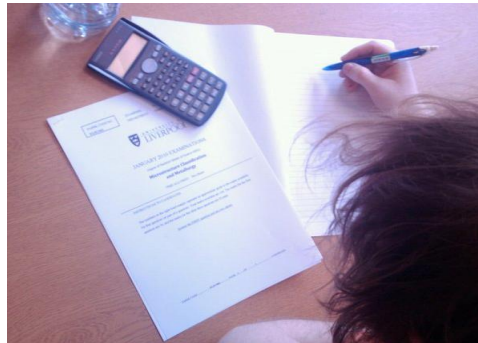


The National Student Survey

An Overview for the UK Materials Programmes 2010



Contents

Introduction	3
The NSS survey and Materials Programmes	3
The Survey.....	4
NSS Timescales.....	5
The Overall Results for all UK Materials Programmes	5
Top 5 high scores for Materials 2010.....	7
Bottom 5 scores for Materials 2010	7
Materials results compared with results from Mechanical Engineering, Physics and Chemistry	8
Summary of the overall NSS results in Materials.....	12
The variation of results between undergraduate Materials programmes	12
References	17
Appendix 1. HEIs and their programmes whose students' responses are included in this study	18
Appendix 2. Confidence intervals for the Unistats website.....	20
Appendix 3. Statistics used in this report	22

Introduction

The National Student Survey (NSS) is an annual survey available to all students in their final year of study* at Higher Education Institutions (HEIs) in England, Wales and Northern Ireland. The survey was introduced in 2005 in order to “gather feedback on the quality of students' courses in order to contribute to public accountability as well as to help inform the choices of future applicants to higher education”¹.

Although completion of the NSS is not a requirement in Scotland, around 60% of Scottish HEIs take part in the survey. The survey is administered by UK market research company Ipsos MORI on behalf of HEFCE (the Higher Education Funding Council for England). All results are anonymised and aggregated according to levels 1, 2 and 3 JACS (Joint Academic Coding System) codes before the results are published on the Unistats website (<http://unistats.direct.gov.uk/>) and made available to HEIs.

This document has been produced by the UK Centre for Materials Education (UKCME) using the full student datasets from 2008, 2009 and 2010. Publicly available data from the NSS can be downloaded from the HEFCE website at <http://www.hefce.ac.uk/learning/nss/data/2010/>

The NSS survey and Materials Programmes

The NSS responses available via the HEFCE website are aggregated into levels 1, 2 and 3 JACS codes that are commonly used in providing statistical analyses in UK Higher Education. However, at UK HEIs, programmes of study classified as ‘Materials’ do not always correspond directly with these JACS codes. Whilst many Materials programmes are included in the level 3 JACS code ‘(044) Materials and Minerals Technology’, (044) also includes some textiles and mining programmes. Conversely, the level 3 JACS code ‘(030) Others in Physical Sciences’ contains some programmes of study in Materials Science. Other Materials programmes are classified under JACS codes associated with engineering or the physical sciences.

In order to provide the most accurate data for the Materials community, the UKCME obtained the full NSS datasets for 2008, 2009 and 2010 via the Higher Education Academy. The full datasets comprise the data from around 400,000 undergraduate students in the UK for each year and these are not publicly available. Using the full dataset the UKCME was able to identify responses just for the Materials programmes in the UK. This was possible due to the UKCME’s in-depth knowledge of the Materials Higher Education community e.g. the full list of Materials programmes available in the UK as defined in the National Subject Profile for Higher Education Programmes in Materials (2008)² combined with the ability to extract responses from the full NSS dataset using programme names rather than JACS coding.

The Materials NSS results in this document are the views of students from all of the UK’s providers of undergraduate programmes in Materials in 2008, 2009 and 2010, indicated in Appendix 1.

The results from related subject areas in physics, chemistry and mechanical engineering (includes production & manufacturing engineering), which are also presented for comparison, have been obtained from HEFCE’s publicly available data.

* Note: Students are identified for the NSS survey sometime before they enter their final year. Therefore, students who repeat a year, or change to a shorter or longer programme of study (i.e. change between BEng and MEng programmes), may not complete the survey in their final year of study. It is estimated that up to a third of NSS responses are from such students in some cases.

The Survey

The National Student Survey (NSS) comprises 22 statements that are arranged into 7 statement groups, or core scales (see Table 1). On a scale of 1-5, students are asked whether they definitely agree (5), mostly agree (4), neither agree nor disagree (3), mostly disagree (2) or definitely disagree (1) with a series of 22 statements relating to their programme of study. Each response is scored with a value from 1-5.

Statement Group (Core Scale)	Statement Number	Statement
Teaching and learning scale	1	Staff are good at explaining things
	2	Staff have made the subject interesting
	3	Staff are enthusiastic about what they are teaching
	4	The course is intellectually stimulating
Assessment and feedback scale	5	The criteria used in marking have been made clear in advance
	6	Assessment arrangements and marking have been fair
	7	Feedback on my work has been prompt
	8	I have received detailed comments on my work
	9	Feedback on my work has helped me clarify things I did not understand
Academic support	10	I have received sufficient advice and support with my studies
	11	I have been able to contact staff when I needed to
	12	Good advice was available when I needed to make study choices
Organisation and management	13	The timetable works efficiently as far as my activities are concerned
	14	Any changes in the course or teaching have been communicated effectively
	15	The course is well organised and is running smoothly
Learning resources	16	The library resources and services are good enough for my needs
	17	I have been able to access general IT resources when I needed to
	18	I have been able to access specialised equipment, facilities or rooms when I needed to
Personal development	19	The course has helped me present myself with confidence
	20	My communication skills have improved
	21	As a result of the course, I feel confident in tackling unfamiliar problems
Overall Satisfaction	22	Overall I am satisfied with the quality of the course

Table 1. The NSS Statement Groups (Core Scales) and Statements

Students are also invited to add further qualitative comments about their experiences in two open-ended questions/statements, which ask them to highlight particularly positive and negative aspects of their experiences. These qualitative comments are fed back to institutions, but are not made available via the public website – these are not discussed in this document.

The NSS also allows HEIs to customise the survey by adding up to five further statement groups covering topics such as career prospects, social opportunities and workload and they may also add one qualitative statement of their own. The responses to these statements are not publicly available, being released to the institution only, so are not discussed in this document.

NSS results are released publicly on the HEFCE & Unistats websites. In order for this data to be released, a certain threshold must be met: there must be at least 23 respondents per statement and a response rate of 50% or greater. If this threshold is not reached then the results are added to those from the previous year and will be published if the threshold is then met. NSS results are also released directly to individual HEIs. This data is more detailed than that released publicly. In order for this data to be released to HEIs, there must be at least 10 respondents per statement and a response rate of 50% or greater.

