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What Don't We Know About Interactive Lectures?

Roger Murphy

School of Education,
University of Nottingham
Email: roger.murphy@nottingham.ac.uk

Namrata Sharma

School of Education,
University of Nottingham
Email: namrata.sharma@nottingham.ac.uk

Abstract

This article considers aspects of lecturer-student interaction within the context of lectures in higher education. In particular it considers ways in which lectures can involve observable interactions between students and lecturers, and how these sometimes involve novel uses of visualisation supported by modern technologies. It goes on to consider the different ways in which interactive lectures can involve the use of new technologies such as voting systems and SMS messaging from mobile telephones. A full range of types of interactive lectures is reviewed, and the article notes the serious lack of research in existence which can inform thinking about what is a very widely used form of teaching throughout higher education. As well as considering the possible implications for students and lecturers of participating in interactive lectures, this article also goes on to consider ways in which this type of educational situation could be subjected to rigorous research investigations. It is argued that such research needs to focus both on the processes of interactive lectures as well as their impact on student learning outcomes.

Keywords: lectures, interactive lectures, technologies in higher education

Introduction

Lecturing has a long and distinguished history as the prime teaching method in higher education. To some it still encapsulates the very heart of university education, whereas to others it represents an outmoded form of instruction which dates back to the medieval origins of university education in the days before the invention of the printing press. In this article we want to take a look at what modern lectures can look like and to consider ways in which lecturing, in many settings, has moved away from being a straightforward didactic act. In making this distinction we are aware that even straightforward traditional lectures may not be conducted entirely in the absence of any interaction between the lecturer and their audience. Lecturers generally can see and hear their audiences, and even a silent passive audience may convey messages to the lecturer through facial expressions and other forms of non-verbal

behaviour, or by non-attendance, late arrival or leaving the room while the lecture is still continuing, or both. In all such cases it can be argued that interactions are occurring, which may influence the behaviour of the lecturer and indeed the impact of the lecture on the students. However when we talk about 'interactive lecturing' in this article, we are referring to lectures which include observable attempts by the lecturer to introduce techniques or technologies, or both, into the structure of the lecture with the intention of eliciting interactions from their audience.

In wanting to put our focus on modern lecturing, which tries to create more opportunities for audience engagement, participation, and active learning, we are aware that much has already been written about both public speaking more generally and university lecturing in particular (Bligh, 2000; Brown & Atkin, 1988; Brown & Daines 1981). Nevertheless given the importance of lecturing as the major means of teaching in higher education we want to argue that it has had little serious attention as the focus for in-depth research, and this does seem a serious omission given that the focus there now is on both expanding higher education and improving student learning experiences within it. Compared to other types of 'instructional methods', such as classroom teaching in secondary schools, this field of education is, we would argue, both under-researched and indeed under-theorised.

One reason for wishing to focus on lecturing at this time in this article is an increasing interest in the phenomenon of 'adapting' lectures deliberately to make them into a more interactive experience for students. Compared to traditional lecture settings, where the teachers talk and the students listen, interactive lecturing generally sets out to promote two-way teacher-and-student communication during the lecturing process. This may be done through the use of various techniques that enable students to engage in a discussion amongst themselves or to interact with the lecturer. However, interactive lecturing is not just restricted to human interaction, but can also take place through the student's interactions with the lecture material and content. It is also possible to use a variety of modern technological devices to bring elements of interactivity into a traditional lecture-theatre setting. Here we have in mind things such as handheld response pads and text messaging using ordinary mobile telephones, each of which, along with some other possibilities, will be considered at more length later in this article.

The question of what could possibly make a lecture 'interactive' is clearly quite a complex one, because individuals passively listening to a lecture, which they find fascinating, might in all sorts of ways be interacting with the lecturer's ideas in ways which stimulate all sorts of thought patterns, new ideas, and deep learning. Generally that type of interaction is not what people have in mind when they talk about 'interactive lecturing'. The more normal understanding of 'interactive lecturing' is where some form of communication occurs in both directions between the lecturer and their audience. In the traditional form of lecture, lecturers may take questions from members of their audience, either during or towards the end of their allotted time, or, inviting individuals to respond with suggested answers, they may themselves ask questions of their audience. With a large audience and a restricted amount of time such interactions may be quite limited and involve very few individuals. They do nevertheless break through the potential monotony of simple one-way communication from a lecturer to their assembled audience.
With the increased use of new technologies in higher education, there are now additional technology-assisted techniques, which can be employed to increase the possibility of interactions occurring. Lecturers employing such new technologies while lecturing may bring into their engagements with students quite a range of devices, which have the potential to make lectures both more varied and in some cases more interactive. These technologies can widen the scope of lecturer-student communication within the lecture theatre. They can also allow students to access recordings of lectures at a time that suits them

