

Engineering Humour: A student's perspective on the effective use of humour in engineering education

Amelia Greig (amelia.greig@student.adelaide.edu.au),

Dorothy Missingham (dorothy.missingham@adelaide.edu.au)

Colin Kestell (colin.kestell@adelaide.edu.au)

University of Adelaide, Australia



Abstract: *Question: Why did the engineer cross the road? Answer: To get to the other side! Engineers, being logical people, usually have a purpose for everything they do. So although using humour in an engineering lecture may make the experience more enjoyable for students is there actually a useful purpose to the exercise? Neurological evidence shows humour can (among other things) increase memory retention and temporarily reduce distractions from pain, stress or fatigue further increasing learning capacity. From first hand experience even a small distraction during a lecture, whether internal or external can affect concentration reducing the effectiveness of the presentation. A humorous lecture captures the attention of the audience and combined with the neurological evidence for humour in learning provides an effective tool in engineering education. Humour has been successfully used as a tool in engineering lectures at The University of Adelaide, however, sometimes the end result was not desired or the humour distracted too much from the primary lesson of the lecture. These lectures have been reviewed from a student's perspective and an analysis of the outcomes discussed, showing that if used wisely, humour can be an extremely effective tool in engineering education*

Introduction

Regardless of a student's background the years spent at University are often viewed as some of the most difficult of their lives. A multitude of stresses and issues arise, such as an introduction to independent learning, meeting deadlines, new expectations of self and from family and, especially for international students, making new friends. Added to the extreme fatigue many University students experience during the semester these issues can distract from learning in lectures, due to lapses in concentration. This paper discusses a number of techniques, based around the use of humour, which have successfully used to increase enjoyment levels in and information retention of lectures. Humour can increase learning and memory retention in a number of ways as well as improving the attendance levels and attention span of students. The neurological, physiological and psychological basis for the potential of humour to enhance learning is examined along with several examples of the successful use of humour in engineering courses at one Australian university. Importantly, student response to the use of humour in lectures is also investigated.

Neurology, physiology and psychology

Neurology, physiology and psychology are three areas of knowledge most people outside the medical profession probably do not know much about. However, these areas are all of vital importance to the learning process and are also directly related to humour in learning. A more detailed understanding of how the brain learns, in terms of neurology, physiology and psychology is therefore useful in developing effective innovative pedagogy.

The limbic system is a processing centre in the brain responsible for making us aware of our

environment, sensory inputs and determining basic human needs among its many other functions (Mega et al 1997). On a more focused level the limbic system is responsible for the consolidation of memories, learning and emotional responses (Sousa 2001). Three components of the limbic system are involved in learning and memory: the thalamus, hippocampus and the amygdala. In brief, the thalamus receives all sensory data (except that of smell), processes the data and redirects it to the appropriate region of the brain depending on the nature of the input information. The hippocampus consolidates all information and transfers the data from short-term (working) to long-term memory (Bear et al 2006 and Knight 1996). Finally the amygdala attaches an emotional 'tag' to all information transferred to the long-term memory (Tucker 2004). If this information has a positive emotional association hormones are released in the brain that momentarily strengthen the retention capabilities of the long-term memory centres (Sousa 2001). Lectures that incite positive emotional responses therefore increase the retention of knowledge gained from that lecture.

Physiologically laughter has many advantages. Laughter increases the oxygen level of the blood, in turn increasing the rate of blood (fuel) flow to the brain. Increased blood flow to the brain increases the capacity of the brain to function correctly. A hearty laugh will decrease blood pressure and relax muscles. As anxiety and muscle relaxation cannot be simultaneous then laughter reduces anxiety and this effect can last for up to 45 minutes, the approximate length of most lectures (Adams 1992). This muscle relaxation may also alleviate headaches caused by tension in the head and neck muscles. A plethora of hormones are released during laughter that include endorphins, epinephrine and dopamine amongst others (Fry 1992). Endorphins are natural painkillers that free the body from internal distractions and allow full concentration on the particular task; in this case learning. Epinephrine and dopamine are stimulants that heighten the senses increasing sensory inputs to the brain.