NSS Timescales

The timescales for the NSS student survey, including student responses and analysis of the results are shown in Table 2 below:

Timescale	Key Activities
January – End April	8 week period during Jan-May is given for students to complete the NSS questionnaire- process as follows: Week 1 Students emailed with a link to the NSS website inviting them to respond online. Reminder emails sent one week later to non-respondents Weeks 2-3 Paper questionnaires distributed to non-respondents, reminder postcard sent one week later Weeks 4-8 Telephone contact with non-respondents
May-July	Ipsos MORI compile the results
End July	National results available to HEFCE & internal results available to HEIs
Mid August	National results published on Unistats website

Table 2. NSS Timescales

The Overall Results for all UK Materials Programmes

This section presents the aggregated response from all UK Materials students who answered the NSS questionnaire in the years 2008 (282 respondents), 2009 (252 respondents) and 2010 (238 respondents) from the 15 HEIs providing full-time Materials undergraduate programmes (see Appendix 1). For NSS 2010, 64% of Materials students responded to the questionnaire. Figure 1 shows the percentage of respondents that 'agreed' or 'strongly agreed' with each of the 22 ratings statements in Table 1. Figure 2 shows the same data but with statements aggregated into the 6 statement groups (core scales) plus the 'overall satisfaction'. The 95% confidence intervals have been calculated using the Wilson 'score' method with adjustment for the false discovery rate for multiple comparisons (see Appendix 2) as used by HEFCE when compiling the publicly available NSS statistics. These are indicated by the error bars on each of the graphs.

Note: the figures do not include respondents from Cambridge University's Materials programmes which are listed under their Tripos scheme and cannot be isolated.

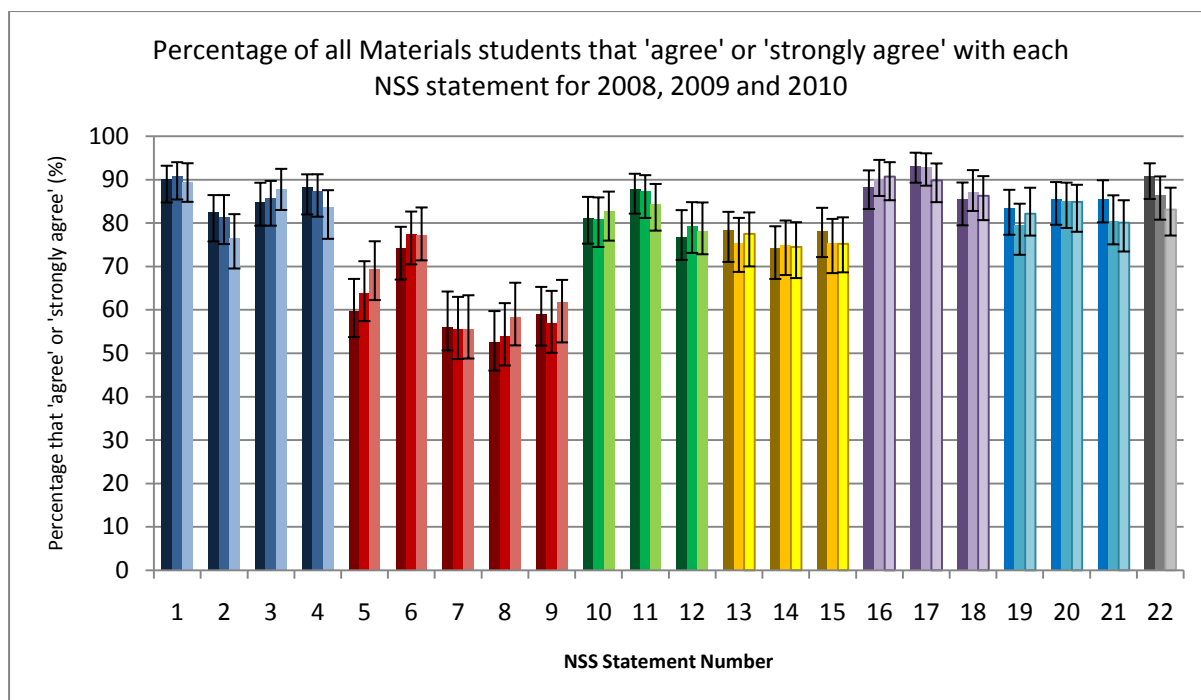


Figure 1. Percentage that 'agree' or 'strongly agree' with each NSS statement from all Materials programmes at UK HEIs for 2008, 2009 and 2010 (darkest colour is 2008, mid colour is 2009 and the lightest colour is 2010). The error bars show the 95% confidence intervals for the data.

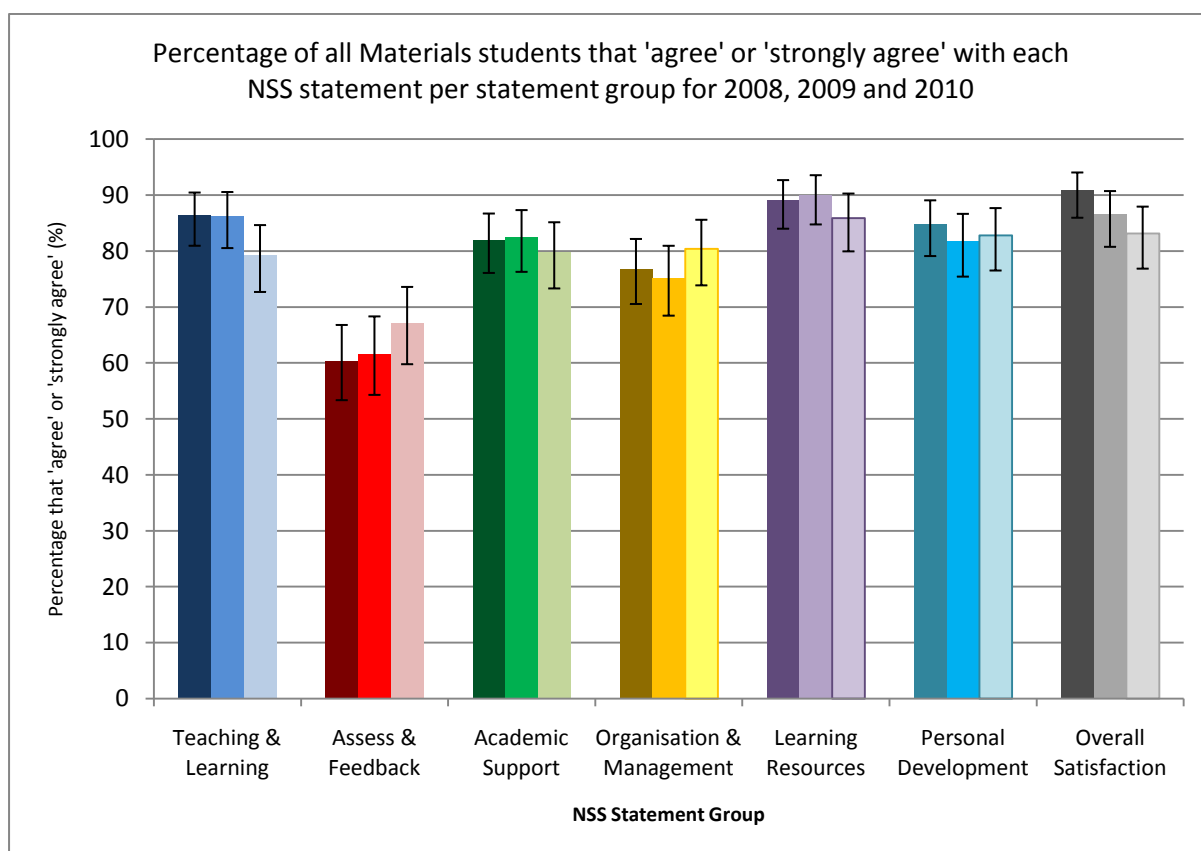


Figure 2. Percentage that 'agree' or 'strongly agree' with each NSS statement per statement group for all Materials programmes at UK HEIs for 2008, 2009 and 2010 (darkest colour is 2008, mid colour is 2009 and the lightest colour is 2010). The error bars show the 95% confidence intervals for the data.

