

# Supervision Guidelines

## The Need to Submit a Thesis

There may be some who would argue that the completion\* rate does not really matter; that many students who complete late or even fail to complete at all nevertheless profit substantially from their period of research training, and failure to submit a doctoral thesis should not be regarded as a failure 'per se'. There is indeed an element of truth in this. A substantial number of students who fail to submit a doctoral thesis do so because they move on to some other line of work. They leave the department with every intention of writing up the thesis, but find their days full, working in an interesting job, which they obtained partly as a result of their research training and as time goes by the importance of submitting a thesis recedes steadily into the background and finally dies. But apart from actually writing up their thesis they have performed all the necessary things that one expects from a doctoral student. They have been well trained; they have learned the techniques of their subject, and in many cases may have even published papers of some significance.

It is still true, however, to say that a substantial portion of the successful research training of a student lies in ensuring that he or she has the ability to write an extended and coherent report on the work that has been done, and in many cases the writing of the doctoral thesis is the one single unaided piece of work that a student undertakes. Where papers are published the supervisor is so closely involved that he or she at the very least will vet the paper, and is often a co-author; thus the student will not have the sole responsibility for producing the written report. Further, almost all activities in life have to be carried out within some sort of time scale, and this is certainly true of the scientific activities of the majority of professional people in their subsequent careers.

Recognition of this fact and some understanding of the way in which it can be achieved should be included within the training of a doctoral student. Almost by definition a student who does not complete within three or four years or does not complete at all is deficient in this aspect of training. We believe that this alone is a strong argument for trying to achieve a reasonable completion rate. A further reason is that many of the students have been funded by the Research Councils.

The bodies are accountable to Government for the use of their funds and the completion rate clearly affects the ease with which this particular use of funds can be defended.

An argument, which may be advanced against any advice on supervisory practice, is that all that is really needed is for the academic community to be told the facts and asked to get on with doing something about it. Academic departments after all are full of experienced supervisors who do not need guidance on how to do their job. The response of students to questions about supervision suggests that they may have very different views of the matter. We suspect that by and large an academic's views of his qualities as a supervisor is rather like the worldview of possession of a sense of humour. Virtually nobody believes himself to be deficient in either case.

For these and many other reasons we think it should be normal practice for a student to complete a doctorate, including the presentation of a thesis, within three years.

## Aspects of Supervision

There are two aspects to supervision. The first and more important is the ability to select problems, to stimulate and enthuse students, and to provide a steady stream of scientific ideas and guidance. The second aspect is concerned with the mechanics of ensuring that the student makes good progress.

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\* 'completion' is defined as the submission of the thesis to the appropriate authorities.

There is no way of giving any guidance on the first matter. The purpose of this document is to point to some ways of ensuring good, steady and satisfactory progress. We believe that to achieve this a definite framework is required which may well be different not merely for each subject but probably for each department. With such a framework, it will be much easier for the supervisor and student to recognise when things are starting to go wrong.

### **Time the Enemy**

Before going further, it is worth looking at some of the reasons for long completion times or failure to complete. There can be no doubt that the major enemy is time. Everything takes much longer than the inexperienced student expects. A student with the help of a supervisor needs to plan the time carefully if a doctoral thesis is to be completed in a three-year period. For students who have just finished their Finals, after a period of very hard work, three years may seem a long time and the necessity for advance planning is not particularly obvious. This immediately leads to one quite common reason for late completion, namely a slow start. The start to a student's research career is nearly always slower than the student initially expects, but even so, he or she needs to put in a lot of work. If insufficient effort is put in to the formulation of the problem, to making a literature survey where appropriate, or such other initial activities as are desirable, the result is that the remaining portion of activities is always a scramble and the programme inevitably slips.

A second common cause of delay is the student who is never satisfied. There are always ways of improving results. In short, nothing can be brought to a conclusion. Perfectionism can be a virtue, but if a student would only write up what has already been achieved, he/she would almost certainly see more clearly whether any improvement was actually necessary, the amount of effort required if it was desirable, or whether it was sensible to attempt that amount of work in the time available. All this forms some part of the process of the planning of time.

A third common cause of delay is distraction from the main line of enquiry. The days a common distraction is for a student to get 'hooked' on computing with a resulting over-analysis of the experimental data, largely because the sheer pleasure of manipulating the computer; but with inevitable delays, leading to a delayed thesis.

A final example is when there has been inadequate collation of the data. The student does not realise the inadequacy until he/she starts to write the thesis, and has to break off in order to perform a further experiment or calculation, usually resulting in a delay of at least six to twelve months. Essentially this is due to lack of planning in the handling of the material and goes along with a lack of planning of time.

