The impact of audience response systems in a multicultural Asian context

Rozz J Albon
Department of Education
Curtin University of Technology

Tony Jewels
School of Information Systems
Queensland University of Technology

This research investigated the implementation of an audience response system (ARS) to learning in a multicultural Asian context using multiple case methodology. Four academic staff teaching in four diverse units with different student numbers (n=133) used ARS as one of their teaching approaches with each using it in very different ways. Both quantitative and qualitative data was collected through questionnaires and convergent interviewing of staff and students. Six constructs emerging from the literature were investigated and five are reported. Although some results aligned with other research, some specific issues were identified and appear relevant not only to other similar cultural contexts but possibly all contexts. The paper concludes with questions for further research into ARS in a multicultural Asian context in pursuant of choices for learners and learning.

Introduction

ARS technology offers a unique and comprehensive approach to learning not currently possible in an equivalent time in face-to-face delivery and particularly in large classes. Central to ARS is the integration and spontaneity of three key teaching and learning concepts of feedback, prior knowledge and degree of understanding of all students, and assessment. The technology signals the need for different teaching practices and student learning strategies a in the multicultural Asian university context. Given the history and development of the technology (Banks, 2006) it appears there is a need to identify universal learning principles, based upon a sound theoretical framework, on which the future of ARS can be better examined and applied. It is expected that the context in which ARS is reported in this paper will add to this knowledge.

Duncan (2005) claims ARS has the potential to:

- Measure what students know prior to teaching (pre-assessment)
- Measure student attitudes
- Assess whether students have completed required readings and therefore affirm/alter the next step in teaching
- Enable students to confront common misconceptions
- Increase students retention of material
- Test student's understanding – using prediction and conceptual questions
- Contribute to fair assessment
- Facilitate discussion and peer interaction
- Increase class attendance.

Although such claims were influential in the decision to adopt ARS as a teaching and learning approach at the campus, it is our intention to explore teaching and the process of learning using ARS in the particular multicultural Asian context. Prior to using this approach to learning, students had always learnt in a teacher-centred way, and would continue to learn in this way in most of the study units. This 'new' approach would be contrasted by the students themselves and therefore their perceptions about its effectiveness forms the data for the study. Four lecturers trialed Keepad, (a brand of ARS) in various classes across three schools of Engineering, Commerce and Foundation.

Purpose

The purpose of the research was primarily to understand the perceived effectiveness of *Keepad* technology by the multicultural Asian staff and student population at an Australian offshore university Campus. ARS was the means to providing one type of intervention to the entrenched teacher-centred delivery of information and traditional didactic view of learning. It favoured a process of learning involving interaction and engagement by students in contrast to the existing passive learning approach emphasising the retention of information by students. By enabling lecturers to immediately identify students' understanding or misunderstanding of concepts and principles pertaining to their discipline field it was expected they would be involved in giving or obtaining other/additional explanations as feedback and therefore engaging with students. Likewise it was expected that students would be involved in using the immediate collective and anonymous feedback made available through ARS and the visual graphical representations, as well as lecturer and/or peer feedback. The language of delivery is English which, for most students and staff is their second or other language (L2). The research also sought to investigate several learning theories to explain the results and the perceptions of academics, both to be reported in another paper.

Context of participants

The offshore campus of an Australian University located in Asia has a unique and diverse multicultural context, and the use of and pronunciation of English by academic staff whose first language is not English was reported by students to detract from optimum learning or make the task of learning more difficult than it should be (students, 2005-2006). Lecturers too lamented that what they taught was not learnt or understood by students. Lecturers felt they were caught in a bind. Students expected to be 'spoon fed' (staff usage of this word) but they wanted to encourage a more independent and critical approach. Not listening to students requests would mean a lower rating on their teaching and learning performance as evaluated by students. Students complained they did not understand all the spoken material and as a reaction organised self-study groups with the belief they can just as easily learn on their own. This was strong evidence that students believed they were not able to gain sufficiently from the time they spend in a lecture ranging from 1- 2 hours and belief in themselves as learners a characteristic of Confucius Heritage Culture (CHC) learners (Littlewood, 1999; Smith & Smith, 1999). Student's reasons for attending lectures centred on a class attendance role with many students fearful of their reputation as 'bad' students if they did not attend. Unfortunately, the impact of teaching is not usually identified until poor and unexpected student results are obtained, complaints and poor teaching are evident in formal university evaluation data, and personal complaints are made to such persons as Deans or Directors of Teaching and Learning. The trialing of ARS technology will provide insight into the lecturer's ability to focus on key concepts and provide explanations to these concepts which in turn should enhance student learning outcomes and student satisfaction.