Top 5 high scores for Materials 2010:

1. Q16 – The library resources and services are good enough for my needs. (91% agree)
2. Q17 - I have been able to access general IT resources when I needed to. (90% agree)
3. Q1 - Staff are good at explaining things. (89% agree)
4. Q3 – Staff are enthusiastic about what they are teaching (88% agree)
5. Q18 – I have been able to access specialised equipment, facilities or rooms when I needed to (86% agree)

Bottom 5 scores for Materials 2010:

18. Q14 - Any changes in the course or teaching have been communicated effectively (74% agree).
19. Q5 - The criteria used in marking have been clear in advance (69% agree).
20. Q9 - Feedback on my work has helped me clarify things I did not understand (62% agree).
21. Q8 - I have received detailed comments on my work (58% agree).
22. Q7 - Feedback on my work has been prompt (55% agree).

All three of the statements in the ‘Learning Resources’ group are in the top 5 highest score for the Materials community – this can be seen as an area of particular strength across almost all the Materials providers included in these results. Students recognise and value the support received in terms of availability of library and IT resources and also access to the specialised equipment and facilities required in this highly technical discipline.

Two of the top five highest scores for the Materials subject area are in the ‘Teaching and Learning’ group: this is of particular importance to the student learning experience and also in the comparative rankings of HEIs that is obtained using NSS overall satisfaction scores: it has been shown^{4,5} that improvements in the ‘Teaching and Learning’ group has the most impact on the overall satisfaction of students. It was first noticed by Surridge (2006) that "In linking the different areas of teaching quality to students’ overall assessments, it is clear that the greatest influence came from ‘Teaching and Learning’. This effect was almost twice the effect of the scale with next greatest influence, ‘Personal Development’. ‘Learning Resources’ has the smallest impact on overall satisfaction, however ‘Assessment and Feedback’ also had a relatively weak relationship to overall satisfaction."

Consideration must also be given to the ethnic background of students on these programmes: it has been shown in recent analyses by HEFCE³ that when considering the ‘Teaching and Learning’ group, students from a white ethnic background were significantly more satisfied than the overall NSS student body in this group, and students from all minority ethnic backgrounds were significantly less satisfied than the overall NSS student body in this group. Also, students from the EU and

international students were also significantly less satisfied with 'Teaching and Learning' than the whole NSS student body.

Of the bottom five statement scores, four are in the 'Assessment and Feedback' group. NSS statements regarding 'Assessment and Feedback' typically score lowest across all disciplines. Analyses by HEFCE have shown that for 'Assessment and Feedback', students from the EU were significantly less satisfied than the overall NSS student body; however international students were significantly more satisfied.

The results for the whole Materials community appear to show improvements in assessment and feedback over the last three years, although this change is right on the margin of showing any statistical significance. There is moderate evidence to show that the 'Overall Satisfaction' of Materials students ($z=2.35$, $p=0.019$) and their satisfaction with 'Teaching and Learning' ($z=2.015$, $p=0.045$) has declined over the period 2008 to 2010.

Materials results compared with results from Mechanical Engineering, Physics and Chemistry

Figures 3 and 4 show how the subject of Materials compares with the national results for Chemistry (JACS code 025), Physics and Astronomy (JACS code 026) and Mechanical, production and manufacturing engineering (JACS code 037) from NSS 2010.

The aggregated 'Teaching and Learning' results, shown in Figure 4, highlight a significantly more positive response for both Chemistry and Physics when compared to Materials and Mechanical, Production and Manufacturing Engineering. Figure 3 shows that some of this difference can be explained by the results for Q4 (*The course is intellectually stimulating*) where a significantly higher proportion of Chemistry and Physics students agree compared to Materials and Mechanical, Production and Manufacturing Engineering.

Comparison of Results for Q4	z	p
Physics and Materials	3.797	<0.001
Chemistry and Materials	2.618	0.009
Physics and Mechanical, Production, Manufacturing Engineering	11.972	<0.001
Chemistry and Mechanical, Production, Manufacturing Engineering	7.836	<0.001

Table 3. Significance results between subjects for Q4. See Appendix 3 for statistics used.

Also, Q3 (*Staff are enthusiastic about what they are teaching*) shows a significantly lower 'percentage that agrees' for Mechanical, Production and Manufacturing Engineering than the other 3 subjects.

Comparison of Results for Q3	z	p
Materials and Mechanical, Production, Manufacturing Engineering	-4.246	<0.001
Physics and Mechanical, Production, Manufacturing Engineering	-9.474	<0.001
Chemistry and Mechanical, Production, Manufacturing Engineering	-8.500	<0.001

Table 4. Significance results between subjects for Q3. See Appendix 3 for statistics used.

The results for Physics and Astronomy are significantly higher than the results for Materials, Chemistry and Mechanical, Production and Manufacturing Engineering for Q11 (*I have been able to contact staff when I needed to*), Q14 (*Any changes in the course or teaching have been*

communicated effectively), Q15 (*The course is well organised and is running smoothly*) and Q22 (*Overall I am satisfied with the quality of my course*).

Comparison of Results for Q11	z	p
Physics and Materials	3.150	0.002
Physics and Mechanical, Production, Manufacturing Engineering	11.441	<0.001
Physics and Chemistry	2.984	0.003
Comparison of Results for Q14		
Physics and Materials	3.319	<0.001
Physics and Mechanical, Production, Manufacturing Engineering	11.029	<0.001
Physics and Chemistry	4.908	<0.001
Comparison of Results for Q15		
Physics and Materials	3.372	<0.001
Physics and Mechanical, Production, Manufacturing Engineering	12.329	<0.001
Physics and Chemistry	4.454	<0.001
Comparison of Results for Q22		
Physics and Materials	2.981	0.003
Physics and Mechanical, Production, Manufacturing Engineering	10.051	<0.001
Physics and Chemistry	2.061	0.039

Table 5. Significance results between subjects for Q11, Q14, Q15 and Q22. See Appendix 3 for statistics used.

In a report by HEFCE in 2009 it was shown that the students with the highest 'Overall Satisfaction' scores were those undertaking the physical sciences, as well as historical and philosophical studies³.

The general trend shows that for almost all statements and NSS statement groups, Materials scores are higher than Mechanical, Production and Manufacturing Engineering, but lower than Physics and Chemistry. For all four subject areas both 'Teaching and Learning' and 'Learning Resources' score highly whilst the lowest scores tend to be for 'Assessment and Feedback'.