A hierarchy of data processing published by Sousa in 2001 states the order of data transfer from the short-term memory to long-term memory occurs in a hierarchy of needs. Data affecting survival is processed first, followed by data from events that evoke emotions, finally followed by any other new information. Thus a student must be in an environment where they feel safe and relaxed before they can learn properly. Psychologically humour helps alleviate nervous feelings and relax the student letting them feel safe, so they are able to learn effectively. Also laughter is contagious and can easily spread through an entire lecture theatre, 'grabbing' the attention of the entire class and facilitating learning benefits on a wide scale.

An international language

If there is one language that is truly international it is that of humour. Walt Disney stated in 1954 that 'humor transcends language barriers.' This transcendence can be seen in Disney's classic comedic cartoon 'Mickey Mouse' that has spanned generations. First broadcast in 1928 Mickey Mouse is still making people laugh worldwide with the 'Mickey Mouse Clubhouse' broadcast in 140 countries and 25 languages (Nielsen Media Research report 2Q09). Walt Disney (1954) attributes his success to the type of humour he uses.

'What may cause a Latin to howl with glee may leave a Nordic colder than his frigid zone. ... If it deals with human beings, it must draw on the common characteristics of humanity itself, well beyond any specialized traits of race, culture, and habit.'

With an increasing number of international students enrolling in Universities adding to the already wide multiculturalism in many countries, teaching techniques must be adapted to suit the audience. It is important that if humour is used in lectures that the humour is not offensive to any culture or society. The use of humour in an engineering environment is most likely to be successful if it is related to engineering in some way. An amusing anecdote about a past experience or witty 'one liners' on any aspect of what is being taught are usually effective and ensures no offense to any particular student group. Some examples of different types of humour used successfully (and one not so successfully) from various lectures at the University of Adelaide in Australia are analysed below in terms of both their effectiveness and how these examples can be adapted to suit different occasions.

BoBo or BooBoo

In 2009 as part of a new initiative of engineering education in the School of Mechanical Engineering at The University of Adelaide, introductory courses for all first year mechanical engineering students were introduced. These courses provide a basic introduction to the mechanical engineering degree program. One early topic covered is that of the engineering design process. All engineers know this is

a vitally important part of any engineering discipline, however at the start of their degree some students might consider this a 'boring' topic, as it is not directly practical, and not pay proper attention. The lecturer presenting this lecture in 2009 decided to take drastic measures to improve attention for this topic. It was also a good opportunity to 'welcome' the first years to a completely different form of learning. Students attending this lecture were very surprised when instead of the lecturer appearing, a gorilla walked in from the back of the lecture theatre. This was of course the lecturer in a full bodied gorilla costume who then proceeded to present the remainder of the lecture in the persona of BoBo, a gorilla in the wild, who saw an aeroplane fly overhead and began to wonder how humans were able to build such incredible machines. To find out, this gorilla enrolled in a University (naturally one of the rival Universities to The University of Adelaide; to elicit an even bigger laugh) and studied engineering. He discovered it was due to the engineering design process that allowed humans to combine smaller components and resources to build something as large and complex as an aeroplane. This style of lecture may also be easily adapted to other situations internationally to suit different topics and cultures simply by changing the character and 'back story' to suit.

In order to assess the effectiveness of this presentation technique, the students who attended the lecture were surveyed. The students were given five statements relating to different aspects of the lecture and asked to indicate their agreement on a seven tiered scale, with one being the lowest and seven being the highest. Each tier was assigned a 'percentage of agreement' from 0% to 100% and the results averaged. The results shown in table 1 below indicate that the majority of students found the lecture was enjoyable (87%), held their attention (79%) and stimulated their interest in engineering design (70%).

Table 1 Gorilla Lecture Survey Results

Statement	Agreement (%)
The lecture was enjoyable	87
The lecture held my attention throughout	79
This lecture stimulated my interest in Engineering Design	70
I can remember the required information from this lecture	48
The use of humour is effective in conveying material for an introductory lecture	85

Interestingly the level of information retained from this lecture was 48%. This may appear quite low however when compared to other results of memory retention levels for lectures, this statistic is actually quite good. This particular survey was conducted approximately four months after the lecture took place. Early studies on the curve of forgetting by Radossawljewitsch and Ebbinghaus show 76.1% and 78.9% rates of forgetting respectively after only 30 days (Finkenbinder and Clark 1913). Therefore, by comparison a forgetting rate of only 52% after four months is highly favourable. This result suggests that being Bobo was indeed not a boobo.

