

Chapter 2

Research Possibilities for Pre-graduate Students

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2.1 Introduction

Synergies between university teaching and research are essential to promote scientific culture. This is particularly relevant in a society in which knowledge, science and technology walk hand by hand, and therefore, it is up to universities to promote training and qualification, and to develop scientific and technological knowledge that will drain to everyday life, increasing quality demand. At medical schools, where medical research is often considered below expectations [2], early exposure of students to research activities has been pointed out as a way to promote medical research as a relevant career component [3].

Understanding scientific research as one of the components of medical education, the Faculty of Medicine at University of Lisbon (FMUL) developed several initiatives to stimulate undergraduate students to experience a deep contact with research activities. The main objective is to lead students understand how to formulate a scientific hypothesis and to train students in objective and rigorous analysis of facts so that they will be better able to critically draw conclusions. These skills are not only indispensable for the practice of scientific research, but are also highly relevant for critically informed medical practice. The goal is that early exposure to scientific research constitutes an advantage for the preparation of future medical doctors, whether or not they will continue to take part in research activities. Indeed, exact reasoning, detailed

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follow-up of hypothesis, and critical analysis of data are common attitudes to daily medical practice, being it at the bench or at the bed side.

So, students at FMUL have several possibilities to develop research skills [1]. Some are integrated within the curriculum, such as Laboratory Research Training Courses, Research Initiation, Clinical Laboratory Research, Clinical Research and Research in the Community. Others go beyond the curriculum, as it is the case of the “Education through Science” Programme, which is the focus of this chapter. This programme started in 1996 through an initiative by Professor David Ferreira, the first coordinator of GAPIC (Gabinete de Apoio à Investigação Científica, Tecnológica e Inovação, <http://www.fm.ul.pt/GAPIC>), an office devoted to the support of scientific, technological and innovation research at the Medical School. A brief follow-up of the 13 years of the Programme follows.

2.2 The Education Through Science Programme at the FMUL

The aim of this programme is to make it possible for the students to apply the scientific method, to promote a scientific project, to guarantee the quality, accuracy and critical attitude necessary to carry it out, to ensure the adequate management of resources available, and to encourage the promotion of results. There is an annual workshop organized by the GAPIC, specially designed for results presentation. A written report is also asked. Students often present their results in scientific meetings outside the Medical School, with expenses covered by the research budget.

Participation in the “Education through Science” Programme is a free will of the student. If he/she wants to participate, the procedure starts by contacting a Research Unit at the Medical School or closely related to it. If necessary, GAPIC provides guidance on this search. Once a student finds a research unit with research objectives of his/her interest, as well as a tutor within it, he/she is encouraged to design a small research project. The main question is very often, if not always, given by the tutor that will guide the student throughout the project, from its conception towards its end. The tutor him/herself is someone highly engaged in the research topic. Indeed, enthusiasm and active engagement on research are among the characteristics that students appreciate more in a tutor [5,7], and this also applies to our students. The research atmosphere, the possibility to interact with other pre- and postgraduate students, the availability of tutors and other research staff in the Unit are also key elements for a successful project development. The Medical School of the University of Lisbon actually belongs to the Medical Research Center, a consortium that synergises facilities of three Institutions, each covering complementary aspects necessary for high-quality medical education: the Faculty of Medicine, the Institute of Molecular Medicine (a research institute highly interconnected with the faculty of Medicine) and the Hospital the Santa Maria, the University Hospital. All three institutions share the same campus and quite often the research staff belongs to two or even three of them. This tripartite consortium indeed creates a suitable ambience to prime curiosity and to develop a research career.