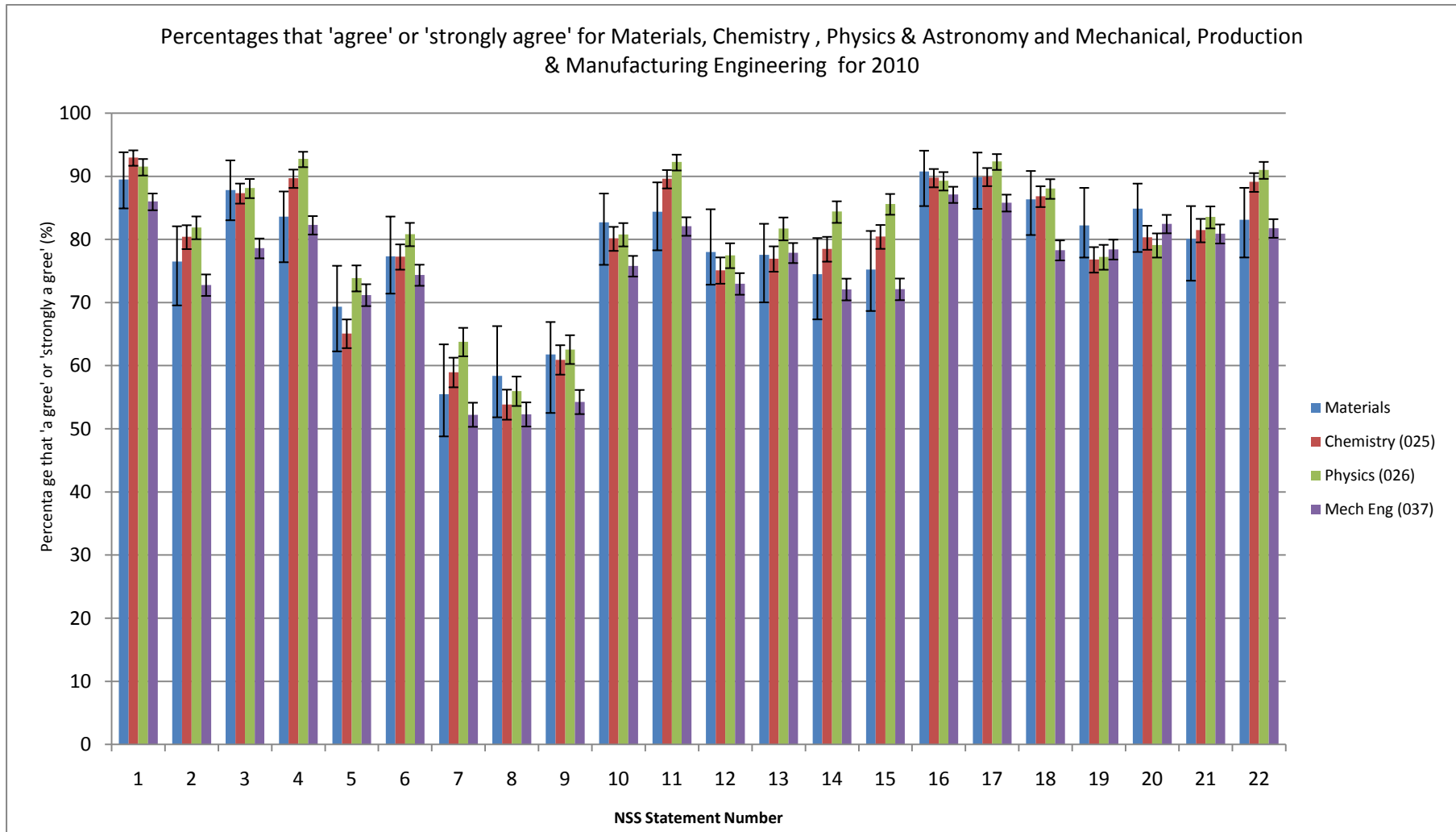


Figure 3. Percentage that 'agree' or 'strongly agree' with each NSS statement: Comparison between Materials 2010 and national results for Chemistry (JACS code 025), Physics and Astronomy (JACS code 026) and Mechanical, production and manufacturing engineering (JACS code 037). The error bars show the 95% confidence intervals for the data.

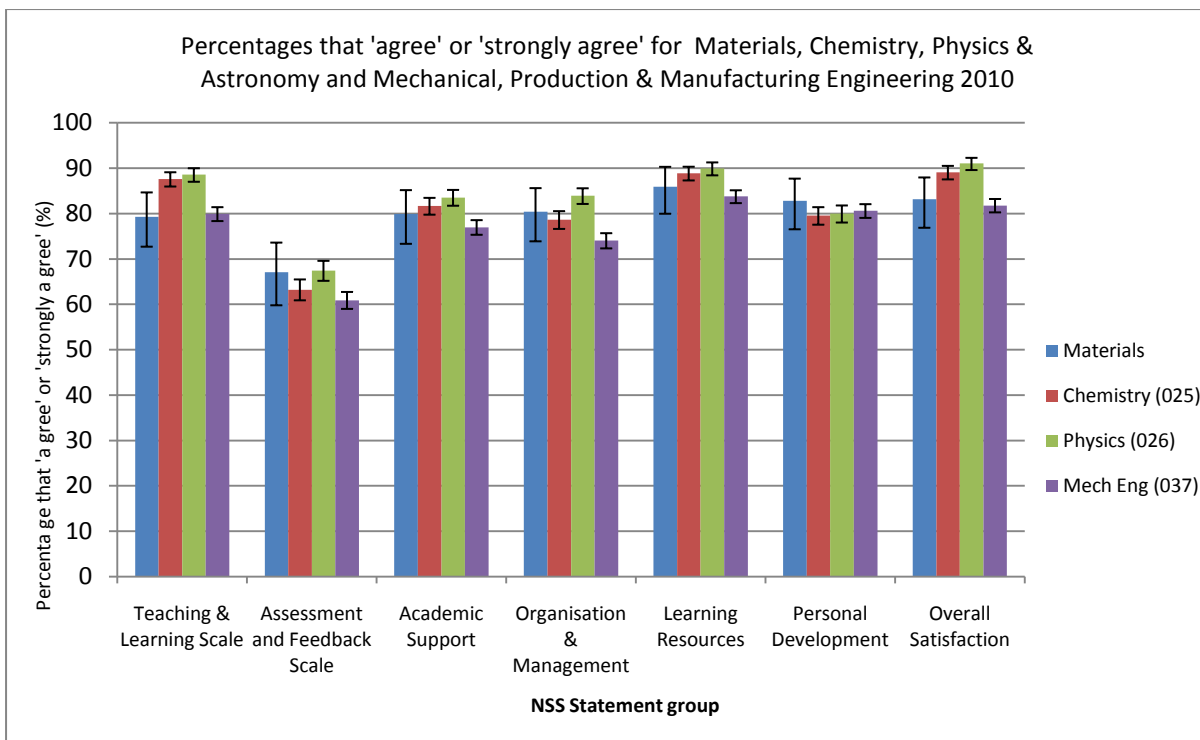


Figure 4. Percentage that 'agree' or 'strongly agree' with each NSS statement group: Comparison between Materials 2010 and the results for Chemistry (JACS code 025), Physics and Astronomy (JACS code 026) and Mechanical, production and manufacturing engineering (JACS code 037). The error bars show the 95% confidence intervals for the data.