A quiz to remember

In 2008 the lecturer for the first year Design Graphics course at The University of Adelaide presented the revision lecture for the course in a quiz show format. A selection of six students were taken from the audience as the contestants and divided into two teams of three to create a fun rivalry. The lecturer presented a series of questions on course material using colourful Powerpoint slides and music for the contestants to answer. To increase the humour content, contestants were made to yell out either 'meow' or 'woof', as their 'buzzer', before answering the questions and the audience was encouraged to heckle as much as possible and try to scream out answers before the contestants could answer. Chupa Chups were awarded as prizes to those who answered questions correctly; both contestants and audience members, even those sitting in the back rows.

This style of lecture allows the students to revise the course material and answer questions in a manner allowing (loud) discussion between classmates while maintaining attention and enthusiasm. A survey of student participants from the 2008 year found 93% of students found the lecture enjoyable with 75% believing both the style of the lecture and the personal involvement improved their revision (Greig and Kestell 2009).

This quiz show method was not repeated in 2009 as the lecturer wanted to ensure future students were surprised when the lecture was presented. This difference in approach between successive

cohorts provides a good basis to compare overall results to the course to consider if the lecture affected marks. In 2008 when the quiz show revision lecture was given the average mark for the design graphics and communication course was 73.5% with 14 fail marks from 256 students. In 2009 when the lecture was not presented the average mark for the course was 67.7% with 36 fail grades from 258 students. These results show a lower fail rate and a 5.8% increase in average mark in the year the quiz show revision class was presented. Unfortunately, due to major changes to the design graphics course in 2008 to include a communications component, it is not appropriate to compare previous years' results. Thus it is currently not possible to identify if the quiz show lecture was responsible for the increase in average mark or if it was simply a natural deviation between year levels. An examination of further results from future student cohorts will provide more statistical comparisons on the effectiveness of this revision lecture style.

Although it is apparent the lecture may be effective, there have been suggestions from students regarding possible improvements to the style. As presented, the format only directly involved six students as contestants, with the remainder of the class involved as the interactive audience. The audience was not so directly involved and therefore may not have benefited to the same degree. One suggestion to involve more students directly is to divide the lecture theatre in half, forming two teams of half the class each. Each question is presented to the entire class, with a student being chosen at random after 20 seconds to provide an answer. The students chosen would reflect an even split over the two teams, but not necessarily alternatively to ensure students in both groups remain engaged with each question and answer. The team that has the most points at the end of the lecture gains bragging rights over the other team. This method allows full participation from all students but may remove some of the atmosphere that comes from a quiz show. Another option to involve the entire class is to use 'learner response systems' such as 'Votapedia' in which class members use their mobile phones to anonymously submit answers in real time (Meyer 2009). Then, either the answer with the largest amount of responses is taken as the teams overall answer, or the number of answers in total is the team score for that question. This method of presenting a revision lecture can be adapted to suit a variety of courses, regardless of course, discipline or country context. The quiz show format can still be followed but the style of the show can be adapted to mimic the type of quiz show most popular in the particular region in which the University is situated.

Flying to the moon in a wooden rocket

The two examples illustrated above examine the use of extreme humour in lectures, however often simpler more subtle humour can be just as effective. One such example introduced by a lecturer at The University of Adelaide is that of the 'Moon 1 Rocket'. To encourage students to think laterally about the materials needed to build a space craft the lecturer draws a cartoon rocket ship on the board then asks the students to consider what would happen if the rocket was made from wood. Initially the students just laugh at the ridiculous proposition but soon come to realise it is an effective tool in learning to consider the full life cycle and failure modes of the material before making a decision. It is often only in considering the ridiculous that students see what they may fail to see in 'serious' examples. More often than not students thoroughly enjoy this technique and remember the concept well into the future, using it in the workforce when designing a new component.

