

# **International Bench-marking Review of Best Practice in the Provision of Undergraduate Teaching in Quantitative Methods in the Social Sciences**

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# 1. Background

This international benchmarking review was commissioned to analyse the form and extent of quantitative methods training offered in undergraduate social science courses and how this may prepare and encourage students to undertake postgraduate study. The review was commissioned as part of an effort by the ESRC, working with the Funding Councils, to develop an integrated strategy aiming to improve the supply of quantitatively trained social scientists. Concerns over the need to develop quantitative skills amongst the social science population has identified the issue of training during the earliest stages of career development, particularly at undergraduate level, in order to support career pathways into postgraduate research and training in quantitative methods. This study will seek to:

1. Detail on the extent of quantitative methods training in each target social science discipline in each target country
2. A contextual evaluation of how this training fits into the overall education system, particularly within the undergraduate degree but also with reference to secondary and postgraduate education.
3. An evaluation of the connection between this training and the creation of postgraduate social scientists
4. A benchmarking of best practice in methods training
5. An evaluation of how these practices might be applied to the U.K.

## 2. Executive Summary

This international benchmarking review analyses undergraduate quantitative methods training in the United States, Sweden, Norway, Finland, Spain, the Netherlands, Canada and Australia. These countries all have established reputations and track records in producing quantitatively skilled social science postgraduates and are influential policymakers in higher education. The study includes the social science subjects economics, business, political science, sociology, psychology, and human geography. It places quantitative methods training in the wider context of the undergraduate degree by measuring the extent to which all types of research methods are taught and practiced in these subjects. A sample of universities is surveyed in each country, focusing primarily upon leading research universities because these institutions produce most postgraduate students. Each subject's degree requirements are analysed to determine the requirements for 1) quantitative methods; 2) general research methods; and 3) undergraduate research such as a thesis or dissertation. The study takes into account each country's system of higher education and debates over curricula at both the national level and in each social science discipline. Each of these countries has had to deal with the increasing need for quantitatively skilled postgraduates while students have become increasingly hostile towards pursuing more mathematical topics. As a result, a number of studies on this problem have already been produced and some countries have already identified what they judge best practice in the teaching of quantitative methods. The results of the surveys, when combined with the secondary literature, compare what countries and disciplines claim is best practice with what they actually require of undergraduates.

The results suggest that, apart from economics or business, quantitative methods are seldom required at an advanced level, meaning at least two full modules. Outside of these more numerate disciplines, no subject requires more than one module of training, on average, in a majority of countries. General research methods requirements are more common and consistent than for quantitative methods, but the levels still rarely exceed a mean of two modules for a degree. In contrast to its strength in quantitative methods, economics and business are particularly weak in general methods training with only two countries averaging more than one module and most varying around half a module. Geography, Psychology, and Sociology appear stronger, requiring averages of just under two modules, while Political Science requires an average of just over one module. Undergraduate research trends are driven more by countries than subjects, with Sweden and the Netherlands consistently

requiring more than one module on average across all subjects, while Norway and Finland require between one-half and one full module. Other countries' requirements are negligible. The overall results show that quantitative methods need to be seen in the overall context of research methods training and practice, and that there are strong trends across subjects and countries.

The literature on methods training and research in the social sciences identified two similar and related approaches that were regarded to be best practice. These approaches consist of: 1) quantitative literacy for all students, accomplished through the integration of quantitative skills and data analysis throughout the programme; and 2) rigorous methods training as part of a wider programme of scientific research in the social sciences.

Much of the more recent literature on quantitative literacy recommends the integration of quantitative skills throughout a curriculum. Such skills cannot be learned or retained without practicing and reinforcing them, so they must be embedded within modules or classes throughout a programme. This integration of quantitative skills throughout a programme is best accomplished by encouraging students to handle data and engage in practical research projects as early and as frequently as possible. The United States and Canada now promote undergraduate research, not only as educationally desirable in its own right but also as a means of teaching and reinforcing quantitative skills.

This approach recommends teaching research methods of all types, not just quantitative, as early as possible, though not necessarily to an advanced level. Modules throughout the programme should engage students in large or small research projects. Research Councils in the U.S. and Canada have funded projects to make the use of data, particularly from large datasets, easily available for use in the classroom as part of the effort to encourage students to work with such data. The provision of undergraduate research skills such as data handling and analysis throughout the curriculum demonstrates its importance to students, allows them to practice in order to develop their skills, and reduces hostility towards quantitative topics by having students engage in smaller, more practical exercises throughout their programmes of study (Howery and Rodriguez 2006).

A related, but similar, approach views the main purpose of the social science degree as developing the ability of students to carry out scientific research and giving them experience in doing so. For example, the Netherlands requires advanced training in quantitative methods across the social sciences. However, this training is not carried out in isolation. It also requires extensive coursework in general research methods with a strong component of undergraduate research throughout multiple modules. Social science degrees in the

Netherlands require students to learn and practice scientific methods. These degrees are modeled upon those in the natural sciences and their purpose is to produce graduates trained in the scientific method. Sweden, Norway and Finland recommend a similar approach by requiring strong sequences of methods training and undergraduate research as part of a degree.

Even where such research training and experience is not required, it is still often held up as best practice. For example, in the United States the elite liberal arts colleges, that are renowned for the excellence of their teaching, are most likely to require students to take research methods and do a thesis or dissertation. Most universities do not require methods and a thesis, but many universities offer methods training and research experience in honors programmes to the most able and promising students on a voluntary basis. Australia, which has the fewest requirements for methods and research experience, allows students to gain an honour's degree by continuing for an additional year that requires extensive methods training and research.

The literature and practices of the survey countries are clear and consistent, and they provide clear indications of best practice that can effectively inform policy developments in the U.K. Based upon these trends and areas of consensus, the key recommendations of this report are:

1. Developing good methods skills requires engaging students in the process of scientific research throughout their programme. Undergraduates should learn about research methods but, most importantly, they should apply them in order to better understand the scientific method, reinforce the skills they learn, and experience the benefits of using them rather than seeing methods as a purely theoretical exercise. A major research project should be a required part of any honours degree in the social sciences, but the student experience of research should not be confined to that one project.
2. Methods training and research should be integrated throughout social science programmes. For too long, quantitative methods teachers have carried out in isolation the difficult job of teaching a topic both feared and disliked by many students. It should not be the job of one or two specialists in methods to provide all the methods training in a programme. Data handling and analysis should occur in modules throughout a degree. They should all build upon and develop

research methods skills, both quantitative and qualitative, with the clear aim of getting students doing research.

3. Quantitative methods, in particular, should be emphasised throughout the modules of a programme, though not necessarily at an advanced level. All students should become used to collecting, reading, manipulating, and analysing numerical data. These tasks are all more interesting and relevant when carried out within the context of a particular subject. Numerical data inspires less fear and hostility from students if it occurs frequently across many different subjects. It is seen as a normal way to examine almost any subject rather than a difficult set of skills completely contained within one module called 'quantitative methods' or 'introductory statistics'.

All of these recommendations build upon the existing challenges and strengths of undergraduate methods teaching and research in U.K. universities. There is a long tradition of undergraduate research, with a strong emphasis upon the dissertation in most subjects. There is also a widespread culture of hostility towards mathematics throughout many subjects. The lack of sustained and widespread mathematics training among secondary school students and their fear and suspicion of taking up maths or statistics once in university creates a substantial impediment to quantitative methods training, particularly in the increasing competition for student numbers that will occur over the next decade. Any successful response to this problem should build on the strengths of the current system. The strong culture of undergraduate research creates a context in which skills and experience in using quantitative data can be successfully integrated throughout undergraduate programmes. Quantitative methods can be integrated into ordinary subject modules rather than entirely isolated within 'methods' or 'statistics' modules. Students will practice their skills more frequently and stop regarding research as being entirely quantitative or non-quantitative. The promotion of undergraduate research will then help recruit new cohorts of postgraduate students less hostile to training in the quantitative skills that the subjects will need.

### 3. Research Design

Educational research into best practices for the teaching of undergraduate statistics and research methods largely concentrates upon the module or classroom level experience of students. This particular topic has been gaining in prominence, and there is now a large literature investigating the effectiveness of particular approaches to teaching. These studies most often seek to demonstrate the relative effectiveness of one technique compared to another (See Garfield and Ben-Zvi. 2007 for an overview of current research), and they often take a very practical approach in their aims. The most prominent design or method consists of case studies that identify advantages, disadvantages, and often include guides to implementation, classroom tips, and examples of projects or datasets to help the research methods teacher.

The particular course settings used for almost all pedagogical research in this area make the broad generalisation of results very difficult to achieve. Experimental conditions cannot be easily imposed on undergraduates, so the best research methods available are not able to entirely isolate the impact of a particular teaching example, lesson, approach, or technique. Further, there is great difficulty in defining consistent learning outcomes that can be measured and compared across studies. Subsequently, the impact of these techniques cannot be easily measured or estimated to a high degree of accuracy. As with most areas of pedagogic research, there is no one definitive 'best practice' in the teaching of quantitative methods. Instead, the literature on learning and teaching has identified broad principles of effective teaching which have been consistently upheld and validated. Many of these principles have been found to apply equally to teaching in research methods classes. The following basic principles of effective teaching were identified in a review of the literature on quantitative research methods by Garfield and Ben-Zvi (2007):

- Students must construct their own meanings out of their coursework to learn it, so simply presenting correct information is not enough. Getting students to construct their own meanings of the coursework can be accomplished through active involvement in learning activities.
- Students also learn what they practice doing.
- Exploring visual aspects of data helps students to learn basic statistics concepts.
- Students learn better when they receive timely, consistent, and helpful feedback.

- Fundamental concepts of probability and statistics are difficult to learn for many students, who struggle to understand basic ideas and concepts.

All of these principles are well known concepts in the higher education literature but have also been tested and analysed in methods classes to ensure their applicability. Validating their principles in the methods classroom is arguably necessary because methods teaching is different from most subject teaching in the social sciences. Quantitative methods and, to a certain extent, research methods are perceived as difficult by students because they are not about particular subject areas and learning the concepts of probability is often counterintuitive and inherently difficult for some many students. This type of teaching is more challenging than most others. The techniques that have been shown to work for teaching in higher education may have more or less effectiveness when used in teaching quantitative methods. The principles listed above are effective at helping students to see the subject as more interesting and relevant while less fearful. Getting them to engage in hands on activities and projects while using active learning techniques in the classroom can help them to learn more consistently and effectively. There is a wide literature on these techniques and each discipline should actively nourish a network of methods teachers to share and promote good teaching practices based upon research evidence. Some disciplines, such as psychology and sociology, are more active in supporting good teaching, and there is much work to be done in this area throughout the social sciences.

The expansion of research into the teaching of research methods and statistics has provided a very welcome and needed resource to support a difficult subject to teach. The application of innovations in the teaching of higher education to research methods has brought improvements in student outcomes. However, if one is considering the preparation of social science undergraduates for quantitative training in a postgraduate degree, then it is the accumulation of learning outcomes within an entire degree that matter, rather than how well quantitative methods is taught within any one class. No matter how finely designed and implemented, one particular class in research methods or statistics is only a small part of a student's degree. The relationship of research methods to the degree as a whole has a huge impact upon students motivations for taking that subject, the use to which they put what is learned in methods courses, and, ultimately, what students retain from such training. Therefore, it is critical to examine the place of methods in the overall university curriculum when seeking to identify best practices.

As previously noted, quantitative and other research methods courses can put off students because they are not about particular subject content and because they are difficult and complex. Methods classes develop skills in conducting research, and they develop tools with which students can study different content areas. This makes the relevance of this coursework heavily dependent upon the requirements, content, and structure of the overall degree programme. For example, not all degrees require students to take quantitative methods or research methods early in their undergraduate programme. Students, who often fear these classes, put them off as long as possible. In countries that allow undergraduates more latitude over the sequencing of their course of study, particularly in the United States, students will often wait until the end of their degree to take methods classes. Methods classes, that are taken as one of the final elements of a degree, by definition, cannot be of much use to a student in the study of that subject, which has an impact on how that student approaches such a class. The sequencing of methods classes can definitely pose an obstacle to teaching the subject, but is not necessarily the main problem. Many degree programmes do require methods early in the degree so that students develop these skills before taking upper level content classes in a subject. However, in many cases few other modules require methods as a prerequisite, and these classes rarely link their content and study to the content of the methods training or use these methods in coursework. The impact of any quantitative training is affected by the extent to which coursework follows up on this training and gets students to apply research methods or statistics.

Many programmes see quantitative methods as a ‘good thing’ that should be required but then place all the training and statistical content for the degree into one very unpopular module and nowhere else. Students do not see the importance of learning difficult skills that will never again be employed in a degree subject. The seeming irrelevance of such coursework, combined with its difficulty, undermines the efforts of methods instructors before anyone even sets foot in the classroom. It also leads to heavy workloads, poor student ratings, and difficult teaching assignments for (often junior) staff: a heavy disincentive even for those interested in or committed to teaching methods.

The curriculum of the degree programme determines when students develop their skills in statistics and research methods. It determines the depth to which students will develop these skills. Finally, it determines the ways in which these tools will be used by students, not just within the methods class itself, but in all subsequent classes in the degree subject. The overall

curriculum determines, not just how much methods training students do, but also when they do it and why they are do it. Will these methods be required for and applied in subsequent classes in particular subjects in the discipline? Will students have to conduct one or more research projects in which these skills are applied? Such reinforcement is crucial to hone these skills and keep them from quickly disappearing after the final exam for introductory statistics. The purpose, place, and application of methods in the whole degree influences student skills in quantitative methods as much as what happens within methods classes. The relationship of research methods to the rest of the degree is critical for the student experience.

The most common model for teaching methods in the social science disciplines is to require one module of introductory statistics and one module of general research methods. This typical sequence would account for between 5% and 8% of a degree, depending on the credit weighting and years of study for an undergraduate degree. The burden of developing student skills in designing, carrying out, analysing, and presenting research cannot rest upon such a small proportion of undergraduate class time. Two modules do not turn undergraduates into social scientists. Students cannot possibly gain sufficient data handling and hands-on research experience if it is confined to the methods classes, though that is often what the degree programme suggests in how they approach the teaching of social sciences.

Training students to be social scientists is a collective responsibility of a programme rather than the burden of the methods teachers alone. Methods classes of all types are only sufficient preparation and training for students when the rest of the curriculum bears its share of the responsibility for nurturing scientific research skills. Basic skills learned in methods classes must be repeated, reinforced, and applied in the other classes. When a degree segregates all the methods teaching within specific required classes, and when further methods classes are few in number and offered on an optional basis for an elite core of students, it sends a clear message that these methods are not necessary for doing that subject. Students pick up on that message and view methods as largely irrelevant, since they will have little or no bearing on the rest of the teaching in the curriculum. It is the whole degree and the way in which its elements fit together that is crucial for the development of quantitative and research methods. Therefore, the main focus of this benchmarking study will be to examine and analyse the entire degree rather than classroom practices.

### **3.1. Sample Selection: Countries**

The project examines quantitative methods training at the undergraduate level in the United States, Sweden, Norway, Finland, Spain, the Netherlands, Canada and Australia. These countries were selected because of their long-standing track records in producing social scientists, particularly those with quantitative methods skills (ESRC 2006). Selection relied upon a ranking based upon the number of social science PhDs produced in 2004 (National Science Foundation 2006). Those selected were all highly ranked with a high reputation for producing quantitative postgraduates and represent a good spread of countries for an international comparison. The US is a leading country in terms of quantitative skills among its social scientists and has by far the largest number of universities and postgraduate students, so it is a major focus of the study. Many countries, while not producing as many aggregate doctorates as those with much larger populations, demonstrate a higher rate of productivity through an active system of postgraduate training. The Scandinavian countries Norway, Finland, and Sweden produce large numbers of PhDs considering their comparatively small populations. The Netherlands is considered one of the more advanced countries in terms of quantitative methods in the social sciences and also produces a large number of PhDs relative to its population. Australia, similarly, produces a very large quantity of PhDs per head of population and is also regarded as being a leader in higher education research and policymaking. Australia also competes in a very different international student market and provides an interesting contrast with European and North American countries, which constitute the majority of the sample. Finally, Spain is included because of its increasingly large numbers of computationally and quantitatively skilled postgraduates and also to provide a southern European comparator.

Most of these countries have, to a larger extent than the U.K., a liberal arts tradition of a broad education in secondary school and a more general undergraduate curriculum. Despite these differences, the list of countries includes higher education systems that have many similarities to the U.K. In the cases of Canada and Australia the systems were initially modelled upon the Scottish system. The European countries all share a predominantly public system of higher education, as in the U.K., and most have similar degree structures. The survey attempts to balance the spread of differences and similarities with the U.K. in order to get a good picture of practices internationally but also provide a good basis for identifying successful practices and experiences that might be applied in the U.K. The sample tends towards European countries partly because of their resemblance to the U.K. This similarity

can help identify relevant implications for policy more easily from the experiences of these countries and make conclusions for future policy in the U.K. easier to derive.

The study examines each country to review the current educational debate concerning quantitative methods education and place the undergraduate curriculum into its particular social and cultural context. The state of undergraduate methods teaching across a range of social science disciplines is surveyed to gain an accurate indication of current practices. Reports and the secondary literature from each discipline are considered, and degree requirements for each discipline are collected and analysed across a range of universities in each country.

