Differentiated learning

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Abstract

An HEA Bioscience Centre report in 2007 entitled “Differentiated Learning: Stretching the Most Able” argued that “the most able students are not being stretched to achieve their full potential”. It was also suggested that differentiated learning already exists for less able students with universities having numerous initiatives providing support explicitly for them. To address a possible inequity in provision and after consultation with those identified as able students we designed an optional module consisting of more advanced material with more emphasis on practical work for a small group (~30) of selected students.

Students were selected onto the optional module when they had achieved sufficiently high standards in their core modules in the Physiology/Pharmacology cognate area of their degree programme. Analysis of the outcomes for the selected able students for three of the years in which the module ran showed that their performance was better than their performance on a core module in which the whole cohort participated (~140 students).

On the other hand, in three other years the optional module was run without selecting for higher ability students but contained a mixed ability group. Under these circumstances the top performing students in the year cohort did not do better in the optional module compared to the core module. Furthermore, the less able students, in these years, did no better on this module than on the core module. This suggests that able students are only able to improve their marks when they are specifically selected alongside other able students to be academically stretched compared to a setting where they are not so targeted. The data also suggests that less able students are unable to benefit from exposure to more advanced material and smaller class sizes.

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I. Introduction

Many universities in the UK Higher Education (HE) sector subscribe to the notion of widening participation (WP). In a UK context widening participation means that universities are financially incentivised to enrol students with a wider range of abilities, aspirations and motivation than has previously been the case. The Higher Education Funding Council for England state in terms of widening participation that:

“*Our aim is to promote and provide the opportunity of successful participation in higher education to everyone who can benefit from it. This is vital for social justice and economic competitiveness.*”

Consequently different teaching strategies and processes have been adopted to account for this shift in the student population. In particular, universities have a financial and competitive imperative to look after these students due to payment for retaining WP students and the effects of successfully progressing WP students through the system on ranking in university league tables (Pugh et al, 2005). Therefore much resource has been devoted to those students coming from parts of the population previously excluded from HE. Whilst the aims of such initiatives are to be lauded as exemplifying an admirable commitment to social justice and social mobility some caveats have arisen. For example, the Higher Education Academy’s Bioscience Centre in the UK issued a report in 2007 entitled “Differentiated Learning: Stretching the Most Able” which argued that, despite equal funding, students performing well on their courses were often given less attention and access to resources than lower-achieving students. This situation was held by the authors of this report to be inherently unethical due to the fact that as all students are liable for the same fees, they should all get equal provision. It was also suggested that focussing some attention on the more able students might yield disproportionate gains in innovation and subsequent benefits to the wider economy.

The beneficial effect of able peers on the academic achievements of individual students may also have been taken for granted but underlies much of the marketing and promulgation of institutional cultures espoused by universities across the world. This is probably especially true of the more prestigious universities where selection of appropriately qualified, able students is thought to maintain and promote the educational quality of such institutions (Winston and Zimmerman, 2004). The Maclean’s Guide to Canadian Universities for example explicitly states that “students are enriched by the input of their peers” and Hanushek et al (2002) have reported that peer achievement has a positive effect on achievement growth of individual students. Furthermore, Dill and Soo (2005) have suggested that the contribution of peers to student learning is greater than the contribution made by teaching staff! However it is not known in a UK context whether this effect is present and whether higher or lower ability students benefit more from the presence of higher ability students. Thus this study has been conducted to investigate issues surrounding the possible differentiation of learning at Kingston University.
2. Method

2.1 Investigating the “problem” at the local level

To address this possible inequity a study was initiated in the School of Pharmacy and Chemistry at Kingston University in Surrey, UK. Firstly a pilot study was conducted in which the views of the students were sought concerning the provision of material tailored to higher achieving students. As a result the teaching team developed an optional module of more advanced material incorporating more practical experimentation and data interpretation. This module was entitled “Advanced Cardiovascular Physiology and Pharmacology” and was a 30 credit module (constituting 150 hours of study in total) assessed by both examination (60 %) and course work (40 %) involving practical sessions on advanced cardiac dissection, obtaining, analysing and interpreting ECG data and organ bath pharmacology experiments.

Initially, only those Level 6 (third year) students achieving sufficiently high grades in core physiology/pharmacology modules in their programme were allowed to participate in the optional module containing the more advanced material. Student attainment in this selective module (normally involving 20-30 students) was then compared to the attainment of the same students in a core physiology/pharmacology module containing the whole cohort (usually ~140 students). A potential confounding factor in the interpretation of the results was that student performance was being compared over different modules containing different numbers of students.

Fortunately, at least for the purposes of this study, due to various logistical and administrative reasons (largely residing in the popularity of the module as an option choice amongst the whole student body) the optional module was not restricted to only the highest performing students in a number of years. In these years the module was open to all students on a “first come first served basis”. Thus performance on the optional module when there was no selection for ability could also be recorded. Additionally, in these years the attainment of lower achieving students in the optional module and core module could also be compared giving a further measure of the specific effect on the more able students of focussing academic attention upon them alone. The study ran over six years and during this time the module ran three times with selected students only and three times with no selection of the intake being applied for the reasons previously given.
3. Results

When selected for participation in the option module on the basis of past performance more able students achieved significantly higher marks in the option module than they did in a core module in which the whole year cohort participated (see Table 1). However, in those years where selection was not undertaken there was no statistical difference in the scores of the more able students on the option compared to the core module (Table 2). This suggests that individual able students did better when studying alongside selected higher achieving students than in the mixed ability whole year cohort.

