

# Progressing to Higher Education in the UK: The effect of prior learning on institution and field of study

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## Introduction

Students applying to study a course in a Higher Education (HE) institution have to make two choices: what subject to study and at which institution. These decisions are influenced by a range of different factors, for example their personal interests, their socio-economic background and, in particular, their prior qualifications and performance. In fact, Hoelscher, Hayward, Ertl and Dunbar-Goddet (2008) showed that the educational background of students is the factor with the greatest influence. This clearly makes sense as some qualifications (and, in some cases, specific subjects) are a necessary condition for studying a course in a specific HE institution.

Young people progressing to HE hold a wide range of qualifications and combinations of qualifications. In England, the vast majority of learners at Level 3<sup>1</sup> (usually aged 16–19) still take 'traditional' academic qualifications such as AS/A levels in schools or colleges (e.g., Department for Education [DfE], 2013a). However, the government's commitment to widening participation has encouraged the growth of more and different pathways to HE study. For example, AS/A levels are supplemented with or replaced by other academic qualifications such as the Cambridge Pre-U, the International Baccalaureate (IB) or the Extended Project. Recently, there has been an increase in learners taking more applied or vocational qualifications such as Applied AS/A levels, Advanced Diplomas, Oxford, Cambridge and RSA Examinations' (OCR) Nationals and, particularly, Business and Technology Councils' (BTECs) (e.g., Hayward & Hoelscher 2011; UCAS, 2012; Gill, 2013)<sup>2</sup>.

In the last decade, there has been some research on how different educational pathways lead to different kinds of institutions and different subjects. This body of research includes themes such as the status of non-traditional qualifications, the transition from vocational education and training to HE, and the imbalance of different types of qualifications across HE institutions and courses. For a broad review of the literature in this area see Vidal Rodeiro, Sutch and Zanini (2013). However, new qualifications that aim to prepare learners for study at university have been introduced quite recently, some qualifications have been withdrawn, and others are being comprehensively reformed. It is therefore crucial to better understand how current qualifications, both academic and vocational, are used by young people to progress to HE. Understanding the use of different pathways for progression should enable fairer and more transparent admissions to HE.

The main aim of this work was, therefore, to provide detailed quantitative evidence to shed light on the above topic. Specifically, the research focused on the following issues:

1. Understanding the range of qualifications and combinations of qualifications held by learners aged 16–19 who progressed to different types of HE institutions to study different subjects. It should be noted that, to date, some work has been carried out at a subject

level to understand which subjects studied at age 16–19 facilitate progression to HE courses (Russell Group, 2012; Vidal Rodeiro & Sutch, 2013).

2. Identifying the HE destinations (both institutions and subjects) of learners holding different types of qualifications and of learners with a mixed economy of qualifications.

## Data and methods

### Data

The data for the analyses carried out in this article was provided by the Higher Education Statistics Agency (HESA)<sup>3</sup>. It covers all full-time, first year undergraduates aged 17–19, domiciled in England, studying at UK universities in the academic year 2011/12. In particular, this dataset includes information on the students' qualifications prior to starting the HE course, the courses studied and the institutions where the students were enrolled. Alongside this, detailed student-level information such as gender, socio-economic background and previous institution was also available.

In this research, the HE institutions were considered in 'mission' groups. The following university groups were considered: Russell Group, 1994 Group<sup>4</sup>, University Alliance and Million+ Group. Universities that have not joined any of these groups were included in a separate group, labelled as 'Other'. The Russell and the 1994 groups consist of research intensive and highly selective institutions. The University Alliance and the Million+ Group are constituted by the newest universities and colleges, which are usually recruiting universities or universities with former 'polytechnic' status. A full list of members of each group can be obtained from the groups' websites.

For each student, information on up to three subjects of study and the subject percentage (i.e., the relative contribution of that subject to the university degree) was provided. The subject of study was aggregated into 20 broad subject areas and analyses were carried out at this level. It should be noted that the subject area relates to the principal subject of study. For degrees with more than one subject (e.g., balanced combinations or triple honours) it corresponds to the subject with the largest percentage. If a student took a balanced combination or a triple honours degree in three different subject areas, then the subject area was 'Combined'.

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1. Each regulated qualification in England has a level between Entry Level and Level 8. Qualifications at the same level are of a similar demand or difficulty. To find out more about qualification levels see <http://www.ofqual.gov.uk/help-and-advice/comparing-qualifications/>.  
2. Information about the Level 3 qualifications considered in this research can be found here: <http://www.accreditedqualifications.org.uk/qualification-types-in-the-uk.html>.  
3. Source: HESA Student Record 2011/12. Copyright Higher Education Statistics Agency Limited 2012. HESA cannot accept responsibility for any inferences or conclusions derived from the data by third parties.  
4. The 1994 group dissolved in November 2013.

In this research, the following Level 3 prior qualifications were considered: AS and A levels; Double Award AS and A levels (also known as Applied AS/A levels); BTEC; Extended Project; Free Standing Mathematics Qualification (FSMQ); International Baccalaureate (IB) Diploma; OCR National; Advanced Diploma; Progression Diploma; Cambridge Pre-U.

## Methods

The issues researched in this article were addressed, in the first instance, through descriptive analyses. Subsequently, an assessment of the universities and courses in which the different prior qualifications were over- or under-represented was made using odds ratios derived from multilevel logistic regressions. The regression analyses differ from the descriptive analyses because they take into account students' characteristics when looking at the probability of attending a specific university or pursuing a specific course.

Multilevel models were proposed due to the hierarchical or clustered structure of the data (as students were grouped within schools). Detailed discussions of the implementation and outcomes of the multilevel logistic regression can be found in Goldstein (2011).

For the purpose of the regression analyses presented in this article, the dependent variables for the models were: 1) enrolment in a university; and 2) studying a course in a subject area. The independent or explanatory variables were: gender, prior educational institution, socio-economic status and prior learning.

Prior learning was categorised in two different ways:

- Candidates were classified as having the following types of prior qualifications, and no other qualifications alongside: A level; IB; Cambridge Pre-U; BTEC; OCR National.
- Candidates were classified as having A levels *plus* one other type of mainstream prior qualification, as follows: A levels only; A levels plus Extended Project; A levels *plus* Cambridge Pre-U Principal Subject; A levels plus Cambridge Pre-U GPR<sup>5</sup>; A levels *plus* BTEC; A levels *plus* OCR National; A levels *plus* Double Award A level.