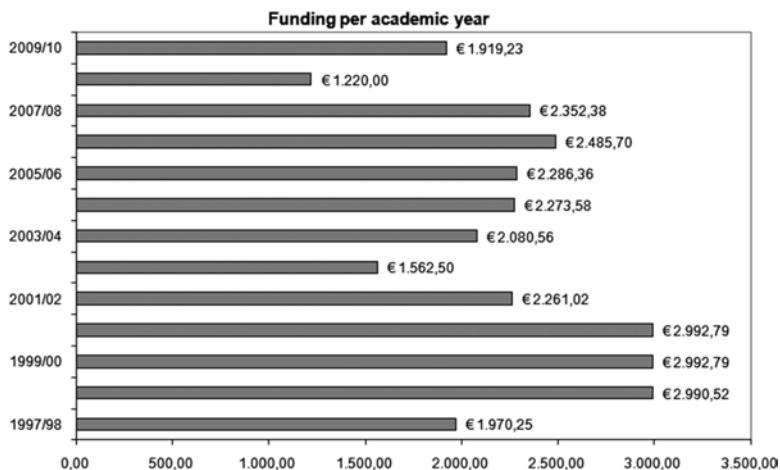


Fig. 2.1 Budget allocated to the “Education through Science” Programme per academic year. Through the years, the programme has been supported directly by the School of Medicine and by external sponsors, such as *Fundação Merck*, which we acknowledge. Note that fluctuations in funding do not follow fluctuations in number of projects approved (see Fig. 2.2) since whenever there are budget constrictions the policy is to decrease the amount of money per project rather than decrease the number of projects funded. Indeed, project approval depends strictly on quality evaluation, rather than budget to avoid discouragement of motivated good students

Once submitted, the project, which has to be highly focused, is then evaluated by a panel of evaluators, usually university professors that judge its scientific quality and feasibility. If accepted, a certain amount of bench money is given by the Medical School to the research Unit. This is regarded as an incentive to accept students and their research projects, in spite of very often real expenses being underfinanced. The approved projects are funded with up to 2,500 €. The total budget allocated by the FMUL during the 13 years of the programme was 494,912 € which corresponds to an average financing of 2,261 € per project (Fig. 2.1). Extra financing comes from research projects running in the unit. Indeed, desirably, the focus of the student’s project is inserted in a broader research project of the unit, to guarantee a proper scientific atmosphere and financial support. The student itself does not receive any fellowship from the FMUL. As former programme coordinators, we discussed this point and always concluded that the student’s interest in research activities has to be the major driving force, rather than any economically based interest. From time to time, the Ministry of Science in Portugal openly calls for studentships designed for pre-graduate students, to which our students can, of course, apply, but the process runs independently. The students’ marks already obtained are also considered upon evaluation of the research projects at FMUL, though their weight in the evaluation criteria is deliberately weak. Indeed, ability for research activities does not necessarily closely correlate with marks at the course, in spite of being an indication of the workload capacity of students.

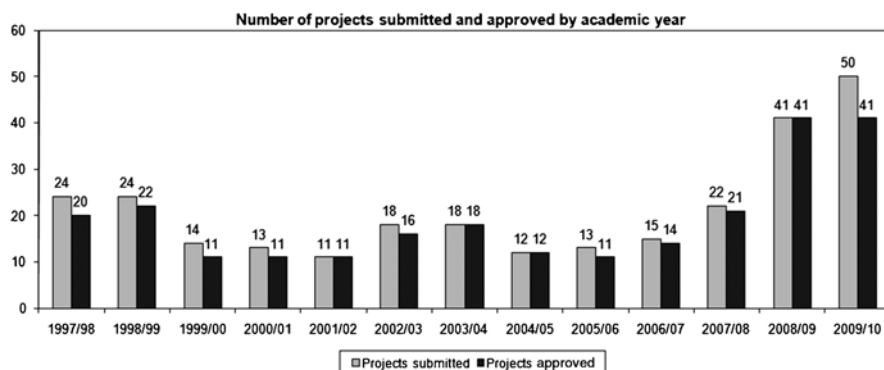


Fig. 2.2 Number of research projects submitted and approved per academic year. Note that in 2009/2010, number of proposals was more than twice than those during the inaugural year and more than four times than minimum proposal numbers

Calls for project application open by the beginning of the academic year, a time at which the students come full of energy after holidays. Search for tutors may start earlier, i.e. before main holidays, and this often applies to highly motivated students. The selection procedure is finished by November/December, but it is not unusual that the student starts to contact with required technical skill immediately after project submission. Students can develop the project throughout the year according to their own schedule. Some students may spend a day per week in the lab, several half days per weak, or to concentrate research activities during a specific period, for instance between semesters, during holidays, etc. It all depends on the nature of the project, and on the agreement between tutor and student. Once committed, the student is requested to fit expectations.