### **3.2. *The Context of Undergraduate Education and Postgraduate Recruitment***

Two of the goals of this review were to place undergraduate training in the context of each country's overall system of education. Education prior to university and the system of graduate education both play important roles in setting the context in which undergraduate curricula are designed. The review was unable to explicitly analyse links between quantitative methods training in secondary schools and undergraduate degrees. While some aggregate data on mathematical training in secondary education was available, there was no data available on the entry level skills of undergraduates or on their skills upon completion of an undergraduate degree. The lack of entry and exit data for undergraduates in and across countries meant the review could only examine aggregate training in secondary education systems and examine broad trends in selected countries.

Similarly, in the absence of consistent national data from each country it was not possible to draw direct connections between the mathematical training and the influence of postgraduate systems of education. There are far too many possible intervening factors and cultural aspects of each system to easily isolate such a relationship. For example, the United States produces a highly regarded cohort of quantitatively trained PhDs. Do graduate schools there foster these skills by demanding such abilities from applicants? Do such training programmes influence undergraduate training? Such a relationship may exist, but it is not so clear or direct. First, postgraduate students will undergo four years of full time training, so it may be the length and intensity of the programme that matters. Students in the United States are required to take mathematics coursework through high school and university, which may keep their skills honed, regardless of any additional quantitative methods training linked to their subject. Finally, all standardised admissions tests weight mathematical aptitude very

highly, which emphasises the importance of mathematical skills to all potential students at both undergraduate and postgraduate levels. These factors all exist independent of any subsequent quantitative methods training at the undergraduate level. To further explore this link would require an extensive study of postgraduate admissions and methods training across universities and countries, which is beyond the scope of this study.

Two particular factors heavily influence a country's approach to undergraduate education: breadth and access/selectivity. The breadth of the curricula in both high schools and universities has a large influence on methods training. High school qualifications that emphasise breadth lead to undergraduates with a wide range of skills, though little specific training in any particular subject. One large effect of high school education is the extent of training in mathematics. Some countries require maths coursework throughout secondary education, some countries strongly encourage it, and others have minimal requirements. Most western countries now struggle to recruit enough students in maths and science subjects at university level, but each takes a different approach to these subjects at the secondary level. For example, all high school students in the United States contemplating going to university are strongly encouraged to take maths all the way through their diploma. Enrollment in the equivalent of A-level (Advanced Placement) maths courses in that country is rising, and one-half of the standardised admissions test for universities consists of mathematics questions. This strong emphasis on breadth and the importance of maths skills continues into the undergraduate curriculum. Universities provide a broad, four-year, liberal arts degree, usually requiring students to take a broad range of subjects in their first two years. Almost all students are required to do at least one maths module as part of this requirement. Further, one-half of the standardised admissions tests for graduate schools in the social science (GRE) consists of mathematics questions. This emphasis on breadth is most marked in the United States, but also characterises undergraduate education in other countries such as Canada and Finland. This general approach to education also affects the skills and attitudes of students entering postgraduate education.

Graduate schools in the United States assume that most students have studied maths up until the age of eighteen and have done some coursework while in university. They are only required to show 'aptitude' rather than specific content knowledge for maths on the standardised graduate school examination. The assumption is that graduate schools recruit bright, motivated students and then train them thoroughly an appropriate range of research methods. While no discipline claims to exclusively value quantitative methods, the widespread use of them throughout the social sciences make such training necessary to

understand the major literature in the field. In addition, the length and breadth of postgraduate training in the United States, requiring two years for a masters degree and two more years of coursework for a PhD, allows such skills to be more thoroughly taught and practiced. Undergraduate methods training plays a very small role in this process because of the emphasis upon training at postgraduate level, and because the undergraduate curriculum emphasises breadth to an extent that makes it very difficult to require specific sequences of required coursework outside the sciences.

Other countries, particularly those with three year undergraduate degrees, tend to emphasise depth and specialisation over breadth. Not all embrace the depth which characterises the single honours system in England. For example, Sweden adopts an approach which takes three years but typically requires a major subject, a minor subject, and a large proportion of electives as part of the degree. In the face of this diversity of structures for the undergraduate curriculum, a survey of methods teaching across countries will provide the best means of comparing approaches teaching and methodological training in the social sciences.

### **3.3. *Sample Selection: Subjects***

- Economics/business
- Politics/Political Science/Government
- Sociology
- Psychology (social science route rather than natural science where possible)
- Geography (human geography)

These subjects represent the largest social science subjects in the U.K. Some smaller subjects, such as anthropology and linguistics, were excluded. Similarly, more applied, professional subjects such as law and social work were also excluded. The three primary disciplines of economics, political science, and sociology are represented. Business degrees may have an applied element which encourages methods training in some countries so it has been included, though it traditionally does not have a strong quantitative component in the U.K. Psychology and human geography, are large subjects in terms of student numbers, but, more importantly, they straddle both natural and social sciences. These subjects both provide substantial contributions to quantitative methods in the U.K. and may also provide good examples in other countries.

### **3.4. Sample Selection: Universities**

This international benchmarking review consists of, first, a literature review of the current educational debate in and amongst the target countries concerning quantitative methods education. Second, the report surveys the undergraduate requirements for the five identified social science subjects across eight countries. A sample of universities are surveyed in each country in order to identify degree requirements for quantitative methodology modules, general methods modules, and student research projects, thesis, or dissertation modules. The survey did not include elective courses because the numbers involved would be too cumbersome to collect, too diverse to easily categorise, and too subject to yearly change to provide an accurate picture of long term curriculum standards. Many students also avoid quantitative methods, and the unpopular nature of the subject makes it difficult to gauge the influence of any elective. It is difficult to know how often such courses run and how many students take them across universities and countries. Such a detailed picture of methods teaching is beyond the scope of this study and does not really demonstrate what is 'best practice.' The focus on requirements has the advantage of showing what coursework all students take and where disciplines and universities agree on what students should learn to earn a degree in that subject.

The survey concentrated on research universities because data from the United States indicates that those universities' undergraduate programmes produce far more doctoral candidates (over 50% of the total between 1991 and 1995) compared to other types of universities such as doctoral, comprehensive, and liberal arts colleges and universities (National Science Foundation 1996). Since one of the major motivations behind this study is to improve the provision of quantitatively trained postgraduates and academics in the U.K., it makes sense to concentrate on university curricula most often taken by undergraduates who continue on to postgraduate study. The universities included in the survey are selected from the top of various rankings and league tables, which either identify research universities explicitly or use criteria that will elevate the leading research universities into the top places. The detailed accuracy of the rankings did not matter so much as broadly identifying a top tier of institutions within each country which potential postgraduates are most likely to attend.

The sample in Australia consists of the top 25 universities listed in the current Shanghai Jiao Tong University (2006) ranking of world universities. The sample in Canada consists of the top 50 universities listed in the current Shanghai Jiao Tong University (2006) rankings. Universities in Spain were selected by surveying the top 25 universities listed in the

Webometrics Ranking of World Universities (Cybermetrics Lab 2007). The United States sample consisted of the top 50 universities identified through current U.S. News and World Report (2007) university rankings for national research universities. The samples in Finland, the Netherlands, Norway, and Sweden consist of all universities providing undergraduate social science degrees.

### **3.5. Survey Design:**

The survey retrieved mandatory course requirements for undergraduate degrees or majors in each subject from university catalogues, reports, and websites. Modules in quantitative methodology, general research methods, and student research projects were recorded using the course titles and descriptions from the websites. This approach differs from many surveys of quantitative methods teaching that examine classroom practices and module level content. This review does not seek to find out the best way to teach quantitative methods in the classroom. It seeks to examine the place of methods in the curriculum and examine best practice for the type, timing, and extent of methods teaching and undergraduate research. Consequently, it seeks to evaluate the content of the whole programme or degree rather than a single module. Therefore, the use of remote surveying has distinct advantages to direct contact with module tutors or programme representatives. First, the response rate is not an issue since all programmes publish or otherwise reveal their curriculum requirements. Secondly, surveying module requirements provides a level of consistency and reliability that would not be as easy to accomplish in an international survey of universities in different countries with different languages. Aside from the problems of surveying across different cultures and languages, the accuracy of reports from various representatives or respondents could not be easily verified when covering such a large target population. In the interest of getting a good spread of reliable results, remote surveying provided the best data for the needs of this review. The following definitions were used to identify modules.

#### **3.5.1. Definition of Quantitative Methods**

Quantitative methods are research methods concerned with numbers and anything that is quantifiable. The U.K. QAA's benchmarking statements for economics (Quality Assurance Agency for Higher Education 2007) provide the most comprehensive listing of requirements for quantitative methods of all the social sciences in the U.K. Even these statements appear fairly general but provide a working list of content with which to identify quantitative

methods teaching. The definition of quantitative methods modules would include the following topics:

- Graphical, Mathematical and Econometric Representation of Ideas and Analyses
- Manipulation, Treatment and Interpretation of Statistical Data
- Statistics, Numeracy and Quantitative Skills, Including Data Analysis, Interpretation and Extrapolation
- Survey design and analysis
- Psychometrics
- Experimental Design
- Mathematics

Any modules that include these topics in their titles or descriptions are classified as quantitative methods.

### **3.5.2. Definition of General Research Methods courses**

This classification covers any research training not classified as quantitative methods. It encompasses a broad range of topics, but generally describes modules covering epistemology and methods. These modules define the scientific method, what research is, categorise the different types and the different ways it can be carried out, and explain different methodologies used to conduct it. The aim of all of these courses is to introduce students to the scientific method and improve their research skills, which could be either qualitative or quantitative in character. This definition could incorporate many different types of content for different disciplines. Typically, the courses included are just named ‘research methods’, ‘scope and methods’, or ‘research design’. There is some risk of this category becoming a label that refers to qualitative research methods, but that problem almost never arises. Few programmes ever require qualitative methods as an identifiable module, so defining all non-quantitative modules as general research does actually capture a separate, broader category. One common approach is to split a module and have half quantitative methods and half scope and methods. In cases where half the course is clearly dedicated to teaching quantitative methods, then it is recorded as 0.5 research methods and 0.5 quantitative methods modules.

### **3.5.3. Definition of Thesis, Dissertation, and Research Project**

This classification consists of modules where students design and engage in their own research. It is often defined as a thesis, dissertation, capstone course, or senior seminar. The course should be dedicated to the ‘practice of research’ and the research process including designing and conducting research or participating in a research project.

### 3.5.4. Credit Weighting

Comparing modules across universities in just one country can present a daunting challenge due to the multitude of credit systems and student workloads that can exist across different institutions. Extending the comparison across countries greatly multiplies this problem. One possible solution is to calculate the number of credits needed for an undergraduate degree and classify each module as a set percentage of that degree. For example, in the United States a typical three credit module in a B.A. of 120 credits would constitute 2.5% of an undergraduate degree, whereas a lab related module of four credits would be 3.3%. In addition, the use of a common European standard (ECTS) for module credits promises to enable quick comparisons across many different countries. However, it is widely noted anecdotally that the ECTS credit designations are not precisely accurate, particularly in European countries that don't use credit systems that resemble that format. Further, countries also differ on how many years to complete an undergraduate degree. Many countries require three years instead of four, and others require an additional fourth year to attain an honour's degree. These large variations across countries inhibit any attempt to quantify the exact value of a training module in methods. A single module's weighting would depend on how many years of study a student undertakes, how many hours of coursework it represents, and what sort of assessments it demands. Identical modules in terms of curriculum content and hours of work required could have different weightings depending on the length of degree. For example, the typical three credit module found in the United States, cited previously, is 2.5% of a degree, but the same module in a three year programme would be 3.3%. Deciding on whether to weight the percentage of a degree or the amount and level of coursework is a difficult tradeoff.

Standardizing module weighting to the percentage of a degree proves far too cumbersome, time consuming, and difficult, while the results would be misleading in terms of how much training a student actually receives. For the purposes of this study, module data is only used to construct simple distribution tables, so such a precise level of standardization is unnecessary. The study adopts a quick rule of thumb that modules are all generally equivalent. Most universities operate on an eight to ten module workload per year. Credit weightings are collected in order to classify modules as a half, single, or double according to their relative weight in whatever system was being used. For example, in the United States, 1 or 2 credit modules were labelled a 'half' module while three or four credit modules were categorized as 'one' module. The credit systems did not vary so widely within countries, so

this system worked well as a simple rule of thumb to weight courses by their credits. This method does not account for the number of years required to complete a degree, but resolving such a complicated debate is far beyond the scope of this study.

## 4. Results

The survey results are summarised below for quantitative methods, general research methods, and theses/dissertations. More detailed results and discussions of each country are provided in Appendices at the end of the review.

### 4.1. Quantitative Methods Training

Table 1: International Comparison of Mean Number of Required Quantitative Methods Modules

	Australia	Canada	Finland	Netherlands	Norway	Spain	Sweden	United States
Business	0.7	2.0	1.6	2.0	1.3	1.5	0.1	1.4
Economics	0.7	2.0	1.9	2.8	2.2	2.0	1.2	2.0
Geography	0.0	0.6	1.0	2.0	0	0.2	0.1	0.4
Political Science	0.0	0.2	0.3	1.1	0.3	1.0	0.1	0.2
Psychology	0.2	1.2	1.5	3.4	0.8	0.6	0.6	1.1
Sociology	0.0	0.7	1.0	3.2	0.6	1.6	0.4	0.9

Comparing mean numbers of required quantitative methods modules across all eight countries gives a good overview of the training in undergraduate degrees. This data provides a broad indication of practice rather than allowing fine comparisons between countries. Minor variations in the credit weighting of modules and differences in the content taught in them are not reflected in this survey.

Consistent similarities and variations across disciplines and countries do suggest some areas of international trends. First, there are distinct differences between disciplines that appear across countries. Business and economics are the most quantitative subjects in all countries, as one would expect, though the level of training varies strongly by country. The most common model, particularly for economics, is two quantitative methods modules for each subject. Psychology and sociology also consistently require quantitative methods,

though at lower levels training. Levels of required quantitative methods in these subjects vary more widely within countries than for business and economics, but are fairly evenly distributed around the standard of one module, which is the most common (mode) level. Finally, geography and political science provide the least quantitative methods training. It should be noted that human geography is not commonly taught as a separate degree subject in many countries, and its correspondingly small sample size reduces the reliability of the results for that subject.

The results demonstrate that, apart from economics and business, quantitative methods are seldom taught to an advanced level, which is defined as going beyond an introductory module. Even in business and economics the training is not consistent, nor is it particularly deep. Further, the effectiveness of the quantitative methods training that does occur also relies upon the extent to which the skills are required, reinforced, and practiced in classes outside of methods training. Advanced statistical training is little use if students are never asked to practice or apply it as part of other modules in their subject. The extent to which such skills are embedded in a curriculum strongly indicates to students how important it is to that discipline. Economics, for example, is considered the most quantitative subject, not just because of its training requirements, but because students are most likely to need and use these skills in their coursework throughout the subject (Ballard and Johnson 2004; Siegfried et al. 1991).

While subjects such as business and economics usually provide some advanced training in quantitative methods, other subjects rarely meet this level of preparation. Sociology and psychology consistently demand quantitative training but do not often go beyond introductory coursework. Political science and geography rarely require even an introductory module. The extent to which these skills are practiced in elective modules or those that do not indicate quantitative content in their descriptions is not measured in this survey. However, the embedding of quantitative skills in other modules has already been identified as a desirable innovation in the United States and Canada, so it is unlikely to be widespread practice in the coursework of those countries. Other countries stress the importance of incorporating research training and activities throughout a student's coursework, and this approach would be more likely to encourage the embedding of skills in elective courses. Further, the countries that practice this approach are also require the most research methods training, so students with more methods training should also be more likely to encounter methods teaching in other classes. The link between methods teaching and undergraduate research is strong in many countries, and this link suggests the importance of examining methods training in its wider

context. Quantitative methods should not be viewed in isolation to training in scientific research methods more generally, and a more complete view of this training is gained by examining all general methods training and its application in undergraduate research activities. The conclusions of the study on best practice will then address this trend in more detail.

## 4.2. General Research Methods Training

Table 2: International Comparison of Mean Number of General Research Methods Modules Required

	Australia	Canada	Finland	Netherlands	Norway	Spain	Sweden	United States
Business	1.2	0.1	0.4	4.4	0.3	0.3	0.6	0.2
Economics	1.6	0.1	.09	1.7	0	0.7	0	0.0
Geography	1.0	1.1	2.0	2.3	1.8	4.3	0.8	1.1
Political Science	0.5	0.3	1.1	3.3	0.5	1.9	1.1	0.3
Psychology	1.8	0.9	1.8	2.8	1.0	3.3	1.5	1.0
Sociology	1.4	1.2	2.0	2.7	1.0	4.8	1.3	1.0

General research methods requirements vary more than for quantitative methods but show similarly consistent trends across disciplines and countries. Some subjects show an inverse relationship between levels of quantitative methods and research methods. Economics and business, in particular, show stronger and more consistent quantitative requirements but seldom require general research methods. Countries with lower quantitative methods requirements in the subject, namely Australia and Sweden, have correspondingly stronger requirements in general research methods in these same subjects. Some general methods modules may include elements of quantitative methods, but none of the module descriptions indicate any such content. Geography, psychology and sociology show the strongest and most consistent general research methods requirements, with each discipline requiring a mean of at least one module in every country. Political science, again, has the lowest requirements of the social sciences. While its standards are much higher than for quantitative methods, it fails to require a mean of one module in half the countries surveyed.