The focus of this research was on the association between prior qualifications and the dependent variables, once background characteristics of the students had been taken into account. Therefore, only the odds ratios for the prior qualifications variables are discussed.

## Results

The first part of the Results section focuses on which mainstream Level 3 qualifications are most commonly held by first year English undergraduates in different types of HE institutions and courses. To that end, Table 1 shows the numbers and percentages of students who were enrolled in a UK university with the different prior qualifications listed previously<sup>6</sup>.

The most popular mainstream qualifications held by undergraduates at HE institutions were A and Advanced Subsidiary (AS) levels, with around 86% of the first year undergraduates having at least one A level. BTECs, with 14% of the first year undergraduates having at least one qualification of this type (Award, Certificate or Diploma), were the second

most popular qualification, followed by the Extended Project (6%). Around 2% of the first year undergraduates had OCR Nationals (Certificate, Diploma or Extended Diploma) or Double Awards at AS and A level. Other academic qualifications such as the IB or the Cambridge Pre-U were held by less than 1% of the first year undergraduates.

It should be noted that the percentages in Table 1 add to more than 100% because students can hold more than one type of prior qualification when entering HE. Indeed, Table 2, which shows the percentage of students with different combinations of just two qualifications, highlights that just over 28% of students entering HE with A levels had only A levels and a further 66% of those entering with A levels had one or more AS levels. The next most common qualification also held by those with A levels was the Extended Project (7%). Table 2 also shows that OCR Nationals were taken more in combination with other qualifications (e.g., A and AS levels) than BTECs. Furthermore, a very high percentage of students with Cambridge Pre-U qualifications had at least one A level. Only 8% of the students who obtained Cambridge Pre-U Principal Subject qualifications held no other types of qualifications. Interestingly, only 12% of the students with a Cambridge Pre-U GPR qualification obtained a Cambridge Pre-U qualification in a principal subject. Finally, the qualification most frequently taken in isolation was the IB (92% of the IB students had no other qualification). This was followed by the BTEC Diploma and the OCR National Extended Diploma, which are equivalent to three A levels, and were taken in isolation by 73% and 71% of the students respectively.

**Table 1: Numbers and percentages of students with each mainstream prior qualification**

| Prior qualification               | Number of students | Percentage |
|-----------------------------------|--------------------|------------|
| A level                           | 214,230            | 85.6       |
| AS level                          | 145,430            | 58.1       |
| IB                                | 2,270              | 0.9        |
| Cambridge Pre-U GPR               | 165                | 0.1        |
| Cambridge Pre-U Principal Subject | 815                | 0.3        |
| Extended Project                  | 16,080             | 6.4        |
| Free Standing Mathematics         | 595                | 0.2        |
| Advanced Diploma                  | 585                | 0.2        |
| Progression Diploma               | 65                 | 0.0        |
| A level (Double)                  | 3,480              | 1.4        |
| AS level (Double)                 | 160                | 0.1        |
| A+AS level combined               | 70                 | 0.0        |
| BTEC                              |                    |            |
| All types                         | 35,195             | 14.1       |
| Award                             | 7,005              | 2.8        |
| Certificate                       | 6,115              | 2.4        |
| Diploma                           | 24,015             | 9.6        |
| OCR National                      |                    |            |
| All types                         | 3,780              | 1.5        |
| Certificate                       | 2,600              | 1.0        |
| Diploma                           | 1,090              | 0.4        |
| Extended Diploma                  | 305                | 0.1        |

Due to the large number of possible combinations of prior qualifications, and in order to look at a mixed economy of qualifications, students were classified as having pursued one of the three following programmes of study:

- **Academic:** Students obtained one or more of the following qualifications: AS/A level, IB, Cambridge Pre-U, Extended Project, Free Standing Mathematics.

5. Global Perspectives and Research.

6. Numbers of students have been rounded to the nearest multiple of 5 throughout this article and percentages calculated on groups which contain 52 or fewer individuals were suppressed, following HESA's rounding strategy.

Table 2: Combinations of prior qualifications – for row i and column j, percentage of students with qualification i that also have qualification j

