



## PhD curriculum development and assessment in the AQUA-TNET domain

### Questionnaire outcomes

#### 1. Structure and function of the PhD education at European Universities operational in the AQUA-TNET domain

This section summarises the findings on the current situation of PhD structure in the AQUA-TNET domain at European Universities. Information has been gathered from universities based on a questionnaire (see annex 1 of WP2 Final Report). For information in relation the outcome of the questionnaire itself, the reader is referred to Annex 5 (WP2 Final Report). A PowerPoint presentation summarising the processed data can be found in Annex 6 (WP2 Final Report).

It was tried to gather information on several features of the PhD programme that have a direct influence on the quality of the education and the acquisition of skills and competences. The questions were dealing with the following six topics:

- general information
- organisation of the PhD studies
- PhD training programme
- Supervision
- Evaluation of the PhD
- Financial matters

#### *General information*

Most of the institutes (>80%) have two to more PhD students in the AQUA-TNET domain. Just more than half had more than 5 PhD students. The latter is considered to be interesting critical mass level. Yet a lot of universities have small groups of PhD students. A minority of universities (19%) still accept BSc student as PhD students. Within the current European framework this practice should be phased out. Most PhD programmes are open to international students and there is a strong requirement for English language skills. Roughly two thirds of the universities (sometimes depending on the funding body) operate an entrance examination. Only at 16% of the institutes PhD students are never asked to write a PhD proposal or PhD work plan at the start of their studies. Also there are a lot of *ad hoc* practices, as one third of the institutes indicated that such an activity is required "usually". Although such an activity might be part ( or not ) of local practice, it is clear that writing a PhD proposal or work plan should be encouraged from the very beginning as it stimulates scientific thinking and develops skills. The choice of the thesis topic seems to lay with either the student of the supervisor or both. It was striking that the choice of the thesis topic was almost never (6%) determined by a long term predefined strategy of the institute. Although flexibility in scientific research is an asset, the latter result could indicate that PhD students probably often work in research groups with a lack of long-term vision and hence lacking critical mass.



### *Organisation of the PhD*

Although a PhD supervising committee seems to be common, only 25% of the PhD students have more than one supervisor. It is advisable to move in the future to a double supervision. In respect to the official duration of the PhD, two third of the PhD programs are (at the start) limited to 3 years, while 25% last 4 years. However when asked about the real time lapse between the start and the final defence of the PhD thesis, only 16% seems to be able to finish the PhD within that period (in one quarter of the situation the PhD is lasting more than 5 years). This situation is worrying, especially within the frame work of the current tendency towards a structured PhD programme with a taught phase. If the demand for a taught phase comes on top of the demand for a strong research phase, it is likely that in the future the number of unfinished PhD studies within a 3 year time frame will increase. In order not to jeopardise the research phase of a PhD and to allow for the combination of a taught phase, it is advisable to move in the direction of a 4 year programme.

Most of the PhD studies are up to some kind of internal review, situated half term. Yet an external review is less frequent (50%). Again having to defend a PhD project before an external jury could be an important element in the process of acquiring specific competences and skills.

### *PhD training programme*

At 80% of the institutes a PhD training programme is recommended, while only 56% make it compulsory. Slightly more than half the available PhD training programmes are organised in ECTS. This is considered to be a setback, as it occludes mobility at the national and international level.

The current available PhD training programmes seem to include opportunities to acquire generic skills. The programmes can include presentation skills (18%), statistics (15%), computing (14%), teaching (13%) and management skills (14%).

The institutes were also asked about non-generic elements in their PhD programmes. Obviously the answers tended to become very disperse. Yet the following elements became obvious:

- 59% of the institutes always offer specific courses
- At 53% of the institutes, supervision of MSc thesis is a way of gaining credits
- Publishing papers is in 63% of the cases a way of gaining credits
- Presenting results at conferences (poster or oral) is another way of gaining credits (44%)

It appears that the currently available PhD programmes are well-balanced, but in a number of cases probably lack the possibility for national and international mobility.

### *Supervision*

Supervision is mostly limited to a single person (41%). In one third of the cases there are no predetermined and formal requirements for regular meetings. When meetings between the PhD students and the supervisor are organised, mostly (63%) no record keeping is done.

Although supervision might require flexibility, it is obvious that a lot of PhD studies could benefit from the presence of more than 1 supervisor.



### *Evaluation*

It is striking that only in 38% of the cases English is the compulsory language for writing the PhD thesis. However in only 16% of the institutes the national language is still the only possible language. Similar values were noticed for the actual (public) defence of the thesis.