Despite having more consistent requirements for research methods training, the levels still rarely exceed a mean of two modules for a degree. As with quantitative methods, there are few instances of particularly advanced and sustained levels of training. However, just as quantitative methods cannot be separated from general research methods, the overall levels of methods training should not be separated from actual undergraduate research, which offers students the chance to apply their skills.

### 4.3. *Theses, Dissertations, and Research Projects*

Table 3: International Comparison of Mean Thesis/Dissertation Module Requirements

	Australia	Canada	Finland	Netherlands	Norway	Spain	Sweden	United States
Business	0	0	.7	1.9	0.7	0.1	0.8	0
Economics	0	0	0.4	1.0	0.4	0.1	0.9	0
Geography	0	0	1.0	2.5	0.4	0.1	1.6	0.1
Political Science	0	0	0.6	2.1	0.3	0.1	1.6	0
Psychology	0	0	0.3	1.7	1.0	0	1.3	0.1
Sociology	0	0	0.7	2.3	0.6	0.1	1.5	0.1

Comparisons of undergraduate research requirements vary widely across countries but, unlike the results for quantitative and general research methods, do not vary much across disciplines. Clearly, some countries' systems of higher education promote or require the inclusion of a research project, thesis or dissertation as part of their undergraduate curricula. Those countries adopt such requirements consistently across the social sciences, though the levels vary by subject. The Scandinavian countries Norway, Sweden and Denmark, along with the Netherlands all have consistent requirements for a student thesis or research project across all subjects while the four other countries do not. In addition, about 12% of students in Australia take an extra year to complete an honours degree, which includes this requirement. This study was not able to conduct the level of in-depth analysis of individual subject modules that would reveal the extent to which they embed student research projects, so the figures only refer to required modules. Averages of 'zero' do not indicate that no undergraduate research takes place in some countries, but it does indicate that none is required as part of a degree. Undergraduate research is a popular and growing trend in some countries,

such as the United States and Canada, and is often linked to work or placements in local communities. However, these courses are electives and reserved for a few select students (Jenkins 2007). This report demonstrates that half the countries surveyed have explicit requirement for students to design and conduct their own research. Despite the lack of formal requirements in many countries this practice is held up as ‘good practice’ and is more common among the best students and in universities with the best reputations for teaching, such as liberal arts colleges in the United States.

## **5. Best Practice in Quantitative Methods Training**

The review identifies best practice by combining the literature of what countries say is best practice with a comparative analysis of what they actually do. These two sources of information give a good indication of common practice in methods teaching among different countries and the extent to which it conforms to the literature. The results suggest that, apart from economics or business, quantitative methods are seldom required at an advanced level, meaning at least two full modules. Outside of these more numerate disciplines, no subject requires more than one module of training, on average, in a majority of countries. General research methods requirements are more common and consistent than for quantitative methods, but the levels still rarely exceed a mean of two modules for a degree. In contrast to its strength in quantitative methods, economics and business are particularly weak in general methods training with only two countries averaging more than one module and most varying around half a module. Geography, Psychology, and Sociology appear stronger, requiring averages of just under two modules, while Political Science requires an average of just over one module. Undergraduate research trends are driven more by countries than subjects, with Sweden and the Netherlands consistently requiring more than one module on average across all subjects, while Norway and Finland require between one-half and one full module. Other countries’ requirements are negligible.

The overall results show that quantitative methods requirements, when viewed in isolation, do not often require advanced training of undergraduates across most countries and disciplines. However, the results also demonstrate that these requirements should be viewed in the overall context of research methods training and practice. There are strong trends across subjects and countries in how methods training is integrated into an overall discipline or degree. Quantitative methods is often taught as simply one particular way of conducting scientific research, and this coursework is often combined with more general scope design

issues as well as qualitative methods training. The way in which this training is put to use also matters, with many subjects and countries showing strong trends in requiring students to carry out hands-on research. The combination of these trends, alongside a body of theoretical and empirical literature, suggests substantial cross-subject, international consensus over best practice in research methods training in the curriculum. The literature on methods training and research in the social sciences identified two similar and related approaches that were regarded to be best practice across most of the survey countries. These approaches consist of: 1) quantitative literacy for all students, accomplished through the integration of quantitative skills and data analysis throughout the programme; and 2) rigorous methods training as part of a wider programme of scientific research in the social sciences.

### **5.1. Quantitative Literacy**

Most of the countries in this survey suffer from shortages in the mathematical skills of their populations at all levels of education. Employers demand more numerate graduates at the same time that research councils worry about the need for more numerate postgraduates. Universities face a difficult task in meeting both of these demands in their undergraduate curricula (Association of American Colleges 1990; Eberts et al. 1990; Levine et al. 2004; McKinney et al. 2004). The first focuses upon the minimum basic skills of all graduates while the second seeks to provide more advanced training for the more successful students who might continue on to postgraduate education. On the issue of minimum skills for all graduates, the concept of ‘quantitative literacy’ has become increasingly prominent as the need for mathematical skills has become more important and understood to be something all graduates should have (Steen 2001), while the quantitative abilities of most graduates remain low (Madison 2003).

Universities in many countries, including Australia, Canada, Finland, and the United States, offer broad based liberal arts curricula. Many of these institutions, particularly in the United States, Canada, and Finland, have long required undergraduates to complete credits in mathematics. Most students choose introductory or even ‘remedial’ maths or statistics modules which develop their numeracy skills. A common practice of advocates of quantitative literacy, such as the American Statistical Association, has been the search for common standards or ‘best practice’ for introductory statistics curricula and teaching methods (Garfield et al. 2000). These modules reflect the need to develop practical skills and understanding among all students, but they are separate from any particular (major) subject of

study. Such isolated, stand-alone modules can only develop a student's skills so far outside of a disciplinary subject. When students take such courses in isolation from their main subject they often see it as irrelevant or something that can be completed and then forgotten. Further, teachers in particular subjects cannot assume their students have any prior quantitative training because such universities rarely stipulate when the math requirement must be taken, and students can choose from a variety of modules, not all of which will be appropriate for studying the major subject.

Requiring students to take a single course in maths or statistics does not ensure that they will develop the level of skills required. More recent literature on quantitative literacy recommends the integration of quantitative skills throughout a curriculum. Such skills cannot be learned or retained without continuing to practice and reinforce them, so they must be embedded within many different modules or classes throughout a programme (Howery and Rodriguez 2006; Levine et al. 2002; Schneider 2004). The American Mathematics Association has played a leading role in developing quantitative literacy and actively supports the adoption of minimal quantitative training standards for all students as well as the use of data and quantitative skill in modules throughout a students' programme (Gillman 2006). The National Science Foundation, the social science funding council in the U.S., promotes this integrated approach to quantitative skills and student research as best practice (Levine et al. 2004). It endorses the MOST and IDA projects, developed by the American Sociological Association, which emphasise the importance of adopting curriculum changes across whole departments or, at least, substantial proportions of them rather than in individual modules (Levine et al. 2002).

Quantitative methods should be taught as early in a student's programme as possible. Practical use of quantitative data is emphasised in multiple modules throughout the programme, though not necessarily to an advanced level. Students are encouraged to experience hands-on research as often as possible. The linking of quantitative literacy to research is a critical aspect of this approach, which seeks to explicitly use quantitative skills as part of the research experience, making student research the main goal (Ishisyama 2002; Levine et al. 2004; SSHRC 2005). Though advocates of quantitative literacy tie the acquisition of skills to practical student projects, the promotion of undergraduate research is a separate educational innovation in its own right with its own champions and sources of support.

## **5.2. Undergraduate Research**

In 1998, the Boyer Commission of the Carnegie Commission on Higher Education recommended that universities provide research-based learning, undergraduate research, and internships. The National Science Foundation reaffirmed this commitment, alongside an endorsement of the integration of data analysis throughout an entire programme in their recommendations of best practice for teaching social science (Levine et al. 2004). Discipline reports on best practices in undergraduate learning and teaching for psychology and sociology promote undergraduate research (Halonen et al. 2007; McKinney et al. 2004). Practicing social science is seen as the best way to develop higher level skills and learning outcomes while engaging students (see Seymour et al., 2003 and Jenkins, Breen and Lindsay, 2003 for reviews of the literature).

The different countries which advocate this approach to teaching share a concern with increasing student understanding of the scientific method and developing the skills to apply it by carrying out research. This approach clearly emphasises teaching the scientific method and engaging students in research rather than developing quantitative skills in particular, even where there are explicit concerns over the need for such skills. The particular methods used are not deemed as important as actively doing scientific research. The most common example of this approach involves a large final year research project, thesis or dissertation. However, viewing the final year project as the be all and end all of undergraduate research seriously underestimates the aims of the integrated approach that many programmes take to encouraging student research. The final project is simply the culmination of a sequence of research methods training and practice. The whole programme of study is supposed to develop a student's ability to carry out research. Just as the teaching of methods should not be confined to a single module, students' hands-on experience of doing research should not be limited to a final dissertation module.

Modules throughout the programme should not only cover how to do research but should engage students in large or small hands-on projects. Research Councils in the U.S. and Canada have funded efforts to make the use of data, particularly from large datasets, easily available for use in the classroom as part of the effort to encourage students to work with such data (Howery and Rodriguez 2006; Levine et al. 2002; SSHRC 2002, 2005). The provision of undergraduate research skills such as data handling and analysis throughout the curriculum demonstrates its importance to students, allows them to practice in order to develop their skills. The United States and Canada promote an integrated package of research

methods and undergraduate research as best practice for the social sciences as an aspiration for their universities, most of which do not follow such an approach. However, universities in other countries such as the Netherlands, Finland, Norway, and Sweden largely follow this approach in the social sciences as an explicitly identified requirement of an undergraduate degree.

The Netherlands demonstrates the most rigorous use of the integrated approach to undergraduate research, but the pattern is similar in the Scandinavian countries. Students take classes on research methods early in their degree, and they continue to take other such modules throughout their degree. This high level of training in research methods is put to use throughout the degree. Students engage in multiple research projects. The integrated approach is clear in this pattern: methods training and hands-on research, sometimes referred to as theory and practice, is carried out by students throughout their programme rather than simply in a few modules near its end. Social science degrees all seek to train students to understand and apply the scientific method as researchers. The strong system of quality assurance strictly enforces this ethos, and external auditors inspect programmes down to the number, content, and timing of modules in a student's programme (QANU 1999, 2001, 2002, 2003, 2004). Finland, Norway, and Sweden provide similar social science curricula, though none has as many required components as the Netherlands. Each country requires an integrated package of methods training and undergraduate research that is not restricted to just a final year dissertation. These countries also have a strong, centralised system of quality assurance that oversees detailed subject reviews that enforce this approach to teaching.

This review concludes that best practice in the teaching of quantitative methods consists of the integration of methods training across as much of the programme as possible. The best way to demonstrate the relevance of this training and to reinforce the skills it develops is to include hands-on research projects or activities across the programme as well. A majority of the survey countries either advocate or practice this approach to social science degrees. The importance of providing a coherent and consistent approach throughout a programme should be emphasised. Where this approach is adopted, it promotes active student engagement with scientific research. It is the process of preparing for and doing hands-on research that is the most important. The actual level or extent of quantitative training is key element of these programmes. When quantitative methods are included frequently and as part of the research process, rather than isolated in a single module that does not connect to any other coursework in the programme, then students will engage with these key skills. More importantly, it is doing research that gets students excited about social science and makes them more likely to

consider postgraduate training (Hathaway and Gregerman 2002; Kremer and Bringle 1990). Even better, this method shows particular success in engaging and recruiting students from a minority or disadvantaged background (Levine et al. 2002). Once at the postgraduate level, student can undergo the levels of advanced training needed to produce strong quantitatively trained social scientists.

## 6. Recommendations

The literature and practices of the survey countries are clear and consistent, and they provide clear indications of best practice that can effectively inform policy developments in the U.K. Based upon these trends and areas of consensus, the key recommendations of this report are:

1. Developing good methods skills requires engaging students in the process of scientific research throughout their programme. Undergraduates should learn about research methods but, most importantly, they should apply them in order to better understand the scientific method, reinforce the skills they learn, and experience the benefits of using them rather than seeing methods as a purely theoretical exercise. A major research project should be a required part of any honours degree in the social sciences, but the student experience of research should not be confined to that one project.
2. Methods training and research should be integrated throughout social science programmes. For too long, quantitative methods teachers have carried out in isolation the difficult job of teaching a topic both feared and disliked by many students. It should not be the job of one or two specialists in methods to provide all the methods training in a programme. Data handling and analysis should occur in modules throughout a degree. They should all build upon and develop research methods skills, both quantitative and qualitative, with the clear aim of getting students doing research.
3. Quantitative methods, in particular, should be emphasised throughout the modules of a programme, though not necessarily at an advanced level. All students should become used to collecting, reading, manipulating, and analysing numerical data. These tasks are all more interesting and relevant when carried

out within the context of a particular subject. Numerical data inspires less fear and hostility from students if it occurs frequently across many different subjects. It is seen as a normal way to examine almost any subject rather than a difficult set of skills completely contained within one module called ‘quantitative methods’ or ‘introductory statistics’.

All of these recommendations build upon the existing challenges and strengths of undergraduate methods teaching and research in U.K. universities. There is a long tradition of undergraduate research, with a strong emphasis upon the dissertation in most subjects. There is also a widespread culture of hostility towards mathematics throughout many subjects. The lack of sustained and widespread mathematics training among secondary school students and their fear and suspicion of taking up maths or statistics once in university creates a substantial impediment to quantitative methods training, particularly in the increasing competition for student numbers that will occur over the next decade. Any successful response to this problem should build on the strengths of the current system. The strong culture of undergraduate research creates a context in which skills and experience in using quantitative data can be successfully integrated throughout undergraduate programmes. Quantitative methods can be integrated into ordinary subject modules rather than entirely isolated within ‘methods’ or ‘statistics’ modules. Students will practice their skills more frequently and stop regarding research as being entirely quantitative or non-quantitative. The promotion of undergraduate research will subsequently help recruit new cohorts of postgraduate students who are less hostile to training in the quantitative skills that the subjects will need.

## 7. Conclusion

This review has carried out its goals listed in the Background section.

1. It has provided current details on the state of undergraduate quantitative methods training in social science disciplines in the survey countries. The results of that survey are provided in the appendices which follow.
2. The evaluation of how this training fits into each country's overall education programme and how it helps create quantitatively skilled postgraduates is contained within the discussion of the results for each country in the appendices. There was not enough evidence to test any correlation between the overall system of education, provision of quantitative training at undergraduate level, and the production of postgraduates.
3. Best practices in methods training were identified using the survey results and academic literature for each discipline.
4. The implications of these findings for U.K. undergraduate education were evaluated and appropriate recommendations made.

## 8. Appendix A: Summary of Results Across Countries

**Mean Number of Quantitative Methods Modules Required**

	Australia	Canada	Finland	Netherlands	Norway	Spain	Sweden	United States
Business	0.7	2.0	1.6	2.0	1.3	1.5	0.1	1.4
Economics	0.7	2.0	1.9	2.8	2.2	2.0	1.2	2.0
Geography	0.0	0.6	1.0	2.0	0	0.2	0.1	0.4
Political Science	0.0	0.2	0.3	1.1	0.3	1.0	0.1	0.2
Psychology	0.2	1.2	1.5	3.4	0.8	0.6	0.6	1.1
Sociology	0.0	0.7	1.0	3.2	0.6	1.6	0.4	0.9

The results suggest that, apart from economics or business, quantitative methods are seldom required at an advanced level, which is defined as going beyond an introductory module. Even in business and economics the training is not consistent, nor is it particularly deep.

**Mean Number of General Research Methods Modules Required**

	Australia	Canada	Finland	Netherlands	Norway	Spain	Sweden	United States
Business	1.2	0.1	0.4	4.4	0.3	0.3	0.6	0.2
Economics	1.6	0.1	.09	1.7	0	0.7	0	0.0
Geography	1.0	1.1	2.0	2.3	1.8	4.3	0.8	1.1
Political Science	0.5	0.3	1.1	3.3	0.5	1.9	1.1	0.3
Psychology	1.8	0.9	1.8	2.8	1.0	3.3	1.5	1.0
Sociology	1.4	1.2	2.0	2.7	1.0	4.8	1.3	1.0

Despite there being consistent requirements for research methods training, the levels rarely exceed a mean of two modules for a degree. As with quantitative methods, there are few instances of particularly advanced and sustained levels of training. However, just as

quantitative methods should not be considered in isolation from general research methods, the overall levels of methods training should not be separated from undergraduate research.

### Mean Number of Undergraduate Research Modules Required

	Australia	Canada	Finland	Netherlands	Norway	Spain	Sweden	United States
Business	0	0	.7	1.9	0.7	0.1	0.8	0
Economics	0	0	0.4	1.0	0.4	0.1	0.9	0
Geography	0	0	1.0	2.5	0.4	0.1	1.6	0.1
Political Science	0	0	0.6	2.1	0.3	0.1	1.6	0
Psychology	0	0	0.3	1.7	1.0	0	1.3	0.1
Sociology	0	0	0.7	2.3	0.6	0.1	1.5	0.1

Comparisons of undergraduate research requirements vary widely across countries but, unlike the results for quantitative and general research methods, do not vary as much across disciplines. Clearly, systems of higher education in some countries endorse the inclusion of a research project, thesis or dissertation as part of their undergraduate curricula.