|                                   | A level | AS level | IB   | Cambridge Pre-U GPR | Cambridge Pre-U Principal Subject | Extended Project | Free Standing Mathematics | Advanced Diploma | Progression Diploma | A level (Double) | AS level (Double) | A+AS level combined | BTEC Award | BTEC Certificate | BTEC Diploma | OCR National Certificate | OCR National Diploma | OCR National Extended Diploma |
|-----------------------------------|---------|----------|------|---------------------|-----------------------------------|------------------|---------------------------|------------------|---------------------|------------------|-------------------|---------------------|------------|------------------|--------------|--------------------------|----------------------|-------------------------------|
| A level                           | 28.1    | 65.8     | 0.0  | 0.1                 | 0.3                               | 7.1              | 0.3                       | 0.1              | 0.0                 | 1.3              | 0.1               | 0.0                 | 2.0        | 1.2              | 0.5          | 0.9                      | 0.3                  | 0.0                           |
| AS level                          | 96.9    | 1.0      | 0.0  | 0.1                 | 0.3                               | 8.1              | 0.3                       | 0.1              | 0.0                 | 1.0              | 0.0               | 0.0                 | 1.5        | 1.1              | 1.1          | 0.8                      | 0.3                  | 0.0                           |
| IB                                | 3.3     | 3.1      | 92.3 | 0.0                 | 0.0                               | 0.0              | 0.3                       | 0.0              | 0.0                 | 0.0              | 0.0               | 0.0                 | 0.1        | 0.0              | 0.0          | 0.1                      | 0.0                  | 0.0                           |
| Cambridge Pre-U GPR               | 100.0   | 63.8     | 0.0  | 0.0                 | 12.3                              | 0.0              | 0.0                       | 0.0              | 0.0                 | 0.0              | 0.0               | 0.0                 | 0.0        | 0.0              | 0.0          | 0.0                      | 0.0                  | 0.0                           |
| Cambridge Pre-U Principal Subject | 90.4    | 48.0     | 0.0  | 2.5                 | 7.6                               | 4.7              | 0.4                       | 0.0              | 0.0                 | 0.0              | 0.0               | 0.0                 | 0.1        | 0.0              | 0.0          | 0.0                      | 0.0                  | 0.0                           |
| Extended Project                  | 94.3    | 73.3     | 0.0  | 0.0                 | 0.2                               | 0.8              | 0.3                       | 3.0              | 0.4                 | 1.0              | 0.0               | 0.0                 | 2.2        | 0.9              | 1.3          | 0.8                      | 0.3                  | 0.1                           |
| Free Standing Mathematics         | 91.9    | 74.7     | 1.2  | 0.0                 | 0.5                               | 8.9              | 0.7                       | 0.2              | 0.0                 | 0.7              | 0.0               | 0.0                 | 2.0        | 1.0              | 6.2          | 0.7                      | 0.5                  | 0.0                           |
| Advanced Diploma                  | 48.0    | 19.6     | 0.0  | 0.0                 | 0.0                               | 82.9             | 0.2                       | 1.5              | 0.0                 | 0.5              | 0.0               | 0.0                 | 19.1       | 1.5              | 1.2          | 2.9                      | 0.3                  | 0.0                           |
| Progression Diploma               | 29.2    | 41.5     | 0.0  | 0.0                 | 0.0                               | 87.7             | 0.0                       | 0.0              | 3.1                 | 0.0              | 0.0               | 0.0                 | 7.7        | 3.1              | 0.0          | 0.0                      | 0.0                  | 0.0                           |
| A level (Double)                  | 78.9    | 43.6     | 0.0  | 0.0                 | 0.0                               | 4.6              | 0.1                       | 0.1              | 0.0                 | 7.7              | 0.2               | 0.1                 | 3.4        | 0.6              | 0.7          | 1.6                      | 0.3                  | 0.0                           |
| AS level (Double)                 | 67.3    | 42.6     | 0.0  | 0.0                 | 0.0                               | 2.5              | 0.0                       | 0.0              | 0.0                 | 3.7              | 6.2               | 0.0                 | 9.3        | 3.7              | 9.3          | 1.9                      | 0.0                  | 0.0                           |
| A+AS level combined               | 88.2    | 41.2     | 0.0  | 0.0                 | 0.0                               | 4.4              | 0.0                       | 0.0              | 0.0                 | 4.4              | 0.0               | 1.5                 | 5.9        | 2.9              | 1.5          | 1.5                      | 0.0                  | 0.0                           |
| BTEC Award                        | 68.2    | 35.5     | 0.0  | 0.0                 | 0.0                               | 5.8              | 0.2                       | 1.8              | 0.1                 | 1.9              | 0.2               | 0.1                 | 11.4       | 9.7              | 4.9          | 3.8                      | 1.3                  | 0.1                           |
| BTEC Certificate                  | 42.6    | 25.8     | 0.0  | 0.0                 | 0.0                               | 2.5              | 0.1                       | 0.2              | 0.0                 | 0.4              | 0.1               | 0.0                 | 10.0       | 33.3             | 1.0          | 2.2                      | 0.4                  | 0.0                           |
| BTEC Diploma                      | 4.8     | 6.9      | 0.0  | 0.0                 | 0.0                               | 0.9              | 0.2                       | 0.0              | 0.0                 | 0.1              | 0.1               | 0.0                 | 1.2        | 0.2              | 73.3         | 0.4                      | 0.1                  | 0.0                           |
| OCR National Certificate          | 79.2    | 45.2     | 0.1  | 0.0                 | 0.0                               | 5.3              | 0.2                       | 0.7              | 0.0                 | 2.3              | 0.1               | 0.0                 | 9.6        | 5.4              | 3.6          | 4.0                      | 2.6                  | 0.1                           |
| OCR National Diploma              | 54.1    | 34.2     | 0.0  | 0.0                 | 0.0                               | 4.8              | 0.3                       | 0.2              | 0.0                 | 1.0              | 0.0               | 0.0                 | 7.5        | 2.0              | 2.9          | 6.0                      | 19.8                 | 0.0                           |
| OCR National Extended Diploma     | 8.2     | 7.8      | 0.0  | 0.0                 | 0.0                               | 2.9              | 0.0                       | 0.0              | 0.0                 | 0.0              | 0.0               | 0.0                 | 1.6        | 0.0              | 0.0          | 0.7                      | 0.0                  | 71.2                          |

(Note: The shaded diagonal cells show the percentage of students with qualification i that have no other qualification types)

- **Vocational:** Students obtained one or more of the following qualifications: Double Award AS/A level, BTEC, OCR National.
- **Mixed:** Students obtained a Diploma (Progression or Advanced) or a combination of academic and vocational qualifications.

Figure 1 shows the percentages of students progressing to HE through the different programmes of study. Although the percentages of university students having followed vocational and mixed programmes of study have been growing in the last few years (see, for example, Hayward & Hoelscher (2011)), the majority of the first year undergraduates in the

academic year 2011/12 had followed an academic programme of study (80%). Approximately 11% of the first year undergraduates had followed a vocational programme and the remaining 9% followed a mixed one.

Figure 2 shows the percentages of students who progressed to HE through the different programmes of study by university mission group. The highest percentages of students having followed an academic programme of study were in universities of the Russell Group (96%), followed closely by universities in the 1994 Group (90%). The lowest percentages of students with an academic programme were in universities of the Million+ Group (67%). The highest percentages of

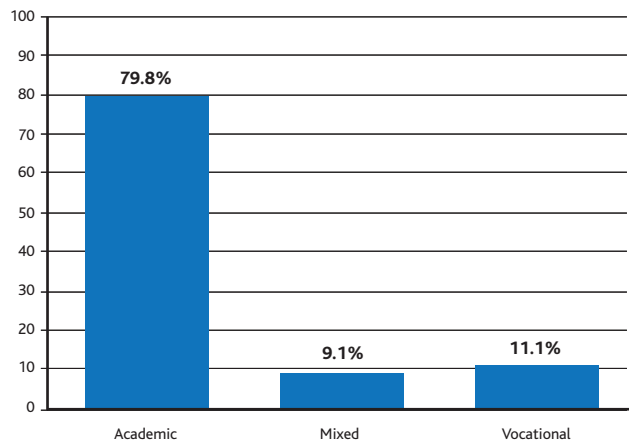


Figure 1: Percentages of students progressing to HE through different programmes of study

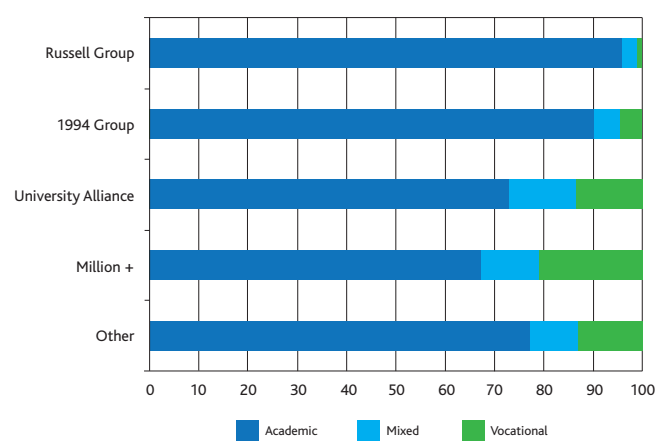


Figure 2: Percentages of students progressing to HE through different programmes of study, by type of university

students with a vocational programme of study were in universities of the Million+ Group (21%), followed by universities in the University Alliance (14%). Unsurprisingly, the lowest percentages of students having followed a vocational pathway into university were in the universities of the Russell Group (1%). It is worth noting that, in the Russell Group universities, the percentage of students with a mixed programme of study was higher than the percentage of students following a vocational one (3% vs. 1%).