through a facility of web-based lecture capture. Web-based lecture capture systems record live lectures and then make them available as web-based resources. In some cases such lectures are supported by other on-screen resources, which allow further possibilities with respect to audience interaction. Although the issues faced with regard to analysing lecturer-student interactivity change in such settings, they do at least go even further in illustrating what a changing landscape is now encompassed by the former seemingly straightforward category of 'university lectures'. Clearly when students are accessing a lecture through a web-based recording they necessarily have the facility to stop, start, and re-run parts of the lecture at their own convenience.

It is our view that the research literature relating to conventional lectures is rather thin. In contrast to that state of affairs the research literature into 'interactive lectures', encompassing the range of developments, which have just been discussed, is almost non-existent, with major issues waiting to be examined. Later in this paper we intend to map-out more fully an agenda for future research into 'interactive lectures'. First we want to look in a little more depth at the key issues that are likely to shape such a research agenda.

One of the major arguments in favour of 'interactive lectures' is based upon the assumption that students will learn more in educational settings where they have the opportunity to be active participants in the learning process. Indeed those proponents of the benefits of active learning tend to hold out little hope for the effectiveness of conventional one-way didactic lectures, which anticipate a passive and receptive audience. In support of this stance research has shown the merits of interactive learning across various disciplines (Gage & Berliner, 1991; Foley & Smilansky, 1980; Frederick 1986; Papp & Miller, 1996; Saroyan & Snell, 1997; Steinert & Snell 1999). Some of these studies suggest that increased student participation takes place when student interest has been captured. However, there is a paucity of research that can provide evidence to support student learning. Although there has been research in this area, studies are generally unable to suggest whether there is better student learning through interactive lecturing as compared to more didactic forms of teaching. In fact, some studies (e.g., Van Dijk et al., 2001; Lake 2001) report a preference amongst students for traditional lectures over those with interactive elements, even when student performance was higher in the former (Lake, 2001). Also, potential disadvantages of making lectures more interactive have been identified, including loss of teaching time (Lammers & Murphy, 2002), reduction in factual content (Murray & Brightman, 1996), reduction in accuracy of transmission, and loss of control by lecturers over the class (Huxham, 2003).

There is also inadequate research on the pedagogical implications of the emerging interactive forms of learning. As this article argues, there is a need for more robust discussion on the theoretical underpinnings of how technological advancements in lecturing can improve student learning with respect to providing the enabling conditions that can facilitate knowledge of discipline-related content and also gain generic skills like critical and analytical thinking. This article draws up a theoretical framework to consider these issues that have wider implications for learning and teaching in higher education.

Different Approaches to Interactive Lecturing

Various interactive techniques are being used to make lectures more interactive, which include the following examples selected from recent studies.

- *IVS, Interactive Voting System*

Interactive Voting Systems are an interactive means of presentation and communication which can support large group interaction (Schijven et al., 1997). IVS consists of a series of electronic voting devices that presenters can use to keep in contact with their audience… In a lecturing setting IVS provides lecturers with the opportunity to ask questions about the subject matter, which students can answer anonymously using their voting devices. The results of the voting session can be projected on to a screen, thus making it possible for the students to see them. The lecturer can give feedback to the student answers.

(Van Dijk et al., 2001, p. 17)

- *Peer instruction*

  Peer instruction is an instructional method aimed at exploiting student interaction during lectures and at focussing students' attention on underlying concepts (Mazur, 1997). Using PI in lectures implies departing from the traditional lecturing format. Instead of presenting the level of detail covered in the textbook or lecture notes, lectures consist of a number of brief presentations on key points, each followed by short questions on the subject under discussion. The students are first given time to formulate answers and then they are asked to discuss their answers with each other.

  (Van Dijk et al., 2001, pp. 17- 18)

- *Breaking the class into smaller groups*

  This approach overlaps with peer instruction to some extent, although is significantly different as Cooper and Robinson (2000) make *the argument for making large classes seem small* through various case studies and examples. Two interesting examples of this technique have also been presented by Schwartz (1989), teaching biochemistry to a large number of students, and by Stein et al. (1990), who incorporated small group teaching methods in a large group setting in clinical pharmacology. The general strategy is to break the class into small groups, using a judicious rearrangement of seating if necessary (Gibbs et al., 1988; Newble and Cannon 1994)…Small groups may be asked to discuss a limited topic for a few minutes (in what is often called 'buzz groups' because of the noise in the room) or they may consider broader issues for a longer period of time.

