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Examining the impact of tiered examinations on the aspirations of young people

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Introduction

Tiered examinations are commonly employed within the General Certificate of Secondary Education (GCSE) examinations in the UK. Within a given subject, tests at different levels of difficulty are developed and then teachers or schools can decide which tier is most appropriate for their candidates (Dhawan and Wilson, 2013). Within current tiered GCSEs, more able candidates will be allocated to more difficult, "higher" tier tests whereas less able candidates will be directed towards the "foundation" tier. The highest GCSE grades (A*–B) are only available to those candidates who take the higher tier version of the test. In the past, GCSE Maths used a three tier structure where pupils of low, medium and high ability were directed towards foundation, intermediate and higher tier versions of examinations.

The aim of tiering is to ensure that the difficulties of exam papers are correctly tailored to the ability of the candidates taking them; this should ensure more accurate measurements and also a better experience for candidates as they do not spend time addressing questions that are either too easy or too difficult given their level of skill. However, tiered examinations have been criticised for potentially damaging the aspirations of young people. For example, the Department for Education's (DfE) 2012 consultation into the reform of qualifications stated:

> *The prospects for those students taking a foundation tier paper are poor... Having a grade-cap in foundation tier examinations is also likely to be de-motivating and limit the aspirations of students*. (DfE, 2012).

Other research has linked the use of tiered examinations with the more general issue of ability setting and, similarly, suggested that, in this context, tiered examinations may have a demotivating effect (Boaler, 1997; Boaler *et al*. 2000). For example, Boaler (1997) reported results from qualitative research in one school. She found that:

> *... students became disillusioned and demotivated by the limits placed upon their achievement within their sets*. (Boaler, 1997).

In the light of these statements, the aim of this paper is to provide a large scale, quantitative examination of the extent of the link between GCSE entry tier and aspirations and also to investigate the extent to which this link can be explained by differences in achievement and background characteristics of pupils. It should be noted that, in some sense, there is an intrinsic link between aspirations and entry tier in that, in general, students can only continue to higher level study within a subject if they achieve a grade B or above, and this can only be achieved if they enter the higher tier. Thus, by entering the lower tier, the decision not to continue studying the given subject further beyond GCSE has already been made. As such, it is not sensible to quantitatively examine the link between tiers and aspirations *within* a given subject. However, the quotes above hint at a wider form of de-motivation and disillusionment coming from students being placed in a lower tier, suggesting that being entered for such an examination may harm students' educational aspirations and desire for learning across all subjects, not just the subject they are entered for. It is this hypothesis that is explored in this paper. Namely, we examine whether there is any evidence of entering candidates for lower tier examinations having a negative impact on their wider educational aspirations or, indeed, on their chances of participating in post-compulsory education.

It should be noted that this paper does not explore the effects of tiered assessment on the achievement of young people but is purely concerned with the effect on aspirations. Furthermore, this paper only examines the possible effects of tiering during Key Stage 4. Any effects of tiering on pupils prior to the beginning of Key Stage 4[1] are beyond the scope of this research.

Data and Method

The research makes use of data available from the Longitudinal Study of Young People in England[2] (LSYPE). The LSYPE began collecting data on the attitudes of around 16,000 Year 9 pupils in a representative sample of English schools in 2004. These pupils have been followed up in every subsequent year so that data has been collected on their educational and attitudinal development over time. Of particular focus for this paper is data regarding the entry tier of these young people in their GCSEs; the majority of which were taken in summer 2006 and are recorded in the National Pupil Database (NPD). By linking this data to questionnaire responses about young people's future educational aspirations, we can explore the relationships between GCSE entry tiers and aspirations.

Data on the entries and achievements at Key Stage 4 of the young people participating in the LSYPE is available from the NPD. For every qualification taken by young people during Key Stage 4, a number of details including qualification type, subject and achieved grade are recorded. Also recorded is a qualification identifier provided by the exam board delivering the qualification. For GCSEs delivered by AQA (and occasionally OCR[3]) the qualification identifier is suffixed by the letters "F", "I" or "H" to indicate whether the candidate took the qualification at the foundation, intermediate or higher tier respectively. Using this information, for a sub-sample of young people, it was possible to identify the tier at which they were entered for their Maths and English GCSEs.