## 9. Appendix B: Australia

The Australian undergraduate degree system was modelled upon the Scottish system. It offers a three year bachelor’s degree with an optional fourth year to gain an honours degree. The degree requirements are relatively flexible in the liberal arts tradition, and there are current moves to strengthen this approach, particularly at the University of Melbourne. Student preparation in high school is an important issue when discussing quantitative training at undergraduate level, since the breadth of the curriculum and depth of mathematical learning determines the skills students bring to their degree study.

Mathematics is compulsory up to the age of 16 and is voluntary for the final two years of secondary education. As in many Western countries, there has been a decline in students taking the most rigorous mathematics courses. For example, in Queensland student numbers for such courses (Maths C) declined by 51% between 1991 and 2001 (Ridd 2004). The increasing decline in mathematics education and skills among secondary school students has effects at the undergraduate level as well, and many higher education institutions have reduced requirements for these higher mathematics qualifications. As in many countries, there is a decline in students’ willingness and ability to take courses that require maths.

**Table 4: Quantitative Methods Modules in Australia Universities**

			Number of Quantitative Methods Modules				Total	Mean
			.0	1.0	1.5	2.0		
subject	Business	Count	4	6	0	1	11	0.7
			36.4%	54.5%	.0%	9.1%	100.0%	
	Economics	Count	8	2	0	4	14	0.7
			57.1%	14.3%	.0%	28.6%	100.0%	
	Geography	Count	6	0	0	0	6	0.0
			100.0%	.0%	.0%	.0%	100.0%	
	Political Science	Count	12	0	0	0	12	0.0
			100.0%	.0%	.0%	.0%	100.0%	
	Psychology	Count	9	1	1	0	11	0.2
			81.8%	9.1%	9.1%	.0%	100.0%	
	Sociology	Count	14	0	0	0	14	0.0
			100.0%	.0%	.0%	.0%	100.0%	
Total		Count	53	9	1	5	68	
			77.9%	13.2%	1.5%	7.4%	100.0%	

Quantitative methods training levels appear relatively low within the social sciences in Australia. The majority of undergraduate courses in every subject except business have no

requirements for quantitative methods. Even the most quantitative subject, economics, rarely has compulsory modules. Australia comes last among the survey countries in quantitative methods training for every subject except business, which is second to last ahead of Sweden. It appears that only a small proportion of programmes in the social sciences require quantitative methods training.

**Table 5: Research Methods Modules in Australia Universities**

		Number of Research Methods Modules							Total	Mean
		.0	.5	1.0	2.0	3.0	4.0			
subject	Business	Count	4	0	3	3	1	0	11	1.2
			36.4%	.0%	27.3%	27.3%	9.1%	.0%	100.0%	
	Economics	Count	4	0	2	4	4	0	14	1.6
			28.6%	.0%	14.3%	28.6%	28.6%	.0%	100.0%	
	Geography	Count	4	0	0	1	0	1	6	1.0
			66.7%	.0%	.0%	16.7%	.0%	16.7%	100.0%	
	Political Science	Count	9	0	1	1	1	0	12	0.5
			75.0%	.0%	8.3%	8.3%	8.3%	.0%	100.0%	
	Psychology	Count	1	1	3	3	2	1	11	1.8
			9.1%	9.1%	27.3%	27.3%	18.2%	9.1%	100.0%	
	Sociology	Count	3	0	6	2	3	0	14	1.4
			21.4%	.0%	42.9%	14.3%	21.4%	.0%	100.0%	
Total		Count	25	1	15	14	11	2	68	
		%	36.8%	1.5%	22.1%	20.6%	16.2%	2.9%	100.0%	

Australia falls roughly in the middle of the survey countries in terms of its level of general research methods training. Though the more numerate subjects of business and economics have low levels of quantitative methods training, they have the second highest level of general research training. These subjects do not traditionally require general research methods, and Australia and the Netherlands are the only two countries to require more than a full module. In the other subjects Australia falls almost exactly in the middle of the survey countries.

### **9.1. Honours Degrees**

No ordinary bachelor's degree programmes in Australia require a thesis or dissertation, but this lack of student research requirements could be misleading since a substantial number of students do an additional year to gain an honours degree. This additional year often involves some research training, and it always involves a thesis, dissertation, or other form of research project carried out independently by the student. The figures from 2005 indicate that about 12% of undergraduates in the social sciences go on to take an honours degree (Australia

Department of Education 2007). Clearly, a substantial group of students do research related work by pursuing this route.

**9.2. The Bachelor of Social Science in Australia**

The relatively low level of research and methods training in social science subjects in Australia, like the figures for theses and dissertations, may underestimate the extent of training because some universities offer general social science degrees that are more focused upon research and methods training than named degrees in disciplinary subjects and have a strong reputation in this approach. Out of the 14 universities surveyed in Australia, six grant Bachelor of Social Science degrees. Their core requirements are summarised in the tables below.

**Table 6: Quantitative methods modules for Bachelors of Social Science in Australia Universities**

			Number of Quantitative Methods Modules		Total	Mean
			.0	7.0		
Subject	Social Science	Count	5	1	6	1.2
		% within Subject	83.3%	16.7%	100.0%	

**Table 7: Research Methods Modules for Bachelors of Social Science in Australia Universities**

			Number of Research Methods Modules				Total	Mean
			.0	1.0	2.0	4.0		
Subject	Social Science	Count	1	1	3	1	6	1.8
		% within Subject	16.7%	16.7%	50.0%	16.7%	100.0%	

These degrees offer little training in quantitative methods, despite their reputation in this area. Only one requires quantitative methods, but it focuses heavily this training and single-handedly drives the mean score up to 1.2 even with no other universities requiring quantitative methods. General research methods training appears more robust, with all but one university requiring at least one module and two thirds requiring two or three modules. The average of 1.8 modules puts it ahead of most subjects in all countries except the Netherlands and Spain. None of these programmes require a thesis or dissertation, which are only required for honours degrees.

### **9.3. Business**

Of the surveyed subjects business departments are the most likely to require a quantitative methods course with about two-thirds requiring one or more modules. This level of methods teaching is high compared to most other business degrees in the surveyed countries. The figures for research methods modules appear similarly rigorous with about two-thirds of departments requiring at least one module. Further, many departments required more than one module, and the mean number of research methods modules for business was 1.2 compared to only .7 for quantitative methods.

### **9.4. Economics**

Fewer than half of the surveyed economics departments require a quantitative methods module. Of those who do, most require two modules. Research methods courses are required in over two-thirds of the surveyed departments with over half requiring two or three modules. It may be the case that some quantitative training is provided in the research methods modules, though this was not apparent from the titles and short descriptions of the modules.

### **9.5. Geography**

None of the geography departments require quantitative methods modules and only one-third require any research methods. This lack of methods training is very striking for a subject that is often seen as straddling the social sciences and natural sciences. Only a small number of geography programmes were identified in the survey. Students may take this subject through natural science or sociology degrees, as is common in many countries.

### **9.6. Political Science**

Political science generally provides the least methods training of all the social sciences, and the Australia follows this pattern. None of the surveyed departments require a quantitative methods course. This puts Australia firmly last among all countries. In research methods it appears slightly stronger. Half of the survey countries require less than one full module, and Australia appears at the top of that list.

### **9.7. Psychology**

Like geography, psychology straddles the social and natural sciences and usually requires a high level of methods training. However, only two of eleven departments require any quantitative methods. Even those two only require one and one-and-a-half modules each.

Australia's average of .2 modules is by far the lowest of any survey country. Only three countries require less than a full module, and the other two countries, Spain and Sweden, require .6 modules on average. Research methods fare much better with all but one department out of eleven requiring it, but this level does not compensate for the lack of any quantitative methods training. A majority required either one or two modules with a mean of 1.8 modules over all the programmes. Most other countries provide similar levels. Only Canada, Norway, and the United States require fewer modules, with roughly one each.

### **9.8. Sociology**

Like geography and political science, none of the sociology departments require any quantitative methods courses in their undergraduate curricula. This lack of training is very unusual since such training is required in most programmes in all other survey countries. However, eleven of fourteen departments do require research methods. The most common requirement is for one module, but a substantial number require more, returning a mean score of 1.4 modules. Australia appear slightly above average compared to sociology in other countries. When the lack of any quantitative methods is taken into account, the levels of methods training look relatively low.

### **9.9. Summary**

The level of quantitative methods training in undergraduate programmes in Australia appears low throughout the social sciences and is clearly the lowest of the survey countries. Even the more numerate disciplines such as economics have no consistent level of training. Research training appears stronger and more consistent across most subjects, though these levels appeared generally average compared to similar subjects in the other survey countries. Interestingly, the commonly more numerate discipline of economics and its companion subject business provide the strongest research methods training, which is unusual among the countries examined in this report. Only political science, which is the weakest subject for any form of methods training across all countries, fails to return a mean of over one required module. Similarly, the state of undergraduate research, while completely absent from ordinary bachelor's degrees, shows some strength with over one-tenth of students going on to complete an honours degree which requires a thesis, dissertation, or research project.

## 10. Appendix C: Canada

Canadian universities offer three year bachelors degrees, though some four year single subject degrees have been developed. Its undergraduate degrees historically developed out of the Scottish system and tend to blend the UK's depth of study in disciplinary subjects with the wider North American emphasis on breadth in the liberal arts tradition. An additional year is optional in order to gain an honours degree. The Social Sciences and Humanities Research Council of Canada (SSHRC) has identified the lack of quantitative skills among postgraduates and academic staff as a serious problem (SSHRC and Statistics Canada 2002), which has pointed to the lack of research training at the undergraduate level and called for the integration of research training into undergraduate studies (SSHRC 2005). In response, the research council has proposed to increase the use of social statistics in undergraduate training. However, most of the policy proposals by the research council to increase quantitative skills among academic staff and postgraduates have focused upon postgraduate training. Initiatives at undergraduate level appear comparatively limited in size and scope and are targeted more at promoting general research training rather than any specifically focused attention on quantitative methods.

**Table 8: Quantitative Methods Modules in Canada Universities**

			Number of Quantitative Methods Modules									Total	Mean
			.0	.5	1.0	2.0	3.0	3.5	4.0	5.0			
Subjects	Business	Count	2	0	5	8	3	0	2	1	21	2.0	
		%	9.5%	.0%	23.8%	38.1%	14.3%	.0%	9.5%	4.8%	100.00%		
	Economics	Count	6	0	6	12	9	0	4	3	40	2.0	
		%	15.0%	.0%	15.0%	30.0%	22.5%	.0%	10.0%	7.5%	100.00%		
	Geography	Count	17	1	11	3	1	0	0	0	33	0.6	
		%	51.5%	3.0%	33.3%	9.1%	3.0%	.0%	.0%	.0%	100.00%		
	Political Science	Count	34	0	9	0	0	0	0	0	43	0.2	
		%	79.1%	.0%	20.9%	.0%	.0%	.0%	.0%	.0%	100.00%		
	Psychology	Count	8	2	19	10	3	0	0	0	42	1.2	
		%	19.0%	4.8%	45.2%	23.8%	7.1%	.0%	.0%	.0%	100.00%		
	Sociology	Count	23	0	12	6	0	1	0	0	42	0.7	
		%	54.8%	.0%	28.6%	14.3%	.0%	2.4%	.0%	.0%	100.00%		
	Total		Count	90	3	62	39	16	1	6	4	221	
			%	40.7%	1.4%	28.1%	17.6%	7.2%	.5%	2.7%	1.8%	100.00%	

Overall, Canada appears low on methods training compared to other countries. It requires fewer modules, on average, in all types of research methods and has low levels of mandatory research projects or dissertations. The subjects of business and economics both prove the exception to this trend, showing higher levels of quantitative training than in other

countries. Psychology appears similar to most other countries in the survey while geography, political science, and sociology appear weaker. The results for geography and sociology show an interesting distribution, with a small group of universities providing rigorous levels of training, but over half of the universities provide no mandatory training in either subject.

**Table 9: Research Methods Modules in Canada Universities**

			Number of Research Methods Modules							Total	Mean
			.0	.5	1.0	2.0	3.0	4.0			
Subjects	Business	Count	18	0	3	0	0	0	21	0.1	
		%	85.7%	.0%	14.3%	.0%	.0%	.0%	100%		
	Economics	Count	38	0	2	0	0	0	40	0.1	
		%	95.0%	.0%	5.0%	.0%	.0%	.0%	100%		
	Geography	Count	10	1	11	8	2	1	33	1.1	
		%	30.3%	3.0%	33.3%	24.2%	6.1%	3.0%	100%		
	Political Science	Count	34	0	6	3	0	0	43	0.3	
		%	79.1%	.0%	14.0%	7.0%	.0%	.0%	100%		
	Psychology	Count	11	2	23	6	0	0	42	0.9	
		%	26.2%	4.8%	54.8%	14.3%	.0%	.0%	100%		
	Sociology	Count	5	1	19	13	3	1	42	1.2	
		%	11.9%	2.4%	45.2%	31.0%	7.1%	2.4%	100%		
	Total		Count	116	4	64	30	5	2	221	
			%	52.5%	1.8%	29.0%	13.6%	2.3%	.9%	100%	

Research methods training appears weak for business and economics, which is common among the survey countries. Geography appears similar, though it did not have a high level of quantitative methods to offset this level. Political Science is particularly weak with only 9 of 43 universities providing any research methods training at all. Psychology appears lower than average, though it should be balanced against a higher score for quantitative training may have depressed the level of general research training. Sociology is slightly higher than average, which may also reflect its low score in quantitative training. This difference may occur because some quantitative training happens within general research methods modules, but there is no indication of this content from general module descriptions.

Table 10: Thesis/Dissertation Modules at Canada Universities

			Number of Thesis/Dissertation Modules		Total	
			.0	1.0		
Subjects	Business	Count	20	1	21	
		%	95.2%	4.8%	100.0%	
	Economics	Count	38	2	40	
		%	95.0%	5.0%	100.0%	
	Geography	Count	32	1	33	
		%	97.0%	3.0%	100.0%	
	Political Science	Count	43	0	43	
		%	100.0%	.0%	100.0%	
	Psychology	Count	39	3	42	
		%	92.9%	7.1%	100.0%	
	Sociology	Count	42	0	42	
		%	100.0%	.0%	100.0%	
	Total		Count	214	7	221
			%	96.8%	3.2%	100.0%

Canada does not have a widespread practice of requiring theses or dissertations from undergraduates. No university requires them in sociology or political science. Only 7% of universities offering psychology degrees and 5% of those offering business or economics degrees require them. However, like the United States, Canada allows students to voluntarily enrol in an Honours programme for selected subjects in each university. Students must have high grades and are typically required to complete a thesis or dissertation. Because the system is voluntary and elite it does not appear on these tables.

### 10.1. *Business*

All but two university business programmes require at least one course in quantitative methods. Two-thirds of these programmes require two or more modules (67%). This figure represents a very high level of training for a subject that tends to be the less numerate relative of economics. This high level of requirements rapidly falls away for general research methods courses, with 18 of 21 universities requiring no training at all. The remaining three only require one course. Similarly, only one university requires a thesis or dissertation. Business closely resembles economics in Canadian universities with a focus on quantitative skills but not upon research in general.

## **10.2. Economics**

Like business, economics shows a strong commitment to quantitative methods with thirty-four out of forty universities requiring training. A majority of programmes require either two or three modules with a mean number of 2.0 modules per programme. This training falls off almost completely when it comes to research methods. Only two out of forty programmes require any training in this area with one module each. Similarly, only two programmes require a thesis or dissertation.

## **10.3. Geography**

Fewer than half of geography departments require any quantitative methods for undergraduates. Of those universities that do require quantitative methods, two-thirds require one module. The overall mean number of modules required is 0.6, though geography appears stronger in general research methods with a mean of 1.1 modules. The distribution for general research methods roughly falls into thirds. The first third of programmes has no requirements, the second third requires one module, and the final third requires more than one module. Only one university out of thirty three requires a thesis or dissertation.

## **10.4. Political Science**

Fewer than one-quarter of political science programmes require any quantitative methods. All departments with such training (21%) require one module. Research methods requirements appear almost identical with fewer than a quarter of programmes having a requirement of either one or two modules. No programmes require a thesis or dissertation.

## **10.5. Psychology**

More than three-quarters of programmes require at least one quantitative methods module. Of those that require it, most (45% of all programmes) demand one or two (23 %) modules. One-fifth of programmes require no quantitative methods, which lowers the overall mean to 0.7 modules. The picture is slightly stronger for research methods with over half (55%) of all programmes requiring one module. A much smaller group (14%) requires two modules. However, one quarter of programmes require no methods at all, which lowers the mean down to 0.9 modules. Only three of forty-two programmes require a thesis or dissertation.

## **10.6. Sociology**

Fewer than half (55%) of sociology programmes require any quantitative methods training. The most common standard for those programmes with training is one module. The picture for general research methods is much stronger. Almost nine in ten programmes require some training, with three quarters of programmes requiring either one or two modules, and one-tenth requiring three or four modules. No programmes require a thesis or dissertation.