The number of projects submitted and approved per academic year since the Programme started is indicated in Fig. 2.2. The usual procedure is to accept all the projects that meet quality criteria independently of the yearly budget that the Scholl of Medicine can devote to the Programme. Projects can even be approved without budget and it is up to the tutor to accept it. Since student research projects are to be performed within active research units, which have their own research budget, the small amount of money given as an incentive by the Medical School is often regarded as a positive but not imperative issue. The Programme has been subjected to annual evaluation by students and tutors. Both groups have highly positive opinions. Students mainly highlight the possibility to experience and receive training in the research; and tutors refer the opportunity to stimulate research interest among younger people.

In the thirteen years of the Programme, 275 projects have been submitted, from which 249 were approved. As it can be seen in Fig. 2.2, the number of projects per year has markedly increased in recent years. The Programme does not intend to

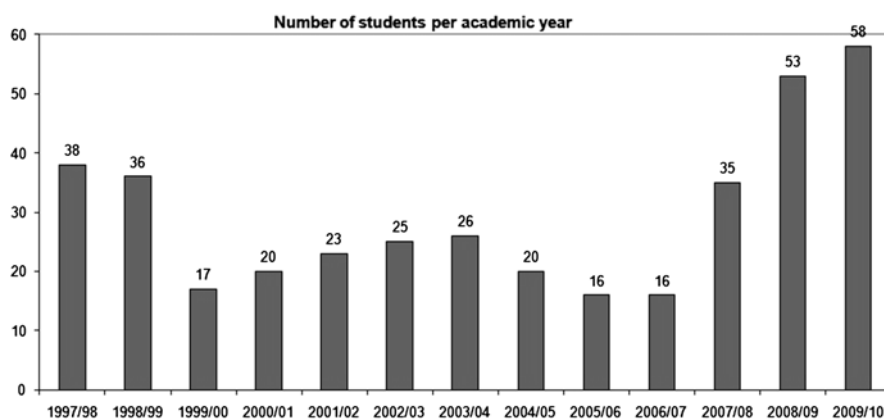


Fig. 2.3 Number of students enrolled in the “Education through Science” Programme per academic year. Note marked increase in recent years. To this increase, it may contribute the reform of the curriculum, making it necessary that the students, by the end of the sixth year, present either a research report, or a monograph or a detailed report of clinical activities during that year. Some students choose the research report, starting to prepare it few years ahead

have a large number of students each year, but it intends to create the conditions for motivated students to be able to carry out a research project. In the last 2 years, the number of project proposals steeply increased, 50 projects being submitted in 2009/2010. The number of students involved per academic year (Fig. 2.3) also increased concomitantly. A research project can accommodate a maximum of three students, but often there is only a student by project. Whenever a project includes more than one student, the research plan needs to specify the tasks done by each of them. A total number of 383 students were engaged in the “Education through Science” Programme since it was created. Fifty-eight students enrolled the programme last academic year (Fig. 2.3), which roughly corresponds to about 3% of the total student population in the Medical School. It has to be noted that, as mentioned in the Introduction, there are several other possibilities for a medical student at FMUL to participate in research activities, besides being directly involved in the Programme here analysed. So, the actual percentage of pre-graduate medical students enrolled in research activities is higher than 3%.

Gender distribution is shown in Fig. 2.4. Roughly, gender has been balanced, except at the first year of the Programme where there were more than twice women than man participating. Currently, men predominate, in spite of the majority (~65%) of medical students being women. The students are distributed through the second to sixth curricular years (Fig. 2.5). However, the students in the third, fourth and fifth curricular years are those that have participated more in research projects. It must be noted that students at the first curricular year cannot apply, and that nowadays the sixth academic year is a full-time hospital practice and that students in the first

