Why research informed teaching (RIT) in acoustics education: How can we embed research in acoustics education to improve students' learning?

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Abstract:

How do acoustic students learn? How can we understand if students learn what we teach them? Should lecturer's objectives be achieving the learning objectives of module whereas students want to pass or get high marks? How can we embed research in acoustics education? Does research improve students' learning? Lecturer roles are to deliver the course material, and to broaden the learners' understanding with a different point of view. Sometimes lecturers need to change the way they teach according to the level of the learners by using different teaching methods and strategies (Ramsden, 2003; Biggs and Tang, 2007; Petty, 2009; Cowan, 2006; and Gravells, and Avis *et al*, 2009) depending on the level and skills of students, and evaluate them while the lessons progress and change or adopt new strategies if needed to. This paper highlights research on students' learning, and implementation of RIT in acoustic education.

1. Introduction

The objective of lecturer is to achieve the learning objectives of module whereas students want to pass or get high marks. The learning objectives of module can be achieved by adopting appropriate teaching and learning, and assessment methods in which students are asked the issues that they are supposed to learn. Teaching is a demanding role and lecturer's role is to deliver the course material, to broaden the learners' understanding with a different point of view. It is important that lecturers change the way they teach according to the level of the learners by using different teaching methods and strategies (Ramsden, 2003; Biggs and Tang, 2007; Petty, 2009; Cowan, 2006; and Gravells, and Avis *et al*, 2009) depending on the level and skills of students, and evaluate them while the lessons progress and change or adopt new strategies if needed to. Gibbs's reflective cycle (1988) can be used as a model to improve the quality of the teaching.

2. Teaching

2.1. Teaching session:

Teaching approach changes from lecturer to lecturer, from subject to subject, and from department to department. I believe in that there is no best teaching approach. My teaching approach includes lecture, tutorial, self-directed learning, and laboratory work. It is a mixture of lecture centred teaching and student centred teaching. The session I teach is about the effects of vibration on human health. Teaching materials were uploaded on Virtual Learning Environment two days before the sessions, and students were asked to read teaching materials before they attend the class. As tutor goes through the power point slides, students were asked questions regularly to make sure they are listening. Towards the end of the teaching session students were divided into two groups, then group task which is about hand-arm vibration and whole body vibration were introduced. For a ten minutes learning activity, students were asked

to make a list of equipment/machines causing hand-arm vibration, and whole body vibration, to answer and discuss the following questions: What causes the vibration? Where does the vibration enter the body? How can the vibration be measured? Students were observed while they are trying to answer questions. They were asked to present group findings after ten minutes. Previously tutor was asking a volunteering member of group to present group's findings. On a year 7 level course students should build the confidence to present their findings. Tutor felt that all students needed to present more to their peers. Therefore, tutor tried a different way to make each member of group to speak in front of their class mates. Each member of group was asked to present the answer for one question. They were not expecting to be asked to present group's findings. Students who tried to answer the questions and participate to group discussion were good at presenting group's findings, and they spoke with confident. Students who did not take part in group discussion, did not know what to say. Students who were listening other members of group, just said what they heard in their own words.

The reason for giving students the activity towards the end of the session is to understand if students are deep learner and/or surface learner. I believe in that students should join the group discussions, and question the objectives and aims of the topics of the day. Students learning approaches has been an intense topic for researchers (Ramsden, 2003; Prosser and Millar, 1989; Biggs, 1988; Marton and Säljö, 1984, 1976a, and 1976b; and Lewin, 1951. Ramsden (2003: 47) has stated that surface learning focus on 'the signs' for example the words and sentences of the text, or unthinkingly on the formula needed to solve the problem while deep learning focuses on 'what is signified' for example the author's argument, or the concepts applicable to solving the problem. As emphasised in Ramsden (2003), students do not necessarily have to be either deep learners or surface learners; they can only learn the content in a deep or surface way.

2.2. Tutorial session*:*

A tutorial session followed teaching session. Students were given tutorial sheet to check if they remember anything from previous sessions. Therefore, some questions they were asked to solve at tutorial session are related to the topics of the day and some of them are related to previous topics. I found out that some students are still struggling with this topics during tutorial session.

I believe in that students can gain the knowledge they need if they are provided with necessary information as discussed in the work done by Vygotsky who developed 'Zone of Proximal Development' which is the distance between a student's actual development, determined with the help of independently solved tasks, and the level of the potential development of the student, determined with the help of tasks solved by the student under the guidance of instructors, and in cooperation with his more intelligent partners (Veer and Valsiner, 2001). The gap between students who are good at this subject, and who are not good, may be lessened by using appropriate teaching methods as suggested by Biggs and Tang (2007).