It is relevant to understand the multicultural Asian context in which ARS is being considered. The university is situated in a rural Malaysian city with a population of over 300,000. Most students live at home and travel to the campus, while a smaller group live in shared student or university housing. The university student population of 2000 represents 32 nationalities with the dominant national/cultural group being Asians (Chinese and Malays), while the teaching staff represents 16 nationalities. The language of delivery for the three programs of Engineering, Business and Pre-University studies is English which is most students second, or other language (L2). Problems have arisen when the articulation of English through the many and varied accents imposes additional cognitive demands on students, many of whom practice code switching to arrive at an understanding; that is students take a word they believe they have heard, translate it into their first language then consider its meaning with a goodness of fit strategy. Such a process is time consuming, particularly in a lecture style approach to learning. When students cannot hear the spoken English word, they rely on PowerPoint for the visual representation of the word be (students, 2005-2006). ARS technology provides another means to present spoken words as visual data for these particular students.

The Asian students in the study report a history of being passive and nonverbal in school from their earliest school experience (students, 2005-2006; personal consultation with Principals of Chinese Schools), a point noted by Park (2000). This is not to say constructivist approaches do not occur in the home, nor are students incapable of learning with constructivist approaches. Humility, obedience to, and the high respect afforded to the community, adults, and particularly those in professional roles is indicative of this culture (Littlewood, 1999, Park, 2000; Smith & Smith, 1999) and is believed to contribute to students continued use of and expectation for passive learning approaches while at university. From their earliest school experiences students are told information, which they know must be remembered to be later produced under testing conditions. Rote learning is quickly learnt to be the valued

approach to learning while institutionalised at schools, and by the time students enroll at university it has become the accepted and expected way to learn: it is culturally embedded in their psyche. Therefore, it is understandable that when culturally contrasting teaching and learning strategies are used they are met with some ambivalence. There appeared an anomaly in the student population on the campus. Students were aware they learn in social, situative and constructivist ways but they seemed unable to reconcile this with learning when in a university context (students, 2005-2006). These same students have openly acknowledged their learning after experiencing constructivist and co-participatory approaches and considered them effective. They recognised that when they form study groups they engage in constructivist approaches. Ironically, they then request passive approaches as a way to access more course content and lobby for past exam papers for study and memorisation purposes. Assessment at the university is exam based dominated by multiple choice questions and mathematical problem solving questions. Such an assessment approach is believed to relate to the learning approach adopted by students as noted by Barron and Arcodia (2002) and Biggs (2003). The traditional learning approaches by the students in this study may well be complicated by western conceptions of learning, differing learning environments, past learning experiences (some students have studied in western institutions), teaching styles and expectations. Wilkinson (2006) noted that when specially constructed structured workshops involving small groups were devised Chinese student's spontaneous oral participation increased, affirming that Asian students respond to interactive and constructivist approaches.

However despite Wilkinson's conclusion, it is no longer possible to conduct small group classes for every unit of study at the university in the study. Mass education of large classes pervades the modern western education system. In this climate we ponder over the question: can the use of ARS with its feature of anonymity be perceived as effective in the learning of these Asian students? Activities become structured enabling interaction and engagement but not necessarily requiring individual oral responses to the larger group. Can debate, reflection, and critical thinking be embedded within the traditional lecture style delivery of information using ARS to increase the perceived effectiveness of student learning? It is noteworthy that the high unemployment of graduates from Malaysian universities is reflected in the call for more critical thinking in these same universities in the 9th Malaysian Plan, (Bernama, 2005). "In most jobs, except law and medicine, technical skills alone will not ensure survival in the marketplace. Graduates need critical and creative thinking, inter-personal, presentation and problem-solving skills". ARS was hpothesised to offer an approach to overcome the range of problems and concerns of students and staff in the multicultural Asian university context.