## **10.7. Summary**

Quantitative methods in undergraduate programmes in Canada appear strongest in the more numerate subject of economics and its related subject, business. Psychology also shows a robust level of training. However, geography, political science, and sociology appear comparatively weaker in relation to practices in other countries with mean numbers of required modules well below 1. This picture changes somewhat for general research methods, where geography and sociology require mean numbers of modules above 1. Research methods training appears less substantial in political science and, surprisingly for a potentially scientific subject, psychology. Economics and business focus entirely upon quantitative methods and have almost no general research methods courses. Canadian universities do not seem to engage strongly with undergraduate research with few universities requiring a thesis or dissertation.

The social science research council in Canada is clearly worried about quantitative skills among its graduates and postgraduates. It has commissioned reports on the issue and its preferred solutions are to promote undergraduate research more generally and boost the provision of data handling modules and lessons to be integrated into social science programmes (SSHRC 2005).

## 11. Appendix D: Finland

Undergraduate degrees in Finland take three years to complete. The degrees offer an element of breadth, and both the government and universities have promoted increasing breadth through the study of minor subjects more freely across faculty and department boundaries. (Kaiser et al. 2001b; Massen et al. 2005). Finland has twenty universities. The eleven that offer social science degrees were included in this survey. Quantitative methods training in Finland encounters obstacles that are common to most other countries. In particular, student hostility and poor results have undermined the effort to provide quantitative skills, which presents a serious issue due to the need for these skills in pursuing undergraduate research (Murtonen 2005).

Table 11: Quantitative Methods Modules in Finland Universities

			Number of Quantitative Methods Modules							Total	Mean
			.0	1.0	1.5	2.0	3.0	4.0			
subject	Business	Count	4	0	0	2	1	0	7	1.6	
		% within subject	57.1%	.0%	.0%	28.6%	14.3%	.0%	100%		
	Economics	Count	2	1	1	1	2	1	8	1.9	
		% within subject	25.0%	12.5%	12.5%	12.5%	25.0%	12.5%	100%		
	Geography	Count	0	1	0	0	0	0	1	1.0	
		% within subject	.0%	100.0%	.0%	.0%	.0%	.0%	100%		
	Political Science	Count	6	0	0	1	0	0	7	0.3	
		% within subject	85.7%	.0%	.0%	14.3%	.0%	.0%	100%		
	Psychology	Count	1	3	0	2	0	0	6	1.5	
		% within subject	16.7%	50.0%	.0%	33.3%	.0%	.0%	100%		
	Sociology	Count	4	1	0	1	0	1	7	1.0	
		% within subject	57.1%	14.3%	.0%	14.3%	.0%	14.3%	100%		
	Total	Count	17	6	1	7	3	2	36		
		% within subject	47.2%	16.7%	2.8%	19.4%	8.3%	5.6%	100%		

Quantitative methods training in Finnish universities appears above average compared to levels in other survey countries, though these figures are derived from a small number of programmes. There is also a distinct divide in some subjects between strongly quantitative programmes and those with no quantitative training at all. Business, economics, political science and sociology require levels of training which appear similar to the average of levels

in other countries. However, the figures for Sociology are skewed by one programme with a high requirement of four modules. This outlier masks the fact that a majority of programmes in Sociology require no quantitative methods. Geography and psychology require the second highest average levels of any survey country other than the Netherlands. However, the Geography figure refers to only one university. In addition to quantitative methods requirements in degree subjects, universities require general maths modules as part of a liberal arts requirement similar to those found in U.S. universities. Such courses provide general maths skills but are not focused upon quantitative methods in a discipline. Since they were not integrated into the programme they were not counted, though this may underrepresent the mathematical skills of students when they do undertake quantitative training.

**Table 12: Research Methods Modules in Finland Universities**

			Number of Research Methods Modules							Total	Mean
			.0	1.0	2.0	2.5	3.0	4.0	5.0		
subject	Business	Count	4	3	0	0	0	0	0	7	0.4
			57.1%	42.9%	.0%	.0%	.0%	.0%	.0%	100%	
	Economics	Count	4	2	0	1	1	0	0	8	.09
			50.0%	25.0%	.0%	12.5%	12.5%	.0%	.0%	100%	
	Geography	Count	0	0	1	0	0	0	0	1	2.0
			0%	0%	100.0%	.0%	.0%	.0%	.0%	100%	
	Political Science	Count	2	3	1	0	1	0	0	7	1.1
			28.6%	42.9%	14.3%	.0%	14.3%	.0%	.0%	100%	
	Psychology	Count	1	2	2	0	0	0	1	6	1.8
			16.7%	33.3%	33.3%	.0%	.0%	.0%	16.7%	100%	
	Sociology	Count	0	4	1	0	0	2	0	7	2.0
			.0%	57.1%	14.3%	.0%	.0%	28.6%	.0%	100%	
Total		Count	11	14	5	1	2	2	1	36	
			30.6%	38.9%	13.9%	2.8%	5.6%	5.6%	2.8%	100%	

Levels of general research methods requirements also appear slightly above average compared to other survey countries. Economics, political science, and sociology require comparatively higher levels of training while business, geography, and psychology show levels that are about average.

**Table 13: Thesis/Dissertation Modules in Finland Universities**

			Number of Thesis/Dissertation Modules			
			.0	1.0	Total	Mean
subject	Business	Count	2	5	7	.7
			28.6%	71.4%	100%	
	Economics	Count	5	3	8	0.4
			62.5%	37.5%	100%	
	Geography	Count	0	1	1	1.0
			.0%	100.0%	100%	
	Political Science	Count	3	4	7	0.6
			42.9%	57.1%	100%	
	Psychology	Count	4	2	6	0.3
			66.7%	33.3%	100%	
	Sociology	Count	2	5	7	0.7
			28.6%	71.4%	100%	
Total		Count	16	20	36	
			44.4%	55.6%	100.0%	

Dissertation and thesis requirements appear fairly high compared to other survey countries, with a majority of Finnish programmes requiring one thesis. Only economics and psychology do not require a thesis in a majority of their programmes. The lack of research experience in psychology appears particularly odd since that subject is most often associated with the natural sciences and, therefore, would seem more likely to promote research among students. Finland’s widespread requirements for undergraduate research make it the third highest among the survey countries, behind only the Netherlands and Sweden.

### **11.1. Business**

Business programmes show a high level of quantitative methods requirements with an overall mean of 1.6, which is comparatively high but masks a polarised distribution. A large gap exists between universities with and without quantitative methods requirements. Only three out of seven programmes require quantitative methods but those require two or three modules each. General research methods levels are much lower, with a mean of 0.4, but this result is typical across countries. However, the thesis requirement is very consistent, with five of seven programmes requiring one module.

### **11.2. Economics**

The level of quantitative methods training in economics appears just below the average of other survey countries with a mean of 1.9. Six of eight programmes require it with

the levels evenly distributed between one and four modules. Half of the programmes require general research methods training which makes its mean of 0.9 modules the third highest in the survey, behind the Netherlands and Australia. Thesis requirements are the lowest for any subject in Finland, with three of eight programmes requiring one thesis. However, this mean of 0.4 is still above average for most survey countries.

### **11.3. Geography**

There is only one human geography programme in Finland, so these results should be interpreted very cautiously. The lack universities offering this degree reflects the extent to which the B.A in geography is seen as a part of the natural sciences in Finland. Human geography is often taken as part of a sociology degree, as is often in the case in other countries such as the United States. Finland's programme appears rigorous in its overall research training. The programme requires one module of quantitative methods, which puts it higher than any other country other than the Netherlands. It requires two general research methods modules, which ranks third behind the Netherlands and Spain. Finally, one thesis module is required making the level equal to Sweden and behind only the Netherlands.

### **11.4. Political Science**

Only one out of the six political science departments requires any quantitative methods, though this level is typical of the survey countries. Research methods appear stronger with a mean of 1.1 modules. Five out of seven programmes require it with most (3) requiring one module. Four of seven programmes require one thesis module as well. The requirements for political science appear above average for the subject.

### **11.5. Psychology**

Five of six programmes in psychology require quantitative methods with three requiring one module and two requiring two modules. The mean of 1.5 modules is higher than in any other country except the Netherlands. General research methods are also required in five of six programmes with two requiring one module, two requiring two modules, and one requiring five modules. The mean of 1.8 modules is about average for the survey countries. Only two of six programmes require a thesis, making psychology the weakest of any subject in Finland for undergraduate research.

## **11.6. Sociology**

Only three of seven sociology programmes require quantitative methods, through these programmes require one, two, and four modules. The mean of 1.0 is about average compared to other survey countries but masks the lack of any training in most programmes. By contrast, all seven programmes require research methods training with a mean of 2.0 modules. This level is the third highest in the survey, behind only the Netherlands and Spain. Five of seven programmes require one thesis module, and its mean of 0.7 is again third, behind the Netherlands and Sweden.

## 12. Appendix E: The Netherlands

The Dutch system of higher education is extremely centralised with a small number of overall university programmes in social science subjects. There are two types of higher education programmes in the Netherlands: research oriented education and professional higher education. A Bachelor of Arts or Bachelor of Science requires three years to completion. Undergraduates in the Netherlands specialise in their degree subjects, as they do in the U.K., with little coursework taken outside their particular disciplinary area.

The central government has historically controlled the finance, organization, management, and even curriculum of universities and only began to relax this control over the past twenty years (Huisman & Jenniskens 1994). Despite some attempts at decentralisation through legislation in 1981 and 1993, the government still retains substantial formal control of the curriculum (Huisman & Jenniskens 1994). The system of self regulation was set up, very similar to the system of subject review initially adopted, then abandoned, by the Q.A.A. in the U.K. This system of peer review generates very detailed reports on social science programmes that examines and evaluates the detailed curriculum provision for each. This centralised system with commonly established curriculum standards maintained by peer review in a small academic network allows the Netherlands to maintain such a rigorous system of methods instruction across the social sciences. Such a regime of curricular control resembles that of other Scandinavian countries, and there are many similarities between these countries' approaches to the social sciences. However, only the Netherlands requires such high levels of methods training and research experience.

Table 14: Quantitative Methods Modules in Netherlands Universities

			Number of Quantitative Methods Modules							Total	Mean
			.0	1.0	2.0	3.0	4.0	6.0			
subject	Business	Count	0	1	5	1	0	0	7	2.0	
		% within subject	.0%	14.3%	71.4%	14.3%	.0%	.0%	100.00%		
	Economics	Count	0	0	4	1	0	1	6	2.8	
		% within subject	.0%	.0%	66.7%	16.7%	.0%	16.7%	100.00%		
	Geography	Count	0	1	2	1	0	0	4	2.0	
		% within subject	.0%	25.0%	50.0%	25.0%	.0%	.0%	100.00%		
	Political Science	Count	2	3	3	0	0	0	8	1.1	
		% within subject	25.0%	37.5%	37.5%	.0%	.0%	.0%	100.00%		
	Psychology	Count	0	0	2	4	3	1	10	3.4	

		% within subject	.0%	.0%	20.0%	40.0%	30.0%	10.0%	100.00%	
	Sociology	Count	0	0	2	1	3	0	6	3.2
		% within subject	.0%	.0%	33.3%	16.7%	50.0%	.0%	100.00%	
Total		Count	2	5	18	8	6	2	41	
		% within subject	4.9%	12.2%	43.9%	19.5%	14.6%	4.9%	100.00%	

Levels of quantitative methods teaching in the Netherlands appear higher than in any other country in this survey for every subject except business, where Canada's mean is equal. The Netherlands does not just lead other countries, but it sets a level of quantitative training far beyond any other system. In business and economics the difference is smaller with the Netherlands about one half a module higher than most other countries. In the subjects of psychology and sociology, the mean is more than two modules higher than other countries in the survey. In the subjects of political science and geography the mean is over one module higher than most other countries in the survey. This level of training clearly establishes the Netherlands as having the highest expectations for quantitative methods training.

Table 15: Research Methods Modules in Netherlands Universities

			Number of Research Methods Modules									Total	Mean
			.0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	9.0		
subject	Business	Count	1	0	0	2	0	1	2	1	0	7	4.4
		% within subject	14.3%	.0%	.0%	28.6%	.0%	14.3%	28.6%	14.3%	.0%	100%	
	Economics	Count	1	2	1	2	0	0	0	0	0	6	1.7
		% within subject	16.7%	33.3%	16.7%	33.3%	.0%	.0%	.0%	.0%	.0%	100%	
	Geography	Count	0	1	1	2	0	0	0	0	0	4	2.3
		% within subject	.0%	25.0%	25.0%	50.0%	.0%	.0%	.0%	.0%	.0%	100%	
	Political Science	Count	1	1	2	2	0	0	1	0	1	8	3.3
		% within subject	12.5%	12.5%	25.0%	25.0%	.0%	.0%	12.5%	.0%	12.5%	100%	
	Psychology	Count	0	2	2	3	2	1	0	0	0	10	2.8
		% within subject	.0%	20.0%	20.0%	30.0%	20.0%	10.0%	.0%	.0%	.0%	100%	
	Sociology	Count	1	0	0	4	1	0	0	0	0	6	2.7
		% within subject	16.7%	.0%	.0%	66.7%	16.7%	.0%	.0%	.0%	.0%	100%	
Total		Count	4	6	6	15	3	2	3	1	1	41	

	% within subject	9.8%	14.6%	14.6%	36.6%	7.3%	4.9%	7.3%	2.4%	2.4%	100%	
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The results for research methods teaching, like those for quantitative methods, show the Netherlands to be at the forefront of the countries in this survey, though as marked as for quantitative methods. It maintains a strong level of training in research methods in the more numerate disciplines of business and economics when most countries only require quantitative methods. Its level of training is high in the disciplines of psychology, geography and sociology, and only one country, Spain, has a higher level of requirements in these subjects. Finally, its high level of methods training in political science, consistently the weakest discipline for methods training, surpasses the other countries by more than two modules in most cases.

**Table 16: Thesis/Dissertation Modules in Netherlands Universities**

			Number of Thesis/Dissertation Modules						
			.0	1.0	2.0	3.0	4.0	Total	Mean
subject	Business	Count	1	3	1	0	2	7	1.9
		% within subject	14.3%	42.9%	14.3%	.0%	28.6%	100.0%	
	Economics	Count	2	2	2	0	0	6	1.0
		% within subject	33.3%	33.3%	33.3%	.0%	.0%	100.0%	
	Geography	Count	0	0	2	2	0	4	2.5
		% within subject	.0%	.0%	50.0%	50.0%	.0%	100.0%	
	Political Science	Count	0	3	2	2	1	8	2.1
		% within subject	.0%	37.5%	25.0%	25.0%	12.5%	100.0%	
	Psychology	Count	0	4	5	1	0	10	1.7
		% within subject	.0%	40.0%	50.0%	10.0%	.0%	100.0%	
	Sociology	Count	0	2	1	2	1	6	2.3
		% within subject	.0%	33.3%	16.7%	33.3%	16.7%	100.0%	
	Total	Count	3	14	13	7	4	41	
		% within subject	7.3%	34.1%	31.7%	17.1%	9.8%	100.0%	

The Netherlands combines a strong tradition in both quantitative and research methods training with a vibrant level of undergraduate research that, again, outpaces all other countries in this study. Every single discipline requires at least one thesis/dissertation module, and most require two. This level is far beyond even Sweden, Finland, and Norway, the other countries with strong undergraduate research traditions. The Netherlands is unambiguously

the most advanced country in the provision of training and research experience to undergraduates in the social sciences.

### **12.1. Business**

Quantitative methods training in business is high compared to other countries. The mean module requirement of 2.0 is, along with Canada, at least a half module ahead of other countries and equal to most economics programmes as well. The mean of 2.0 modules is also the most common practice among programmes (71%) with none requiring fewer than one module. General research methods training is even stronger with a mean of 4.4 modules. This level far exceeds that of any other country in either business or economics, and is particularly noteworthy because most programmes in business and economics concentrate upon quantitative methods and rarely require any research methods, whereas only one programme does not require any research methods. The distribution of programme requirements is evenly spread between three and eight modules with over half requiring five or more modules. The depth in methods training is put to use in student research requirements, with the subject requiring a mean of 1.9 modules consisting of a student thesis or research project. Again, this high level occurs in a subject that rarely requires even one thesis of undergraduates.

### **12.2. Economics**

Quantitative methods in economics is, like that for business, ahead of all other countries in this study with a mean of 2.8 modules. Most countries require two modules of training, which is the most common requirement for the Netherlands (67%) as well. However, a sixth of these programmes require three modules with another sixth requiring six modules. The sample of six universities is not particularly large, so these last two outliers do have a strong impact on the mean. Research methods are required in most programmes with a mean of 1.7 modules, which is far higher than any country except Australia (with 1.6). Only one programme (17%) requires no methods with two (33%) requiring one module and two (33%) requiring three modules. Thesis requirements, with a mean of 1.0, are far higher than in any other country except Sweden (which has a mean of 0.9). Only these two countries consistently require such undergraduate research projects in economics.

### **12.3. Geography**

Quantitative methods training in geography, with a mean of 2.0 modules in each programme, has the highest requirements of any country in the survey. The mean number of modules in other countries never goes higher than 1.0 and is usually lower than 0.5. All programmes require quantitative methods with half of all programmes requiring two modules. Research methods training appears similarly high with a mean of 2.3, and this level is ahead of all other countries except Spain. Again, all programmes require research methods with half requiring three modules. The thesis or equivalent research project requirements for geography are particularly rigorous with a mean of 2.5. All other countries have means lower than 0.5 except for Sweden (1.6) and Finland (1.0).

