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Research training experiences of visiting students in physics

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Abstract

We explore the experiences, both positive and negative, of six visiting research students in physics in an Australian university. We consider their motivations for coming to Australia, their take-home impressions of their visits, and what institutions can do to maximise the success of such visits for both the students and the institutions.

Keywords

Visiting students, interns, research experience.

Introduction

The increasing globalisation of higher education is demonstrated by increases in both collaboration, such as, for example, the formation of networks such as Universitas 21 (Universitas 21 2007), and competition in the international higher education market (Marginson & van der Wende 2007). As a result, factors such as academic mobility of students and staff (Papatsiba 2005; Teichler & Jahr 2001), differences between and influences of higher education systems (e.g., the Lisbon process, the Bologna process, etc) (Adams 2007; Dion 2005; Keeling 2006), teaching and learning strategies reflecting diverse student customers, supervision for international postgraduate students, and so on (Wisker, Robinson & Shacham 2007) and items such as mutual recognition of degrees or other qualifications, joint degree programs have received increased attention. These factors are embedded in a broad range of higher education policies and impact funding and management. As a result, despite being "somewhat fuzzy", research on international higher education is a recently growing area with practical or economical concerns, as Kehm and Teichler (2007) pointed out in their review.

Apart from enrolment in international institutions or formal exchange programs, academic mobility at both postgraduate and undergraduate levels can also be found in the forms of visiting research students, occupational trainees, and internship programs. While these programs may vary from a few weeks to a year, a common aim is to obtain research experience in different countries, along with more general goals of visiting or international students, such as to explore different cultures and lifestyles. The international nature of these programs can be viewed, at least to some extent, as part of the global nature of science (Guest, Livett, & Stone 2006). We explore the experience of six international visiting students in physics in an Australian university, from a number of countries, seeking positive and negative aspects, and steps that can be taken to enhance student outcomes. Education research on university research internships in physics seems to be extremely rare. Akerson and Volrich (2006) reported research on undergraduate science teacher internship programs, and Guest, Livett, and Stone (2006) studied undergraduate exchange programs in science, including physics. There appears to be no prior research on postgraduate international internships in physics.

This study aims to benefit the host institution and country as well as for the (future) students concerned—through this exposure, these students can develop positive or negative notions about the host institution, and continuing or further studies in that field in the host countries. In addition, they may seek future employment in, or to live in, host countries (Tremblay 2005).

In particular, this may be of interest and value to Australian higher education providers, as the perceived quality of educational services and experiences, and the host institution, will influence advice to colleagues about choice of university or country for international study (Australian Education International 2003). In view of the extensive participation of many Australian higher education providers in the international education market (Marginson 2007), the recruitment of academically motivated and competent students is a core issue, perhaps even, in a long-term view, a survival issue as Australian research-intensive universities strive to compete with international high-prestige universities in the international higher education market, and to maintain a visible distinction from institutions perceived as degree-mills. More academically able students are likely to choose

institutions with higher prestige, *cetera paribus*, and are in turn more likely to become visible and successful alumni, contributing in turn to the host institutions prestige.

Since visiting research students and interns usually do not enrol in courses in the host institution, their motivations for choosing an institution can differ from those of enrolled international students, and a significant number can come from countries (and did, in our study) that are not typical countries of origin of international students. Since the bulk of international students studying in Australia come from a small number of countries, this can provide knowledge of Australian universities to students in a broader range of countries than usual. Word-of-mouth *matters*, and can be built through provision of quality services.

Methodology and Participants

Six international visiting students from Germany (two students), France (two students), Denmark (one student) and China (one student) on occupational trainee visas volunteered to participate in this qualitative study as co-authors by sharing personal opinions and experiences. Their ages were from 24 to 27. Five of them were postgraduate students (two PhD students, two masters students, and one masters graduate undertaking miscellaneous courses) and the last one in a third year undergraduate student. Their total visits in the host university varied approximately from two and a half months to six months; at the point of writing of this paper, two of them had spent two and a half months (and had finished their visits), three of them had spent almost six months and five months (with only two weeks left before finishing), and the last one had spent about four months out of a total of six months. Five of them received financial support from their home countries to study in Australia, and the last was self-supported by research assistant work, covering living expenses. None of them were required to pay a tuition fee to the host university in Australia. Four of them had previous overseas experiences, varying from one month to one year, consisting of previous internships or visiting study during a masters degree.