Table 3 shows the percentages of students who progressed to HE through the different programmes of study by the field of study (subject area) at university. It shows that the highest percentages of students progressing from an academic programme of study were in subject areas related to Languages, in Historical and Philosophical Studies, Medicine and Dentistry and Physical Sciences. Conversely, the highest percentages of students progressing from a vocational programme of study were in Creative Arts and Design, Education, Technologies and Veterinary Sciences, Agriculture and related subjects.

**Table 3: Percentages of students progressing to HE through different programmes of study, by subject area**

| University subject area   | Programme of study |       |            |
|---|--------------------|-------|------------|
|   | Academic           | Mixed | Vocational |
| Architecture, Building and Planning   | 78.2               | 9.5   | 12.3       |
| Biological Sciences   | 78.1               | 8.6   | 13.3       |
| Business and Administrative Studies   | 71.0               | 13.8  | 15.2       |
| Creative Arts and Design  | 68.8               | 10.9  | 20.2       |
| Eastern, Asiatic, African, American and Australasian Languages, Literature and related subjects | 97.0               | 2.1   | 0.9        |
| Education   | 67.1               | 15.8  | 17.0       |
| Engineering   | 82.9               | 7.1   | 10.0       |
| European Languages, Literature and related subjects   | 96.4               | 3.5   | 0.1        |
| Historical and Philosophical Studies  | 95.7               | 3.9   | 0.4        |
| Law   | 86.0               | 9.3   | 4.7        |
| Linguistics, Classics and related subjects  | 94.1               | 5.5   | 0.4        |
| Mass Communications and Documentation   | 74.6               | 12.6  | 12.9       |
| Mathematical and Computer Sciences  | 69.6               | 13.0  | 17.4       |
| Medicine and Dentistry  | 97.8               | 2.2   | 0.0        |
| Physical Sciences   | 92.4               | 4.7   | 2.9        |
| Social Studies  | 85.6               | 7.5   | 6.9        |
| Subjects Allied to Medicine   | 75.0               | 11.2  | 13.8       |
| Technologies  | 65.5               | 11.5  | 23.0       |
| Veterinary Sciences, Agriculture and related subjects   | 73.6               | 5.3   | 21.1       |
| Other/Combined  | 85.1               | 7.8   | 7.1        |

To complement the analyses presented so far, the remainder of this section focuses on individual prior qualifications (namely, A level, IB, Cambridge Pre-U, BTEC and OCR Nationals) and shows the universities and fields of study in which they are over- or under-represented using odds ratios derived from multilevel logistic regressions.

An odds ratio represents the factor of increase in the odds of attending a university (or studying a subject) when the value of a categorical independent variable changes from the baseline to a specified category or when the value of a continuous independent variable increases by a

specified unit. An odds ratio greater than 1 indicates an increase in the likelihood of attending a university (or studying a subject), with a greater odds ratio indicating a greater likelihood. Conversely, an odds ratio less than 1 indicates a decrease in the likelihood of attending a university (or studying a subject), with a smaller odds ratio indicating a smaller likelihood. Finally, an odds ratio equal to 1 indicates an equal likelihood of attending a university (or studying a subject).

Tables 4 and 5 present the odds ratios for prior qualifications in comparison to A levels. The reference group, A levels only, is not shown in the tables, as all values for the odds ratios would be 1.

Table 4 shows that students who followed a full IB programme prior to entry at university were more likely to study in a Russell Group university or in a university member of the 1994 Group than those who followed a more traditional pathway and studied A levels only (higher likelihood in a Russell Group university). On the other hand, IB students were less likely to study in universities of the Million+ Group or the University Alliance (lower likelihood in a Million+ Group university). There was a relatively small number of students progressing to university with only Cambridge Pre-U qualifications (see Table 1). However, those who progressed were much more likely to study in a Russell Group university than the students holding any other prior qualifications. Similarly to IB students, Cambridge Pre-U students were under-represented in universities of the Million+ Group or the University Alliance. The opposite pattern was found for students holding BTEC qualifications or OCR Nationals.

**Table 4: Type of university – odds ratios for mainstream prior qualifications in comparison to A levels**

| University mission group | Prior qualification |                 |             |              |
|--------------------------|---------------------|-----------------|-------------|--------------|
|                          | IB                  | Cambridge Pre-U | BTEC        | OCR National |
| Russell Group            | <b>2.98</b>         | <b>4.25</b>     | <b>0.18</b> | <b>0.10</b>  |
| 1994 Group               | <b>1.63</b>         | 0.37            | <b>0.46</b> | <b>0.26</b>  |
| University Alliance      | <b>0.38</b>         | <b>0.07</b>     | <b>1.09</b> | 1.15         |
| Million +                | <b>0.31</b>         | 0.03            | <b>1.55</b> | <b>2.17</b>  |
| Other                    | <b>0.73</b>         | 0.57            | <b>1.21</b> | 0.96         |

Note: Candidates have only the stated qualification

Note: Significant odds ratios at the 0.05 level are presented in bold type

Table 5 shows that having an Extended Project qualification alongside A levels significantly increased the probability of attending a university in the Russell or 1994 groups. Similarly, holding a Cambridge Pre-U GPR qualification alongside A levels (and also, to some extent, holding a Cambridge Pre-U qualification in a principal subject) increased significantly the probability of attending a university in the Russell Group (increases in the probability of attending a university in the 1994 Group were not statistically significant). In contrast, having an OCR National or a BTEC qualification alongside A levels decreased the likelihood of attending the more competitive universities (Russell Group and 1994 Group) but increased the likelihood of attending universities in the Million+ Group and in the University Alliance.