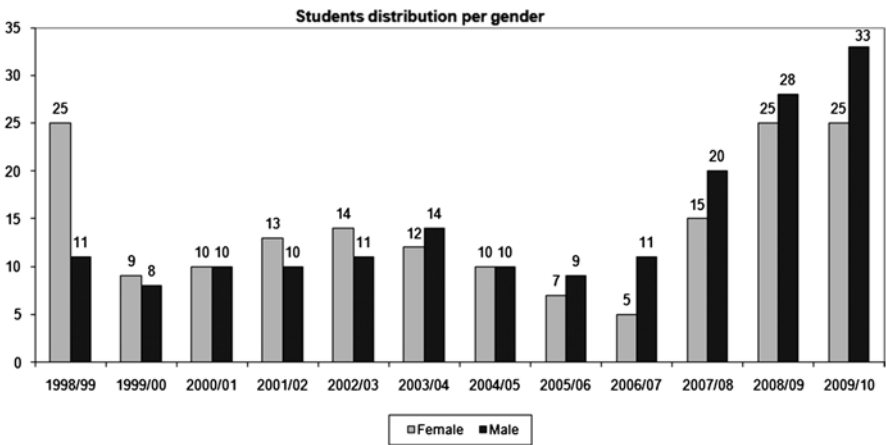


Fig. 2.4 Gender distribution. Note that gender has been roughly balanced, except in the first year of the programme where more than two third of the participants were women. More recently, there is a tendency for higher participation of man, in spite of a higher proportion of the actual medical students being women (in 2009/2010, the women/men proportion of all (2076) medical students at FMUL was 65%/35%)

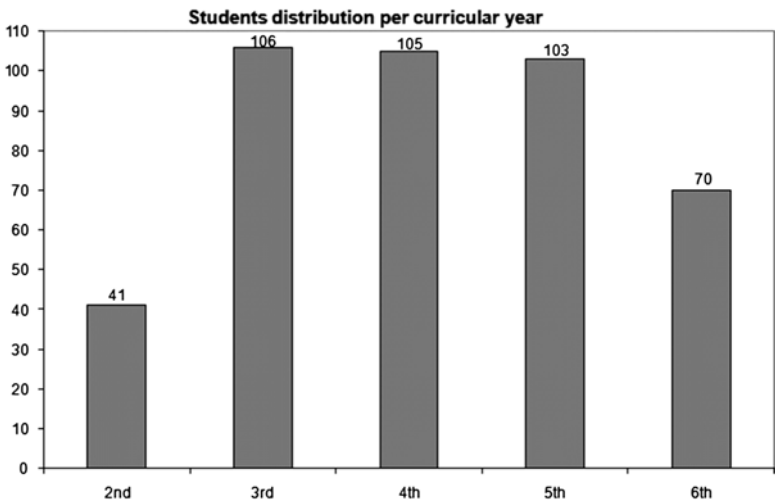


Fig. 2.5 Distribution of students participating in the Programme, per curricular year. Total number of students engaged in the programme since its beginning in 1998 is included. Students in the first curricular year cannot apply, so absence of participation does not mean absence of interest. Indeed, several of the participants started to be motivated during the first curricular year. Nowadays, during students welcome sessions, there is time to explain the different possibilities they have to be engaged in research activities at FMUL

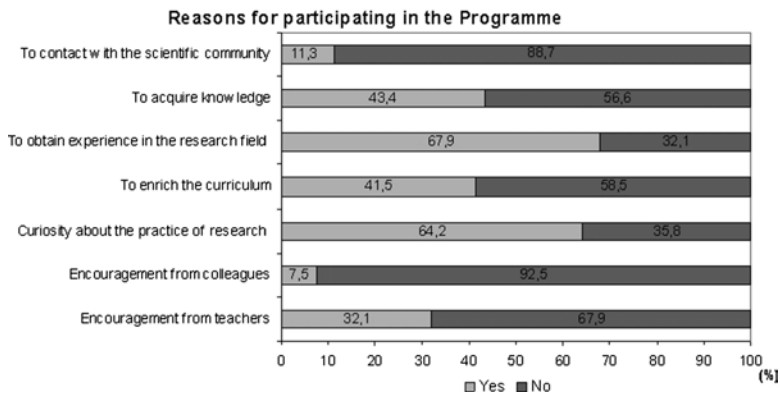


Fig. 2.6 Main reasons pointed out by the students to participate in the Programme. Total number of survey responders: 53 out of 122

curricular year cannot apply to the Programme. A student can join the programme just for 1 year or can re-apply for it. Some students prefer to follow a research track in successive years; some others prefer to experience different research topics or perspectives (e.g. basic research vs. clinical research).