Procedure

A three-stage procedure was used. In stage one, the six international visiting students were asked to fill out a questionnaire focusing on academic experiences in Australia. Since we were interested in student experiences, which are, in turn, affected by motivations and expectations, these were included in the questionnaire. We were also interested in quality and impact on the host institution. The questionnaire consisted of ten sub-topics: (1) personal demographic information, (2) general reputation of Australian degrees in home country and personal views about Australian degrees, (3) reasons to choose the host physics department, (4) comparison of usual supervision practices and research training between Australia and other countries, (5) suggested improvements based on personal experiences in the host university, (6) career plans, (7) life/non-academic experiences in Australia, (8) higher education in home country, (9) physics in home country, and (10) personal and extrinsic motivations for studying physics. The questions were open-ended.

In stage two, after filling out the questionnaire, each student had a two hour discussion with the principal researchers in order to clarify and elaborate the issues of the questionnaire. Based on the discussions, the questionnaire was augmented, and students provided further explanations on the new version. In the third stage, following on from the questionnaire and discussion, thematic analysis (Braun & Clarke 2006) was used to identify four main themes: recognition about Australian university degrees, the management and arrangement of the visiting study, motivations for coming to the host university in Australia, and, finally, research experiences and cooperative relationships in the context of research work. In this last stage, short follow-up discussions or email were made when necessary.

Results

Recognition of Australian Universities and Degrees

Australian universities and degrees appear to be generally unknown among students and prospective students in most of the countries of origin of the visitors. Perhaps surprisingly, the exception was China, which is a major country of origin for international students studying in Australia (Department of Education, Science and Training 2004). The student from China had not met any graduates in China with Australian degrees, but knew of some Australian universities, and had heard that they and their degrees were good.

Of course, one may argue that different education systems can also result in the quality of Australian degrees being relatively unrecognised. For example, one could ask how a 3 year bachelor's degree compares with an American 2 year college degree or a 4 year degree; research-only PhD degrees are also considered to be highly unusual in some countries. However, this does not appear to contribute to the lack of recognition in this study—the cause is a general lack of recognition of Australian universities, compounded by a lack of recognition of Australia as a science-generating country. As one student noted,

> …I think Australian research could be really competitive to European or US institutes. The conditions are great; there is sufficient funding and well-equipped facilities. And it is well considered in the Asian–Pacific area what gives them good possibilities for research collaboration..…I also believe that it [Australia] is simply not known in the western/northern hemisphere as a serious study place besides marine or biology studies. Well, because of the nature here, e.g. Great Barrier Reef and so on. Much free space, not very dense populated and very different to elsewhere. Where I got this from, no idea. Generally, perhaps TV, etc. Australia is well know as a paradise for travelling but if one would be asked about reputations, you would only think about Europe and US.

To some extent, this will not be central to the motivations of most visiting students since they do not intend to obtain a degree or formal Australian qualification as a result of their visit. Nonetheless, it is interesting and important for the internationalisation of Australian higher education. Notably, despite some Australian universities being ranked comparably with respected American and European universities in the better known "objective" rankings of world universities such as the Times ranking and the Shanghai Jiao Tong rankings (Liu & Cheng 2005), the Australian universities appear to be much less well known. Given that Australian universities generally do not appear in the top 10 in any ranking of world universities—the top 10 being typically dominated by the most widely known universities in the world—a lesser degree of fame is to be expected, but Australian universities appear to perform poorly in terms of recognition even compared to similarly ranked European and American universities. We speculate that American universities, especially, benefit from a national reputation for scientific research, aiding the reputation of any university recognised as being American. Conversely, Australian universities may well suffer a corresponding lack of national scientific reputation.