<table>
<thead>
<tr>
<th>Year</th>
<th>Option Module mean mark</th>
<th>Core Module mean mark</th>
<th>Statistical significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>68 ± 4 (n = 20)</td>
<td>57 ± 3 (n = 20)</td>
<td>p &lt; 0.0001</td>
</tr>
<tr>
<td>2</td>
<td>69 ± 5 (n = 24)</td>
<td>64 ± 4 (n = 24)</td>
<td>p = 0.016</td>
</tr>
<tr>
<td>3</td>
<td>67 ± 9 (n = 30)</td>
<td>59 ± 7 (n = 30)</td>
<td>p = 0.0013</td>
</tr>
</tbody>
</table>

Table 1: The effect of selection on the more able students’ attainment

The data in Table 1 shows that for the rather small cohort selected to undertake the optional module the performance on average was better in this module than on another core physiology/pharmacology-related module undertaken by the larger whole year cohort for each of the years studied. This might lead one to the conclusion that the effect being monitored here is simply one relating to class size and that students do better academically in smaller groups as more attention can be given to individual students. However, in those years where selection was not able to be undertaken, the attainment of the most able students was not enhanced on the option module compared to the core module (Table 2). This suggests that the more heterogeneous a group of students is, in terms of ability, the less well the more able students perform.

<table>
<thead>
<tr>
<th>Year</th>
<th>Option Module mean mark</th>
<th>Core Module mean mark</th>
<th>Statistical significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>63 ± 3 (n = 21)</td>
<td>67 ± 3 (n = 21)</td>
<td>p = 0.2</td>
</tr>
<tr>
<td>2</td>
<td>60 ± 5 (n = 17)</td>
<td>61 ± 4 (n = 17)</td>
<td>p = 0.4</td>
</tr>
<tr>
<td>3</td>
<td>72 ± 7 (n = 20)</td>
<td>68 ± 6 (n = 20)</td>
<td>p = 0.22</td>
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Table 2: Most able student attainment when participation in an advanced options module was not selective

Table 2 shows the diluting effects on attainment of the more able students when they are placed in classes not explicitly designed to address their specific learning needs. In fact the
table shows that such students were more likely (two out of three years) to perform better on the large core module than on the optional module involving fewer students. More evidence for the notion that it is particularly the more able students who benefit from being exposed to more advanced material is the fact that lower-achieving students saw no improvement in their performance in the options module compared to the core module when they were able to access the more advanced options module. For example, in one of the years where selection onto the options module was not undertaken students obtaining marks in the bottom 10% of the marks range in the core module (52 ± 4%) were also not able to benefit from the more advanced material being presented in the options module (48 ± 2; n = 12; p = 0.12).

4. Discussion

This study has shown the benefits to more able students of targeting educational interventions to their specific learning needs. This occurred even in a post-1992 institution wedded to the ethos of widening participation where resources are more usually targeted to students unfamiliar with the prevailing HE contexts (Freestone, 2009). The study has further shown that less able students are unable to benefit from the same intervention designed to enhance the learning of the more able students. This is evidence then for a peer enhancement of learning amongst the more able group. In this study, less able students were unable to benefit from the presence of the more able students in the same way. Martins and Walker (2006) have previously shown that increases in student attainment can be linked to the achievements of their peers. In their study, on average all students tended to perform better when they learned alongside more able student colleagues. Furthermore, these researchers reported a positive correlation between a student’s own and their peers’ grades. Sarcedote (2011) has also shown that higher ability students benefit from the presence of other high ability peers.

Meanwhile, Hoxby (2000) has additionally made the important point that peer effects have implications for the economic efficiency of academic provision. How students are grouped will affect the total amount of learning produced in given participants from given resources. There is then an implied trade-off which might have to be negotiated in the future. That is, if more able students are able to obtain greater benefit from the presence of more able peers than less able students, then the random assignment of students into learning groups may be contra-indicated and stratification should be employed to increase the learning benefits for the more able students (as suggested by Winston and Zimmerman, 2004). Alternatively, if weak students were found to gain more from proximity to strong peers than the strong students lose from that association, overall learning would be increased by increasing the ability mix of each student cohort ie. reducing stratification. On the other hand Jones and Ficano (2010) have demonstrated that the presence of peer effects is not always apparent or if they are, are more subtly expressed than first assumed. In their study they found no peer effects from roommates, hall mates or classmates generally. They did however find that peer effects were apparent contingent upon student gender. Thus male students tended to do better if their male classmates had a higher than average academic performance. This peer effect was not found amongst female students.
4.1 Implications for future practice?

Whilst some authors have suggested that peer effects are mostly felt by those students in the middle of the ability range in both a positive and negative direction, the study presented here seems to show that students at the top end of the ability spectrum can be academically stretched to improve their learning outcomes. This benefit is not experienced by less able students placed in the same milieu as shown here by their inability to gain better marks on a small class optional module compared to a whole cohort core module. What this study does not show however is whether the specific intervention we have chosen – provision of a module containing more advanced material and techniques - is the best way to enhance student learning at the top end of the student ability range. Other means of academically stretching and challenging these students have been suggested. These include within institutions; voluntary extra classes, involvement in research, certificated master classes and fast track integrated BSc/MSc degrees. Outside of institutions stretching the most able might involve essay competitions, academic sessions conducted by external bodies, attending conferences and obtaining external placements in work or research environments.

Tackling the perceived inequity in provision afforded to the different ends of the ability spectrum might in fact be better tackled outside of the core academic curriculum as interpreting the data obtained in the current study might lead one to conclude that students, even in a higher education setting, should be streamed according to their ability. This in turn would logically lead to the conferment of different degrees reflecting the ability range of the students achieving each qualification. Streaming students in this way would obviously be very problematic and is probably undesirable for many reasons. Given the changing HE landscape of recent years and the ever-increasing financial demands placed upon students it will be necessary however in the future to more explicitly address the learning needs of each individual student. This will also place a great administrative and resource burden on HE institutions.

References