Tables 6 and 7 present, in the form of odds ratios, the likelihood of studying a university course in a specific subject area of a student with a non-traditional background (academic and/or vocational qualifications) compared with that of a student with a traditional academic qualification (A levels only). As above, the reference group, A levels only is not shown in the tables.

**Table 5: Type of university – odds ratios for combinations of prior qualifications in comparison to A levels only**

| University mission group | Prior qualifications       |                           |                               |                          |                |                        |
|--------------------------|----------------------------|---------------------------|-------------------------------|--------------------------|----------------|------------------------|
|                          | A level + Extended Project | A level + Cambridge Pre-U | A level + Cambridge Pre-U GPR | A level + Double A level | A level + BTEC | A level + OCR National |
| Russell Group            | <b>2.16</b>                | <b>1.64</b>               | <b>2.15</b>                   | -                        | <b>0.12</b>    | <b>0.23</b>            |
| 1994 Group               | <b>1.09</b>                | 1.24                      | 1.45                          | -                        | <b>0.47</b>    | <b>0.38</b>            |
| University Alliance      | <b>0.64</b>                | <b>0.58</b>               | 0.67                          | 1.56                     | <b>2.20</b>    | <b>1.73</b>            |
| Million +                | <b>0.62</b>                | <b>0.54</b>               | <b>0.46</b>                   | 2.40                     | 1.00           | <b>1.44</b>            |
| Other                    | <b>0.82</b>                | <b>0.61</b>               | 0.76                          | 0.46                     | 0.97           | 0.94                   |

Note: Significant odds ratios at the 0.05 level are presented in bold type

Table 6 shows that students who followed a full IB programme prior to entry to university were significantly more likely to study courses in the areas of Languages and Literature than those who studied A levels only. IB students were also significantly more likely to study Medicine and Dentistry, Historical and Philosophical Studies and were also significantly more likely to study courses in the areas of Law, Physical Sciences or Social Studies. Conversely, they were significantly less likely than A level students to study courses in the subject areas of Creative Arts and Design, Education, Mathematics and Computer Sciences, Business and Administrative Studies, Engineering, Subjects Allied to Medicine, Mass

**Table 6: Subject of study – odds ratios for mainstream prior qualifications in comparison to A levels**

| University subject area   | Prior qualification |                 |             |              |
|---|---------------------|-----------------|-------------|--------------|
|   | IB                  | Cambridge Pre-U | BTEC        | OCR National |
| Architecture, Building and Planning   | 1.23                | 1.02            | 0.93        | <b>0.26</b>  |
| Biological Sciences   | 1.10                | 0.01            | <b>1.71</b> | 0.92         |
| Business and Administrative Studies   | <b>0.60</b>         | 0.35            | <b>1.63</b> | <b>2.73</b>  |
| Creative Arts and Design  | <b>0.36</b>         | 2.60            | <b>1.18</b> | <b>0.53</b>  |
| Eastern, Asiatic, African, American and Australasian Languages, Literature and related subjects | <b>2.12</b>         | -               | <b>0.16</b> | -            |
| Education   | <b>0.48</b>         | 0.22            | <b>2.29</b> | <b>2.18</b>  |
| Engineering   | <b>0.75</b>         | 0.30            | <b>0.76</b> | <b>0.31</b>  |
| European Languages, Literature and related subjects   | <b>1.89</b>         | <b>6.08</b>     | <b>0.02</b> | -            |
| Historical and Philosophical studies  | <b>1.59</b>         | 1.39            | <b>0.05</b> | <b>0.08</b>  |
| Law   | <b>1.39</b>         | 1.09            | <b>0.35</b> | <b>0.45</b>  |
| Linguistics, Classics and related subjects  | <b>1.46</b>         | <b>4.70</b>     | <b>0.04</b> | -            |
| Mass Communications and Documentation   | <b>0.41</b>         | -               | <b>0.90</b> | <b>1.68</b>  |
| Mathematical and Computer Sciences  | <b>0.43</b>         | 1.29            | <b>1.52</b> | <b>2.35</b>  |
| Medicine and Dentistry  | <b>1.70</b>         | 0.26            | -           | -            |
| Physical Sciences   | <b>1.31</b>         | 0.86            | <b>0.30</b> | <b>0.10</b>  |
| Social Studies  | <b>1.24</b>         | 1.12            | <b>0.66</b> | 0.96         |
| Subjects Allied to Medicine   | <b>0.68</b>         | -               | <b>1.38</b> | <b>2.33</b>  |
| Technologies  | 0.80                | -               | <b>1.83</b> | 1.08         |
| Veterinary Sciences, Agriculture and related subjects   | <b>0.44</b>         | -               | <b>1.72</b> | 0.35         |
| Other/Combined  | <b>1.35</b>         | 0.84            | <b>0.72</b> | <b>0.67</b>  |

Note: Candidates have only the stated qualification

Note: Significant odds ratios at the 0.05 level are presented in bold type

Communications and Documentation and Veterinary Sciences, Agriculture and related subjects.

There were no statistically significant differences between the students holding only Cambridge Pre-U qualifications and only A level qualifications in the majority of the subject areas. The only significant differences appeared in the European Languages, Literature and related subjects and the Linguistics, Classics and related subjects areas. In those two subject areas, Cambridge Pre-U students were much more likely than A level students to be pursuing a course.

Regarding the vocational qualifications (BTECs or OCR Nationals) the most extreme differences were found in some academic subject areas such as Languages, Historical and Philosophical Studies or Physical Sciences. For example, the likelihood of someone holding just BTEC qualifications entering a course in the area of European Languages was more than 50 times lower than for a student with A levels. BTEC and OCR National students were also significantly less likely than A level students to study in the areas of Engineering, Law or Social Studies. However, these vocational students were over-represented in Biological Sciences, Creative Arts and Design (BTEC students only), Business and Administrative Studies, Mathematical and Computer Sciences, Education and Subjects Allied to Medicine. It should be noted that the majority of these university subject areas correspond with BTEC sectors and/or OCR National subjects and therefore it is not surprising that students with these prior qualifications were more attracted to them.

Table 7 shows that students holding an Extended Project qualification alongside their A levels were more likely to study Medicine and Dentistry than students without it. It could be the case that in competitive courses such as these, the Extended Project had been used to differentiate among very high achieving candidates at A level. These students were also significantly more likely to study a degree in the following subject areas: European Languages, Literature and related subjects, Historical and Philosophical Studies, Linguistics, Classics and related subjects, Law, Physical Sciences and Veterinary Sciences, Agriculture and related subjects.