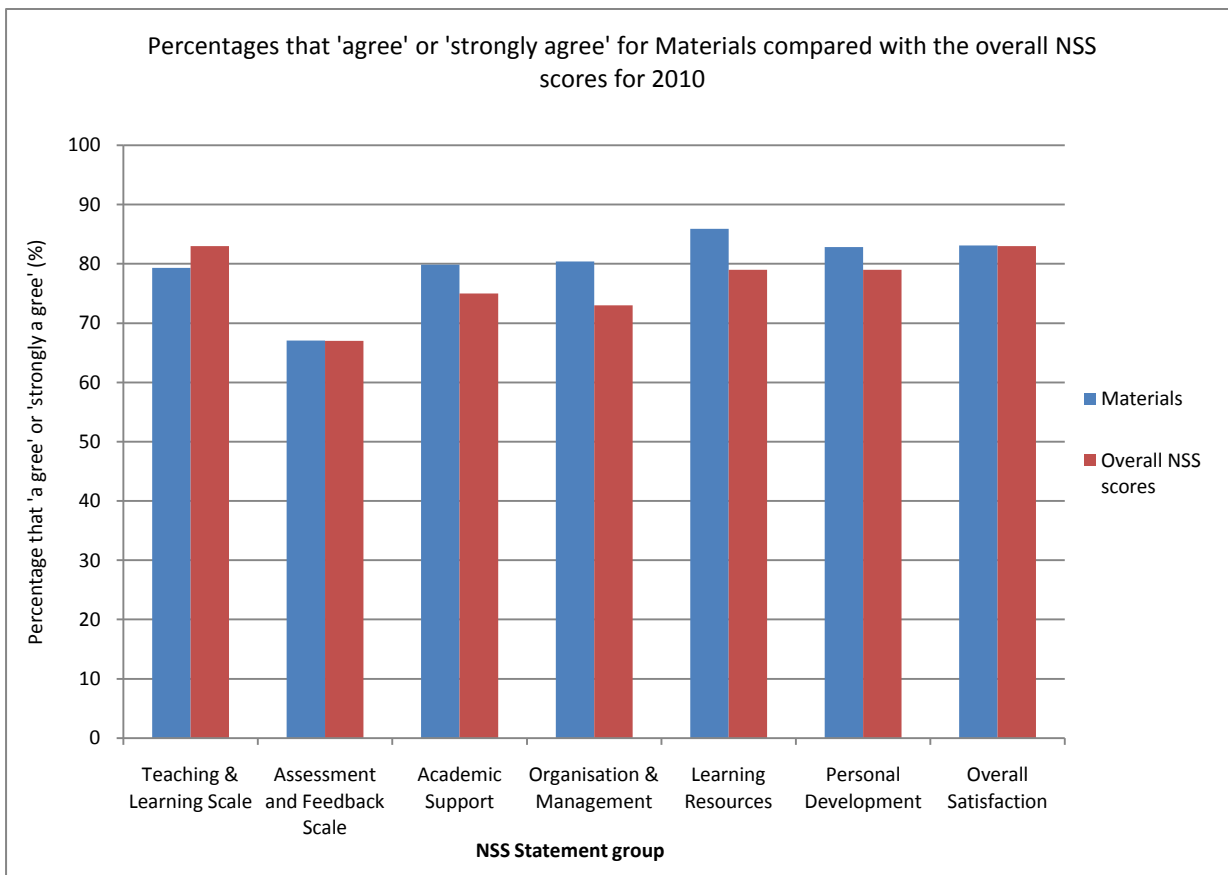


Figure 5. Percentage that 'agree' or 'strongly agree' for the Materials programmes compared with overall percentage that 'agree' or 'strongly agree' for all NSS respondents in 2010

Figure 5 compares the Materials responses with the responses from all subject areas for 2010. The data shows that in general Materials students score higher in all areas except 'Teaching and Learning'.

Summary of the overall NSS results in Materials

- The availability of learning resources, IT and specialist equipment is a particular strength across the Materials subject area, and one which students recognise and value.
- 89% of Materials students agree that staff are good at explaining their subject and are enthusiastic about what they are teaching.
- Results in 'Assessment and Feedback' are low: only 56% agreeing that feedback on their work had been prompt and 54% agree that this feedback included detailed comments on their work. However, it is comparable with other, similar disciplines.
- The results show a statistically significant decline in the Overall Satisfaction and satisfaction with 'Learning and Teaching' from 2008 to 2010.
- When comparing the responses from the Materials discipline with Mechanical, Production and Manufacturing Engineering, Physics and Chemistry responses, Materials scores are generally higher than Mechanical, Production and Manufacturing Engineering, but lower than Physics and Chemistry. Similar trends are seen in all these subjects: both 'Teaching and Learning' and 'Learning resources' score highest whilst the lowest scores tend to be for 'Assessment and Feedback'.

The variation of results between undergraduate Materials programmes

The variation of NSS results between the UK's undergraduate Materials providers is presented here. In order for an HEI to be included in this analysis, the HEFCE threshold of at least 23 respondents per statement and a response rate of 50% must be met. For the Materials NSS results in 2010, 12 of the 15 HEIs identified in Appendix 1 met this threshold, although eight of them had their results aggregated over 2008, 2009 and 2010 so as to meet the HEFCE constraint.

The results from the 12 HEIs are presented in rank order in Figures 6-12. In order to maintain anonymity, there is no direct correspondence in the number assigned to each HEI's result in, or between, each figure or the list of HEIs included in Appendix 1.

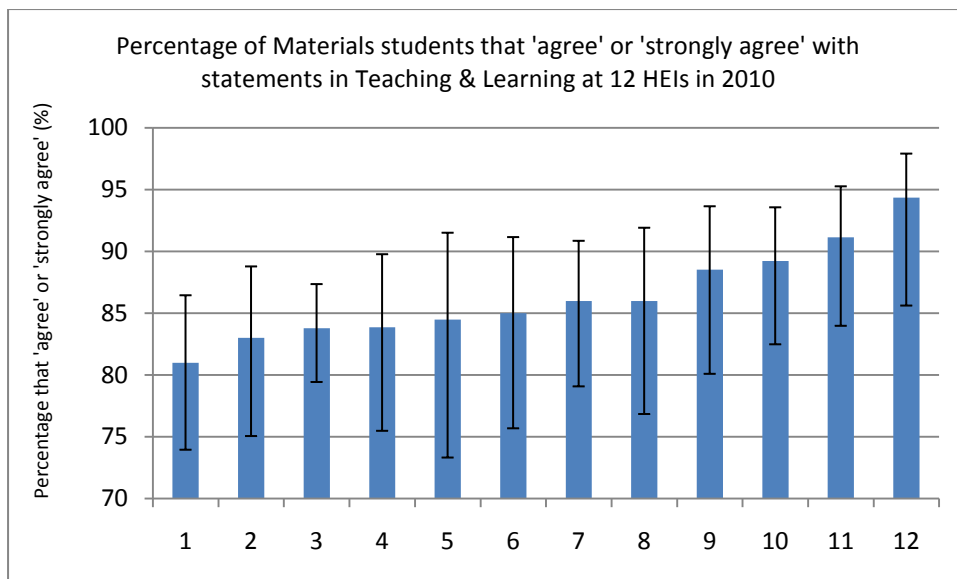


Figure 6. Percentage that 'agree' or 'strongly agree' with NSS Teaching and Learning statements for 12 HEIs that offer undergraduate Materials programmes in 2010. Anonymised data is presented in rank order with error bars showing the 95% confidence intervals.