A survey carried out by the GAPIC on the impact of participation of former students on the “Education through Science” Programme revealed a positive outcome. Among the responders, the main reasons for participating in the programme (Fig. 2.6) were to obtain experience in research (68%) and being curious about the practice of research (64%). When asked about the perceived major benefit in participating in the Programme, students considered that their participation allowed them to develop the capacity to conceive and carry out experiments and to analyse results (96.2%), to acquire specific knowledge (94.3%) and to obtain research training (92.5%). As to their expectations regarding the future, the vast majority of the former students of the programme wish to be able continue to carry out research activity (94.3%), to have the possibility of maintaining some form of connection to higher education institutions or research laboratories (92.5%), an indication that they perceived research as an intellectually rewarding activity.

It should be stressed out that 34% of those questioned continued to carry out research activities (Fig. 2.7), co-authoring scientific papers (33.3%) early in their career. Considering that the major reason to apply to the Medical School might not be the will to pursue research activities, the finding that 34% of the students engaged in the programme continue to do research means either (1) that those motivated a priori for research are more prone to apply to the Programme and/or (2) that the Programme itself is able to trigger research interests among future medical doctors. We believe that both situations apply, since a rewarding research exposure will amplify pre-existing research curiosity (see also [7]).

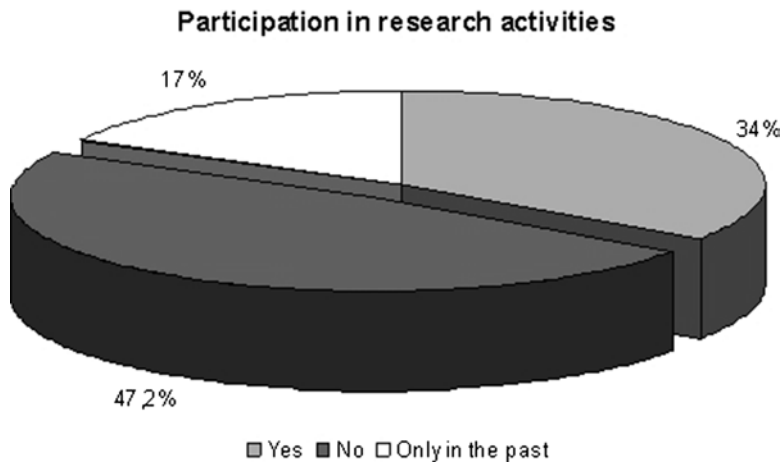


Fig. 2.7 Proportion of former Programme students who continued to participate in research activities after leaving the Medical School. Among those who did not continue, lack of time due to demanding patient care activities and difficulties in finding financial support were pointed out as main causes of discontinuity

2.3 Conclusion

Overall, it became clear that those involved in the “Education through Science Programme”, including students and tutors, highlight its relevance. Therefore, FMUL will continue to use this Programme as a tool to promote a scientific culture among students. They are the future medical doctors, and our hope is that some will be also researchers and eventually to encompass an academic career. This aim is indeed shared by several other similar initiatives in other medical schools (see e.g. [3–7]). It is, however, imperative to avoid passing an idea that scientific research is to be done as a hobby or in between jobs. We do hope that our students do enjoy the experience, but that they grasp that research activities are demanding, are frequently full-time jobs, though being in many cases complimentary or side by side with medical practice activities or university teaching activities. Indeed, a medical doctor at a university hospital has to be engaged with science and the same applies to a university professor. It is also highly important that the students perceive that identical general rules apply to different types of scientific activities, from basic to applied or translational research. Students should understand that throughout the academic and/or the medical career, the time allocated to the different activity levels may change, but in all cases each piece of work has to be done with full dedication, that is to say, with heart and mind together. Above all we hope that students that experience the programme will follow the lemma “experiment you do not enjoy is experiment without success”. So, they may become surprised when realizing that successful researches work to have fun! But they need to understand that it can be hard and time-consuming, but fun anyway.

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