Most supervisors will have come across these faults, and many others and will have tried to cope with them. In most cases, in spite of their very best efforts, they appear to have no impact on the student. We think that the existence of a framework, accepted within the department, which marks out the stages which a student should be expected to have completed at various point in the three year period of study, would help to reduce these delays. Without being driven into planning at an early stage, the student may never be persuaded into it. Students will be helped by knowing that they are expected to reach certain stages at certain times and will come to accept that part of their training is, in fact, learning how to manage their time and organise their affair, something which they will certainly have to do if they are going to make a success of any job in later life.

## **Beginnings**

The relationship between a student and supervisor is a peculiarly close one. They start as master and pupil and ideally end up as almost equal colleagues. In these circumstances it is obviously desirable that the student and supervisor should be carefully matched. Two extreme beginnings quite often occur. In the first the student intends to do research in the department in which the first degree was obtained and where stimulation by a particular subject and a particular lecturer has dictated the direction in which the student wishes to go. The other extreme occurs when the student comes from another university. In this case there is at best likely to have been only a few days opportunity for talk between various people, and for both sides to make up their minds about each other. Clearly in this latter case there is a particular responsibility on the supervisor to develop the working relationship in the early stages. In any case there is responsibility, usually on the head of the department, to exercise as much care as possible in matching student and supervisor taking into account such facts as whether the student is a team person or a loner, the number of students already being supervised, whether the supervisor easily handles many or few students, etc.

Once a student has been assigned to a particular supervisor, the next matter is the choice of the student's research topic. In some areas the student has no alternative but to accept one of the main on-going lines of research within the department. In other areas the supervisor may have a general idea which it is possible to develop in various directions and here, at least with an able student, it is possible for the student to play a significant role in the final decision on the research topic. This final decision must be reached reasonably early. Delay is only too easy, particularly if a large amount of the first year is devoted to course work and further learning.

In most disciplines, in proposing a particular research topic, the supervisor is well aware that given hard work and reasonable ability, it is pretty certain that the student will bring matters to a satisfactory conclusion. But occasionally an exciting line of research appears in which the outcome is more uncertain and in these cases the supervisor should have a fall back position in case some unexpected difficulty arises.

Decisions about the allocation of students to supervisors are usually taken after the student's final results have come out. At this moment the student is usually feeling somewhat euphoric and it will bring home some idea of the amount of work which will be expected in the next three years if some directed reading is assigned over the summer vacation. The nature of this will, of course, depend on the general area of research, and the sort of department the student is entering. It can vary from being of a general background nature required to bring the student to a level which he/she can understand what their supervisor is talking about, to say, starting a literature survey on the topic in question.

## **The First Year**

It is in the first year that the existence of an appropriate framework is most important, for it is in this year that a decision will usually be made as to whether the student is to carry on for a doctorate or not. An experienced supervisor will probably have little difficulty in making up his mind by the end of the first year, but the student must be able to see the decision as just and fair, as indeed so must others working in the same department. For this to happen it is clearly important that the student should know at various stages how well he or she is getting on, and must feel they are being properly directed and can communicate with the supervisor. While in normal circumstances supervisors are likely to have frequent contacts with their students at this stage. There are virtues in having a regular (say weekly) tutorial, in which the student and supervisor meet to discuss problems. Fixing a time ensures a busy supervisor does not inadvertently find the student has been seen more seldom than appropriate, and also provides easy points in time for the supervisor to insist that certain things have been done.

The first year is also the period during which the student receives the bulk of the formal training that is considered necessary and desirable in many doctorate courses. The form of this will of course vary with the nature of the subject and the department. In large departments it is common to put on courses and to examine the students in these courses either by a written test or continuous assessment. In other cases the course work may consist to a greater or lesser degree of directed reading accompanied by tutorials and viva voce examinations. The student should also have an identifiable piece of work which is written up, independently, and which is examined. In our view this examination should always include viva voce examination carried out by at least two people, so the student is obliged to explain him/herself to at least one person other than their supervisor, and the other person who is at most just working in the general area. This arrangement has the virtue that the student can be cross-examined on the details of the work by the expert, but is also likely to be asked simple but fundamental questions by the non-expert. A clear and well-defined process of assessment allows the student to know where he or she stands, makes for a reasonable objective judgement of his or her suitability for further work, and can be of value if things are going wrong.

It is also during the first year that the student should learn the pattern of work that is appropriate to the subject of study and research. First the student must learn to work hard and to recognise that if he or she is going to complete the thesis in the three years they will have to work long hours and ensure that the time is spent usefully.

However, the student will not spend the whole of the first year on the formal portion of introductory training, including project work. There are many other things, which should be carried out in this period. These will vary enormously according to the nature of the research, and all we can do is list a few examples, which will have varying degrees of relevance.