  (Steinert & Snell, 1999, p. 39)

- *Questions for the audience or lecturer*

  Lecturers can either ask questions, which they invite members of the audience to answer, or they can invite members of the audience to ask them questions. Both techniques can be used in a wide variety of ways, for example, to include the use of buzz groups, where students can either reflect on possible answers to a question that the lecturer has given them, or to frame questions, which they might ask the lecturer. This approach might also be supported by getting the students to brainstorm either ideas or questions. Other approaches might involve the lecturer surveying the class (in which the lecturer adapts to audience needs and interest), or furnishing them with quizzes and short answers (to check up on learning), or giving them problems to solve, which might allow them to apply the ideas presented in the lecture.

- *Using audience responses*

  This can be done through interactive computer systems or flash cards. Essentially the lecturer is hoping here to increase audience

engagement and interactivity through inviting responses to questions or dilemmas. As with the IVS approach, the results of such audience responses can be summarised and fed-back allowing further opportunities for reflection, discussion and interactions between the lecturer and the audience.

- *Use of clinical cases*

  As Steinert and Snell (1999, p. 40) suggest, the use of clinical cases has been found to be particularly useful in medical education. This technique is also used in other settings such as Business, Education, and Social Work. In all such areas the lecturer shares a 'case' with a group of students, inviting them to engage with it, and allowing opportunities for enhanced interactivity around a discussion of the case.

- *Use of written materials*

  Distributing handouts, for instance, before or during the teaching session, is one possible way of facilitating interaction during the lecturing process. Here much depends upon the nature of the handouts and their purpose. Rather than simply summarising the key points from the lecture, handouts may provide stimulus material for students to reflect upon, analyse, and discuss, and can form the basis for lecturer-student interactions while the lecture is in progress.

- *Organising debates, reaction panels, and guests*

  Students can be divided into groups in order to think of arguments from different perspectives (Frederick, 1986, 1987). Such an approach can be developed into a full debate or can just lead to group feedback for further whole group discussion. Clearly this can be pre-planned or introduced spontaneously by a lecturer responding to an issue or argument that has emerged during the course of a lecture. In either case the properties of the learning space, where the lecture is taking place, will be of considerable importance. Again the design of learning spaces is not the prime focus of this article, but it is an issue, which is considered elsewhere in this journal. Lecturers using such techniques extensively may use lecture theatres that allow ease of movement for groups to form or even to disperse to rooms where smaller groups can meet and later provide feedback to the larger group.

- *Using simulations and role plays*

  Simulations and role plays allow students to try out a real-life situation in a 'safe setting' and to receive feedback on their experiences (Handfield-Jones et al., 1993; Steinert, 1999 in Steinert & Snell 1999). Second Life (SL) simulations have been used within various Higher-Education courses (and lectures have even been held within SL itself, with potentially problematic implications for interactivity).

- *SMS Text Messaging in Lecture Theatres*

  Another emerging innovation in interactive lecturing involves lecturers providing students with an SMS text messaging address to which they can send questions and comments while attending a live lecture. Technology exists to allow this to be set up in such a way that the lecturer can view any text messages on a computer screen, while they are giving their lecture. Advocates of this approach point to the benefits of students being able to remain anonymous in interactions

with a lecturer, and to the advantages of lecturers being able to scan a range of comments and questions before deciding how or whether to respond to them. Although this approach does have some similarities to the use of Electronic Voting Systems, it does differ with regard to the use of students' own familiar personal devices and the facility for them to use free text in formulating their questions.

- *Use of Technology to Connect the Lectures to Different Places, People or Contexts*

  This includes for example, video-conferencing technology, which is increasingly being installed within lecture theatres, and which is used to link lectures to practice-based settings and external experts, etc. Here the interactivity is being achieved with both people and contexts, which are external to the lecture theatre.

Most of these methods can be used across various subjects and can certainly act as triggers that can stimulate student thinking and promote enhanced engagement and discussion. Rather than diminishing the role of the lecturer, several of these approaches can give the lecturer a bigger and more complex role in an interactive lecturing process, where they can act not only as an instructor, but also a guide or facilitator who aids the students learning process by responding to student inputs and reactions while teaching. The complexity of interactive lecturing means that it demands quite sophisticated research approaches both to understand what types of interactions are involved and to consider their impact on individual student learning.