Background

The use of personal response technology has increased in popularity in the last decade, but it still has not been used extensively in teaching in higher education. In cases where it has been used it appears without a clear theoretical framework. We argue that one is needed to ensure its continued application and the development of its design and function in a variety of learning contexts. Implementing any new technology based on a 'good idea' principle falls short of using and developing the application to truly enhance learning in the future. Without tried and evaluated implementations ARS may be open to failure, or at worst, be detrimental to learning. Reports of students' interest and acceptance of ARS in various experiential reports (Duncan, 2005) or case studies of delivery approaches (Fagen, Crouch, & Mazur, 2002), in various disciplines (eg physics, Crouch & Mazur, 2001), engineering (Q. Su, date unknown) and medicine (Robertson, 2000), appear to perpetuate claims for its effectiveness in learning to any culture or discipline. Further, few theories of learning are used to underpin the collection of data and interpretation of results. We do not claim ARS is ineffective, but wish to make explicit the need for future decisions to use ARS be based on more rigorous research.

We concur with Judson & Sawada, (2006) that is not the technology itself which creates better learning but how that technology is used in a learning context to create a better or richer learning environment. Beatty, Leonard, Gerace, & Dufresne, (2006) state that technology doesn't inherently improve learning; it merely makes possible more effective pedagogies. Judson and Sawada in wrestling with the question - does ARS enhance or improve student learning, begin with a pre -question of knowing if there are cases where there has been improvement. This was followed by asking a more relevant question relating to pedagogy: 'do we know what led to such improvement'? Knowing how a particular application impacted on student values, attitudes or motivation to learning is a worthwhile pursuit, as also acknowledged by Judson and Sawada who make a convincing case for examining the pedagogy. Essential to this research was finding out how different academics across different disciplines used the technology. This question was fundamental to the current research investigating the learning processes and how academics used the technology of ARS.

It is without doubt that students like using ARS, as reported in 5 studies across 4 decades (Judson & Sawada, 2006). Students perceive using ARS as motivational and beneficial to learning. Brown (cited by Judson and Sawada) found a more positive attitude towards instruction when ARS was used, irrespective of differences in anxiety alongside non ARS instruction, and interpreted this as increased student attendance.

Investigations in the early 1970s between non-ARS and ARS instruction found no differences in academic achievement (Judson & Sawada, 2006). However, when instruction is aligned with constructivist views of learning such as when ARS facilitates discussion among students and allows and encourages the sharing of thought processes and ideas, reflection, explanation concomitant with public display of responses, the results are more positive than the early 1970s, although these are few in number (7 studies from 1997-2004). Common to all these studies is the process of interactive engagement and dialogue in which students defend their reason for a particular response. It appears that ARS technology incorporates features of good teaching such as acknowledging the complexity of information processing, focusing on using conceptions or confronting misconceptions, and enabling the development of mental models and schema for all students simultaneously. Some theories have been postulated to account for the processes of learning using ARS technology.

Penuel, Abrahamson, & Roschelle (2006) propose sociocultural theory as a more complete theory to explain the motivation of the diverse experiences and outcomes for students using ARS, addressing the levels at which interactions occur and the dynamic structuring of the classroom. In sociocultural theory learning cannot be separated from interaction, whereas in constructivism it can, as one can learn something in a solitary way. Student responses indicate this theory explains their motivation to participate. Penuel et al., (2006, p194), cite Rogoff, (1995, 2003; Rogoff, Baker-Sennett, Lacasa, & Goldsmith, 1995) "Contemporary sociocultural theories define learning and development as a process of *transforming participation in valued sociocultural activities".* That is, students learn when "given opportunities to practice using the tools of a discipline – including its discourse, methods and technological instruments that aid discovery – under conditions in which they can be guided by experts …." (Penuel et al., 2006, p194).

Although we agree that sociocultural theory explains learning when employing ARS, it falls short in explaining the learning achieved by individuals. Other theories such as behaviourism, and information processing may warrant inclusion.

Irrespective of any theoretical explanation, Judson & Sawada, (2006) compiled the following list to illustrate how ARS technology is successful in enhancing learning.

- Displayed questions address conceptual understanding of the subject
- Distractors include possible wrong answers
- Time allocated to student discussion before/and/or after submitting an initial response
- Student responses are publicly displayed
- The instructor/academic facilitates discussion among students
- Students engage in defending their responses and voice their reasoning to others publicly
- Socratic discussion among students and instructor leads to consensus

These outcomes, Judson and Sawada believe, lead to "truly interactive classrooms and increased comprehension among students" (p.34) which also concur with the phenomenography (learner perspectives defines what is learned) and constructivism (what the learner has to do to create their knowledge) described by Biggs (2003) and noted above as aspects of good teaching.