Students holding Cambridge Pre-U qualifications alongside A levels were significantly more likely to study courses in the areas of Languages and Literature than those who studied A levels only. Students with A levels and Cambridge Pre-U qualifications were also over-represented in Historical and Philosophical Studies and Creative Arts and Design. In contrast, they were less likely than students holding A levels only to pursue courses in the subject areas of Biological Sciences, Medicine and Dentistry, Engineering, Physical Sciences, Subjects Allied to Medicine and Veterinary Sciences, Agriculture and related subjects. It is worth pointing out here that the choice of university degree might also depend on the subject of the prior qualification and, in the case of the Cambridge Pre-U,



**Table 7: Subject of study – odds ratios for combinations of prior qualifications in comparison to A levels only**

| University subject area   | Prior qualifications          |                              |                                  |                   |                           |
|---|-------------------------------|------------------------------|----------------------------------|-------------------|---------------------------|
|   | A level +<br>Extended Project | A level +<br>Cambridge Pre-U | A level +<br>Cambridge Pre-U GPR | A level +<br>BTEC | A level +<br>OCR National |
| Architecture, Building and Planning   | 0.93                          | 0.96                         | 2.33                             | 1.14              | 0.98                      |
| Biological Sciences   | 1.05                          | <b>0.58</b>                  | 1.21                             | <b>1.11</b>       | <b>0.75</b>               |
| Business and Administrative Studies   | <b>0.57</b>                   | 0.71                         | <b>0.40</b>                      | <b>1.83</b>       | <b>1.85</b>               |
| Creative Arts and Design  | <b>0.61</b>                   | <b>1.80</b>                  | 0.93                             | <b>1.65</b>       | 0.90                      |
| Eastern, Asiatic, African, American and Australasian Languages, Literature and related subjects | 1.05                          | <b>2.56</b>                  | 4.02                             | <b>0.09</b>       | <b>0.43</b>               |
| Education   | <b>0.65</b>                   | 0.52                         | 0.33                             | <b>1.75</b>       | <b>1.84</b>               |
| Engineering   | <b>0.87</b>                   | <b>0.40</b>                  | 0.46                             | <b>0.56</b>       | <b>0.73</b>               |
| European Languages, Literature and related subjects   | <b>1.18</b>                   | <b>2.74</b>                  | 0.35                             | <b>0.31</b>       | <b>0.31</b>               |
| Historical and Philosophical studies  | <b>1.61</b>                   | <b>1.45</b>                  | <b>2.51</b>                      | <b>0.29</b>       | <b>0.44</b>               |
| Law   | <b>1.39</b>                   | 0.83                         | 0.51                             | <b>0.75</b>       | 0.79                      |
| Linguistics, Classics and related subjects  | <b>1.58</b>                   | <b>2.02</b>                  | 1.34                             | <b>0.34</b>       | <b>0.60</b>               |
| Mass Communications and Documentation   | <b>0.78</b>                   | 0.67                         | 0.88                             | <b>1.28</b>       | <b>1.74</b>               |
| Mathematical and Computer Sciences  | <b>0.83</b>                   | 0.79                         | 0.37                             | 1.12              | <b>2.58</b>               |
| Medicine and Dentistry  | <b>2.25</b>                   | <b>0.61</b>                  | 2.12                             | <b>0.03</b>       | <b>0.08</b>               |
| Physical Sciences   | <b>1.16</b>                   | <b>0.52</b>                  | 1.39                             | <b>0.31</b>       | <b>0.38</b>               |
| Social Studies  | 1.01                          | 1.06                         | 1.14                             | <b>0.71</b>       | <b>0.79</b>               |
| Subjects Allied to Medicine   | <b>0.75</b>                   | <b>0.29</b>                  | 0.67                             | <b>0.87</b>       | 0.94                      |
| Technologies  | <b>0.63</b>                   | 0.48                         | 1.33                             | <b>1.99</b>       | 1.02                      |
| Veterinary Sciences, Agriculture and related subjects   | <b>1.40</b>                   | <b>0.12</b>                  | -                                | 1.04              | 0.62                      |
| Other/Combined  | <b>1.10</b>                   | <b>1.53</b>                  | 1.07                             | 0.92              | <b>0.74</b>               |

Note: Significant odds ratios at the 0.05 level are presented in bold type

the most popular principal subjects in the June 2012 examination series (DfE, 2013c) were Literature in English, History, Mathematics, French, Economics and Philosophy and Theology, which supports the relationships reported above.

There were no statistically significant differences between the students holding A levels and Cambridge Pre-U GPR qualifications and those holding only A level qualifications in the majority of the subject areas. The only significant differences appeared in the areas of Historical and Philosophical Studies and Business and Administration Studies.

For students holding A levels and one of the vocational qualifications (BTECs or OCR Nationals) the most extreme differences were found in some academic subject areas such as the Languages, Historical and Philosophical Studies or Physical Sciences. For example, the likelihood of a student holding a BTEC alongside the A levels entering a course in the area of European Languages was around 4 times lower than for a student with A levels only. Students with BTEC and OCR Nationals alongside A levels were also significantly less likely to study in the areas of Engineering, Law, Medicine and Dentistry or Subjects Allied to Medicine than students with only academic qualifications. However, students holding BTECs or OCR Nationals alongside their A levels were significantly more likely to study for a degree in Biological Sciences (BTEC students only), Creative Arts and Design, Business and Administrative Studies, Education, Mass Communications and Documentation, Mathematical and Computer Sciences (OCR National students only), Social Studies and Technologies. These subject areas also attracted students with BTECs and OCR Nationals only (see Table 6) so it seems that when a student has a combination of A levels and vocational qualifications, the latter might be driving the choice of subject at university.

Note that the odds ratios for the combination of A levels and Double A levels were not included in Table 7, as there were no statistically

significant differences with A levels only, and in many of the subject areas there was not enough data to allow for comparison.

## Conclusions and discussion

In a rapidly evolving qualifications system it is crucial to better understand how qualifications, both academic and vocational, are used by students for progression, in particular to HE. This article aimed to provide quantitative evidence to show how different types of qualifications and combinations of qualifications channelled learners in particular directions. Note that the nature of this study does not allow drawing causal relationships between specific qualifications and students' participation in HE, as there might be other factors not included in the analyses that have a direct impact on progression to a HE institution or field of study.