Tommy Cooper in the classroom

Halfway through the Design Graphics course the lecturer often sets a formative test to gauge students' understanding of early course material. The lecturer, however, does not inform the class it is formative, just mentions there is a test next lecture. The questions for the test appear on a Powerpoint presentation pre-set with times to answer each question. By not informing the students it is a formative test they will try their best to answer the questions assuming it is part of their graded work. However, the lecturer claims this environment is still not nearly as stressful as that found in an exam situation and the students would be able to think clearly and calmly giving a false impression of how they would perform during an exam. During high stress situations the hormone cortisol is released into the brain that adversely affects the performance of the hippocampus (Brenmar 1999). Therefore in high stress situations the memory recall ability of the brain is compromised. In order to better match the conditions found in an examination the lecturer provides distractions in the form of Tommy Cooper jokes read out while students are attempting to answer the questions. Tommy Cooper jokes are usually simple one liners such as 'I went to the doctor the other day, I said 'it hurts when I do that' and he said 'well don't do it.'" While this does not raise the stress levels of the students it provides enough of a distraction to simulate a lowered ability of recall during high stress situations. From the test results both the students

and lecturer have a better idea of the areas that need to be addressed in further detail before the final exam.

A bad example

Several examples of humour being used in an effective manner have been discussed, however the use of humour in teaching does not always work well. In an urban legend among students there was once a psychology lecturer who set up an elaborate demonstration to show human responses to difficult situations. The daughter of the lecturer was in the class, unbeknown to most of her classmates, so the lecturer organised for her (old) mobile phone to ring during class. He promptly confiscated the phone and smashed it beyond repair in a mock rage. Pausing for effect before explaining the psychological value of what he had just done the entire back row of the lecture theatre got up and left in disgust. Although the lecturer had a genuine and effective purpose for what he did, the delivery was not received well thereby negating any effect gained from the demonstration. Perhaps he should have thought his idea through a bit more before delivering it.

A matter of opinion

Whilst there is neurological evidence to support the use of humour in lectures it is important to gauge student response to its use. Thirty-six engineering students from The University of Adelaide were randomly selected and surveyed on their opinions regarding the use of humour in lectures. The students were asked four short answer questions, given below, the answers tallied depending on response and the results analysed.

1. Can you think of any specific lectures you have attended that involved the use of humour? Give examples.
2. What kind of humour do you prefer in lectures?
3. Do you think the use of humour in engineering lectures increases your retention of the lecture material and why?
4. Are you more likely to attend a lecture if you consider the lecturer 'funny' and why?

The students ranged from first to final year from a range of engineering disciplines and cultural backgrounds as shown in Figures 1a and 1b respectively.

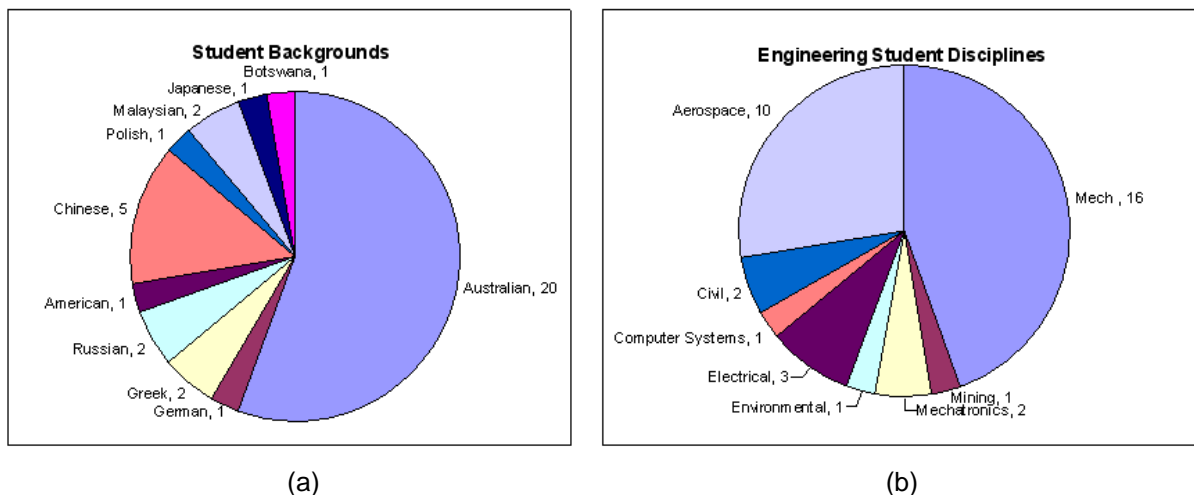


Figure 1: Engineering disciplines (a) and cultural background (b) of surveyed students

All student respondents could recall at least one example of humour being used in their lectures ranging from simple topic related one-liners and amusing anecdotes to cases where the lecturer delivered the entire lecture dressed in a costume. Some examples are:

'(The lecturer) throwing a mudflap across the room to show how a point rotated about the CG (centre of gravity) of a 'rigid body'.'