Data on the educational aspirations of these young people is available from a questionnaire completed during 2006 by around 12,000 of the

1. At the time of the data collection, pupils were also entered for higher and lower tiers in Key Stage 3 tests.
2. For further detail on this study please visit: https://www.education.gov.uk/ilsype/workspaces/public/wiki/Welcome/LSYPE
3. But never Edexcel or WJEC.

LSYPE participants at the end of Year 11. This questionnaire asked specific questions about whether young people intended to stay in education post-16 and also about how likely it was that they would apply to university in the future. The aim of analysis was to explore the relationship between young people's responses to these questions and their GCSE entry tiers in Maths and English.

In undertaking such an analysis it is immediately clear that any link between tier and educational aspirations could be explained by a number of pre-existing external factors. For example, it may be that pupils who enter lower tiers at GCSE are those that had low aspirations to begin with and so would be likely to continue to be those with low aspirations even if the GCSE tier itself had no negative effect. Alternatively, it is extremely likely that pupils entering lower tiers at GCSE will be those with lower levels of ability on average and thus would tend to have lower aspirations regardless of their entry tier. For these reasons it was important for the analysis to take account of these factors and others in order to make valid conclusions about the relationship between entry tier and aspirations. The analysis accounted for the following potentially influential factors:

- Educational ability
- Gender
- Eligibility for free school meals
- Level of special educational needs
- Ethnicity
- Language spoken at home
- Initial intentions regarding post-16 education as measured in Year 9[4]
- Feelings in Year 9 about likelihood of applying for, and being accepted into, university in the future
- Attitude to school work as measured in Year 9 using a composite score derived from 12 survey questions[5]
- Number of risk factors experienced by students[6] in Year 9

Analysis comparing the aspirations of pupils in each tier was undertaken using a combination of propensity score matching and multilevel modelling. Initially pupils were divided into two groups based upon their entry tier. Pupils whose entry tier was not identified were removed from analysis. Within each group, pupils with background characteristics unlikely to be found in the opposing group were removed from analysis. For example, because very high attaining students were unlikely to be entered for lower tier exams, all such pupils were removed from the data set. At this point an initial comparison between the aspirations of the young people in each tier was made. Responses from the group of students in the higher of the two tiers being compared were weighted according to the background characteristic of students. This was done such that, after weights were applied, the background characteristics of pupils in the higher tier matched the background characteristics of those in the lower tier. Comparing aspirations between lower tier pupils, and the resulting weighted data for higher tier pupils, provided an estimate of the differences between the two groups whilst accounting for the effect of other influential factors. The statistical significance of differences was then verified using multilevel modelling.

4. That is, prior to beginning study for GCSEs.
5. See page 381 of http://www.esds.ac.uk/doc/5545/mrdoc/pdf/5545wave_one_documentation.pdf for further details.
6. Risk factors include involvement in activities such as smoking, alcohol or drug abuse, vandalism, truancy and others.

For the purposes of analysis, educational ability was measured in each of two ways; either using Key Stage 3 attainment[7] or Key Stage 4 attainment[8]. In the latter case, because GCSE entry tiers restrict the grades available to students, this placed a restriction on the data that could be meaningfully included in analysis. For English GCSE, aspirations of foundation and higher tier pupils could only be meaningfully compared for those achieving grade C or D in GCSE English. For Maths GCSE, foundation and intermediate tier pupils could only be meaningfully compared for those achieving grade D or E, whereas intermediate and higher tier pupils could only be compared for those achieving grade B or C. No such explicit restrictions were placed on the analyses which used Key Stage 3 attainment to account for differences in the educational ability of students within different tiers[9].

As noted earlier, entry tier was only identifiable for candidates taking their GCSEs with particular exam boards. For English GCSE, because AQA is the major provider of this qualification, all relevant data could be identified for a sample of over 7,000 pupils. However, for Maths GCSE, because a greater proportion of candidates take the subject with Edexcel, a sample of less than 3,000 pupils was available for analysis. Furthermore the data for Maths GCSE was split across three tiers rather than two. For this reason estimates of the relationship between Maths entry tier and aspirations are subject to greater uncertainty than similar estimates based on entry tier in English[10].