Given that constructivism appears integral to the many reported uses of ARS technology a short diversion to identify its essence seems in order. Constructivism in all its forms states that individuals construct their own learning by internalising incoming information with existing knowledge. Piaget documented the epistomology of cognitive learning stating that individuals (of any age) are accelerated in their understanding if socialisation and interaction with others facilitates the learning. This was supported by another school of thought of sociocultural learning of Vygotsky who said that much of what is come to be known is transmitted through socialisation in various forms. This translates into learning in higher education contexts if students can do any one or more of the following: talk, discuss, explain, produce, replicate, teach, debate, argue, and design with others. The idea that learning equates only to memory and its concurrent testing is an idea relegated to the last century. Learning is more than memory and technology such as ARS provides an alternative means to support other more constructivist approaches to learning for large groups.

Hake's (1998) investigation of learning in physics, using base data of normalising gains showed how students, even in the worst interactive classroom, outperformed students who learned in traditional lectures. Mazur (1997) found that students were moved to construct correct answers rather than stay with the incorrect or misunderstood answer, and the new learned information was better retained. The investigations by Horowitz (1988) in the initial development of personal response systems found student attentiveness increased from an index of 47 with traditional style lectures to 68. He also reported higher grades by students who used the system. In addressing the universal phenomena of 'fade' over the duration of the lecture, Pollock (2004) more recently successfully introduced the response system to fight the fade. Trees and Jackson, (2003), found better attendance, less sleeping in class, more engagement, better feedback in both directions, better class preparation but more noise from the necessary talk arising from questions. Woods and Chiu (2003) reflected on the issues of large classes and noted that rarely is there time for more than a small fraction of students to voice answers or opinions. Nor is the monitoring of student comprehension possible**.** Horowitz (2003) and Burton (2004) further note that personal response systems can provide instant feedback to learners of their performance against an established answer to a question. Further, Horowitz noted, they support exploration of the material under consideration. Some areas of use for such systems are:

- Communication: create an environment in the classroom where differences in answers and opinions as a group can be observed and discussed immediately on tabulation while keeping each students specific response anonymous
- Learning desire and commitment: provide students with frequent indicators of both individual and group learning progress
- Customised instruction: provide a means for both pre-planned and ad hoc questioning including the opportunity for students themselves to initiate the solicitation of class responses
- Data collection: capture data on student responses divided into demographic categories to facilitate course revisions etc.

Personal response systems were also beneficial for more mechanistic purposes such as monitoring class attendance via individual handsets, providing instant marking and feedback and for gathering data that can be used to support research activities related to classroom processes (Mitchell, 2001).

In more advanced application of the simple system, Hunt, Irving, Read, and Knight (2003) report the use of the Teamworker keypad system in a first-year information systems unit, decision making in a third-year psychology course, and with second-year BSc Pharmacy students. In the pharmacy course questions were posed via the keypad and the resulting answers discussed by the whole group. A key issue here is that what is being sought is not necessarily the 'correct' answer but instead an examination and exploration of all answers and the reasons that individuals give for selecting a specific answer. They report that students expressed enthusiasm (via a questionnaire at the end of the final practical session) for the system, particularly in its ease of use, the ability to discuss answers immediately after making their choice and in the way it helped students identify where further reading was required. Importantly, they also found it to be fun to use. Having wrong answers explained was found to be particularly useful. Some reservations were expressed in the need to wait for others to answer questions and in the inability to change their minds once the answer was transmitted. They also indicated that more time to think about the questions before answering would have been beneficial.

In sum, the literature, while not confirming measurable gains in learning outcomes by students, appear to converge on the positive contributions of ARS technology to learning. Its successful application across a range of disciplines and contexts suggest it could also be a successful technology to address the problems and issues experienced in one multicultural Asian context.

Research methodology

A multiple case study, using action research in teaching and learning across three schools by 4 lecturers formed the methodological framework. Lecturers interested in ARS technology to address some of the identified problems emerging from the multicultural Asian context of staff and students and specifically for teaching and learning formed a special interest group. The four case studies for this research were self nominated as these were the members of the group who pursued the technology. A questionnaire comprising 6 constructs and 31 questions was administered at the conclusion of the semester. In addition, convergent interviews were conducted with cluster groups of students from each of the four units and with each lecturer. Literature on the use of ARS was disseminated to all members of this research project. Three meetings were scheduled throughout the semester for discussion of member's use of ARS or issues emerging from their own applications or from the literature.