The actual defence of the thesis is mostly public (78%) and includes a presentation of the main results (75%). The members of the jury are mixed internal and external (91%), but less frequently include non-nationals (30%). At the moment of the defence peer-reviewed A1 papers are mostly (69%) not required, neither can a PhD be a collection of A1 peer-reviewed papers (44%). Only at 50% of the institutes a financial rewarding system (either for the lab or the person or a combination) in place for PhD's resulting in A1 international papers.

Finally a great variety of PhD grading systems seem to be in place, although the absence of any grading seems to be most frequent (34%).

### *Financial aspects (tables with the major financing schemes + others)*

The socio-economic status of a PhD student is very diverse for instance in relation to grant/salary level, absence or presence of a full or partial social security system: presence/ absence of a pension scheme; student versus employer status. It is obvious that this situation reduces the attractiveness of the scientific career and contributes to the limited mobility (especially in the long run)

## **2. What is the perception of current PhD students about their PhD training period**

This section summarises the findings on the perception of current PhD students in the AQUA-TNET domain about their training at European Universities. Information was gathered from individual PhD students based on a questionnaire (see annex 2 of WP2 Final Report) which was spread through the AQUA-TNET network.

### **2.1. Methodology questionnaire**

A questionnaire was developed (see Annex 2 of WP2 Final Report) and circulated to the WP2 Core Partners for contribution. The focus of the questionnaire was to gather and compare information and personal views of PhD students on the quality and needs of their respective PhD trainings (if present). All members of the AQUA-TNET network were repeatedly requested to forward the questionnaire to as many PhD students in the relevant domain as possible. In addition, the questionnaire was spread during PhD student events such as the Aqualabs student conference in Galway, Ireland, in 2006.

The total return of questionnaires was 55 (see Annex 7 of WP2 Final Report for results) and therefore the survey cannot be considered to be comprehensive, but it does provide useful insights in the range of differences in the whole of the PhD training that can be found in Europe, thereby enabling the identification of needs for harmonization within Europe.

### **2.2. Questionnaire outcome**

The information from the questionnaires encompasses:

- General information;
- Information on the procedure and organisation of the PhD programme;
- Other duties during the PhD study, including teaching;
- PhD training programme;
- Prospects and mobility.



### *General information*

Of the total of 55 respondents, 22 were doing their PhD in Turkey, 17 in Spain, 6 in Belgium, 3 in the UK, 3 in Italy, 2 in Greece, and 1 in Ireland and Hungary. 67% of the students were working in the field of Aquaculture, 25% in Fisheries, and 6% in Coastal management. One student indicated he/she was working in Ecophysiology.

Thirty-five percent of the respondents were studying as a PhD student for up to one year, 23% were in their second year, 27% in their third year, 9% in their fourth year, and 6% in their fifth year. Also one post-doc responded.

### *Procedure and organisation of PhD programme*

Usually the subject of the PhD research was decided by a combination of the student and supervisor (60%), while in 29% of the cases it was done by the supervisor alone. In 7% of the cases the student decided alone while in one case (2%) it was the institute that decided, or the topic needed to fit a long-term predefined strategy of the government (also 2%). Remarkably, in none of the cases the subject needed to fit the long-term predefined strategy of the institute itself.

Most PhD students (53%) chose their supervisors themselves. In 29% of the cases the supervisors chose the PhD students, while in the rest of the cases the head of department decided on the supervisor.

### *Duties during the PhD study, including teaching*

Around a third (31%) of the PhD students were allowed to completely focus on their projects, while all others had to perform additional duties. These included project work (20%), student practical supervision (15%), lecturing (5%), course writing (2%), and working as a research assistant (2%). In addition, 25% of the respondents performed diverse other duties, including aquarium maintenance, management responsibility, managing labs, consultancy etc.

Of all responding PhD students, most were not involved in lecturing (54%), while 15% lectured at the BSc level only, 26% lectured at the MSc level only, and 6% lectured at both levels. In contrast, only a minority of the respondents was not involved in practical exercises (28%), while most were responsible for practical exercises at the BSc level (34%), MSc level (30%), or both (8%).

### *PhD training programme*

Half of the PhD students indicated that their PhD project was based on an apprenticeship model in which there is an individual study programme based on an informal to formal working alliance between supervisor and doctoral candidate. The other half of the students indicated that there was a structured programme organised within research groups or research/graduate/doctoral schools with two phases: a taught phase (mandatory and voluntary courses or modules) and a research phase.

The majority of respondents (52%) indicated that they are participating in a doctoral training programme, including compulsory courses, while 40% indicated they were not. Eight percent of the respondents followed such courses before the actual PhD programme. Sixty-three percent of the students followed courses that were especially designed for the PhD level, 17% followed courses that were part of the regular MSc curriculum, and 13% followed both types of courses. Seven % indicated that they followed other types of courses.