Results

Results of analysis comparing pupils entered for different tiers whilst controlling for attainment at Key Stage 3 and other background factors are shown in Table 1. The first two columns of data show, for the young people in each tier retained within the analysis, the percentage saying that they intend to stay in education post-16 and the percentage saying they are likely to apply to university in future. The third column then shows the adjusted figure for higher tier candidates after weighting the data to account for the background characteristics of these young people. For example, the first row of data shows that 82 per cent of candidates entering foundation tier English intended to stay in education post-16 compared to 95 per cent of higher tier candidates. However, weighting the data to account for background characteristics reduces the figure for higher tier candidates to 87 per cent. In other words, this means that we estimate that a group of candidates with background characteristics equivalent to those who entered the lower tier, but who actually entered the higher tier would have an 87 per cent chance of saying they intend to stay in education post-16. The final two columns of data present the number of pupils available for analysis within each comparison. A graphical presentation of the same analysis is shown in Figure 1.

These results show that although there is a strong relationship between GCSE entry tier and educational aspirations, much of this link is

7. As measured by fine graded point scores in each subject.
8. Measured by the grade achieved in the subject of interest as well as the "capped total points score" which provided a more general measure of pupils' attainment across all their Key Stage 4 subjects.
9. Although, due to the very strong association between Key Stage 3 attainment and entry tier, a number of pupils with achievement levels that were not comparable across tiers were removed from analysis.
10. Another impact of the smaller sample size for analysis of Maths GCSE was that, for analysis taking account of Key Stage 3 attainment, it was not possible to adequately match higher and lower tier candidates across all of the listed background characteristics. For this reason it was necessary to restrict analysis to take account of only: Key Stage 3 attainment, gender, prior intentions regarding post-16 education and prior attitudes to university.

Table 1: Differences in aspirations between candidates entering different tiers before and after accounting for differences in Key Stage 3 attainment and other background characteristics

GCSE subject (tiers being compared)	*Outcome*	*Lower tier*	*Higher tier*	*Higher tier (weighted)*	*N (Lower tier*	*N (Higher tier)*
English (foundation vs higher)	% Intending to stay in education post-16	82	95	87	*2920*	*4222*
	% Likely to apply to HE	47	80	53	*3041*	*4273*
Maths (foundation vs intermediate)	% Intending to stay in education post-16	79	89	80	*558*	*1553*
	% Likely to apply to HE	36	65	55	*582*	*1591*
Maths (intermediate vs higher)	% Intending to stay in education post-16	89	97	88	*1255*	*607*
	% Likely to apply to HE	68	88	77	1286	613

Table 2: Differences in aspirations between candidates entering different tiers before and after accounting for differences in Key Stage 4 attainment and other background characteristics

GCSE subject (tiers being compared)	*Outcome*	*Lower tier*	*Higher tier*	*Higher tier (weighted)*	*N (Lower tier*	*N (Higher tier)*
English (foundation vs higher)	% Intending to stay in education post-16	86	92	88	*2090*	*1722*
	% Likely to apply to HE	54	68	55	*2156*	*1754*
Maths (foundation vs intermediate)	% Intending to stay in education post-16	79	84	81	*402*	*541*
	% Likely to apply to HE	38	52	41	*416*	*569*
Maths (intermediate vs higher)	% Intending to stay in education post-16	93	96	93	*869*	*442*
	% Likely to apply to HE	76	87	76	*879*	*447*

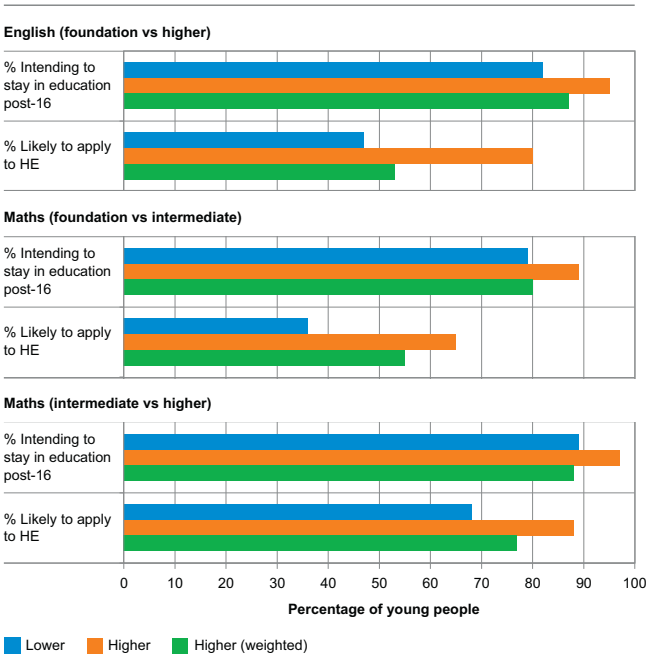

Figure 1: Differences in aspirations between candidates entering different tiers before and after accounting for differences in Key Stage 3 attainment and other background characteristics