We considered data covering first year undergraduates aged 17–19, domiciled in England, studying at UK universities in the 2011/12 academic year. Considering data on undergraduates did not allow us to study the determinants of progression to HE, but enabled us to focus on university participation in terms of institution attended and subject chosen for the students who did progress. It was not possible to identify, for example, whether students with vocational qualifications failed to apply to prestigious or highly selective institutions or whether they applied but were not accepted. Furthermore, it should be taken into account that the data on prior learning provided information about the qualifications achieved by students who accessed HE but not about the qualifications actually required by the HE institution.

Overall, the current research showed that prior qualifications, and combinations of prior qualifications, are represented in different proportions in HE and particularly in the different institution types and

fields of study. This could be cause for concern as the prior learning of the students might steer them towards universities and courses that could bring fewer economic benefits or provide a disadvantage in the labour market. For example, Chevalier and Conlon (2003) reported that prestigious institutions provide higher financial returns to their graduates; specifically, even after accounting for personal characteristics, graduating from a Russell Group institution adds between 0% and 6% to a graduate's earnings compared to graduating from a modern university, for example those in the University Alliance or Million+ Group. More recent studies (e.g., Bratti, Naylor & Smith, 2005; Walker & Zhu, 2005; Greenwood, Harrison & Vignoles, 2011; Walker & Zhu, 2011) showed that there is a large heterogeneity in wages by degree subject area with Health, Science and Social Sciences graduates earning more than Humanities, Education and Arts graduates. Furthermore, Walker and Zhu (2013) revealed that after certain controls were factored in, male graduates of Russell Group universities earn 3% more than students in post-1992<sup>7</sup> universities.

In more detail, the outcomes of this research showed that AS and A levels were the most popular mainstream qualifications held by undergraduates at HE institutions. In fact, in the academic year 2004/05 the vast majority of university entrants (almost 81%) held AS/A level qualifications (Connor, Banerji & Sinclair, 2006) and our research showed that just below 86% of the students starting in 2011/12 did so as well. However, the percentage of full-time entrants holding A levels only has been decreasing in the last few years (UCAS, 2012) and, as shown in this research, it reached 28% in 2011/12.

The highest percentages of students with A levels were in universities of the Russell Group, where high A level grades usually dominate entry requirements. Furthermore, students with other academic qualifications (e.g., Cambridge Pre-U or IB) were also more likely to go to Russell Group or 1994 Group universities than to other types of universities. Previous research (HESA, 2011) has already shown that students with an IB Diploma were more likely than A level students to study at high ranking institutions.

Regarding some of the recently introduced academic qualifications, this research showed that having an Extended Project qualification or a Cambridge Pre-U GPR qualification alongside AS/A levels significantly increased the probability of attending a university in the Russell or 1994 groups. These qualifications, which require research and autonomous working, have been praised by universities, especially competitive ones, as they allow the development of independent research skills needed for undergraduate study. It is therefore not surprising that they provide 'better' access to competitive universities.

On the topic of the field of study in the HE institutions, the highest percentages of students with A levels were in subject areas related to Languages, Historical and Philosophical Studies, Medicine and Dentistry and Physical Sciences. This finding was supported by research carried out by Connor et al. (2006), who found that A levels were over-represented in the Humanities and also in Physical Science, Law and Social Studies. Similarly, Hoelscher et al. (2008) reported that the likelihood of a student with a traditional academic background (A levels) studying Medicine and Dentistry was more than 25 times higher than that for a student with other types of qualifications.

Similarly to A level students, those holding Cambridge Pre-U (Principal Subject) qualifications or an IB Diploma were more likely to study Languages, Historical and Philosophical Studies, Linguistics, Classics and related subjects and Social Studies, and less likely than average to study Science subjects, with the exception of Medicine and Dentistry. IB and Cambridge Pre-U students were particularly unlikely to study Creative Arts and Design or Mathematical and Computer Sciences. However, the university subject choices of these students may reflect patterns of uptake or provision of Cambridge Pre-U or IB subjects in schools.

On the topic of progression from vocational backgrounds, previous research by Connor et al. (2006) showed that there was an uneven distribution of vocationally qualified entrants to full-time degree courses across HE institutions and they represented a relatively small proportion of the overall intake. The latter seems to be changing, with percentages of university students having followed vocational and mixed programmes of study growing in the last few years (see, for example, Hayward and Hoelscher (2011) or UCAS (2013)).

BTEC qualifications, particularly the BTEC Diplomas, have become valued and respected qualifications and are a popular option within Further Education (FE) and HE. In fact, the current research has shown that BTECs are the second most popular qualification held by undergraduates at HE institutions in the UK. However, its popularity varied by type of institution and subject.

Regarding the type of institution, our research showed that the highest percentages of students with BTEC qualifications were in universities of the Million+ Group, followed by universities in the University Alliance. As expected, the lowest percentages of students with these qualifications were in universities of the Russell Group. Those findings support previous studies by Schwartz (2004) and Hoelscher et al. (2008), among others, who have shown that students with non-traditional qualifications typically progressed to post-1992 institutions and colleges of HE. This could be partly related to the type of courses offered by each group of institutions. In fact, Carter (2009) argued that vocational progression routes are often best developed in the newer parts of the HE sector. Many post-1992 universities, FE and HE colleges have rich experience in developing learning programmes and recruitment procedures that are tailored to the needs of vocational learners. This research confirms somewhat the above argument as the most popular destinations for candidates with vocational qualifications, and in particular BTECs, were HE institutions in the University Alliance and Million+ Group, which are constituted by the newest universities and colleges.

Regarding the subject of study, and as pointed out previously by the Higher Education Funding Council for England (HEFCE) (2007), the most popular fields of study at university for students with BTECs were closely aligned to BTEC subject areas.

Similarly to students holding BTEC qualifications, students with other vocational qualifications (OCR Nationals and Double Award AS/A levels) were found to be more likely to attend a University Alliance or Million+ institution than other types of institutions.