A great majority of the respondents (79%) indicated they would be in favour of a structured PhD programme with a taught phase, while only 14% did not want this. Seven % of the students did not have a specific view on this. None of the students wanted the PhD training programme to include generic courses only. The vast majority (87%) preferred a combination of generic and advanced courses in the specific research area. Thirteen % was only interested in the latter type of courses. The respondents indicated a wide variety of advanced courses, but courses related to (bio)statistics, aquaculture, molecular techniques, pathology/immunology, and microbiology were mentioned more often than others. There was also a wide variety of generic courses mentioned, of which statistics, computer courses, academic writing, foreign language courses, and management courses were mentioned most often.

### *Prospects and mobility*

The majority of the respondents (32%) expected to do an academic post-doc after finishing their PhD, while 25% anticipated a university position (e.g. as assistant), 24% a job in a research institute, and 11% a job in industry. A minority (8%) did not have any prospects at the moment of the interview.

The majority of the respondents (65%) indicated that they would like to do a research period outside the lab where they do the major part of their PhD research. Most of these students would like to go to labs in different countries (38%). Of those not wanting to go to other countries most would like to go to other labs within the same institute (34%), while the rest would prefer staying in the country, but going to another institute.

## **3. What is the perception of (recent) post-doc of their PhD training period (input 3° questionnaire)**

### **3.1 Questionnaire Methodology**

This section summarises the reflections of postdoctoral graduates on PhD structures within the AQUA-TNET domain at European Universities over the last 18 years. A questionnaire (see annex 3 of WP2 Final Report) was devised. The focus of the questionnaire was to solicit views on the perceived needs for generic and specific training during the PhD, from those having completed their doctoral programmes. [It is often the case that students do not fully appreciate the value of their training until they have to draw upon it in a different environment; this questionnaire was aimed in part to enable a comparative view of training opportunities against that of current students.] All members of the WP were invited to distribute to recent postdoctoral researchers, both within their own institutions and those that had departed, but were still in contact. With a total return of 32 responses the survey cannot be considered to provide a comprehensive picture across the whole of the network, but does provide a useful range of insights and experiences upon which to draw conclusions on a number of core issues to be considered further.

In addition to general demographic information, an attempt was made to gather information specifically focused on the provision of, and perceived value of, on training-related features of the PhD programme that have a direct influence on the quality of their employability / preparation for the sector:

- PhD training programme



- Taught courses
- Generic skills and competences
- Research-specific skills

### **3.2 Questionnaire outcomes (see Annex 8 of WP2 Final Report)**

The national breakdown of the respondents was very much biased towards western Europe, and was dominated by those who studied in Italy (9), Greece, Turkey and Italy (4 each). Over half (53%) of respondents had undertaken collaborative work in at least one other country (13% in two) during their PhD. Interestingly, France was named by four respondents, providing the largest proportion of collaborations (13%). Only two respondents had gained experience outside of Europe: in Canada, Chile and Peru. There was a strong link between the country in which the PhD was registered and the location of their current employment, with 63% remaining in the same country.

In terms of employment sector, two thirds were employed at Universities (66%), with 22% at 'Research Institutes', and a mere 9% (just three respondents) working in 'Industry'.

In terms of front-end knowledge transfer activity, if this latter value is truly representative across the wider population, it may be of grave concern to governments and other funders, and raises a serious issues for further exploration: *i.e.* are PhDs in the Aqua-TNet domain providing graduates for 'ivory towers' rather than contributing to the wider needs of society.

The latter half of the structured questionnaire was used to investigate interviewees' assessment of the type of training that they had received during their PhDs. The first element (Q10-15) required a graded response to specific training questions running from 'Completely disagree' (1) to completely agree (5), designed to expose the perceived value of their PhD training to their current, and where applicable previous, employment in the Aqua-TNet domain. In total, 18 responses were received, covering the 'research part' and the taught phase' of their programmes. The detail of the responses can be seen in annex 8 of the WP2 Final Report, and a summary is divided by 'phase' below.

Question 16 followed a different format, by listing specific elements of generic/transferable skills training that may be considered useful to employers: oral presentation, communication, project planning, time management, statistics and 'other'. A grade response was again required, this time to examine how much a lack of such training had impacted on the student experience: running from 'missed a lot' (1) to 'not missed in the least' (5).

In a complementary approach, Questions 17 and 18 were designed to solicit open responses from the interviewees. In the first instance, they were invited to specify courses which they would have liked to follow during your PhD period; further, those that would be of interest to their current employment. Finally, interviewees were asked for any additional recommendations for improvement of future PhD training.



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### 3.2.1 Evaluation of the current situation and recommendation for change: Research part

In hindsight, a number of questions in the questionnaire were open to ambiguous interpretation. As a result, it is not the responses included here, although intended to refer to research training, may also be taken to include the taught phase activities described in more detail below.