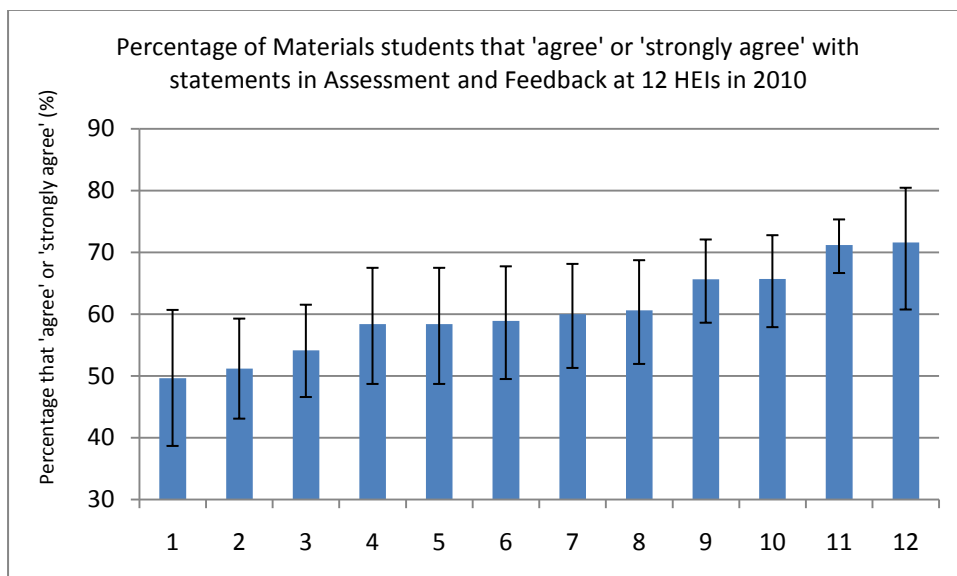


Figure 7. Percentage that 'agree' or 'strongly agree' with Assessment and Feedback statements for 12 HEIs that offer undergraduate Materials programmes in 2010. Anonymised data is presented in rank order with error bars showing the 95% confidence intervals.

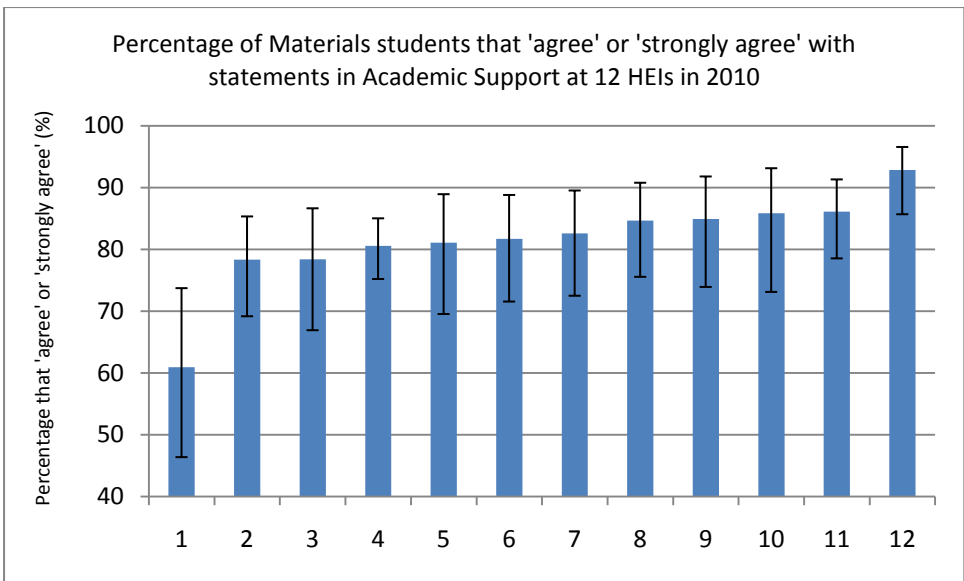


Figure 8. Percentage that 'agree' or 'strongly agree' with Academic Support statements for 12 HEIs that offer undergraduate Materials programmes in 2010. Anonymised data is presented in rank order with error bars showing the 95% confidence intervals.

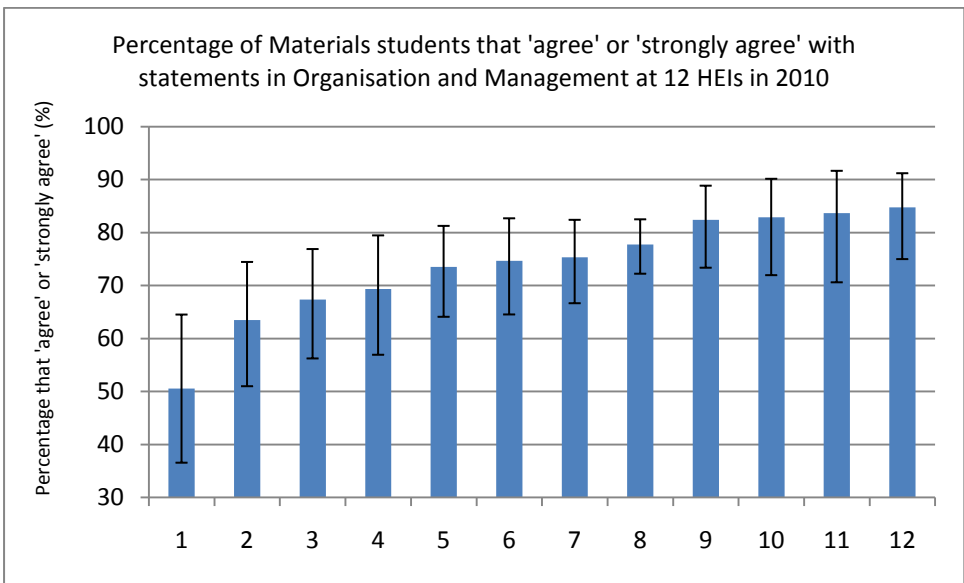


Figure 9. Percentage that 'agree' or 'strongly agree' with Organisation and Management statements for 12 HEIs that offer undergraduate Materials programmes in 2010. Anonymised data is presented in rank order with error bars showing the 95% confidence intervals.