The results in this research support the hypothesis that students with more academic backgrounds are more likely to go to universities in the Russell and 1994 groups, and those holding vocational qualifications are more likely to study in other types of universities (e.g., universities in the University Alliance or in the Million+ Group). One reason for this could be that the more applied/vocational subjects are over-represented in some types of institutions and, for example, candidates with vocational backgrounds are more attracted to those types of subjects. Therefore

7. The *Further and Higher Education Act 1992* ended the divide between universities and polytechnics in the UK. The former are known as pre-1992 HE institutions; the polytechnics and those more recently obtaining degree-awarding powers, such as colleges of HE, are named as post-1992 HE institutions (Hayward & Hoelscher, 2011).

their university choices are determined by their subject choices. In fact, vocational students, who usually come from 'average' or 'more deprived' backgrounds, might be taking applied or more vocational subjects (e.g., Business and Administrative Studies, Law and Mathematics and Computer Science, or Subjects Allied to Medicine) at HE to allow them to quickly (i.e., soon after graduation) join the labour market.

This research has not looked at work based learning (WBL) and the progression to HE of learners with WBL qualifications, such as apprenticeships. One of the reasons for this relates to the fact that quantitative information or uptake data on these types of qualifications is difficult to access and in many cases it is incomplete (Seddon, 2005).

## Recent policy developments and further research

The research reported in this article is not longitudinal but is rather a snapshot of the distribution of prior qualifications in HE in one academic year, 2011/12. However, during recent years there have been many changes in education and assessment in England, particularly relating to Level 3 qualifications and university admissions policies, which could potentially have an impact on the current situation.

Firstly, new qualifications have been introduced at Level 3 that aim to prepare learners for study at university, some qualifications have been withdrawn and other qualifications are being comprehensively reformed. The uptake of these qualifications will probably fluctuate and therefore patterns of entry to university of undergraduates holding them could also vary in the next few years.

Secondly, the uptake of vocational qualifications had increased in the years previous to our research. However, as a result of the *Wolf Review of Vocational Education* (Wolf, 2011), the government announced a reform to performance tables to remove the 'perverse incentives' which could have pushed young people into qualification routes that did not allow them to progress into FE. Following this decision, some vocational qualifications were removed from the league tables and others were reviewed. There are also plans to raise the status of vocational courses in sixth forms and colleges in England with the introduction of a Technical Baccalaureate (DfE, 2013b). This qualification will be taught at a level of difficulty meant to show that pupils are able to carry out 'complex and non-routine' skills, on a par with A levels and will become a league table performance measure from 2017. Those two reforms may have an impact on the provision and uptake of vocational qualifications in schools in the coming years and therefore on the distribution of students with these qualifications in HE institutions and subjects.

Thirdly, from the academic year 2012/13, students attending universities in the UK have been charged higher university tuition fees. The cost of each individual course is decided by the university offering it but, while it was originally claimed that £9,000 was the maximum amount universities could charge and that very few would decide to go that high, over a third of universities are charging the full amount. It has been claimed by Universities UK<sup>8</sup> that this could affect the governments' commitment to increasing social mobility, and students from low socio-economic backgrounds might find themselves with restricted options.

Similarly, a report by the Higher Education Policy Institute concluded that changes to tuition fees will make it far more difficult for bright students from poorer backgrounds to attend Britain's elite universities (Thompson and Bekhradnia, 2011). However, a report from HEFCE (2013) looking into the impact of the 2012 reforms in HE has shown that 'the current evidence suggests that the reforms have not made young people from disadvantaged areas less likely to study full time'. This report also found indications that students from all backgrounds are more likely to choose courses in clinical subjects and Science, Technology, Engineering and Mathematics and less likely to choose Arts, Humanities or Social Science courses, potentially due to their higher returns. Therefore, the changes in university tuition fees might be causing shifts in entries to particular groups of subjects.

In the light of the current changes, it would be advisable to replicate this research in a few years' time to explore how HE choices have changed and which factors have impacted on those choices. Furthermore, if data on performance prior to university were available, analyses could also control for prior achievements at Level 3 (or before) and comparisons between students who have similar 'academic ability' could be drawn.

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# Teachers' and employers' views on the transition from GCSE Mathematics to A level Mathematics or employment

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## Introduction

The General Certificate of Secondary Education (GCSE) is a British qualification taken by 16-year-olds at the end of compulsory formal schooling in England, Wales and Northern Ireland. Whilst students must continue with some form of education beyond this, it does not have to be full-time education, nor must it continue within a school or college. Therefore, the qualification marks a transition, and the results from it may be used as entry requirements for further study and employment.

Mathematics is one of the core GCSE subjects, and students are required to study the subject until the end of Key Stage 4 (KS4), when they are approximately aged 16. There is no requirement for students to take a qualification in Mathematics, but almost all students do. In 2011/12, 97.3 per cent of students at the end of KS4 took a qualification in Mathematics; 93.7 per cent of the KS4 students took a GCSE in the subject (Gill, 2013a).

GCSE Mathematics is important because it represents the end of students' compulsory Mathematics learning. Despite suggestions that all students should continue studying Mathematics beyond this point, it is currently only a requirement for those students who have not 'passed' GCSE Mathematics (i.e., those who have not gained a grade C or above) to continue studying to do so. Therefore, the qualification needs to accurately assess students' competence in Mathematics. It is also a requirement for continuing to study Mathematics at A level, so needs to reflect the skills that are necessary for starting that qualification. Finally,

it may be necessary for studying Science subjects at A level; a good grade in GCSE Mathematics is often required if students wish to take A level Physics (Gill & Bell, 2013).

Despite being required for entry to further study and employment, there is a history of research that identifies problems in using GCSE Mathematics for both purposes. The transition to A level is seen to be problematic (Mendick, 2008; Hernandez-Martinez et al., 2011). Many students who start A level courses drop out during their first year or after their AS results (Mendick, 2008; Noyes & Sealey, 2012) and there is widely believed to be a gap between the Mathematics that is necessary to pass a GCSE and the Mathematics that students need to be able to do to start A level (Brown, Brown & Bibby, 2008; Noyes & Sealey, 2011). Schools have adopted two approaches in order to combat the gap and avoid high drop-out rates. Most schools require high grades for entry onto A level Mathematics courses. Students often have to have achieved a grade B at GCSE or even a grade A in order to be accepted for the course (Mendick, 2008; Noyes & Sealey, 2012; Hernandez-Martinez et al., 2011). The grades required for Mathematics may be higher than those used for other subjects (Mendick, 2008). Additionally, some schools run extra courses, or set work for students to complete between finishing GCSEs and starting A levels so that their Mathematics is of the standard that is needed for the A level course (Noyes & Sealey, 2011).

Whilst the notion of a gap between GCSE and A level Mathematics appears to be widely acknowledged, there is little research that has investigated what the nature of the gap is. Instead, most of the research