Developing the conditions for learning

One of the key pedagogical aspects in all the above techniques in interactive lecturing is that it opens up the possibility of a dialogic form of learning, and also aims to activate thinking so that students can experience higher levels of cognitive learning (Biggs, 1987; Entwistle & Marton, 1984; Nicholls, 2002; Ramsden, 1992). As is normal when one seeks to understand real learning situations, the picture quickly becomes quite complicated as one seeks to unscramble impacts on both the behaviours and actions of individual students and lecturers, as well as on the learning outcomes which arise from particular interactions. A recent study into interactive lectures in engineering education suggests that interactive teaching will not *automatically* result in students who are more actively engaged, and this adds support to the idea that the interactive elements that might possibly enhance the likelihood of successful student learning need careful examination (Van Dijk et al., 2001). In order to assist the conceptualisation of this complicated network of issues and interactions we offer the Figure 1 which is a depiction of the various processes that we consider need consideration if one is to develop a deeper understanding of interactive lecturing.

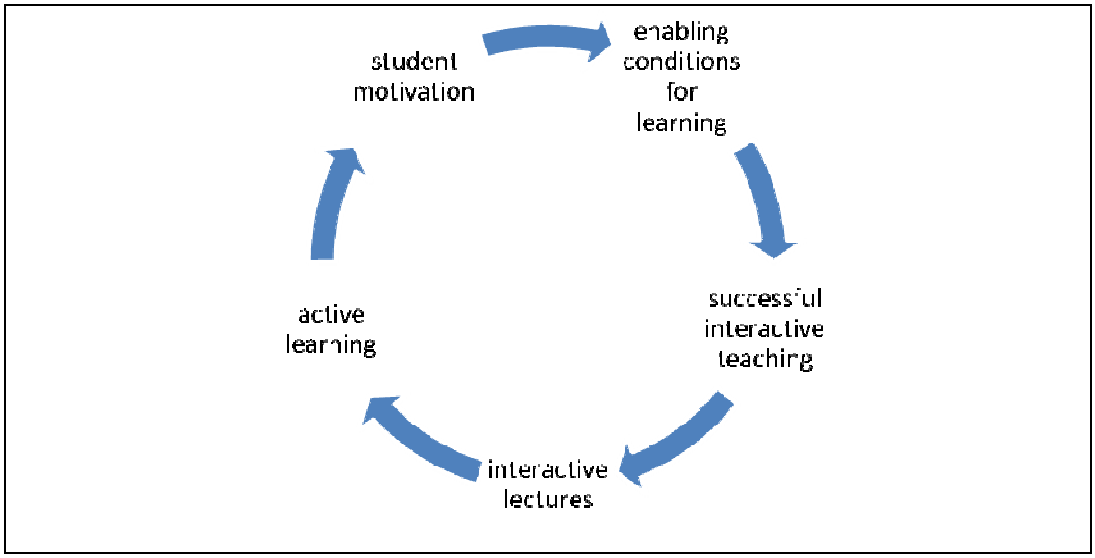

Figure 1: Investigating the multiple dimensions which surround and impinge upon Interactive Lecturing.

Figure 1 indicates some of the complexities which interrelate with the concept of interactive lecturing. This is clearly not a single or simple phenomenon. Interactive lecturing is surrounded by other factors which complicate it with respect to what happens before, during, and after it, as well as individual differences between students, lecturers, courses, and institutions. In the final section of this article we want to reflect a little further on how such issues could be addressed effectively through future research investigations.

Developing Research into Interactive Lecturing

In an earlier section of this article we looked at ten different categories of activities which could be undertaken within the context of lectures and which could potentially be regarded as constituting interactive lecturing. This list does not claim to be exhaustive, but as it stands it indicates something of the variety that exists within this field. Also each of those separate categories will certainly include a great variety of practices, which in turn will be influenced by contexts, timings, facilities, disciplines, students, lecturers – not to mention new technologies and other related developments. Therefore to understand interactive lecturing better we need contextualise learning in specific contexts and to study naturalistic settings in great detail. Here we are arguing for detailed research investigations involving observation, and data recording of various types designed to record and understand different teaching interactions from the perspectives of key participants, including the role that interactions play in them. All such work will need to take place within an institutional and a discipline-specific context, and it is of course always complex to assume that teaching phenomena that occur in one context can be assumed to be characteristic of the phenomena that might occur elsewhere. Therefore institutional and discipline-specific studies need to be planned and over time tested against research conducted in markedly different contexts.