This is an effective demonstration of the engineering concept not only as it is possible to see the effect the lecturer is demonstrating, but also as it is an unexpected approach that is humorous the students

become more engaged. This method of humour can be easily adapted to suit other practical demonstrations.

‘(The lecturer), at the end of every lecture would humorously present an engineering accident, then proceed to explain how the accident came about before using it as a reminder that without proper planning and design human lives can easily be forfeited and liability will ensue’

This is another example of humour used in an effective way to reinforce a point that can be easily adapted to suit any topic. The example simply needs to be changed to a story or disaster related to the current topic.

“At the end of every lecture, (the lecturer) would have a different penguin-related animation.”

Some of these animations included a penguin falling through thin ice, or another penguin sneaking up behind the first and hitting him into a hole in the ice. This is a nice finality to the lecture, not only retaining the attention through until the end of the lecture in anticipation of the new animation but also allowing the students to leave the lecture in a good mood; the dopamine arising with the good mood reinforcing the retention of information students were recently exposed to in the lecture. This method can be applied to any topic as it is totally unrelated to the course material but still effective.

Most of the students surveyed indicated that the use of witty one liners or Powerpoint animations slipped into the lecture at various intervals were preferred to ‘over the top’ humour such as dressing up as they believed this distracted too much from the material in the lecture. Another popular form of humour was that of anecdotes or amusing stories related to the lecture material in some way. A complete outline of the preferred humour types of surveyed students is shown in figure 2.

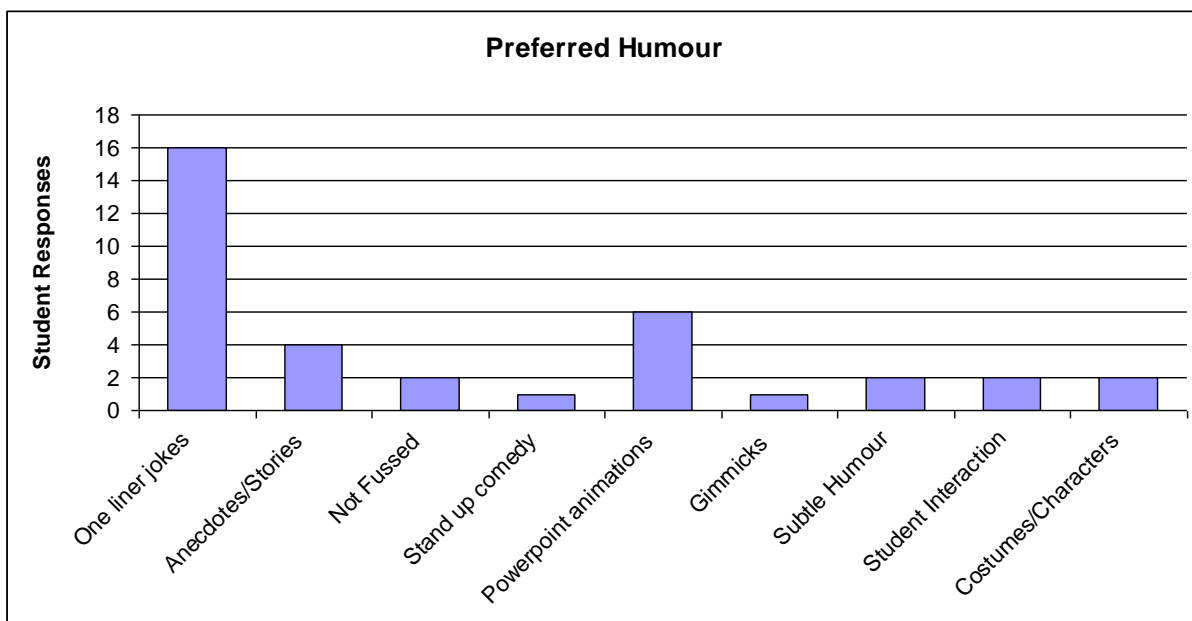


Figure 2: Number of responses for preferred humour type for each type (R=36).