### **12.4. Political Science**

Quantitative methods requirements in this subject appear lower than for other social science subjects, but the mean of 1.1 modules is still higher than any other country except Spain (with 1.0). All other countries have means at or below 0.3 modules. Even in the Netherlands, 25% of programmes have no requirements while the remaining universities are evenly split between two and three modules. Research methods appear much stronger with a mean of 3.3 modules. This level is equal to Spain but almost double that of the next nearest country. Only 12.5% of universities have no such requirement with half of programmes (50%) having either two or three modules. Thesis requirements, with a mean of 2.1 modules, are far beyond any other country. All programmes require a thesis and the distribution is fairly even across one, two, and three modules. The only other country to consistently require a thesis is Sweden with a mean of 1.6 modules.

### **12.5. Psychology**

Quantitative methods requirements are very high with a mean of 3.4 modules. This level is the highest for any subject in any country in this survey, which is remarkable for a subject not seen as numerate as business or economics. No other countries have means higher than 1.5 modules in business programmes. No programmes in the Netherlands require fewer than two modules and over two-thirds require three or four modules. Research methods also appear strong with a mean of 2.8. Only Spain has a higher mean, with 3.3 modules. No other country has a mean higher than 1.8 for this subject. All programmes require some research methods and the distribution is spread fairly evenly from one to five modules. Thesis requirements also appear high with a mean of 1.7 modules, which is higher than for any other

country. Again, no programme fails to require a thesis with almost all (90%) requiring either one or two modules.

## **12.6. Sociology**

Quantitative methods teaching is very strong in this subject with a mean of 3.2 modules. This number is the highest of any country in the survey. It is double that of the next country, Spain, and far exceeds the other countries, none of which has a mean higher than 1.0. No programme requires fewer than two modules, and half of programmes require four modules. Research methods are not quite as strong, with a mean of 2.7 modules, which is second only to Spain among the survey countries. However, there is often an inverse relationship between levels of quantitative and research methods training in a subject. When programmes have particularly high quantitative requirements they often have correspondingly lower general research methods requirements and vice versa. Only one university requires no methods training and two-thirds require three modules. Thesis requirements are also strong with a mean of 2.3 modules. No other country, aside from Sweden with a mean of 1.5, requires a mean of more than 0.7 modules. All programmes require at least one thesis with the requirements distributed fairly evenly between one and four modules.

### 13. Appendix F: Norway

The three year bachelor’s degree is replacing the old four-year university degree (Massen et al. 2005) as a consequence of the Bologna process. Norway has seven universities, which are all examined in this survey. Its higher education system is entirely state controlled and each programme comes under the regulation of a national agency that carries out inspections and requires a relatively strict adherence to a set of national standards for each subject (The Norwegian Agency for Quality Assurance in Education (NOKUT) 2007).

**Table 17: Quantitative Methods Modules in Norwegian Universities**

			Number of Quantitative Methods Modules							
			.0	.5	1.0	2.0	3.0	Total	Mean	
Subjects	Business	Count	0	0	2	1	0	3	1.3	
		%	.0%	.0%	66.7%	33.3%	.0%	100.0%		
	Economics	Count	0	0	0	4	1	5	2.2	
		%	.0%	.0%	.0%	80.0%	20.0%	100.0%		
	Geography	Count	5	0	0	0	0	5	0	
		%	100.0%	.0%	.0%	.0%	.0%	100.0%		
	Political Science	Count	3	2	1	0	0	6	0.3	
		%	50.0%	33.3%	16.7%	.0%	.0%	100.0%		
	Psychology	Count	0	2	2	0	0	4	0.8	
		%	.0%	50.0%	50.0%	.0%	.0%	100.0%		
	Sociology	Count	2	0	3	0	0	5	0.6	
		%	40.0%	.0%	60.0%	.0%	.0%	100.0%		
	Total		Count	10	4	8	5	1	28	
			%	35.7%	14.3%	28.6%	17.9%	3.6%	100.0%	

Quantitative methods training levels in Norway appear roughly average compared to other survey countries. In comparison, the more numerate subjects such as economics and business tend to have higher levels while the less numerate subjects, such as geography, tend to have lower levels of training. Political science has more consistent training than in other countries but the levels remain low. Sociology appears slightly lower on average than other countries because a substantial proportion have no training.

**Table 18: Research Methods Modules in Norwegian Universities**

			Number of Research Methods Modules								
			.0	.5	1.0	1.5	2.0	3.0	Total	Mean	
Subjects	Business	Count	2	0	1	0	0	0	3	0.3	
		%	66.7%	.0%	33.3%	.0%	.0%	.0%	100.0%		
	Economics	Count	5	0	0	0	0	0	5	0	
		%	100.0%	.0%	.0%	.0%	.0%	.0%	100.0%		
	Geography	Count	0	0	2	0	2	1	5	1.8	
		%	.0%	.0%	40.0%	.0%	40.0%	20.0%	100.0%		
	Political Science	Count	2	2	2	0	0	0	6	0.5	
		%	33.3%	33.3%	33.3%	.0%	.0%	.0%	100.0%		
	Psychology	Count	0	1	2	1	0	0	4	1.0	
		%	.0%	25.0%	50.0%	25.0%	.0%	.0%	100.0%		
	Sociology	Count	0	0	5	0	0	0	5	1.0	
		%	.0%	.0%	100.0%	.0%	.0%	.0%	100.0%		
	Total		Count	9	3	12	1	2	1	28	
			%	32.1%	10.7%	42.9%	3.6%	7.1%	3.6%	100.0%	

Research methods training in every subject also appears roughly average compared to levels in other countries across all subjects.

**Table 19: Thesis Requirements in Norwegian Universities**

			Number of Thesis/Dissertation Modules				
			.0	1.0	Total	Mean	
Subjects	Business	Count	1	2	3	0.7	
		%	33.3%	66.7%	100.0%		
	Economics	Count	3	2	5	0.4	
		%	60.0%	40.0%	100.0%		
	Geography	Count	3	2	5	0.4	
		%	60.0%	40.0%	100.0%		
	Political Science	Count	4	2	6	0.3	
		%	66.7%	33.3%	100.0%		
	Psychology	Count	0	4	4	1.0	
		%	.0%	100.0%	100.0%		
	Sociology	Count	2	3	5	0.6	
		%	40.0%	60.0%	100.0%		
	Total		Count	13	15	28	
			%	46.4%	53.6%	100.0%	

Undergraduate research requirements in Norway, unlike those for methods training, are consistently above average levels for the survey countries in every subject except political

science. While only business and sociology require a thesis in a majority of programmes, the requirements are much more frequent than in most other countries.

### **13.1. Business**

Business degrees are more often taught at university colleges, which are not included in this survey, so these results may be skewed by focusing on university curricula alone. The universities tend to emphasise a broader education in a social science business or economics (samfunnsøkonomi). Students would not usually specialise in business until the masters and PhD level. All three universities providing business degrees (økonomi og administration) require quantitative methods, with two requiring one module and one requiring two modules. Only one university of the three requires general research methods training, though two require one thesis module.

### **13.2. Economics**

Quantitative methods training is rigorous for economics, with four of five programmes requiring two modules and the last requiring three modules. However, students are not required to do any general research methods at any university. Two of five programmes require a thesis.

### **13.3. Geography**

None of the five universities offering an undergraduate degree in geography require any quantitative methods. However, all five do require research methods, with an overall mean of 1.8 modules. Two of five programmes require a thesis.

### **13.4. Political Science**

Three of six political science programmes require quantitative methods, though two of these three require a half module, and the third requires one module, which gives a mean of 0.3. Four of six programmes require research methods with two requiring a half module and two requiring one module. Two of six programmes require a thesis. Methods training in political science programmes is more consistent than in many countries but at relatively lower levels.

### **13.5. Psychology**

All four psychology programmes require quantitative methods with two requiring a half module and two requiring one module. The pattern is the same for research methods. All four programmes require a single thesis module. Research training and practice is very consistent in psychology, though not at particularly high levels.

### **13.6. Sociology**

Three of five sociology programmes require quantitative methods with all three requiring one module. All five programmes require a single module of research methods. Three of five programmes require a thesis. Like psychology, research training and practice is very consistent in psychology, though not at particularly high levels.

## 14. Appendix G: Spain

Table 20: Quantitative Methods Modules in Spanish Universities

			Number of Quantitative Methods Modules						
			.0	1.0	2.0	3.0	Total	Mean	
Subjects	Business	Count	1	9	9	1	20	1.5	
		%	5.0%	45.0%	45.0%	5.0%	100.0%		
	Economics	Count	1	3	12	4	20	2.0	
		%	5.0%	15.0%	60.0%	20.0%	100.0%		
	Geography	Count	15	2	1	0	18	0.2	
		%	83.3%	11.1%	5.6%	.0%	100.0%		
	Political Science	Count	3	6	3	0	12	1.0	
		%	25.0%	50.0%	25.0%	.0%	100.0%		
	Psychology	Count	10	3	3	0	16	0.6	
		%	62.5%	18.8%	18.8%	.0%	100.0%		
	Sociology	Count	0	5	4	1	10	1.6	
		%	.0%	50.0%	40.0%	10.0%	100.0%		
	Total		Count	30	28	32	6	96	
			%	31.3%	29.2%	33.3%	6.3%	100.0%	

Overall, quantitative methods requirements in Spanish undergraduate programmes appear similar to other countries in this survey, though it varies by subject. Sociology and political science have higher comparative levels while psychology has lower levels. The subjects maintain the same rank order of training levels seen in most countries. Business and economics appear the most quantitative, sociology and psychology fall slightly lower, and political science and geography showing the weakest requirements.

Table 21: Research Methods Modules in Spanish Universities

Subjects		Number of Research Methods Modules										
		.0	1.0	2.0	3.0	4.0	5.0	7.0	8.0	9.0	Total	Mean
Business	Count	15	4	1	0	0	0	0	0	0	20	0.3
	%	75.0%	20.0%	5.0%	.0%	.0%	.0%	.0%	.0%	.0%	100%	
Economics	Count	10	8	1	1	0	0	0	0	0	20	0.7
	%	50.0%	40.0%	5.0%	5.0%	.0%	.0%	.0%	.0%	.0%	100%	
Geography	Count	1	1	4	1	4	2	2	1	2	18	4.3
	%	5.6%	5.6%	22.2%	5.6%	22.2%	11.1%	11.1%	5.6%	11.1%	100%	
Political Science	Count	0	2	9	1	0	0	0	0	0	12	1.9
	%	.0%	16.7%	75.0%	8.3%	.0%	.0%	.0%	.0%	.0%	100%	
Psychology	Count	0	1	5	5	1	3	1	0	0	16	3.3
	%	.0%	6.3%	31.3%	31.3%	6.3%	18.8%	6.3%	.0%	.0%	100%	
Sociology	Count	0	0	0	2	1	6	0	1	0	10	4.8
	%	.0%	.0%	.0%	20.0%	10.0%	60.0%	.0%	10.0%	.0%	100%	
Total	Count	26	16	20	10	6	11	3	2	2	96	
	%	27.1%	16.7%	20.8%	10.4%	6.3%	11.5%	3.1%	2.1%	2.1%	100%	

Spain shows some areas of strength in its research methods teaching, far surpassing its standing in quantitative methods. In particular, psychology, sociology, political science and geography appear far higher than for any other country in this survey. This strong performance in research methods may also reflect the weaker requirements for quantitative methods in psychology. The results will be discussed in more detail for each subject, but Spain has far more rigorous research methods training in the social sciences than any other country in this study.

**Table 22: Thesis/Dissertation Requirements in Spanish Universities**

			Number of Thesis/Dissertation Modules		Total	Mean
			.0	1.0		
Subjects	Business	Count	19	1	20	0.1
		%	95.0%	5.0%	100%	
	Economics	Count	18	2	20	0.1
		%	90.0%	10.0%	100%	
	Geography	Count	16	2	18	0.1
		%	88.9%	11.1%	100%	
	Political Science	Count	11	1	12	0.1
		%	91.7%	8.3%	100%	
	Psychology	Count	16	0	16	0
		%	100.0%	.0%	100%	
	Sociology	Count	9	1	10	0.1
		%	90.0%	10.0%	100%	
Total		Count	89	7	96	
		%	92.7%	7.3%	100%	

Spain’s rigorous research methods requirements for social sciences degrees is not followed up with a strong culture of undergraduate research. Spain’s requirements for student research projects, theses, or dissertations appear similar to that of most other countries in this study, with fewer than 10% of all programmes requiring such activity.

### **14.1. Business**

Quantitative methods training in business programmes appear about average for the countries in this survey. The mean number of modules required is 1.5 and almost all programmes require either one or two modules. Research methods are rarely required, with only one-quarter of programmes requiring any training, with most of those requiring one module. Only one university out of twenty requires a thesis or equivalent project.

### **14.2. Economics**

Economics provides slightly higher levels of methods training than business. Over half of programmes require two modules. There is slightly more research methods training than for business, with half of programmes requiring some training. Almost all of programmes with training require one module. Only two universities out of twenty required a thesis or equivalent.

### **14.3. Geography**

Quantitative methods training in geography appears about average compared to other countries with no specific requirements in most (83%) programmes. However, when it comes to research methods Spain has more than double the number of modules required in most other countries. Its overall mean of 4.3 modules is achieved by a fairly even distribution of requirements from one to nine modules across programmes. The most common requirement is for either two (22%) or four (22%) modules, but 39% of programmes require more than four modules. This level of training stands out compared to any other country in this survey. The next highest mean is found in the Netherlands, which requires only 2.3 modules. Geography's strength in methods training does not translate into requirements for undergraduate research. Only two universities (11%) require a thesis as part of their degree.

### **14.4. Political Science**

Quantitative methods training is particularly rigorous in this subject, which is usually among the weakest in the social sciences. The mean of 1.0 is almost equal to the Netherlands with 1.1. Together these two countries completely outperform all other countries in this survey. The nearest rivals (Norway and Finland) only produce means of 0.3 each. The distribution of these results is very even, with 25% of programmes requiring no modules, 50% requiring one module, and 25% requiring two modules. Research methods training is similarly strong in a subject that is consistently weak in most areas of methods training in the other survey countries. The mean of 1.9 does not equal the Netherlands with 3.3 modules, but it far outstrips the nearest rivals (Sweden and Finland) with 1.1 each. Spain does not have a strong tradition in student research projects, however, with only one of twelve universities requiring a thesis or equivalent.

### **14.5. Psychology**

Quantitative methods requirements appear surprisingly low in this subject, which is usually more numerate than other social sciences due to its strong natural science links. Spanish programmes require a mean of 0.6 modules, far behind most other subjects and other countries. Almost two-thirds of programmes have no requirement at all. Research methods, however, appear stronger than in any other country. The mean number of modules required is 3.3, which is more than double that of most countries. Not a single programme fails to require some research methods training. The most common requirements are two (31%) or three (31%) modules. Again, this high level of research methods training may mask some

quantitative training, though this content was not evident in module descriptions. Thesis requirements are nonexistent with no programmes requiring such a project.

#### **14.6. Sociology**

Quantitative methods training in sociology appears strong in Spain, compared to other countries. Its mean of 1.6 modules does not reach the levels of the Netherlands (3.2), but easily surpasses the requirements in all other countries, none of which have a mean larger than 1.0. All Spanish universities require at least one module of quantitative methods. Half require one module and half required either two or three modules. While quantitative methods training appears strong, research methods training surpasses that of any other country. Spain's mean of 4.8 modules is far ahead of the Netherlands's 2.7 modules and more than doubles the requirements of all other countries. No Spanish university in this survey required fewer than three modules, and well over half required five modules. As with other subjects, sociology did not often require a thesis with only one of ten universities having this component.

## 15. Appendix H: Sweden

The overall structure of Swedish degrees resembles those in England, Wales, and Northern Ireland, and Sweden has now moved to make all undergraduate degrees last three years as part of the Bologna process. The Swedish National Agency for Higher Education (Högskoleverket) assesses higher education disciplines for governmentally funded colleges and universities throughout the country. This body defines best practice within each subject and issues annual reports for each (Kaiser et al. 2001a; Massen et al. 2005).

In Sweden there are fourteen universities and twenty-two university colleges, all state owned, that grant undergraduate degrees. This survey concentrates upon the more elite institutions that grant PhDs, which consists of the fourteen universities, four university colleges, and three independent institutions. Of those twenty one institutions, sixteen provide undergraduate social science degrees and were included in this survey (Högskoleverket 2006), though not all universities offer each subject.

**Table 23: Quantitative Methods Modules in Swedish Universities**

			Number of Quantitative Methods Modules							Total	Mean
			.0	.5	1.0	1.5	2.0	3.0			
Subjects	Business	Count	8	0	1	0	3	0	12	0.1	
		%	66.7%	.0%	8.3%	.0%	25.0%	.0%	100.0%		
	Economics	Count	3	0	4	0	3	1	11	1.2	
		%	27.3%	.0%	36.4%	.0%	27.3%	9.1%	100.0%		
	Geography	Count	9	0	1	0	0	0	10	0.1	
		%	90.0%	.0%	10.0%	.0%	.0%	.0%	100.0%		
	Political Science	Count	13	0	1	0	0	0	14	0.1	
		%	92.9%	.0%	7.1%	.0%	.0%	.0%	100.0%		
	Psychology	Count	6	1	4	1	1	0	13	0.6	
		%	46.2%	7.7%	30.8%	7.7%	7.7%	.0%	100.0%		
	Sociology	Count	9	0	2	1	1	0	13	0.4	
		%	69.2%	.0%	15.4%	7.7%	7.7%	.0%	100.0%		
	Total		Count	48	1	13	2	8	1	73	
			%	65.8%	1.4%	17.8%	2.7%	11.0%	1.4%	100.0%	

The results show some of the lowest levels of quantitative methods training of the countries in this survey. The more numerate subjects show the largest gaps in training compared to other countries.