In some subjects a literature survey forms an important starting portion of the work, and this should be carried out in the early stages and should certainly be finished by the end of the first year. If the research is going to involve the building of new apparatus, the design at least should be well on the way to completion. During this period also the sharpness of the definition of the research topic should increase markedly. The student should also have been trained in the virtues of the systematic recording of data or theoretical calculations and the importance of keeping and maintaining a tidy; clear record of everything that has been undertaken. In short, by the end of the first year the student should have a pretty clear idea of what the end purpose of the research is to be, should possess the necessary background information of relevant work already carried out and possess a systematic record of all that has been accomplished and attempted. Finally through the assessment of the work which had been written up, the student and the supervisor should know whether the student is capable of writing a coherent, connected account of the work in good English. A weakness in this area will cause the student a lot of trouble later on, and must not, therefore, be ignored.

It is difficult to put too much emphasis on the matter of systematic records. There are several reasons for this. First, without systematic records the student will have considerable difficulty when it comes to final writing up. Secondly, it may not be until later, when further work has been done, that it is possible to obtain a proper grasp of the importance of the earlier work. Once again, this will be very difficult without systematic records. Thirdly, it is perfectly possible that as a result of later work perhaps by other people, a previously abandoned line needs to be re-investigated, and proper records will save time wasting repetition of earlier work. In summary, there should exist in the first year a framework which will enable both the supervisor and the student to recognise whether the student is suitable for research, and also ensure that the latter has adopted appropriate and relevant methods of work so as to guarantee that the remainder of the time is spent fruitfully, with a high probability of completing the task within the allotted span. Such a framework will make that much easier the task of reporting to grant awarding bodies on the progress of students.

We believe that the nature of the framework should be made clear to students by departments circulating their own notes. It should include regular tutorials by the supervisor, a method of assessing course work by examination or continuous assessment, and a report, which is examined by someone in addition to the supervisor. Depending on the nature of the research work and the department, other possible candidates for inclusion are regular reports (termly) to the head of the group or department, and regular presentations to other group members, including other students. Whatever the framework chosen, the aim is to encourage the student's work and to develop good working habits; to train the students to develop his or her own programme schedule and to make the judgement at the end of the probationary period as objective as possible.

### **The Middle Stages**

If it has been a successful first year, the student will enter the second year knowing what he/she is intending to do, with a thorough background knowledge, and with a start made either on the research work itself or in the design and building of the necessary apparatus. A successful framework in the first year will have encouraged the student, one hopes not merely to accept, but to expect a suitable framework for the remainder of the work. Indeed, much of what we have said about the first year applies with equal force to the subsequent years and department notes should emphasise this.

It is in the second year and the early portion of the third year that the student should obtain the bulk of the results which are going to form the main body of the student's thesis. Any student who doubts this should glance now at the next section of this discussion document, where we attempt to lay out the steps, once the research work has been completed, that go to the production of a thesis.

Obviously it would be ideal at this stage if appropriate milestones could be erected, determining the stage which the student should have reached at various times in the year. One must, however, remember that we are talking about original research where, by definition, things do not necessarily go the way intended. Nevertheless, it is a good idea at this stage for the student and supervisor together to do their best to lay out a critical path. This critical path should be reviewed at various stages throughout the year, and become more sharply defined as time goes by.

The plan of campaign should contain ample allowance for unexpected additional work, particularly in the early stage. Indeed if the work laid out in the original plan looks as if it is going to occupy more than half or two thirds of the student's time, it is almost inevitable that in the end he or she will be very hard pushed. This is the nature of research. We are looking for the new and unexpected.

It is extremely important, fairly early on in this stage, of the supervisor to assess whether it is likely that the student will be able to bring the work to a timely conclusion, or whether the difficulties are grater than expected and the student must be transferred to a topic more likely to produce a thesis on time, even if it is less exciting.

It is almost implicit in what has been said so far that we have been talking about the student who is engaged in a project either by themselves or in collaboration only with his/her supervisor. This is not the only way of carrying out research, and more and more these days research is carried out in collaborative terms. This presents somewhat different problems, particularly in the middle stages. Where teamwork is involved, there will usually be several senior academics who are only too well aware of the necessity of milestones; of meeting deadlines and of ensuring the work is progressing in an efficient and satisfactory manner. The problem in this area is not so much to set up a milestone for the project as a whole, but to define the student's specific contribution to the work, and to make sure that not only does he/she fulfil that contribution, but at the same time has a thorough grasp of the project as a whole.

When many people are involved it is likely that there is far less chance of the student falling behind or going off the rails and nobody noticing. Too many people would be dependent on the student completing the tasks assigned. The risk here is of not seeing the wood for the trees. In this case therefore it is almost essential for the student to be occasionally asked to explain to the group with whom they are working not merely what he/she is up to, how much has been achieved and what are the problems foreseen for the future, but also to explain how this fits in to the project as a whole. Obviously a similar process is highly desirable for all students. There is nothing like having to explain yourself to other people for clarifying the mind.