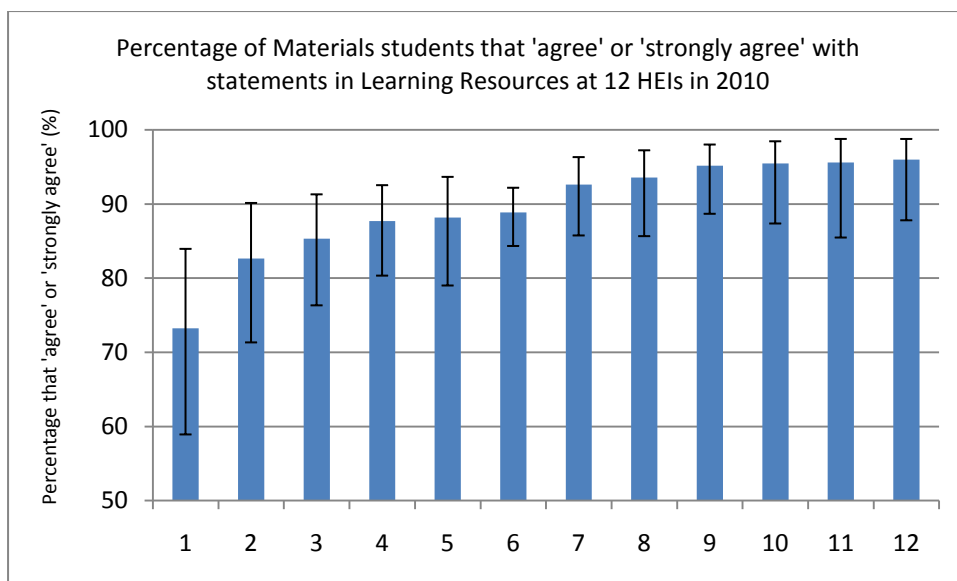


Figure 10. Percentage that 'agree' or 'strongly agree' with Learning Resources statements for 12 HEIs that offer undergraduate Materials programmes in 2010. Anonymised data is presented in rank order with error bars showing the 95% confidence intervals.

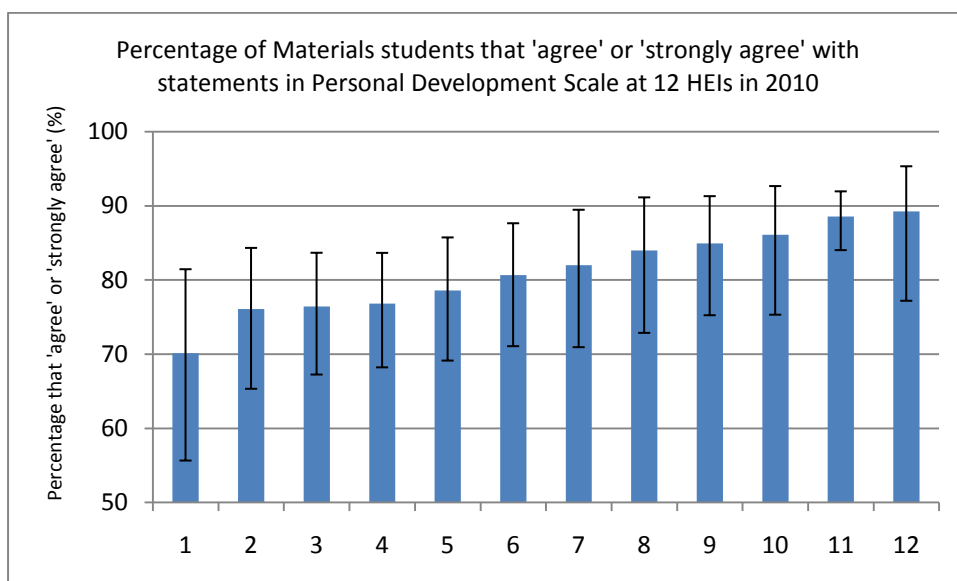


Figure 11. Percentage that 'agree' or 'strongly agree' with Personal Development statements for 12 HEIs that offer undergraduate Materials programmes in 2010. Anonymised data is presented in rank order with error bars showing the 95% confidence intervals.

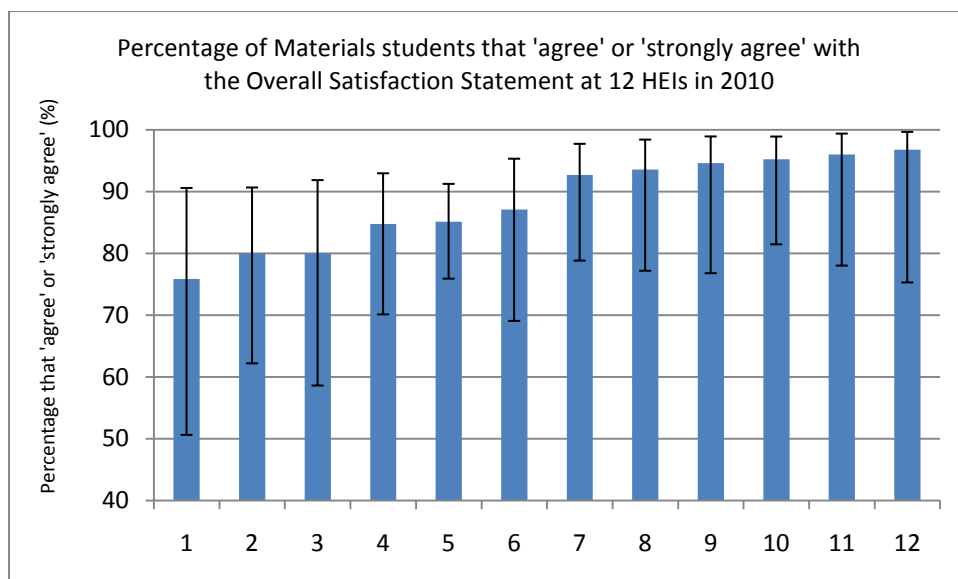


Figure 12. Percentage that 'agree' or 'strongly agree' with the Overall Satisfaction statement for 12 HEIs that offer undergraduate Materials programmes in 2010. Anonymised data is presented in rank order with error bars showing the 95% confidence intervals.

Owing to the relatively small numbers of respondents for each HEI, the 95% confidence intervals are quite large. However, the results show statistically significant differences between the 12 HEIs regarding all the statement groups: Figures 7 to 12 show significant differences between the bottom ranked HEI(s) and those ranked at the top of this scale. The table, below, shows the significance of these results when comparing the top and bottom ranked HEI for each of the statement groups. (There is no direct correspondence in the number assigned to each HEI's result in, or between, each figure or the list of HEIs included in Appendix 1).

Comparison of Top and Bottom ranked results in Teaching and Learning	z	p
Top & bottom	3.758	<0.001
Comparison of Top and Bottom ranked results in Assessment and Feedback		
Top & bottom	3.526	<0.001
Comparison of Top and Bottom ranked results in Academic Support		
Top & bottom	5.574	<0.001
Comparison of Top and Bottom ranked results in Organisation and Management		
Top & bottom	5.273	<0.001
Comparison of Top and Bottom ranked results in Learning Resources		
Top & bottom	4.281	<0.001
Comparison of Top and Bottom ranked results in Personal Development		
Top & bottom	3.038	0.003
Comparison of Top and Bottom ranked results in Overall Satisfaction		
Top & bottom	2.444	0.015

Table 6. Significance results for top and bottom ranked HEI for each statement group. See Appendix 3 for statistics used.

References

1. The HEFCE Website at <http://www.hefce.ac.uk/learning/nss/>
2. National Subject Profile for Higher Education programmes in Materials (2008) at <http://www.materials.ac.uk/subject-profile/NSP-report.pdf>
3. National Student Survey: Findings and trends 2006 to 2009 (2010/18) at <http://www.hefce.ac.uk/pubs/hefce/2010/>
4. Learning from our students... by Clive Robertson and Steve Probert (2010) at http://www.heacademy.ac.uk/assets/bmaf/documents/news/ABS_NSS_2010.pdf (This reference may change)
5. Surridge, P. (2006). The National Student Survey 2005: findings (a report to HEFCE). Department of Sociology, University of Bristol: Bristol.