**Table 24: Research Methods Modules in Swedish Universities**

			Number of Research Methods Modules								
			.0	.5	1.0	2.0	2.5	3.0	4.0	Total	Mean
Subjects	Business	Count	5	0	7	0	0	0	0	12	0.6
			41.7%	.0%	58.3%	.0%	.0%	.0%	.0%	100%	
	Economics	Count	11	0	0	0	0	0	0	11	0
			100.0%	.0%	.0%	.0%	.0%	.0%	.0%	100%	
	Geography	Count	4	0	4	2	0	0	0	10	0.8
			40.0%	.0%	40.0%	20.0%	.0%	.0%	.0%	100%	
	Political Science	Count	3	0	7	4	0	0	0	14	1.1
			21.4%	.0%	50.0%	28.6%	.0%	.0%	.0%	100%	
	Psychology	Count	1	0	8	1	2	0	1	13	1.5
			7.7%	.0%	61.5%	7.7%	15.4%	.0%	7.7%	100%	
	Sociology	Count	3	1	3	4	0	2	0	13	1.3
			23.1%	7.7%	23.1%	30.8%	.0%	15.4%	.0%	100%	
Total		Count	27	1	29	11	2	2	1	73	
			37.0%	1.4%	39.7%	15.1%	2.7%	2.7%	1.4%	100%	

Research methods training levels are slightly below the average for most countries. Business and economics require little training but very few other countries do either. Geography, political science, psychology, and sociology require levels of training that appear roughly average compared to other countries. However, these levels of training may be underestimated because of the integration of these methods with undergraduate research.

**Table 25: Thesis/Dissertation Requirements in Swedish Universities**

			Number of Thesis/Dissertation Modules				
			.0	1.0	2.0	Total	Mean
Subjects	Business	Count	2	10	0	12	0.8
			16.7%	83.3%	.0%	100%	
	Economics	Count	1	10	0	11	0.9
			9.1%	90.9%	.0%	100%	
	Geography	Count	0	4	6	10	1.6
			.0%	40.0%	60.0%	100%	
	Political Science	Count	0	5	9	14	1.6
			.0%	35.7%	64.3%	100%	
	Psychology	Count	0	9	4	13	1.3
			.0%	69.2%	30.8%	100%	
	Sociology	Count	0	6	7	13	1.5
			.0%	46.2%	53.8%	100%	
Total		Count	3	44	26		73
			4.1%	60.3%	35.6%		100.0%

Sweden requires more theses, dissertations or research projects than any other country except the Netherlands, and its consistent practice puts it at the forefront of countries promoting undergraduate research. Its mean scores for each subject are very close to a minimum of a full module for every subject, and half the subjects require at least 1.5 modules. This strong commitment to undergraduate research projects makes the full level of research training difficult to accurately gauge. Thesis courses often include methods seminars and lectures as well as time to work on the individual projects. The extent to which Sweden includes additional training is impossible to measure from the information available, but this pattern occurs across all subjects.

### **15.1. Business**

Only one-third of business programmes require quantitative methods, though these programmes require two modules each, creating a stark divide between universities that do and do not require quantitative methods. Over half of programmes require research methods, but none require more than one course for the bachelor degree. According to an evaluation by the Högskoleverket, the Swedish National Agency for Higher Education (NAHE) in 2002, the most effective way of developing scientific analysis and methods is to have students do a thesis, which include choosing a research topic, defining a research questions, using proper methodology to answer that questions asked, and writing a report on the results. The conclusions by NAHE are also reflective of the curricula of business programmes, with 83% requiring a thesis. The NAHE notes that the Swedish business discipline is “multi-methodological”, using both qualitative and quantitative methods (Högskoleverket 2002). Despite official endorsement of both quantitative and qualitative methodologies, the balance in business programmes appears more tilted towards the qualitative side simply because of the very low levels of quantitative training. Both teachers and students in business lack mathematical skills, which creates problems in and resistance to quantitative methods modules (Högskoleverket 2002)

### **15.2. Economics**

Economics programmes consistently require quantitative methods, with students doing this training in eight of eleven universities. The depth of training splits fairly evenly into thirds. One third of programmes have no requirements, one third require one module, and one third require two or more modules. While this requirement is widespread, it is a low level of training compared to every other country except Australia. It is frequently the case that

strengths in one aspect of methods training are offset by lower training levels in another, but no Swedish economics programmes require any general research methods training either. This absence is offset somewhat by dissertation requirements. Ten of eleven economics programmes require a dissertation module, which helps develop research training in addition to any quantitative methods.

### **15.3. *Political Science***

Quantitative methods training is rare in Swedish political science programmes with only one out of fourteen political science degrees requiring it. However, general research methods modules are very common, with eleven of fourteen programmes requiring either one or two modules. This mean level of 1.1 modules per programme is high for this subject among the survey countries. In addition to general research methods training, political science relies heavily on thesis work with all of the departments requiring at least one thesis and nine of fourteen even requiring two. Methods education within the discipline has been criticised by the NAHE (2006) which recommended more of all types of methods education in the political sciences departments, but especially an increase in quantitative methods education since methods education is considered an important aspect of educational quality (Högskoleverket 2006).

### **15.4. *Human Geography***

Geography is not a particularly numerate undergraduate subject in Sweden with only one of ten geography programmes requiring one quantitative methods module. Research methods are required by six of ten programmes, four with one module and two with two modules. The most consistent research requirements are found in undergraduate research. All ten geography programmes require at least one thesis and as much as six require two modules.

### **15.5. *Psychology***

Quantitative methods training levels appear relatively low for psychology in Sweden. The mean requirement of 0.6 modules is among the lowest levels in the survey, being equal to Spain and only higher than Australia. Only seven of thirteen programmes require quantitative methods with an average requirement of roughly one module for the programmes that do require it. Research methods training is much more widespread with all but one programme requiring it. Most programmes require one module but four require between two and four.

The one programme with a four module requirement slightly skews the overall mean score of 1.5 modules. All degree programmes require undergraduate research components, with nine requiring one module and four requiring two. In an assessment of psychology departments by the NAHE (2004) most departments signalled their support for methods education as a disciplinary strength. Curiously, given the comparatively low levels of training in Sweden, psychology departments stressed the importance of quantitative methods in the NAHE study. While acknowledging the strong scientific links in psychology, the report emphasised the importance of methodological pluralism in the subject, partially in order to decrease the polarisation between staff and students. The NAHE further suggested cooperation with sociology departments which are qualitatively oriented to exchange competencies within methodological teaching and learning (Högskoleverket 2004).

## **15.6. Sociology**

Sociology in Sweden requires comparatively little training in quantitative methods, having lower levels than any country but Australia in the survey. Only four programmes out of thirteen require any quantitative methods modules. The average of those four programmes is 1.4 modules. General research methods training appears more robust with ten of thirteen programmes requiring it, and five of those ten programmes require either two or three modules. The overall mean of 1.3 modules is roughly average for the countries in the survey. The dissertation requirements are very high with every programme requiring at least one thesis module and seven of thirteen requiring two. The overall mean of 1.5 modules is the second highest of the survey countries and only one of two countries to require a thesis or dissertation in all programmes. The high level of undergraduate research clearly will include additional elements of research training but any specific methods training in those modules was not detailed in the sources used for this survey. The National Agency for Higher Education in Sweden (NAHES 2004) has established standards for best practice, stating that methods training should be integrated into the theoretical topics and be of both quantitative and qualitative character. There should also be opportunities for students to apply theory and methods knowledge in practical research. The NAHE viewed the levels of methods education within undergraduate programmes as problematic. Qualitative methods dominate the education in most departments and quantitative methods only provided at an elementary level. The NAHE report found that quantitative training often fails to meet expectations for sociology, though the research component of the degree is well developed in all institutions (Högskoleverket 2004).

## 16. Appendix I: United States

The state of quantitative methods training in the United States provides a complicated picture. In terms of the coursework students take in secondary school, mathematical attainment appears to be improving. The percentage of high school graduates who had completed courses in advanced mathematics (i.e., completed at least one course classified as more challenging than algebra II) increased from 26 percent in 1982 to 50 percent in 2004 (National Center for Education Statistics 2007). The percentage of 2000 graduates who earned credits in advanced mathematics ranged from 6% for statistics/probability to 27% for precalculus. Between 1990 and 2004, the number of students taking the Calculus AB Exam nearly tripled and the number taking Calculus BC increased nearly fourfold (National Science Foundation 2006). Moreover, the percentage of graduates who had completed a calculus-level course more than doubled over this period (from 6 to 14 percent) (National Center for Education Statistics 2007).

Despite widespread levels of student preparation in mathematics before entering higher education, the broad based, liberal arts tradition of education limits the depth and extent to which any subject is studied. However, the comparatively successful quantitative training of students at postgraduate level means that the broad based liberal arts education provides a better foundation for quantitative methods training at postgraduate level than appears from the bare curricular requirements. The broad approach and emphasis on choice may result in students being very open to new subjects and ideas. The broad curriculum requirements of most universities mean that all students take some classes in mathematics. Students in the United States tend to do very little methodological training or research at undergraduate level compared to the U.K. However, they are equipped with much better mathematical skills and do not shun further quantitative training when entering graduate schools.

The liberal arts tradition of higher education means that students take a wide sweep of subjects for their university degree, particularly those in the humanities and social sciences. While British universities often debate the extent to which they should provide choice to their students, American universities debate the extent to which they can narrow or restrict student choice. This reversal of emphasis has profound effects on student training. Few students in the U.S. will do more than 25% of their credits in their major subject, and many universities even bar such concentrations. Most students do not choose their major subject until their third or fourth year. Further, changes of major are easy to make and not uncommon. In devising their curricula, specific subjects must take into account that some students transfer into the

university after completing a two year foundation degree at a community college. These factors mean that few programmes in any social science subject can rely on students doing a particular sequence of courses throughout their degree. At best there might be a sequence of two courses. This sequencing would be accomplished by using prerequisites, which still would not stipulate which year the sequence was taken. Even programmes that do provide methods training cannot easily control when students will do that training. Many students fear these classes and take them as late as possible in their education, which often means during the final year. Such an approach severely limits the use to which any methods teaching can be put.

**Table 26: Quantitative Methods in United States Universities**

		Number of Quantitative Methods Modules											
		.0	.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	Total	Mean
Business	Count	7	0	4	0	2	2	1	1	0	0	17	1.4
	%	41.2%	.0%	23.5%	.0%	11.8%	11.8%	5.9%	5.9%	.0%	.0%	100%	
Economics	Count	9	0	26	0	21	16	3	3	2	1	81	2.0
	%	11.1%	.0%	32.1%	.0%	25.9%	19.8%	3.7%	3.7%	2.5%	1.2%	100%	
Geography	Count	21	0	12	0	1	0	0	0	0	0	34	0.4
	%	61.8%	.0%	35.3%	.0%	2.9%	.0%	.0%	.0%	.0%	.0%	100%	
Political Science	Count	65	1	8	0	2	0	0	0	0	0	76	0.2
	%	85.5%	1.3%	10.5%	.0%	2.6%	.0%	.0%	.0%	.0%	.0%	100%	
Psychology	Count	10	0	50	1	15	1	0	1	0	0	78	1.1
	%	12.8%	.0%	64.1%	1.3%	19.2%	1.3%	.0%	1.3%	.0%	.0%	100%	
Sociology	Count	17	2	51	0	8	2	0	0	0	0	80	0.9
	%	21.3%	2.5%	63.8%	.0%	10.0%	2.5%	.0%	.0%	.0%	.0%	100%	
Total	Count	129	3	151	1	49	21	4	5	2	1	366	
	%	35.2%	.8%	41.3%	.3%	13.4%	5.7%	1.1%	1.4%	.5%	.3%	100%	

The state of quantitative methods training in the social science in the United States varies dramatically across the different subjects and disciplines. The most numerate subject, economics, unsurprisingly surpasses every other subject with a mean of 2 required modules in each programme. Interestingly, its less numerate companion subject, business, also proves to be one of the most quantitative of the social sciences. Though many fewer programmes were found in the universities surveyed, business returned a mean of 1.4, which puts it far ahead of

all subjects but economics. Psychology, with its clear links to the natural sciences, also lags slightly behind business with a mean of 1.1. This level appears very similar to sociology with a mean of 0.9. Geography does not exist so frequently as a separate programme, and there is little required quantitative training with a mean of 0.4. Political science proves the least quantitative of all the large subjects with a mean of only 0.2.

**Table 27: Research Methods in United States Universities**

			Number of Research Methods Modules							Total	Mean
			.0	.5	1.0	2.0	2.5	3.0			
Subjects	Business	Count	14	0	3	0	0	0	17	0.2	
		%	82.4%	.0%	17.6%	.0%	.0%	.0%	100%		
	Economics	Count	77	0	4	0	0	0	81	0.0	
		%	95.1%	.0%	4.9%	.0%	.0%	.0%	100%		
	Geography	Count	7	0	19	6	0	2	34	1.1	
		%	20.6%	.0%	55.9%	17.6%	.0%	5.9%	100%		
	Political Science	Count	53	1	21	1	0	0	76	0.3	
		%	69.7%	1.3%	27.6%	1.3%	.0%	.0%	100%		
	Psychology	Count	22	1	37	14	0	4	78	1.0	
		%	28.2%	1.3%	47.4%	17.9%	.0%	5.1%	100%		
	Sociology	Count	8	1	61	8	1	1	80	1.0	
		%	10.0%	1.3%	76.3%	10.0%	1.3%	1.3%	100%		
	Total		Count	181	3	145	29	1	7	366	
			%	49.5%	.8%	39.6%	7.9%	.3%	1.9%	100%	

The state of research methods teaching in the social sciences appears even weaker than for quantitative methods. Economics and business, the two most numerate subjects, teach almost no research methods with means of 0.2 and 0.0 respectively. Geography has a mean of 1.1, showing a much stronger requirement for general research methods than for quantitative training. Psychology and sociology return very similar results to quantitative methods with each having a mean of 1.0. Political science stays in its position among the weakest of subjects for methods training with a mean of 0.3, putting it only slightly ahead of business and economics.

Table 28: Thesis/Dissertation Modules in United States Universities

			Number of Thesis/Dissertation Modules				Total	Mean
			.0	1.0	2.0	3.0		
Subjects	Business	Count	17	0	0	0	17	0
		%	100.0%	.0%	.0%	.0%	100.0%	
	Economics	Count	78	2	1	0	81	0
		%	96.3%	2.5%	1.2%	.0%	100.0%	
	Geography	Count	31	3	0	0	34	0.1
		%	91.2%	8.8%	.0%	.0%	100.0%	
	Political Science	Count	75	1	0	0	76	0
		%	98.7%	1.3%	.0%	.0%	100.0%	
	Psychology	Count	75	1	1	1	78	0.1
		%	96.2%	1.3%	1.3%	1.3%	100.0%	
	Sociology	Count	72	6	2	0	80	0.1
		%	90.0%	7.5%	2.5%	.0%	100.0%	
	Total	Count	348	13	4	1	366	
		%	95.1%	3.6%	1.1%	.3%	100.0%	

The thesis or dissertation is normally a voluntary undertaking in American universities, often taken as part of an honor's degree for the most able students. Only a handful of universities require this type of research as part of a degree.

### 16.1. Business

Quantitative methods training appears strong, on average, in business programmes. This average hides a strong division between universities with the distribution skewed towards both extremes. Over 40% of universities have no requirements at all. Just under one quarter (23.5%) require one module. However, the remaining universities (35%) require between two and five modules. This last group of universities have requirements that surpass those of most social science degrees in any subject but economics. This strength in quantitative methods does not translate into a similar depth in research methods or a thesis. Only three of 17 programmes require any research methods, and those universities all require one module. No universities require a thesis or dissertation for a business degree. These results show a strong similarity between business and economics degrees that is also found in most of the other countries in this survey.

## **16.2. Economics**

Economics has always been viewed as the most numerate of the social science disciplines. Many universities require calculus as a prerequisite for economics majors and others have it as a prerequisite for many core modules. This reliance on quantitative skills appears to be increasing over time. In 1980, a survey of 546 economics programmes found that about 25% required their majors to take a course in calculus (Siegfried and Wilkinson 1982), but a 1990 survey reported that 81% required calculus as a prerequisite for the major (Siegfried et al. 1991). However, some academics argue that calculus is not necessary for much of an economics degree. Many students take calculus courses that emphasise content which is used infrequently in economics. Even if calculus more appropriate for economics is learned, it is often used in only one or two modules. If calculus does not feature throughout upper courses then the students will have little motivation to learn it and their skills quickly deteriorate (Hey 2005; Siegfried et al. 1991).