Towards the end of the period of research training many people have found a mock viva very helpful. Most academics will be familiar with the student who has mastered all the details of a particular research project but not realised that the external examiner may be more interested in the wider aspects of the research and its impact on the whole body of knowledge. If carefully carried out a mock viva will reveal gaps in the student's knowledge, which may now be rectified. It will help greatly in concentrating the mind on the structuring of the remaining portion of the research.

### **The Final Stages**

Between one and two thirds of the way through the third year, depending on the subject, the student would have completed the experimental work or basic theoretical study, and the analysis of the data, so that all that should be left is the production of the thesis. Once again milestones become very important, as slippage now usually means slippage in the final date of submission. There are various questions, which can be asked at this stage, and the wise student will make a list of these and their draft answers.

First, what questions has the work so far answered, and what open questions has it left or raised? Second, what is the relation of the work completed to previous work done by other people? Then does the student really understand the work that has gone before? What comments can be made on it in the light of his/her own work? Is there a full list of references, etc?

By now the student should have acquired a substantial list of references and copies of the most relevant papers. It is advisable at this stage for the student to re-read some of the papers to ensure that the relationship between any previous work and his/her own is fully understood. If the student's work has been carefully carried out, one likely result may be to throw some doubts on previous work. It is important to study this carefully and to try to reconcile any differences that have arisen.

The writing of the first draft of the thesis would have started long before this stage. A general introduction should be drafted as soon as possible, even if it has to have gaps. Equally it will be a great help to the student if a rough draft is written on each piece of work as it is finished. The writing on the full thesis will then be much easier.

It is likely that a thesis will be the first really extended piece of work the student has ever written. It is worthwhile, therefore, spending some time in laying out a plan for the thesis, which can be discussed with the supervisor. Different departments in universities have different rules regarding the amount of assistance that a supervisor may give to a student in this portion of the work; but it is generally accepted that by and large the thesis should be the student's unaided effort.

Two particular points must be mentioned here. First the thesis should be no longer than necessary. It should demonstrate that the student understands the background to the research, explain clearly the methods used, present the results and discuss them within whatever framework is appropriate; but verbosity and padding should be eschewed at all stages; they offer hostages to the external examiner.

Secondly, unless particularly gifted in writing good English, the student should study one of the many books that are now available on the subject. Sir Ernest Gower's 'Plain words' is an excellent example. There is more in this than making the thesis a pleasure for examiners to read. Woolly writing is frequently a reflection of woolly thinking and a student who has trained to write clearly will soon discover that a problem of expression often arises from a lack of understanding, whereas a student who writes poor English can write rubbish without even realising it.

The time taken to write a thesis, like that required for everything else, is longer than at first supposed. A respectable timetable for many subjects might be as follows:

|  |         |          |
|--|---------|----------|
| Introduction                               | 3 weeks |          |
| Method and results                         | 6 weeks |          |
| Discussion, tables, figures, reference etc | 6 weeks |          |
| Typing                                     | 2 weeks |          |
|  |         | 17 weeks |
| Consultation with supervisor or other      | 1 week  |          |
| Revision of draft                          | 2 weeks |          |
|  |         | 3 weeks  |
| Final typing, art work on figures          | 3 weeks |          |
| Prof reading etc                           |         |          |
| Binding                                    | 1 week  |          |
|  |         | 4 weeks  |
|  | TOTAL   | 24 weeks |

The above schedule assumes that some preliminary work has been done ie most of the references are known and listed, some of the diagrams are ready in a form to be incorporated and the analysis of the results has been completed. Thus it is easier for the job to take longer and a particularly well-organised student could take less time, but the above estimate is by no means on the long side.

We suggest as a result, that just before Christmas of the final year the supervisor should spend some time with the student going over the material with particular attention to the state of organisation of the thesis. Useful topics for discussion are things like the numbers of tables and figures and whether they give a clear picture of what has happened, whether they are in a form that is easily digestible, are not excessive in number and no essential ones are missing.

### **A Final Hiccup**

In our earlier discussion of some of the reasons for late completion, we ignored one particular cause which can be controlled by departmental policy. When the work has gone well and opened up prospects for future research, the supervisor may in some subjects suggest that the student might like to consider a two or three year continuation as a post-doctoral research assistant. Experience shows that if the student accepts, and is appointed before handing in the thesis, in the vast majority of cases the rate of

progress on the thesis slows dramatically, and a delay of six months to a year is almost inevitable. This may sometimes be good for science, but may not be fair on the student and is scarcely in tune with the intentions of grant giving bodies. In some cases there are regulations which do not permit the post to be taken up until the thesis has been handed in. We believe that whatever the circumstances, the full financial rewards of the new post should not accrue to the student until the thesis has been submitted. This contains an incentive, and a recognition that the research assistant is still a student with demands on their time for finishing the thesis.