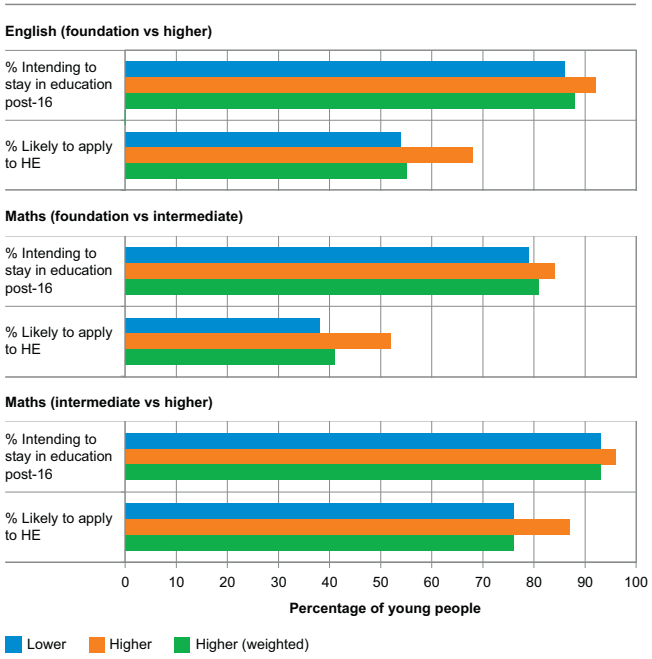

Figure 2: Differences in aspirations between candidates entering different tiers before and after accounting for differences in Key Stage 4 attainment and other background characteristics

explained by the background characteristics of young people. In particular, once the impact of background characteristics has been accounted for, there appears to be very little difference between young people entered for lower and higher tiers in terms of their intentions to remain in education post-16. Having said this, the difference between tiers for English GCSE remains statistically significant, albeit small.

11. Despite the apparently large size of the difference in aspirations regarding higher education between intermediate and higher tier Maths students, the relatively small sample size available for this analysis means that this difference is not found to be statistically significant.

Furthermore, there are statistically significant differences between tiers in terms of aspirations regarding Higher Education (HE) for both English GCSE and for Maths GCSE when comparing those in the foundation tier to those in the intermediate tier[11].

A possible criticism of the above analysis is that it does not adequately take account of the main factor likely to determine the entry tier of young people; namely their ability in the given subject at the time at which they were entered for the exam. To address this, the same analysis was repeated but taking account of achievement at Key Stage 4 rather than

Table 3: Differences in probability of continuing in education between candidates entering different tiers before and after accounting for differences in Key Stage 3 attainment and other background characteristics

GCSE subject (tiers being compared)	*Outcome (% within education or training in....)*	*Lower tier*	*Higher tier*	*Higher tier (weighted)*	*N (Lower tier*	*N (Higher tier)*
English (foundation vs higher)	October 2006	79	94	81	*2748*	*4015*
	October 2007	70	88	71	*2502*	*3807*
Maths (foundation vs intermediate)	October 2006	76	88	84	*503*	*1474*
	October 2007	67	79	73	*468*	*1369*
Maths (intermediate vs higher)	October 2006	88	97	93	*1215*	*589*
	October 2007	81	92	89	*1118*	*573*

Table 4: Differences in probability of continuing in education between candidates entering different tiers before and after accounting for differences in Key Stage 4 attainment and other background characteristics