If we take just one example from our list, that of the use of SMS text messaging in lectures, it is possible to indicate the breadth of this part of a research agenda. This relatively new phenomenon is as yet not all that well researched, and those designing pioneering studies in this area will want to look to see how such a technique is being used in different settings, for different purposes, and quite possibly how it evolves over time as it becomes more familiar to both students and lecturers. Obvious things to wonder about are whether all students will use this facility, what will encourage or discourage them from using it, what kind of messages will they send, how will lecturers use the text-

message information which they receive, what impact will this type of interaction have on the overall structure of a lecture, that is, the attendance, preparation, and follow-up. That is quite apart from the more technical concerns over how the system operates, the display of messages the lecturer can access, and the speed and effectiveness with which the messages get through. All of those questions relate in one way or another to a study of the processes which might surround the use of SMS text messaging in the context of interactive lecturing. Well designed research might allow us to gain greater insights into how this new phenomenon in higher-education teaching is being developed and used. Such findings might help other lecturers to consider how they might or might not introduce such approaches into their own teaching practices, but many will also want to know whether this approach has the potential to improve the effectiveness of student learning. So, as well as research into the processes of interactive lecturing, we also need research into the impact of interactive lecturing on student learning.

If learning processes are hard to study, then learning outcomes are as least as difficult. The learning objectives for higher-education courses are complex and often not defined in great detail. Lectures play a part in a complex set of learning processes and are certainly about much more than knowledge transfer. In a so-called age of knowledge explosion an effective lecture might be more about inspiring students to become more interested in a subject and then to go off and to start engaging with it in their personal study, than about getting them to remember a fixed set of information. Therefore, although we are here interested in much more than the processes of interactive teaching, we are not only interested in simplistic measures of learning outcomes. A sensitive approach to studying the impact of interactive lectures on students needs necessarily to encompass student engagement, student motivation, and the impact of participating in lectures in relation to what students go on to do after they leave them. Ultimately there can be an underlying interest in enhancing student learning, but this needs to be approached wisely and to take into consideration the broader learning activities, which constitute student learning within higher education.

Essentially we are here arguing for a dual focus on both the varied processes of interactive lecturing and their impact on the broader learning achievements of individual students studying in different areas in different universities. We expect understandings to be complex and to be highly context-dependent. We therefore place more faith in detailed naturalistic studies, which can attend to contextual details and build knowledge sensitively, rather than large-scale surveys, which ride roughshod over important contextual variations. We ourselves already have a range of studies underway, most of which are looking at interactive lecturing in very specific settings, and involving detailed observations of such lectures as they happen, complemented by studies of what students and lecturers do before, during, and after such lectures, as well as their own thoughts and impressions in relation to their impact upon their learning. It is early days to be drawing big conclusions, but we certainly have evidence of some very effective practices, which lead to high levels of student engagement. This we take as a sign that the concept of the 'university lecture' is far from that which developed before the invention of the printing press, and is one which is evolving in new and interesting ways as higher education evolves within an age of information explosion and technological revolution. Here we have an area of educational research which is emerging with great promise and prospects and which needs urgently to be developed to provide the type of evidence base that should have major applications within and beyond higher education and the countries where it is being developed. There is so much that we do not know about the possibilities for making learning in lecture-theatre settings more effective, and it hardly seems rash to imagine that increasing student-student as well as student-lecturer interactions may have powerful effects with regard to increasing students' engagement and learning outcomes.

Finally it is necessary for us to state that we do not in any way assume that 'interactive lectures' will necessarily always be more effective than traditional lectures. What we have are some interesting indications that in certain defined contexts this may be the case, and what we are interested in is developing research to build a better knowledge base around the characteristics of good lectures, good uses of interaction within lectures, and ways of developing such approaches within a variety of institutional and disciplinary contexts with individual lecturers, who may or may not be ready or adequately equipped to be party to such changes in their teaching practices. We remain particularly interested in how visualisation can play a critical role in all of this, both by the use of visual images to stimulate interaction and by the use of visual technologies to help make concepts and ideas more vivid and engaging for both lecturers and their students. All of this we believe may have profound implications both for the future of lectures in higher education and the role of university lecturers when they engage in this type of teaching.

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