In the first instance, however, the focus is clearly on research. Interviewees were asked to rate to what extent the PhD training should have its main focus on research. Perhaps unsurprisingly, this received a very strong agreement at 4.28, with 27 marks at 4 or 5. An even higher response was returned (4.34) as respondents agreed the value of their PhD training to the work that they are currently involved in. Somewhat in apparent - but not overwhelming - contradiction, however, was the mean of 3.84 in response to the question about how well their PhD had prepared them for work in their chosen sector. [Although not a major discrepancy, this may highlight an area for some improvement in the link between high-level academic training and skills requirements in the workplace. To counter this simple extrapolation, however, a more sophisticated analysis demonstrates that, with the majority of respondents working in the University sector, several have indicated that their PhD did not effectively prepare them for academic life in a university!]

When interviewees were asked (Q17) to describe specify courses that they would have liked to follow during their PhD, and that would be of relevance to their employment, only 24 responded. Half of these indicated that additional training in specific areas of science (almost exclusively biology) would have been beneficial. Although a range of topics were suggested, microbial and molecular biology (including genetics), biotechnology/bioengineering and wider laboratory skills received most interest. [This may, of course, be a reflection of university departments being unable to keep up with such rapidly developing fields, under tight financial constraints. In the context of the aqua-TNet programme, however, it is critical to highlight where gaps in education and training may exists in a broader sense across the sector.]

In the final body of collected evidence, provided as free-form responses to the request for recommendations to improve training, there are several responses which refer to the research training (see annex 8 of the WP2 Final Report). The only theme which arose from more than two respondents was in relation to 'mobility' of students during their PhD programmes. On five occasions students were explicit about their preference for enhanced opportunities for studying in other countries. Amongst the varied other responses two other areas are worthy of specific mention: (i) more focus on the ownership of research and encouragement to publish; (ii) closer links with industry and emphasis on knowledge transfer

### 3.2.2 Evaluation of the current situation and recommendation for change: Taught part

Of the 32 respondents, 25% indicated that their PhD had not included any taught phase. A note of caution, however, in that all 8 of these interviewees proceeded to respond to subsequent questions which implied that they really 'had' received generic skills training. It may be that there was ambiguity of definition, in that these respondents had perceived the phrase 'taught phase' as indicating a segregated block of time (a few weeks, perhaps) devoted to taught learning – perhaps at the beginning or end of the PhD process – rather than as occasional days of training running throughout the research programme.

Of the 24 positive respondents, the mean average of time spent on a taught phase was 20%; but with a very broad range from 2% to 50%. Respondents confirmed a strongly representative view that



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taught courses should provide an integral component of PhD training, with a mean grading of 3.81 against that specific question. There was an increase to 3.86 in the sense that taught courses were important to train skills useful for work in the Aqua-TNet domain. A further increase, to 4.19, was in recognition of the value of specific generic skills modules. When presented with a list of specific generic skills elements that may be valuable to employers, there was little difference between elements: oral presentation (3.46), communications skills, (3.14), project planning (2.86), time management (2.80), and statistics (3.00). The collective inference from these responses might be that there is a broad recognition of the need for generic skills training, and of the value which it holds in the employment context. There is, however, somewhat less certainty in terms of defining what the core specific courses might be.

In support of the latter conclusion, when interviewees were asked to describe specify courses that they would have liked to follow during their PhD, and that would be of relevance to their employment, almost half indicated a desire for elements of generic skills training to be formally included in the PhD programme of study. Many themes were highlighted, but those receiving a more repeated vote were: English language, scientific writing (publications and proposals), management, communications and teaching. Firmly embedded in the 'hinterland' between research-specific and generic skills requirements is the need for training in statistical methods and their applications. Just fewer than 40% of respondents indicated that such courses would have been a desirable addition to their programme of work: requests ranged from entry-level general courses to 'advanced'.

Responses to the request for free-form recommendations to improve PhD training had greater emphasis on the scope for improved generic skills training. Of the 18 response received, 11 include comments of relevance to the generic skills agenda. Whilst there are a reasonable number of calls for maintaining a flexible approach, focused on student choice, it is clear that students would like a range of opportunities to be provided. Areas which are mentioned specifically include: English language, time and project management, presentation skills, teaching, and the effective utilisation of electronic resources. [Interestingly, and appropriately, one respondent expresses a desire that supervisors should also receive generic skills training – and be examined on their effectiveness in them. This moves into an important area. For new academics in some countries they have passed through a higher education system in which the development of generic/transferable skills has been the norm, from bachelors through masters and PhD programmes. Across Europe, however, are one or two generations of academics to whom such formalisation of non-specific skills training remains a rather alien concept. Whilst some institutions may already be implementing individual strategies to try and engage senior academics with the new training paradigm, Aqua-TNet may also wish to consider this 'barrier' to progress on a sector-wide scale.