However, public recognition, or lack thereof, does not necessarily equate to a lack of recognition of quality of Australian degrees in more limited circles. This is especially the case for postgraduate research degrees, where indicators of student ability, such as number of research publications, perceived quality of journals published in, and so on, beyond the fact of the award of the degree, are available—the achievements of the individual student are important. In addition, since the outcome and quality of postgraduate study can be affected or facilitated by research training and style of supervision that can vary between individual advisors, disciplines, and universities (Paglis, Green & Bauer 2006; Manathunga 2005; McCormack 2004; 2005). In this sense, the quality of research training and the reputation of the advisor(s) can be more important than the university or country.

These six international visiting students report that some specific science research centres in Australian research universities may be well known in relation to research-focused internship programs. In these particular research fields, international students who obtain an Australian university degree can be thought as good as others who get degrees from high-prestige universities in other counties. Given that such particular research centres or areas in the host university in Australia are typically strongly funded by the Australian government, the high recognition shown by these visiting students may be a reflection of the resulting achievements. However, the lack of recognition about Australian universities in general was clearly pointed out.

Management and Arrangement of the Visiting Study

Visiting study or internship is often likely to be encouraged as either an option or a compulsory component of a degree and managed by their institutes in their home countries. The visiting students noted that, for example, some universities in Denmark encourage PhD students to visit another research institution, and supports such visits financially. As a PhD student, he or she can go anywhere he or she wants for the internship if the host institution accepts him or her. With some institutes in France, it is compulsory to undertake a three month internship in the field of research (not necessarily abroad) and financial support is available. A list of internship destinations of the previous year is provided as a base to inform students' choices. In some universities in Germany, students can choose the host university from a list of universities that they have exchange programs with. If there were more applicants than positions available, candidates were ranked in order of pre-diploma grades. In some universities in Germany, students can freely choose both the host country and the host university. Indeed, exchange programmes on SOKRATES or ERASMUS within European universities have been actively implemented for study abroad (Teichler 2004). Students in Europe can find it quite uncomplicated to organise an international semester within Europe.

On the other hand, if a visiting student is sent to carry out specific learning tasks assigned by the research group from the home university, his or her academic excellence can be the main criterion if multiple candidates are available:

> I am a PhD candidate in my home country. It is not compulsory for everyone to have overseas research training….Only students who do well in their study and work hard can be chosen….Our group is one of the groups in a large laboratory…Our group needs me to study some theories to do

> experiments…The head of our laboratory made a program to send four students abroad to study and in my group I was selected.

According to the visiting students, students use three methods for initial screening to find their host universities: recommendation by academic staff in their home universities, internet search, and research papers. Internet search is mentioned as the most common tool to get information about host universities and research groups. This is typically followed by email to the leading researcher of the research group in the possible host university where they were interested in studying, with a short explanation about their study intentions or research proposal. This process is often quick, and can result in an invitation from the host research group following a small number (e.g., 3) communications by email.

Motivations to Come to the Host University in Australia

Three specific factors appeared to have influenced the choice of country and institution. Firstly, the research reputation of the specific research group. Although Australian universities were generally unknown, individual research groups can be well-known in their fields through research publications and conference presentations. This was an important factor for both PhD students in the study, but not for the masters and undergraduate students. This is understandable, given that PhD students typically spend time reviewing and familiarising themselves with the research literature in their field in the early stages of their research work, and undergraduate and masters students spend much less time with research literature, if any. However, it should be noted that the masters graduate in this study invested the effort required to identify major and productive groups doing work of interest. Viewed as investigation of institution and research field with possible intent of undertaking a PhD, this may be more thorough preparation than that of most students, but strikes us as wise rather than wildly atypical. Representative comments were made by the students concerned:

> The group [a specific research group in the host university] is thought excellent because they did very excellent work and published many famous papers. I didn't apply to go to other countries because my supervisor in my home country knows the leading researcher of my research field [in host university], I first contact him and he told me to contact with another researcher [in host university], and then he gave me an invitation….I have chosen to come to [the host university] because it is a famous university and excellent in my research field…There are many famous professors here [in the host university] and their groups are excellent in their research field…
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> …if the current research facilities hadn't existed at [the host university] I wouldn't have been in Australia.
>
> …I chose [the host university] because I was interested in [the specific research area]. There are only two universities seriously doing it [in Australia]… Internet and publications, I did some "research" at home to find groups…

The reputation of a research group can also become known to students through existing international links between groups. As noted above, such links also facilitate the arrangement of visiting programs. Research reputation was the only factor that appeared to significantly affect the choice of institution rather than country; the other two factors very strongly influenced the choice of country, but not institution.