Sixty-two percent of respondents believed the humour assisted in their learning with a variety of reasons as to why. Most believed it was due to the humour helping them stay alert and pay more attention during lectures, with 52% of all responses indicating this. Improved attention levels in lectures help students learn more as they become more engaged to the content. Others believed it was because the humour made the lecture a ‘happy memory’ and happy memories are easier to recall. Others were not sure why humour helped their learning but were convinced that it did. One student’s response summed up this conviction ‘It must be because I got the best marks for those subjects.’

Importantly, 70% of students said they would be more likely to attend a lecture if they consider the lecturer ‘funny’. Higher attendance levels have been shown to increase exam performance and therefore overall grades for the course (Marburger 2001). Therefore, in addition to the neurological

reasons for using humour in the education process, humour also increases both attention and attendance in lectures further increasing the effectiveness of humour as a teaching tool.

It is envisaged that further studies in this area include a larger survey population, mock lectures delivered in different styles and written or oral tests for all participants at various intervals after the mock lectures, to measure information retention and understanding using both qualitative and quantitative scientific methods.

Making lecturers human

Another interesting point raised by this research was that a lecturer who uses humour, even in small doses, appears more approachable than one who does not. The following is an excerpt from a student's response to the survey.

'What I think is important about humour in lectures is that it makes both the lecturers and subjects appear approachable. When you have a lecturer you do not like it is very hard to tackle the material ... humour makes the subject likeable and then by some strange connection a lot more doable (sic). ...another thought is that many engineering subjects can be considered intimidating and a barrier begins to exist between the student and lecturer, this barrier can be mental or physical (have you ever been to really good class and people are scrambling to sit in the first few rows...or a bad lecture when people try to sit at the back) and I think what humour does is break down these barriers.'

Emotional intelligence is the ability of a person to realise and control their own emotions and to understand the effect these emotions have on other thoughts and actions (Mayer and Salovey, 1993). A classic example is that of a student with average grades who studies a course they find very interesting and thoroughly enjoyable. The feeling of enjoyment attached emotionally to the subject will create a psychological belief that the course is not as difficult as originally perceived, allowing the student to attempt the course with greater confidence in their abilities. Conversely, a student who feels intimidated by the course will find it more difficult to motivate themselves to perform well. Employing humour as a lecturing strategy personalises the lecturer and the students will feel more compelled to seek help from them outside of lectures.

Lecturer perspectives

When asked to comment on a lecturers view of the use of humour in engineering education, one University of Adelaide lecturer stated the following:

'The mention of lecturers having fun in front of a class can wrongly conjure up the notion of a clown or a performing idiot (sic) who does not take the lesson at hand very seriously at all. Indeed, engineering can be tremendously difficult and does need to be taken extremely seriously. However, the concept of fun here is far more basic with the simple goal of ensuring that the students enjoy the learning experience and thus engage far more with what is being taught. While a joke may break the ice and be funny, it can also be of immense fun to see a CAD system realistically render a product that you've just designed, or to watch an autonomous robot walk just like a person. Such fun is inspiring! It can also be fun to watch a rubber ball when thrown under a chair bounce back towards you, apparently out of the wrong side, thus providing an opportunity to explain the dynamics. Simply put: keep them smiling and you'll have their attention, but if they fall asleep I doubt that their dreams will be of engineering at all.'

Interestingly, another lecturer equated the use of humour in engineering classes as a technique that teachers have often used subconsciously to enhance student learning.

'Good teachers have always had a knack of being able to create relaxed, participatory, learning environments. We can probably all recall teachers that we loved (sic), we learnt so much from them because of their caring or fun approach to learning, not just their expertise. There is no reason why, as lecturers, we can not reflect on these experiences and extrapolate to teaching at university... The wonderful thing I find with using humour in engineering classes is that it is the engineers who have devised the tools and machines, such as MRI and PET scans, that

neuroscience uses to measure brain activity and that this science confirms the use of humour in reinforcing learning and memory.'