2.3. Practical session:

Practical session took place in acoustic laboratory where students are provided by a laboratory sheet which explains measurement procedure step by step. Tutor explained to them what they need to do, and how they will be doing the measurement. Students will not be able to carry out measurements individually for two reasons. First reason is that each measurement takes about one hour. Students only have two hours to carry out two measurements for this practical

session. So, time will not be enough for them to do measurements on their own. Second reason, it will not be easy to do measurements, to record measurements, to take notes about measurements, and to solve the technical problems they might be encountering during measurements. Therefore, students were asked to work as a group. Each group will be working on a different measurement for one hour then they will swap it to start doing a new measurement. They were left in the acoustic laboratory on their own because they are post-graduate students, and they should be able to do some work as a group without being supervised. Most of them are working either as junior consultant or senior consultant at acoustic companies. They will be doing same or similar work on their own or by getting some help from their work colleagues.

At the end of the session, students said that they enjoyed the practical session which helped them to understand the subject better. The aim of practical session designed is to involve students in action and practice (Heron, 1989:13). However, occurrence of learning is through the transformation of experience. Kolb (1984:38) defines learning as 'the process whereby knowledge is created through the transformation of experience'. Kolb developed a well-known model of how this transformation takes place in an experiential learning cycle which is based on the work of Dewey (1933).

3. Assessment

3.1. Formative assessment:

For formative assessment tutor uses tutorial session, and a learning activity during teaching session to monitor student learning. The details of tutorial session are given in section 2.2. Tutor uses this session to identify students' strengths and weaknesses, and the areas they are struggling with. Students were given feedback to improve their learning while the session progressed.

3.2. Summative assessment at undergraduate and postgraduate level:

3.2.1. *Examination*:

The summative assessment for this module at postgraduate level includes one exam and coursework. The examination held at the end of term, will account for sixty percent of the unit mark. It is a three hours formal written examination containing two parts (part A and part B). Part A is the compulsory short answer section containing eight questions five marks each, part B is the choice of three longer questions from five questions twenty marks each. Three hours exam is considered to be very long and stressful based on the feedback tutor received from last year' students. Feedback from students suggest that they should have two one hour exams instead of having one three hours exam. One exam should be held at the middle of the term and other at the end of the term. This will reduce student' load at the end of term. The coursework for this module includes two formally assessed assignment.

3.2.2. Assignment

Undergraduate acoustic and audio students are asked to work in pairs to research, prepare and deliver a short presentation that describes and summarises the physics involved within an application in entertainment technology for one of level 4 unit. Students should use diagrams to aid their audience's understanding. They need to work in pairs both for the research and presentation. They should prepare a short PowerPoint slideshow to support their oral presentation and upload it via Virtual Learning Environment by the deadline given. Their

presentation must be no longer than 12 minutes and will be to the other members of their tutorial group, so they should regard their fellow students as their target audience. Students need to find a fellow student to carry out their presentations with.

Some students have never done any presentations in front of their fellow students and a lecturer before. Therefore, they are experiencing some anxiety before the presentation. Even if the students who have done presentation before say they get nervous before and during the presentation. Most of them did not rehearse the presentation, thus some of them forgot what to say during the presentation. Even if they rehearse, some students say they forget because they get nervous in front of the audience. In some cases, students' fellow did not turn up for the presentation. Consequently, either they did presentation themselves or waited for next sessions, and expecting their friend might turn up on the next session.

A survey form was prepared for the presentation assignment which consists of eleven multiple choice questions and two open ended questions. Students were given feedback form to complete. I had twenty-two responses from them. In question one students were asked that what the research element of the assignment which is 30% currently, should worth. 36% of responses said it should worth 40% and 32% of responses say that it should worth 60% as shown in bar Chart 1. In question two they were asked what the presentation element of the assignment which is 40% currently, should worth. 41% of responses said it should worth 60% and 32% of responses say it should worth 40% as shown in bar Chart 2.