The second factor—the first major country-choice factor—was the reputation of Australia as a tourist destination. This includes the world-famous Australian natural environment, with blue skies, fine beaches, and unspoiled wild areas, outdoor activities such as surfing, diving, and bushwalking, and the reputation of Australians as friendly and open-minded. Students commented that:

> I wanted to come to Australia in general because it is an amazing country to explore, travel, leisure time, and very popular especially for young people such as backpackers, thrill seeking adventures…
>
> We wanted to go in the sunnier part of Australia in winter, in a place where we could do physics…

Finally, Australia was considered because it is an English-speaking country. In general, this does not appear to be sufficient by itself for Australia to be chosen, but reinforces or is reinforced by the first two factors:

> My goal was to go to an English speaking country to improve my language skills. English is the world language and a standard in business and industries…Australia and New Zealand are interesting because of their geographical position, but in Australia [at the host university] was the more interesting study field…the information I got from my professor in my home country.
>
> …The most important advantage of studying in an English speaking country are the language skills you get. Being fluent in English is the most important thing in a higher career in this global world. If one would look into career chances in the Australasian area, it is probably the best to study in Australia. But for careers in Europe, besides the English skills and the fact that you showed flexibility and mobility by

> studying abroad, it wouldn't have any advantages for a future employment. This is not related to a lower level, it is just due to the lack of awareness and knowledge about Australian universities.

In addition, Australia could become the country of choice due to other possible English-speaking countries being rejected for various reasons, such as overfamiliarity, past visits, political or visa considerations, and so on. To some extent, this was the case in our study, with some of the European students avoiding the UK because they had been there before, or it being so nearby that visiting is trivial.

Research Experiences and Cooperative Relationships

All six visiting students described positive or very positive research experiences in the host university in Australia. The visiting students believed that the research groups that they worked with were financially well-supported, and possessed state-of-the-art facilities and high-quality equipment, with required experimental equipment being available for their use. Five out of the six students were satisfied with the availability and competence of guidance by supervisors and colleagues. In particular, immediate (and friendly!) help from colleagues such as PhD students or research fellows was highly appreciated. Official discussion sessions or meetings with supervisors varied from once or twice a week or fortnightly to daily, depending on the issues requiring discussion and work circumstances. Such meetings varied from shorter than 15 minutes to one hour per meeting. Most supervisors have "open-door" policies, and are usually available for extra meetings if students have problems. Partly based on these positive experiences, one of the visiting students decided to enrol as a PhD student at the host institution.

The sixth student, on the other hand, found it difficult since he was usually alone in the laboratory. The laboratory was in a building some distance away from the building where the student's and supervisor's offices were located (the research carried out there was cross-disciplinary, and the laboratory was located in another department). In addition, the supervisor was often busy, being involved in teaching. Consequently, meetings were usually short, in order to discuss results, making it more difficult to establish rapport. It is not unusual for supervisors to be busy, or to spend relatively little time in laboratories. However, in the other cases, other research workers and students spent a lot of time in the laboratories and help was typically at hand if required.

Moreover, all six visiting students point out that close, friendly, and cooperative relationships with both supervisors and colleagues such as students and research fellows and postdocs, contribute to positive learning experiences in research work. In laboratory work, especially, immediate practical or technical advice can make a large difference to the effectiveness and time-efficiency of experimental work. This requires a supervisor, technician, or other sufficiently skilled or experienced person to be available, and able to communicate skills with international students with different education backgrounds (Grey 2002). In particular, at the beginning of a student's study, it is critical that the supervisor pays attention to the student's study and communicates more frequently. This may well be even more important for student's engaged in short-term projects, since less time is available for a slow-and-steady learning process. Supervisors should also be aware that the power relationship between student and teacher is asymmetrical, with the imbalance varying between different disciplines, different universities, and different countries. In some cases, past experience with the asymmetry of such relationships in a student's country of origin can hamper free communication more than the supervisor might be aware of.