Appendix 1. HEIs and their programmes whose students' responses are included in this study.

* indicates an HEI whose data is included in Figures 6-12.

***University of Birmingham** (includes respondents from programmes in Materials Science & Technology, Materials Engineering, Biomedical Materials Science, Sports and Materials Science, Mechanical and Materials Engineering, Biomedical Engineering, Materials Science & Energy Engineering).

***Imperial College London** (includes respondents from programmes in Aerospace Materials, Materials Science & Engineering, Materials with Management, Biomaterials & Tissue Engineering, Materials with Nuclear Engineering).

***University of Leeds** (includes respondents from programmes in Biomaterials, Materials Science and Engineering, Sports Materials Technology, Mining and Mineral Engineering)

University of Liverpool (includes respondents from programmes in Biomaterials Science & Engineering, Materials Science)

***London Metropolitan University** (includes respondents from programmes in Polymer Engineering, Restoration and Conservation, Sports Product Design)

***Loughborough University** (includes respondents from programmes in Automotive Materials, Design with Engineering Materials, Materials Engineering, Materials with Management Studies)

***University of Manchester** (includes respondents from programmes in Materials Science and Engineering, Biomedical Materials Science)

The University of Newcastle (includes respondents from programmes in Mechanical and Materials Engineering)

The University of Northampton (includes respondents from programmes in Materials Technology (Leather))

***University of Nottingham** (includes respondents from programmes in Biomedical Materials Science, Mechanical Design Materials and Manufacture, Mechanical Engineering Materials and Manufacture, Design Integrity (Manufacture and Materials))

***The University of Oxford** (includes respondents from programmes in Materials Economics and Management, Materials Science)

***Queen Mary, University of London** (includes respondents from programmes in Materials Science, Materials Science and Engineering, Biomaterials, Biomedical Materials Science and Engineering, Dental Materials, Materials Engineering in Medicine, Materials with Business, Polymer Technology, Environmental Materials Technology, Materials with Forensic Science, Sports Engineering)

***University of Plymouth** (includes respondents from programmes in Mechanical Engineering with Composites, Marine and Composites Technology)

***University of Sheffield** (includes respondents from programmes in Materials Science and Engineering, Metallurgy, Aerospace Materials)

* **The University of Wales, Swansea** (includes respondents from programmes in Materials Science and Engineering)

Appendix 2. Confidence intervals for the Unistats website (presented to UKCME by HEFCE)

Introduction

The Unistats website contains results, obtained from the National Student Survey (NSS), in which students are asked how much they agree with a series of statements on a five point scale, ranging from definitely disagree to definitely agree. These results are presented as a percentage of students who agree with each statement, together with the upper and lower bounds (confidence interval) associated with this percentage. The confidence interval is a measure of uncertainty concerning the value of this percentage (see www.stats.gla.ac.uk/steps/glossary/confidence_intervals.html or www.lshtm.ac.uk/hpu/conflict/epidemiology/page_46.htm for more details) and is calculated at the 95% confidence level.

Calculation of confidence intervals

The usual equation for the calculation of a 95% confidence interval for a single proportion is given below:

$$\frac{x}{n} \pm 1.97 \times \sqrt{\frac{\frac{x}{n}(1-\frac{x}{n})}{n}}, \quad (1)$$

where x is the number of responses agreeing with the statement, n is the total number of responses, and the number 1.97 is related to the calculation of the confidence interval at the 95% level.

This calculation assumes that the value for which the confidence interval is being calculated can take any value, whereas the results for the agreement with statements are presented as percentages, bounded by zero and 100. This can cause problems if the value is near either extreme of the scale, because then either the upper or lower bound of the confidence interval can exceed the bounds of the scale. To prevent this from occurring, all confidence intervals presented on the Unistats website are calculated using the Wilson 'score' method: chosen for ease of computation (Newcombe, 1998).

In addition to this it is expected that users of the website will wish to make comparisons between the results from several institutions. The problem with this is that the assumption underlying the above confidence interval calculation (equation 1) is that only one comparison will be made, and that if multiple comparisons are made then the number of comparisons which show a significant difference at the 95% confidence interval level is overestimated. To overcome this, an adjustment is made to the calculation to control the false discovery rate (Benjamini and Yekutieli, 2001). The confidence interval for a single proportion, rather than the difference of proportions, is calculated because it is not known which institutions the users of the website will wish to compare.

The equation for the calculation of the 95% confidence interval, using the Wilson 'score' method with the adjustment for the false discovery rate for multiple comparisons, is shown below:

$$\frac{x + \left(\frac{2.17^2}{2}\right)}{n + 2.17^2} \pm \left(\frac{2.17}{n + 2.17^2}\right) \times \sqrt{n \left(\frac{x}{n}\right) \left(1 - \left(\frac{x}{n}\right)\right) + \frac{2.17^2}{4}}, \quad (2)$$

where x and n are defined as above, and the number 2.17 is related to the calculation of the 95% confidence interval with adjustment for multiple comparisons.

This equation calculates the confidence interval as a proportion and needs to be multiplied by 100 to give the confidence interval as a percentage.

It should be noted that the results displayed on the Unistats website are based on Full Person Equivalents (FPEs) rather than actual respondents; i.e. if a student is studying for a joint honours degree then their responses count as 0.5 FPE for each subject.

Example Calculation

Assuming that 41 responses are received, 39 of which agree with the statement ($n = 41$, $x = 39$), then this gives a point estimate of 95% agreeing with the statement. The usual calculation (equation 1) gives a confidence interval of 88% to 102%, whilst the adjusted calculation (equation 2) produces a confidence interval of 82% to 99%.

References

Newcombe R, 1988, 'Two-sided confidence intervals for the single proportion: comparison of seven methods', *Statistics in Medicine* 17, pp857-872.

Benjamini Y and Yekutieli D, 2001, 'The control of the false discovery rate in multiple testing under dependency', *The Annals of Statistics* 29, pp1165-1187.

Appendix 3. Statistics used in this report

In this report, a z-test has been used to compare two independent groups of Materials students' results for the 'percentages that agree' with certain NSS statements. In analysing the differences between the proportions (percentages that agree) used in this report, the z values have been calculated using the equation for a two-proportioned z-test (unpooled) for $|d_0| > 0$.

$$z = \frac{(\hat{p}_1 - \hat{p}_2) - d_0}{\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}}$$

where

d_0 is the hypothesised difference

n_1 and n_2 are the two sample sizes being compared

p_1 and p_2 are the proportions (percentages that agree) being compared

and the following conditions must be met

$n_1 p_1 > 5$ and $n_1(1 - p_1) > 5$ and $n_2 p_2 > 5$ and $n_2(1 - p_2) > 5$ and independent observations. It is not necessary for the two groups to have the same numbers of respondents.

The null hypothesis in all tests in this report has been that there are no differences between the proportions (percentages that agree) compared. The p-value is the probability of obtaining such data given that the null hypothesis is true. For p-values < 0.01 , it can be said that there is strong evidence against the null hypothesis. For p-values ≥ 0.01 but < 0.05 , it can be said that there is moderate evidence against the null hypothesis. The null hypothesis cannot be rejected for p-values ≥ 0.05 .

For more information on these tests see http://en.wikipedia.org/wiki/Statistical_hypothesis_testing