Conclusion

The examples reviewed above are all, with one exception, successful instances of the effective use of humour in engineering education. All these examples can be adapted to suit any topic both within and external to engineering in any region of the world. Humour is truly an international language and can be successful anywhere if used appropriately. Specifically for engineering education, among the students surveyed in this study the most popular type of humour is simple 'one-liners' or amusing anecdotes related to the topic. From my own experiences as a student I enjoy lectures involving humour and this in turn increases my attention and attendance levels. This is a sentiment echoed by many of my student peers. Both increased attention and attendance levels increase the quality of information gained from lectures and the capacity of students to retain that information. In addition the scientific evidence to support the use of humour and laughter in learning suggests that humour can be an effective tool in teaching and learning. It is important to consider the response of students to the use of humour and to ensure the type of humour used is not offensive. However, humour used in the appropriate way can be a very effective tool in engineering education.

References

- Adams, P. and Mylander, M. (1992) Good health is a laughing matter. *Caring Magazine*, Dec 92, 16-20
- Bear, M.F. Connors, B.W. and Paradiso, M.A. (eds.) (2006) *Neuroscience, Exploring the Brain*. USA: Lippincott Williams and Wilkins.
- Brenmar, J.D. (1999) Does stress damage the brain? *Society of Biological Psychiatry*, 45, 797-805
- Disney, W. (1954) Humor: An international sixth sense. *The Phi Delta Kappan*, 35 (8) 327-329
- Finkenbinder, E.O. (1913) The curve of forgetting. *The American Journal of Psychology*, 24 (1) 8-32
- Fry, M.F (1992) The physiological effects of humor, mirth, and laughter. *Journal of the American Medical Association*, 267 (13), 1857–1858.
- Greig, A. and Kestell, C. (2009) A student's perspective of engagement through innovative teaching techniques. *Proceedings of the 20th Annual Conference for the Australasian Association for Engineering Education*, 6-9 December 2009, Adelaide, Australia
- Kestell, C.D. and Missingham, D. (2006) A funny thing happened on the way to the lectern. *17th Annual Conference of the Australasian Association for Engineering Education*, Auckland NZ.
- Knight, R.T. (1996) Contribution of the human hippocampal region to novelty detection. *Nature*, 383, 256-259.
- Marburger, D.R. (2001) Absenteeism and Undergraduate Exam Performance. *The Journal of Economic Education*, 32 (2) 99-109
- Mayer, J.D. and Salovey, P. (1993) The intelligence of emotion intelligence. *Intelligence*, 17 () 433-442
- Mega, M.S. Cummings, J.L. Salloway, S. Malloy, P. (1997) The limbic system: an anatomic, phylogenetic, and clinical perspective. *Journal of Neuropsychiatry and Clinical Neuroscience*, 1997 (9) 315-330
- Maier, H. (2009) Student participation in lectures using mobile phones. *Proceedings of the 20th Annual Conference for the Australasian Association for Engineering Education*, 6-9 December 2009, Adelaide, Australia
- Sousa, D. (eds.) (2001) *How the brain learns: A classroom teacher's guide*. California: Corwin Press Inc.
- Tucker, M.L. (2004) Linking emotions, the brain and communication. *Proceedings of the 2004 Association for Business Communication Annual Convention*. October 26-29 2004, Cambridge, Massachusetts USA
- Torok, S. E., McMorris, R. F. and Lin, W.C. 2004. *Is humor an appreciated teaching tool? Perceptions of professors' teaching styles and use of humor*. *College Teaching* v52, No.1.

Copyright © 2009 Authors listed on page 1: The authors assign to the EE2010 organisers and educational non-profit institutions a non-exclusive licence to use this document for personal use and in courses of instruction provided that the article is used in full and this copyright statement is reproduced. The authors also grant a non-exclusive licence to the Engineering Subject Centre to publish this document in full on the World Wide Web (prime sites and mirrors) on flash memory drive and in printed form within the EE2010 conference proceedings. Any other usage is prohibited without the express permission of the authors.