Students commented that:

> …in my home university, mostly it was team work with another student. So we could learn about project management and improve soft skills. The way you handle problematic situations with employees or in general your own treatment of other people. Every group has a labour engineer and a professor as supervisor. While the professor comes only once a week for a short discussion of the results, the engineer is every time reachable for the students. He supports the students in any situation, if students have questions in points like theory, practical solution or whatever he supports them. The close contact is an advantage especially for organising material or working devices...The positive aspects of having a supervisor like our labour engineers are the hints they can give: Who should be contact for solving a particular construction design problem? What are the limits of the development environment (research facilities) in the labours? These are things students can't know or estimate in the beginning. On the other hand side too much help should be avoided! In my opinion this handling of research training is very useful for the students because it saves much time for more important things than looking for solder.

> … in my home country… I did experiments with other students and the head of our group. We work together and discuss together. We have a good relationship. But because our laboratory is very large, I seldom talk with my supervisor. The head of my group advises directly. …because my supervisor has about seventy PhD students, I can't often talk with him.

> The relationship to my advisor during my Masters, nothing to complain. Not a friendship but close to it. Couldn't be better… and to the whole faculty staff and academic board was very good and friendly.

In relation to the socialisation within the discipline of the host university, five out of the six internship international students feel very integrated and comfortable. They receive the same email as other members in the discipline and are invited in the same way for meetings, discussions, BBQ parties, etc. They eat lunch together with colleagues almost every day. The last student reports that he feels more or less integrated socially, but has frequent contact with some people from the other department hosting the laboratory where his experiment is set up.

Recommendations

Since the students involved in this study had generally positive experiences, we learned little about potential problems that need to be watched for. However, we can give some advice on what appears to be good practice. Some specific recommendations that we can make are:

1. Visiting students should be socially integrated within their research groups or laboratories, being included in regular group meetings and social activities. This assists them in communication with supervisors and colleagues, and therefore achieve their research goals more effectively. In addition, a common goal is to obtain experience speaking English in a range of situations, including social situations.
2. It is very important for timely assistance to be available, especially in laboratory work. At a minimum, fellow students who are familiar with the laboratory, equipment, and work should be present.
3. Australian supervisors need to be aware that supervisor–student and supervisor–research staff relationships in Australian laboratories appear to be more egalitarian and less hierarchical than in some other countries. Students from such countries may be unwilling to approach the supervisor even when necessary, or may not know how. Supervisors may need to be prepared to initiate meetings or other discussions.
4. Supervisors should find out what the goals of the visiting students are beyond their proposed research projects—what the students are seeking, and how they hope to achieve their goals, especially in relation to the project.
5. Research groups who wish to encourage interns or other visitors can identify potential projects in advance, and can advertise their availability on the group web site. Projects should allow completion or major progress in a short time. A consistent procedure to follow if staff members are contacted by prospective students can be established.

The first three points above are all closely related to communication, especially as related to efficient and effective completion of the research project. The fourth is aimed at ensuring that the experience suitably supports the student's longer-term goals. The final point is that suitable preparation can help ensure that the project made available is both suitable for the student, and beneficial for the research group.

Final Comments

Typically and generally, Australia is known only as a nature-rich tourist destination, and an English-speaking country. This lack of recognition can perhaps be addressed to a small extent by providing international visiting research students with a high-quality and satisfying experience. In this way, the international reputation of the host institution and Australian universities in general can be enhanced.

This requires attention to be paid to the motivations and needs of such visiting students. We have presented the experiences of six such students in physics at an Australian university; we remind the reader of the hazards of extrapolating from such a small sample and suggest further research to determine the generality of these findings.

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