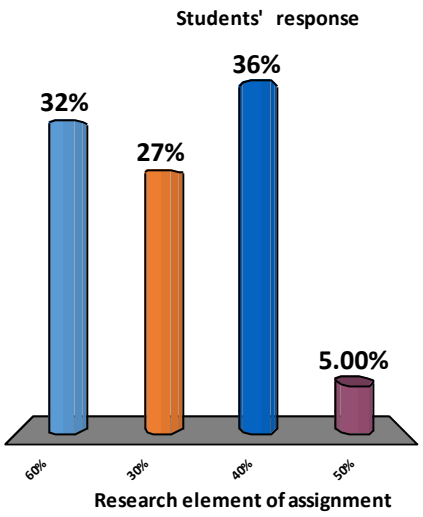

Chart 1: Research element of the assignment versus students' response

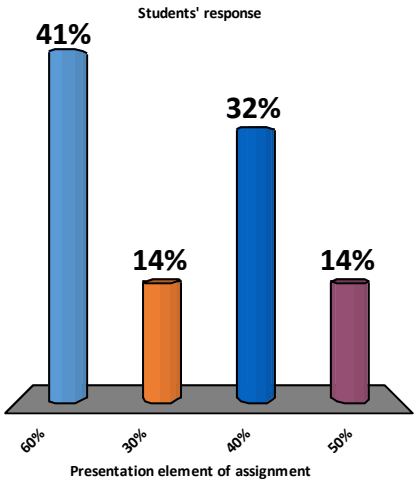

Chart 2: Presentation element of the assignment versus students' response

One of the important think tutor wanted to know is whether students want to do individual or group presentations. Therefore, tutor asked them if they prefer to do a group presentation or an individual presentation. 45% of students' responses prefer individual presentations, and 36% of students' responses prefer group presentations while 14% of students' response said they do not mind as shown in bar Chart 3. Students mostly were not happy with group marking because they picked wrong person to do assignment with. We want students to do research and present

their findings together to learn co-operative working. But pair marking and individual marking is something we need to re-think about it. Thus, in one of the questions I asked students that if they prefer to do a group presentation, how their presentation should be marked. 73% of students preferred individual marking while 27% students preferred a group grade as shown in bar Chart 4. It seems that majority of students preferred an individual grade. I agree with students on this occasion because in case of group grade, some students may leave most of the work to their fellow while individual grade will inspire students to take more responsibility, to work hard and to contribute more to assignment/presentation to get a better grade

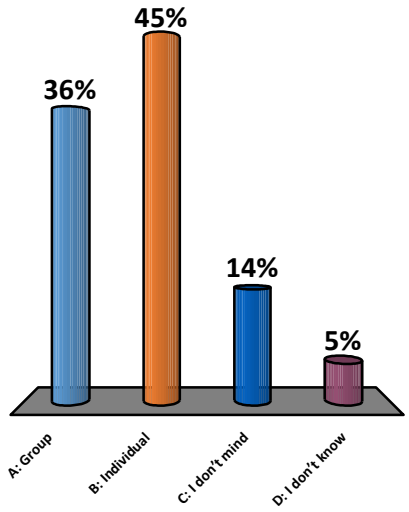

Chart 3: Presentation preferences versus students' response

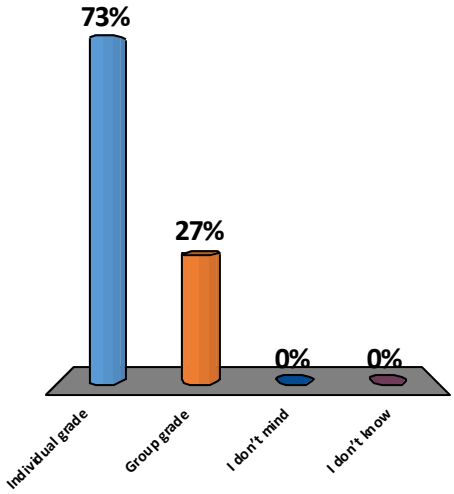

Chart 4: Grade preferences versus students' response.

4. Research informed teaching in acoustics

In survey form students were asked to define the 'Research' and explain 'what research means to them'? Students had some interesting answers for this question. The most interesting answer was that the research is about having a question or hypothesis that needs an answer and to carry out preliminary investigation before attempting to solve it by experimenting.

Research is the methodical investigation that investigate materials and sources in order to answer the questions that have never been answered. Research informed teaching process differs from the subject to subject. The main aim of research informed teaching in acoustics is to inspire learner to develop into employable acoustic engineers, an unfathomable understanding of their potential, and acoustical aspiration to apply to new knowledge. Research and teaching in acoustics should have closer relations and include joint research in acoustic field, developing acoustic research skill, acoustic course development, noiseless and enjoyable learning environment, acoustic teaching materials, provide undergraduate and postgraduate publication in acoustics field, and student placement in acoustic industry.