Statistical methods have a similarly consistent place in the economics curriculum. The 1980 survey discussed previously found that 84.8% of universities required at least one credit hour of statistics (Siegfried and Wilkinson 1982). This figure does not precisely pin down the amount of training since it does not report the distribution of courses between one and three hours. A full module would normally constitute three hours. The survey also found that 37.7% required 4 or more hours of statistics (Siegfried and Wilkinson 1982). Again, this figure does not differentiate between universities requiring two modules adding up to six hours and a university requiring a module with a lab, which might constitute four hours of teaching. Nonetheless, it seems clear that almost all universities required an introductory statistics module and a minority of programmes required more than one module. The survey also reported that 5.9% of universities required more than one hour in econometrics with 5.4% requiring at least 4 hours (Siegfried and Wilkinson 1982). Again, this does not indicate how many required one full module or more than one full module with a lab, so the precise distribution is not known. It is clear from the figures that only a small proportion of universities required advanced statistics courses.

The place of undergraduate research and the thesis was also examined in the 1980 survey. Only 5% of universities reported a requirement for undergraduate research. About 12% of universities offered a voluntary honours degree that required a thesis (Siegfried and Wilkinson 1982). The 1991 review of the economics discipline recommended that

universities encourage undergraduate research, particularly through the adoption of honours degrees with a thesis (Siegfried 2001; Siegfried et al. 1991).

The results of this survey reveal that economics has remained highly quantitative and appears to have strengthened its requirements over time. As of 2007, only 11.1% of programmes do not require quantitative methods in some form (versus 15% in 1980). About a third (32%) require one module while about half (50%) require between two and four modules. A small group (7%) require five or more modules. While the quantitative side of economics appears to have strengthened, undergraduate research has not been strongly promoted as recommended in the 1991 review of the discipline. Only four of 81 programmes surveyed require a single research methods module. Only three of 81 programmes require a thesis or dissertation.

### **16.3. Geography**

Human geography is usually regarded as the area where the social sciences overlap with the scientific aspects of this discipline. It is often part of a larger geography department that encompasses many areas of the natural sciences, including for example the various geosciences as well as information science. Undergraduate majors often have to cover introductions to these different aspects of the subject before specialising. This straddling of many different disciplines reduces the overall curriculum available to do any in-depth methods training for human geography. Therefore, its particular identity as a subject is often lost in the more general curriculum. This fragmentation also occurs in the professional journals, and there is not a teaching journal explicitly dedicated to human geography as would be found in most other social science disciplines. Many aspects of human geography may be found in the other social science disciplines, particularly sociology.

Geography appears to require little training in quantitative methods. Its mean of 0.4 modules across all universities surveyed appears particularly low. Over 60% of programmes have no quantitative methods requirement at all and 35% require one module. No programmes require more than two modules. The picture for research methods is stronger, with a mean of 1.1 modules required in each programme. About 20% of programmes have no research methods requirement. Over half (56%) require one module, and 24% require either two or three modules. Only three universities out of thirty-four require a thesis or dissertation for their majors. The low level of methods training seems surprising considering the strong links with the natural sciences for this subject. It is lower than all other social science subjects in this survey except political science.

#### **16.4. Political science**

Research methods in political science have become a prominent topic of debate. There is no clear consensus over appropriate methods and recent debates have made the dispute both prominent and controversial. In 2000 a backlash occurred against what was called the 'hard science' methods. The most prestigious journals were accused of suppressing other methods such as case studies and other qualitative analyses (Bennett et al. 2003). The discipline has subsequently endorsed a more pluralistic approach to methods in the professional organisations and journals (Klass 2004). Even before the backlash the discipline historically neglected methods education in favour of teaching the theoretical profile of the subject (Thies and Hogan 2005).

Thies and Hogan (2005) surveyed political science departments and their results, from over 300 programmes, show that 64% of all majors required a methods course. This surprisingly high figure is often masked by the lack of required methods courses among undergraduate programmes at the more elite, PhD granting institutions. Only 46% of these programmes required methods of any kind, but this low figure was offset by universities which grant only undergraduate degrees. A very large proportion (73%) of these institutions did require a methods course. This split had not been expected or identified in the literature, perhaps because most studies focus upon the more elite programmes. Doyle and Mezzell (2007) examined the programmes in all 100 PhD programmes in the U.S. and found that only 31% required methods training. This figure was lower than the 46% reported by Thies and Hogan, but their study had only gathered returns from 62 institutions. Another large scale study (Dell 2007) surveyed 224 university programmes in political science, representing national universities and liberal arts universities identified in U.S. News and World Report's college rankings. They reported only 20% of programmes requiring research methods. They found that a further 18% of universities required methods for students doing an optional thesis. The study also found a large proportion, 20%, of universities required a thesis. This extraordinarily high proportion occurred because half the survey focused upon liberal arts colleges, which accounted for almost all thesis requirements.

The survey carried out for this study examines 76 of the more elite PhD institutions. The results may underestimate the overall strength of methods teaching because of the focus on research universities, which Thies and Hogan found were much less likely to teach methods. The figures from Tables 23-25 show a discipline with little attention to undergraduate methods instruction or student research. Only 15% of programmes require any

quantitative methods instruction with just over 10% requiring one module. Only two of seventy-six universities require two modules of quantitative methods. The picture only changes slightly for more general research methods. Just over one-quarter of universities require any research methods, and almost all these programmes require one module. Only one university out of seventy-six requires two modules. Requirements for research also appear to be rare, with only one of seventy-six programmes requiring a thesis or dissertation. Political science appears to be the most underdeveloped discipline in the social sciences when it comes to methods teaching at undergraduate level. However, Thies and Hogan's (2005) research indicates that these low levels are much more prominent in the elite research universities than across the discipline as a whole, though it is these universities that will train many of the future PhD students in the discipline.

### **16.5. Psychology**

Psychology has undertaken more research and reflection upon its curriculum than any other social science. A quick history of these efforts by the professional discipline shows the ongoing concerns over quantitative methods and research. Large scale examinations of the curriculum go back as far as 1938 (Henry 1938) and demonstrate a longstanding concern and interest in the structure and content of a psychology degree. The first major conference on the status of the discipline and degree was the Cornell Conference of 1951, which recommended one core statistics module with research methods integrated throughout the entire curriculum for all psychology programmes (Buxton et al. 1952). The next major inquiry into the state of teaching in psychology, the Michigan Conference of 1960, surveyed psychology curricula across the country to see to what extent the recommendations of the Cornell conference had been adopted. The conference could not agree on a common core of modules and, instead, recommended three approaches, not all of which included statistics (McKeachie and Milholland 1961).

A major investigation of the psychology curriculum was carried out by Kulick in 1973, but that report did not stipulate any requirements or curricular guidelines. Instead, it simply described the range of requirements and modules provided by programmes across the United States to help inform curricula discussions (Kulick 1973). As part of a study of 12 undergraduate major subjects, initiated by the Association of American Colleges (AAC), produced the report on psychology "Liberal Education, Study in depth, and the Arts and Sciences Major—Psychology." This report identified eight different types of learning outcomes that all curricula should meet. It provided a model of a generalist liberal arts

curriculum that required three methods modules: statistics, research methods, and psychometrics. It also recommended a senior research project or seminar (McGovern et al. 1991, 46:598-605).

In 1991, the American Psychological Association sponsored a National Conference on Enhancing the Quality of Undergraduate Education in Psychology (the St. Mary's Conference) that produced a report, 'The Principles for Quality Undergraduate Psychology Programs', which was endorsed by the APA in 1994 (American Psychological Association. 1995:10-11). The report recommended four levels of courses to create a sequence of knowledge and skills to coordinate what was taught in the relatively fragmented liberal arts system. They reaffirmed the recommendation of the AAC report, which called for methods modules in statistics, research methods, and psychometrics. It also recommended final year experiences that could take the form of internships, research projects, or capstone courses.

These principles were further revised in 2002, when the American Psychological Association's Task Force on Undergraduate Psychology Major Competencies produced the report 'Undergraduate Psychology Major Learning Goals and Outcomes' to guide the specific learning outcomes included in all programmes. It named particular knowledge and skill rather than stipulating particular modules. The report called for students to be able to "understand and apply basic research methods in psychology, including research design, data analysis, and interpretation." These methods should include research methods, statistical analysis, and hands-on application of methods by doing research (Halonen et al. 2002). The 2002 report was further revised to become the APA's Guidelines for the Undergraduate Psychology Major (American Psychological Association. 2007). The learning outcomes for research methods now emphasise learning research methodologies and statistics as well as applying them by conducting research, though psychometrics are not specifically mentioned.

Alongside these professional disciplinary discussions over common standards in the psychology curriculum, there has been a rich history of research using surveys to measure its content and structure. This international benchmarking study is focused upon current practice so it concentrates upon more current studies. Perlman and McCann (1999) surveyed a random sample of 500 course catalogues and reported that 58% of programmes required a statistics module, 40% required a research methods module (though statistics and methods were combined into one module in some cases), 38% required a module in experimental psychology (which emphasised research methods), 9% required a module in psychometric testing, and 5% required a senior thesis or research project. These numbers fell far short of the recommendations in the previous reviews and reports, which generally hold to a model of

one statistics course, one methods course, and (recently) one measurement and testing course (Perlman and McCann 1999).

Messner, Griggs, and Jackson (1999) surveyed a random sample of 292 programmes identified in *America's Best Colleges: 1992 College Guide* by U.S. News and World Report. They reported an average of 1.96 statistics and methods modules per programme and 2.53 modules of total methods teaching. In addition, 16% of programmes required a substantial research project (Messner et al. 1999). These figures conform more closely to the professional association's guidance.

Friedrich, Buday, and Kerr (2000) surveyed a sample of 405 programmes from the national and liberal arts universities identified in *America's Best Colleges*. They reported results consistent with Messner and Griggs, with 89% of programmes requiring research methods, 93% requiring statistics, and only 6% requiring advanced statistics (Friedrich et al. 2000).

Perlman and McCann (2005) examine both catalogues and surveys of departments to investigate the integration of undergraduate research experiences into programmes. They find that, for a more complicated, in-depth topic such as student research, catalogues contained a high level of errors. They reported that survey results were a more reliable indicator, suggesting that 26% of programmes require a thesis or large research project (Perlman and McCann 2005). This finding suggests that the lower figures reported in previous studies may be due to errors in catalogues and the difficulties of identifying all the different ways in which undergraduate research is carried out. This study does not undermine all previous catalogue-based surveys. It suggests that electives and individual modules may not be up to date in university catalogues. However, many surveys examine formal degree requirements that have to be much carefully communicated to students in such documents and are more likely to be up to date and accurate.

### **16.5.1. Results**

This survey concentrated upon elite programmes and used university website and catalogue requirements for majors. Only 12.8% of programmes had no quantitative methods requirement, which is an improvement on the figures reported by Friedrich, Buday, and Kerr (2000), who found that 27% of elite and 19% of general programmes had no such requirement. Almost two-thirds (64%) of programmes require one module. A further 22% require two or more modules, which is higher than the 6% reported by Friedrich, Buday, and Kerr (2000). The discrepancy may be caused by the different categories used in the two

surveys. This survey examined quantitative methods while Friedrich, Buday, and Kerr separated advanced statistics from tests and measurements.

Research methods were required by 72% of universities, which appears similar to Friedrich, Buday, and Kerr's finding of 76% of general programmes, though it is higher than their reported figure of 48% of elite institutions. The most common requirement was for one module (48%) while a substantial minority (24%) required two or three modules.

Theses, dissertations, or research projects were required by only 4% of programmes. This very low figure appears inconsistent with all previous studies. Messner, Griggs and Jackson (1999) found that 16% required a substantial research project while Perlman and McCann that 26% had such a requirement, though they disputed the accuracy of catalogue surveys for this type of requirement.

The overall mean module requirements for quantitative and general research methods appear consistent with most of the previous literature. The figures of 1.1 modules for quantitative methods and 1.0 for qualitative methods are consistent with Messner, Griggs and Jackson (1999) who found a mean of 2.0 quantitative and general research methods modules, though they found a higher overall methods requirement of 2.5. The results portray a discipline that largely implements the general recommendation of one statistics module and one methods module (though not the recommendation of one psychometrics module, which is not required in the most recent guidelines). There is less consensus over the exact level of undergraduate research, but all surveys indicate it occurs in only a small proportion of programmes.

## **16.6. Sociology**

The discipline of sociology, like that of psychology, has taken a strong interest in the state of the undergraduate curriculum in its programmes. This interest has led to the formation of two important task forces to examine the state of the undergraduate curriculum. The two reports produced led to the adoption of two sets of recommendations, the latest being ratified by the American Sociological Association's Council in January 2005 (Eberts et al. 1990; McKinney et al. 2004). The first report, *Liberal Learning and the Sociology Major*, found that most undergraduate programmes pushed students towards accumulating credits rather than pursuing their studies in-depth. In order to provide this depth of learning it recommended that all programmes adopt common core courses as pre-requisites and structure all courses into four levels of learning that would follow a prescribed sequence to develop student learning more systematically. An analysis of undergraduate catalogues 10 years ago

demonstrated that most programs require an introductory course, one or more methods and statistics courses, and one or more theory courses for the sociology major (Eberts et al. 1990).

The second report, *Liberal Learning and the Sociology Major Updated* (McKinney et al. 2004), both updated and expanded the previous recommendations. This expanded set of guidelines specifically stated that departments should require introductory sociology and a capstone course in sociology as well as coursework in sociological theory, research methods, and statistics for the sociology major. The norm for the discipline, verified in the previous report, was to require one methods course and one statistics course. The ASA's survey of sociology programs in 2000-2001 verifies that the mean number of statistics, methods, and theory courses required for the sociology major was 1.3 for research methods and 0.9 for statistics (American Sociological Association 2003). One important difference between the two reports was the increased emphasis on undergraduate research training and experience. The original 1990 report recommended that all programmes include a mandatory capstone course to sum up the degree and provide a rich level of learning, perhaps involving a thesis. The updated report put this requirement more strongly, insisting that as part of the capstone, students should write a senior paper, such as a thesis, or complete some other kind of professional "product" (e.g., a videotape or photo display) (McKinney et al. 2004). The ASA survey used different methods from the survey carried out for this study, sending out questionnaires to 1,093 programs that granted a minimum of a bachelors-level degree in sociology and receiving a response rate of 69%. These results represent all different types of universities. This study, by contrast, examined the catalogues and university requirements from the more elite, doctoral granting institutions.

### **16.6.1. Results**

The mean number of quantitative methods courses was 0.9, which was exactly the same figure reported in the ASA's survey. Within this figure, over a fifth (21.3%) of programmes had no quantitative methods component. However, almost two-thirds (63.8%) required the recommended level of one module. A small group (12.5%) required either two or three modules. The figures for research methods modules were also remarkably consistent with the ASA's results. A mean of 1.0 modules was found (slightly lower than the ASA's 1.2), but over three-quarters (76 %) of programmes required the recommended single module of methods. Only 10% of programmes offered no methods training, and a small group (13%) required between two and three modules. The figures on thesis and dissertation requirements were interesting because of the lack of any comparable data. Only 10% of programmes

required one or more theses or dissertations, which stands in stark contrast to the widespread adoption of the recommendations for methods teaching. It may be that some research projects were required as part of a capstone course that was not obvious in the major requirements, but this result suggests that the discipline is not offering the level of research experience recommended by the ASA.

## **17. Best Practice in the Social Sciences: the MOST and IDA Projects**

An ambitious programme involving selected sociology departments in the US is the Minority Opportunities through School Transformation (MOST) Program founded in 1994. The overall aim of the MOST program was to especially encourage students with a minority background, but the project took on the approach that to raise minority participation all students need to be addressed; not isolating minority groups. Within the project departments worked to integrate quantitative data throughout curriculum to enhance research-based practice and discussion into all courses and the importance of mentoring for all students was especially emphasised. Several institutions also added capstone courses to their major requirements. Many of these courses lean heavily on hands-on research, often connected to the neighbouring community (Levine et al. 2002).

From the MOST program of integrating quantitative data analysis into undergraduate education developed the Integrating Data Analysis (IDA) project. IDA was funded by the National Science Foundation (NSF) and undertaken by the American Sociological Association (ASA). The IDA project builds on the ideas of the MOST programme that curricular change demands departmental change and can not be left as an individual faculty agenda (Howery and Rodriguez 2006). The objective of the IDA project is to introduce students to data analysis early, frequently and sequentially throughout the curriculum. Howery and Rodriguez (2006) state that almost every undergraduate programme in sociology across the US has a research sequence of at least two courses. These courses are generally recommended to be taken early in the degree. However, methods courses given in sociology departments were often taken in a later stage. Introductory methods courses that are taught in lower divisions rarely give students the opportunity to engage in hands-on research. Being introduced to research methods late in their course work can make students feel that research is detached from the rest of the curriculum (Howery and Rodriguez 2006).

Assessment of the IDA program shows that long-term projects (such as MOST and IDA) can make lasting changes in the culture of a department. Assessment also showed that students reactions to the IDA program were generally positive and initial data on pre-post learning outcomes show gains in research knowledge. The assessors are convinced that the IDA project will result in new cohorts of undergraduate students with a better understanding of sociology, of what sociologists do, and of the applicability and importance of the discipline. IDA staff interviews with students in participating institutions showed students to be positive about learning math or quantitative skills when they served a purpose or were relevant to the students' life experience so that students were able to connect to what was taught in the classroom with actual hands-on type of data analyses and research experiences (Howery and Rodriguez 2006). Best practice for methods training and improving learning outcomes in the social sciences have been identified by both disciplinary bodies and national educational associations and funding councils as the inclusion of quantitative literacy throughout a programme and the training and practice of hands-on undergraduate research.

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