level better use could be made of the possibilities offered by the different exchange programs, to invite teaching staff from abroad and to send staff elsewhere. In the same way, the so called 'intensive courses', set up by staff members from two or more E.U. countries and followed by students from different countries, could be used to close certain gaps in curricula and provide specialized courses. Departments of biology in the Netherlands should give more attention to the opportunities offered by exchange programmes and take the initiative in starting such courses. Another point to mention is production of adequate brochures to inform students from abroad. Although much is done at the university level, there is still a lack of full and realistic descriptions of programmes and departmental opportunities.
5.2 At the level of the national government

As in most European countries, funds for education are subject to sharp national cuts. It may not be the right moment therefore to discuss new needs when essential elements of the curriculum are under pressure. Better use of restricted financial and human resources in science and education can be attempted however it is already felt that resources are fully stretched.

Public opinion and the government should be aware of the crucial role played by biological sciences in human society nowadays and the importance of these sciences in formulating short and long term solutions to issues such as health, human genetics, biotechnology, environmental conservation etc.

5.3 At the level of the European Union

The European Community, Parliament and the ‘Brussels’ Administration should give appropriate signals and information to underline the importance of biology in todays society. Funds (e.g. SOCRATES, LEONARDO) should be directed in accordance with this importance in favour of biological sciences.

Small but successful ERASMUS-programmes should be given the opportunity to join the larger thematical programmes which are foreseen in the SOCRATES frame.

Further reading

(1) Visitatie Biologie (Quality assessment curricula in biology and medical biology), VSNU (1991, in Dutch)
(2) Quality Assessment of Research, Netherlands Biology in the Nineties, VSNU (1994)
(3) Higher Education in the Netherlands (Higher education system in the Netherlands, with introductory sections on primary and secondary education), VSNU (1994)

Acknowledgements

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