GCSE subject (tiers being compared)	*Outcome (% within education or training in....)*	*Lower tier*	*Higher tier*	*Higher tier (weighted)*	*N (Lower tier*	*N (Higher tier)*
English (foundation vs higher)	October 2006	83	87	82	*1952*	*1572*
	October 2007	73	79	72	*1809*	*1450*
Maths (foundation vs intermediate)	October 2006	79	82	78	*369*	*530*
	October 2007	67	71	65	*349*	*482*
Maths (intermediate vs higher)	October 2006	91	97	96	*835*	*429*
	October 2007	85	90	82	*781*	*414*

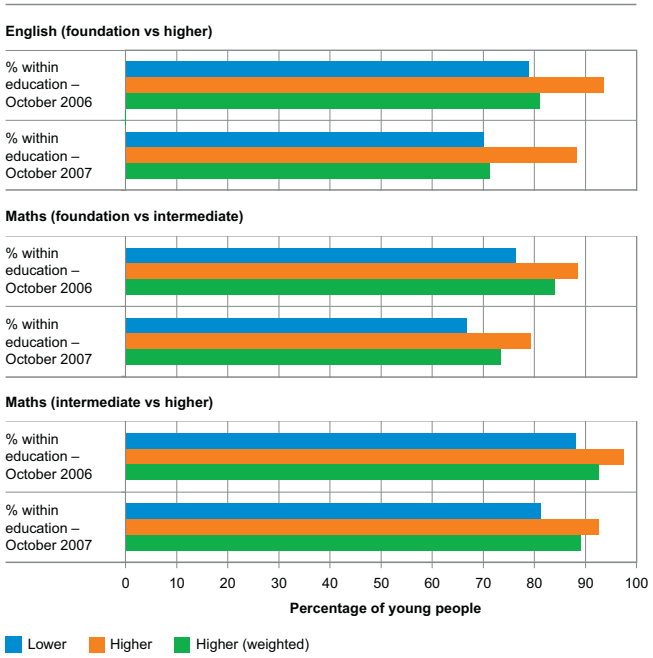

Figure 3: Differences in probability of continuing in education between candidates entering different tiers before and after accounting for differences in Key Stage 3 attainment and other background characteristics

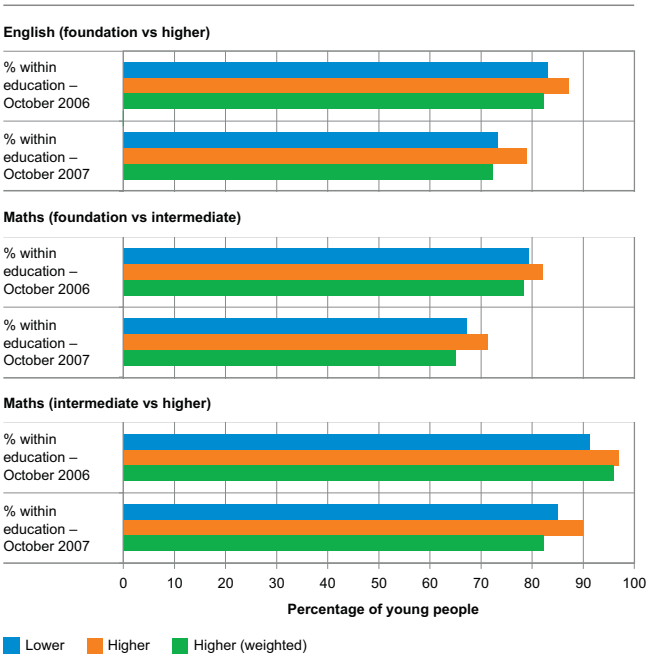

Figure 4: Differences in probability of continuing in education between candidates entering different tiers before and after accounting for differences in Key Stage 4 attainment and other background characteristics

Key Stage 3. The results of this analysis are shown in Table 2 and Figure 2.

As with the previous analysis, these tables show that, before taking account of the impact of background characteristics, there are some large differences in the educational aspirations of young people. However, once the abilities and characteristics of the different students are taken into account, these differences in aspirations almost entirely vanish, Indeed, none of the differences between tiers shown in Figure 2 are statistically significant once we have taken the impact of other factors into account. This implies that, all else being equal, it does not matter whether a candidate achieves a grade C (for example) in the higher tier or the lower tier; the future aspirations of the student will be identical. This would imply that students should be entered for the tier most appropriate to their ability, and there is no need for concern that such a strategy may damage their educational aspirations.

