I have often wondered what students were actually learning when they were sitting in large classes listening to my lectures. I had also read that standard lectures are not an effective way for students to learn, Gibbs [1]. So, in 1997 I decided to try to find out:

• why my students attended lectures
• how useful they found lectures
• what they learned from the lectures

There is virtually no information on these questions in the literature that is specific to mathematics.

Then, in 2005 I began to wonder whether, as a result of the internet revolution, the situation regarding lectures had changed. Specifically, I wanted to know if students still attended lectures regularly and whether their reasons for attending had changed over the nine year period. In 1997, at my university, Queensland University of Technology in Brisbane, Australia, the only resources provided to students apart from the lectures, were a recommended textbook and brief printed notes that were little more than lists of formulae and tutorial problems. In 2005, students could access course outlines, lecture notes, tutorial problems and solutions, assessment items and solutions, past examination papers and supplementary pieces of information that are posted by the lecturer as the need arises on the internet.

Lectures were part of university education from the very beginning of universities. They were the only possible means of communicating with large groups of people before the invention of the printing press in the fifteenth century. Nevertheless more than five hundred years later, in spite of recent technological advances, lectures are still central to most university instruction. Is this because university administrators are old and have not really adapted their thinking to incorporate the new technologies or is it because students still regard lectures as a valuable learning device?

**Students’ attitudes to lectures 1997 – 2005**

The subjects in these investigations were classes of engineering students studying their second or third unit of mathematics. They were asked to respond to the survey on the basis of their total experience of studying mathematics at university, not just the current course. Students could choose as many reasons as they wished from the following list. Their responses, to the same set of questions, are shown in Table 1.
I attend Lectures because:

<table>
<thead>
<tr>
<th>Reason</th>
<th>1997 (%)</th>
<th>2006 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It gives me a chance to catch-up with my friends</td>
<td>32</td>
<td>19</td>
</tr>
<tr>
<td>2. You are supposed to attend lectures</td>
<td>40</td>
<td>39</td>
</tr>
<tr>
<td>3. I can take notes to study later</td>
<td>82</td>
<td>75</td>
</tr>
<tr>
<td>4. It gives me a general idea what the unit is about</td>
<td>71</td>
<td>73</td>
</tr>
<tr>
<td>5. That is how I find out when tests and assignments are due</td>
<td>79</td>
<td>46</td>
</tr>
<tr>
<td>6. I enjoy listening to lectures</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>7. It helps me find out what the lecturer thinks is important.</td>
<td>69</td>
<td>83</td>
</tr>
</tbody>
</table>

Table 1 - Student attitudes towards lectures

The percentages for reasons 2 and 4 have not changed. The same proportions of students think lecture attendance is a duty and use lectures to get a broad picture of the subject. The change in the proportions for reason 1 is probably due to the fact that in Australia, university study has become much more expensive than it was in 1997 and many students have to work to support themselves at university. They simply do not have time for social activities and value lectures because they are paying for them. Perhaps, because of the expense, students now take their studies more seriously, a larger proportion have come to enjoy lectures. In 1997, the 6% who claimed to enjoy lectures actually ticked all the boxes so this percentage is meaningless. No student ticked all the boxes in 2006, which itself reflects the students’ more serious attitude. The change in the proportions in reason 7 may also be explained by this more serious attitude. The greatest change occurred in reason 5; students can now obtain logistical information on the class website, whereas in 1997 this was not available. So, as far as learning from lectures is concerned, there has not been very much change.

Where does your mathematics learning come from?

In 2006, students were also asked to estimate what percentage of their mathematics learning came from the sources: lectures (L), online materials (O), textbooks (TE) and tutorials (TU) in order to find out how important internet learning had become. The boxplot in Fig 1 summarizes the results of this part of the survey.

The boxplots have very large spreads which suggests that students have very different ways of learning. The medians indicate that very few students regard textbooks as useful for learning, although the outliers show that a few students rate them highly. Actually 5 students claimed that 50% or more of their learning was from textbooks, while almost 20% said textbooks contributed 0%.

From Table 1 and the boxplots, the answer to the main question, “Has the availability of materials online reduced students’ need for lectures?” must be “not yet”. Furthermore, if the two categories which involve human contact, lectures and tutorials, are compared to the two which do not, online materials and textbooks, the results are quite definite. The different locations of the boxplots make it clear that for most students, human contact is still a very important part of learning.

![Boxplot of sources of learning](source.png)

**Fig 1 - Sources of learning**

There is no data in the 1997 study which can be directly compared with the data described above because there were no online materials at that time. However, the 1997 students were asked to rate the value of lectures in their...
learning on a 5-point Likert scale from 1 - not useful to 5 - very useful. The responses of 170 students are shown in Table 2. The mean of the responses was 3.7, showing again that students found lectures useful.

<table>
<thead>
<tr>
<th>Score</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>5</td>
<td>8</td>
<td>16</td>
<td>54</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 2 - Student opinion of the value of lectures

In the 2006 survey, students were asked how often they attended mathematics lectures. Of the 149 responses, 75% said they attended regularly, 23% said fairly regularly and 2% said now and then. Presumably those who never attend were not there, but the whole cohort consisted of only 177 students, and some of these would just have been absent from the particular lecture during which the survey was conducted. This compares reasonably well with Hunter and Tetley’s [2] finding that 63% of the students they surveyed had missed 2 or less lectures in a given week.

Discussion and Conclusion

The greatest change in reasons for attending lectures is finding out when tests and assignments are due and this is exactly what is easily accessible online. The increase in enjoyment has already been discussed, but contrasts with the findings of Hunter & Tetley [2]. They asked students if there were any subjects in whom they would never miss lectures and why. “Because it is interesting, I enjoy it” was the reason for not missing lectures given by 77% of the students. However, their students were from most faculties in their university and referred to lectures in many disciplines. This was also the case in earlier New Zealand studies discussed in [2]. This study involved only engineering students studying service courses in mathematics, so mathematics is not their major interest. The increase in the percentage of students who want to find out what the lecturer thinks is important could also be attributed to the fact that current students are under more financial pressure to pass the course. Overall it is clear that the availability of online materials has not made a substantial difference to reasons for attending lectures.

The most significant outcome from the students’ estimates of the sources of their learning, are the two boxplots that contrast the two human contact sources with online materials and textbooks. Students clearly continue to value lectures and tutorials and to attend lectures regularly despite the availability of all the online material described earlier. Exactly what aspects of human contact continue to contribute to student learning needs further investigation. Hunter and Tetley [2] suggest some possibilities, “modeling of the assumptions and procedures of the discipline, commitment to the discipline and excitement about intellectual discovery in general”. More directly related to mathematics students (but not engineering mathematics students), Cretchley [3] asked her students an open-ended question about reasons for attending lectures. She summarized seven reasons and these include, “learning style: hearing and seeing rather than reading”, “to ask questions and hear what others ask”, “motivation and stimulus to keep up”, “enjoyment”, “a sense of belonging and purpose”, “to establish and keep contact with the lecturer”. Each of these reasons contains an important element of human contact.

There is no evidence from these studies to suggest that lectures should be abandoned. On the other hand the results suggest that all the time and effort required to produce online materials is wasted on many of the students while lectures are still available.

References