Assessment based research in acoustic field can be introduced by applying research into assignments at all levels, final year project and thesis. Academics should develop and update teaching and learning materials informed by acoustic sector and by using recent research outputs in this field for new and existing modules.

5. Conclusion

Each member of the group or pair should be given an individual mark for the task, rather than a single mark being given to the group as a whole if hard working good students are going to carry out their presentations with unfavourable students. Measures should be taken to help students to familiarise with the oral assessment format and requirements. Opportunities should be provided to them to practice in class time. The assessment is based on pair presentations. It will be better to use peer evaluation and feedback to help students become familiar with assessment criteria. Usually the students are not used to express themselves orally within their chosen discipline.

The teaching approach should be a mixture of lecturer-and-student centred approach. Work is needed to improve the approach to teaching in acoustic field to ensure students remain motivated and engaged, and graduate keen to pursue acoustic careers. Feedback from students should be used to improve the quality of teaching. Acoustic courses must become better aligned with the varying needs of acoustic industry. In particular, more and better quality project work is needed, based around real-life problems, ideally delivered in collaboration with acoustic industry.

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REFERENCES

1. Avis J., Fisher R., and Thompson R., (2009) ‘Teaching in lifelong learning: A guide to theory and practice’. First edition, Open University press.
2. Biggs, J. and Tang C. (2007) ‘Teaching for Quality Learning at University’. The Society for Research into Higher Education. Third edition, p.10-11.
3. Biggs, J. (1996) ‘Enhancing teaching through constructive alignment’. Higher Education, 32, p. 347-364.
4. Biggs, J. (1988) ‘Approaches to learning and to essay-writing’, R.R. Schmeck (ed.) *Learning Strategies and Learning Styles*, New York: Plenum.
5. Brophy, J. E. (1981). Teacher praise: A functional analysis. *Review of Educational Research, 51*(1), 5–32.
6. Cowan, J. (2006) ‘How can you adapt ideas from my teaching, for yours? Second edition, Open University press, 122-123
7. Dewey, J. (1938) ‘Experience and Education’, Kappa Delta Pi, 19-20.
8. Kolb, D.A. (1984) ‘Experiential Learning: Experience as the source of learning and development’, New Jersey: Prentice-Hall.
9. Heron J. (1989) ‘Six Category Intervention Analysis’, third edition, Guildford: HPRG, University of Surrey.
10. Gibbs, G. (1988) ‘Learning by doing: A guide to teaching and learning methods’. Oxford: Oxford Polytechnic Further Education Unit.
11. Lewin, K. (1980) ‘Field Theory in Social Sciences’. New York: Harper and Row.
12. Marton, F. and Säljö, R. (1984) ‘Approaches to learning’, in F. Marton *et al*. (eds) *The Experience of Learning*, Edinburg: Scottish Academic Press.
13. Marton, F. and Säljö, R. (1976a) ‘On qualitative differences in learning – I: outcome and process’, *British Journal of Educational Psychology*, 46: 4–11.
14. Marton, F. and Säljö, R. (1976b) ‘On qualitative differences in learning – II: outcome as a function of the learner’s conception’, *British Journal of Educational Psychology*, 46: 115–27.
15. Petty G., (2009) ‘Teaching today: A practical guide’. Fourth edition, Nelson Thomes press.

16. Prosser, M. And Millar, R. (1989) 'The "how" and "why" of learning physics', Europen Journal of Phychology of Education 4: 513-28.
17. Ramsden. P. (2003). Learning to Teach in Higher Education, Routledge Falmer, London New York, 2nd edition.
18. Schwartz, F. and White, K. (2000). Making sense of it all: Giving and getting online course feedback. In K. W. White & B. H. Weight (Eds.), The online teaching guide: A handbook of attitudes, strategies, and techniques for the virtual classroom (pp. 57–72). Boston: Allyn & B.
19. Van der Veer, R., & Valsiner, J. (1991). Understanding Vygotsky. A quest for synthesis. Oxford: Basil Blackwell.
20. Vygotsky, L.S. (1978) '*Mind in Society: Development of Higher Psychological Processes'*. Harvard University press, p. 86.
21. Templeton M., and Fitzgerald S. S., 1999. Shaum's quick guide to great presentations. McGraw-Hill.
22. McCarthy P., and Hatcher C., 2002. Presentation skills: The essential guide for students. 1st Edition. SAGE publications.
23. O'Rourke J., 2008. The truth about confident presenting: Focus on what can go right and win them over. 1st Edition. Pearson Education Limited.
24. Stevens, M. 1996. How to be better at giving presentations. 1st Edition. The Industrial Society.