A potential criticism of this approach is that it could be argued that entry tier affects aspirations by first reducing the likely achievement of young people at GCSE. Thus, controlling for attainment within GCSE itself is inappropriate. However, our earlier analysis has shown that even if we only control for attainment at Key Stage 3, much of the difference between the aspirations of candidates in different tiers can be explained. For this reason we can conclude that the impact of GCSE entry tier on educational aspirations is quite small at worst and, when we allow for the possible impact of other potential explanatory variables not included within this analysis, potentially non-existent.

Although examining the association between tiers and aspirations is of some value in its own right, aspirations do not necessarily translate into actual continuation in education (Gorard *et al*., 2012). That is, just because a pupil intends to do something doesn't necessarily mean that they actually will. For this reason, it was of interest to also examine the relationship between tiers and the actual educational destinations of pupils at the start of each of the academic years after the end of compulsory education. That is, whether they were participating in education (including apprenticeships) in October 2006 and October 2007.

The same analysis as for aspirations was undertaken this time with the

outcome of interest being whether young people were participating in any form of education in October 2006 and October 2007. The results after taking account of background variables including Key Stage 3 attainment are shown in Table 3 and Figure 3. The results after taking account of Key Stage 4 attainment are shown in Table 4 and Figure 4. The findings with respect to actual destinations are in line with those described earlier with respect to aspirations. Before taking account of the background characteristics of young people there is a clear difference in the probability of those entered for different tiers remaining in education post-16. However, once the influence of background characteristics is taken into account this difference is greatly reduced. Furthermore, as shown in Table 4 and Figure 4, once we account for the achievement of pupils at Key Stage 4 there is essentially no difference between the educational destinations of those who were entered for the lower tier and those entered for the higher tier.

Summary and caveats

The analysis presented here has explored the link between entry tier in Maths and English GCSE and future educational aspirations as measured within the Longitudinal Study of Young People in England (LSYPE). The analysis shows that any differences in aspirations or, indeed, chances of actually continuing in post-compulsory education can be entirely explained by the background characteristics of young people and in particular their educational ability as measured by their level of achievement at Key Stage 4. Whilst it could be argued that taking account of achievement at Key Stage 4 is inappropriate (as this could itself be affected by entry tier), our analysis has also shown that even taking account of achievement at Key Stage 3 is sufficient to explain much of the difference between higher and lower tier students.

It should be noted that this analysis is based on somewhat old data; the young people being studied completed their GCSEs in 2006. Furthermore, because information about entry tier is only available from particular exam boards, analysis is largely restricted to pupils taking Maths and English with AQA rather than with any other exam boards. Thus our analysis implicitly assumes that the impact of tiering will be similar across different exam boards.

Nevertheless, despite the need to restrict to candidates entering English and Maths to particular exam boards, we have successfully been able to compare the educational aspirations of several thousand higher and lower tier candidates. Once differences in the characteristics of these pupils are accounted for, we have seen remarkable similarity in their educational aspirations. This provides a clear empirical challenge to the statement that being placed in a lower tier examination will lead to demotivation and disillusionment. How teachers and schools should decide upon the most appropriate tier for their candidates remains an open question. However, it is clear that this decision can be made without fear that entering students for a lower tier will have wide reaching consequences beyond the individual GCSE subject.

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Education and neuroscience

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If we value the pursuit of knowledge, we must be free to follow wherever that search may lead us. Adlai E. Stevenson Jr. (1952)

Introduction

This study was aimed at exploring how recent developments in neuroscience (the study of the structure and functioning of the brain) might affect the fields of education and test development in the future.

The study investigated some of the potential areas of application as well as limitations of neuroscience in education. A brief summary of the application of neuroscience in some other areas is also given. These are marketing and advertising, health, psychology and politics.

The main findings of this study were:

- There is a growing interest in the media, commercial organisations and the education sector for anything related to neuroscience.
- Various universities and academic institutions have started centres for research in neuroscience and education including Cambridge, Oxford, Bristol, University College London (UCL), Birkbeck, Harvard and Stanford.
- The field of health and medicine is leading the research in neuroscience which is being used in other fields.
- Neuroscience applications are in great demand in consumer marketing and advertising.
- Considerable research is being carried out in understanding learning disabilities (such as dyslexia and dyscalculia) using neuroscience.