Three objectives for the present research were identified.

1. To investigate the use of ARS in a multicultural environment in Asia in order to enhance learning and understanding of university students who are L2 learners.
2. To extend the literature on the use of ARS technology by applying it to Asia.
3. To identify issues and specifically those related to the particular Asian/L2 context.

Research questions

From these objectives specific research questions were constructed.

1. How do Asian students perceive the use of ARS?
2. What are the perceived effective ways of using ARS from student's perspectives?

The original research was based on 6 key constructs, but this paper focuses on the results of constructs 1-5. Construct 6 requires further analysis and investigation beyond the scope of this paper.

1. Value - do students value the use of ARS? (5 questions)
2. Perception of Learning – What is student's perception of ARS on their learning? (4 questions)
3. Learning strategies- What behaviours emerge or are changed as a result of using ARS, and which are effective? (10 questions)
4. Cognitive processing – The role of verbal and visual information (4 questions)
5. Interaction – What occurs as social learning - how do others influence learning when using ARS? (3 question).
6. Attitudes – Are students supportive of technology in their learning, particularly ARS? (5 questions).

Participants

One hundred and thirty three students from 4 units of study across three programs (degree + pre-university) participated as well as their respective lecturers. Students were completing units in Accounting (ACC), power engineering, commerce maths (CM), research and writing skills in engineering and business (RWS), and information technology (IT), as 1st, 2nd, 3rd, or 4th year students. Each student encountered ARS for the first time. Four staff from an interest group of seven volunteered to implement ARS in their units of study. Each staff decided when and how often ARS would be used following discussions at meetings, demonstrations and reading from the literature.

Interviews with staff and students and a Questionnaire to students were made with four different and distinct units of study, varying in student numbers, subject content and year of study: Accounting (75 students), Commerce Maths (13 students), IT (41 students), Research Writing Skills (7 Students).

Results

Results from the numerous open and closed questions indicate an overwhelming support for ARS as a teaching technology.

Construct 1: The majority of students (70.9%), enrolled in first and second year units of study strongly agreed in the value of ARS, and 57.6% believed it definitely enhanced their learning. The majority of students believed the technology affected their motivation to participate (61.32% believed they were definitely motivated to participate, and 27% were somewhat motivated to participate). This same belief concurred with students who saw ARS as a motivator in their learning.

Students perceived the value of ARS to be similar in both lectures and tutorials (64.85% and 65.18% respectively). Students specifically nominated greater participation and by more students, affects their concentration positively, encourages risk taking to answer questions, visual materials, interest, anonymity, immediate feedback and therefore learning, fun and exciting way to learn and encouragement of thinking.

Construct 2: Students generally felt ARS affected their concentration positively (56.24% definitely or most definitely) concurring with Horowitz's (1988) research supporting fight the fade syndrome. 33.3% of students believed it increased their attendance and 62.18% believed it had little to no affect on their attendance. This result must be considered along side the climate of attendance at this university as noted

above. This result may be interpreted that they felt more motivated to attend and did not necessarily need the compulsory aspect.

Construct 3: The 43.9% of students who prepared differently when ARS was used, indicated they had possibly changed their learning strategies.

Although somewhat a superficial question, students seemed to place value on the use of ARS in the middle or end of lecture, confirming their dislike for them at the beginning of lectures. One class showed high preference for ARS at the end of class and another showed preference for their use in the middle. The ideal number of questions in each session when ARS was used was very dispersed with 38.6% preferring 6-10 questions, 24.9% preferring 11-15 questions and another 15% preferring 15-25 questions.

Construct 4: The use of graphs, charts or histograms was seen as valuable to students. 66.58% believed it was seeing the visual form of responses that affected their learning. This was supported by 64.1% of students who believed the display was a valuable strategy in their learning. The results concurred with the open responses such as "Yes because the statistics show as a graph which enables you to know if you are wrong or right"; "Graphical chart is better in memory retention"; "The graph shows a visual representation and you know where you are in the graph", and "It is more precise clear. I can understand it quickly than the slides" (student 6 Maths/commerce; Students 1, 23 accounting).

Most students thought they had enough time to respond to the questions (60.47%) with only 3.66% believing they did not have enough time. However the number of students in a room with a response pad will influence the time. Most students responded to the 'definitely' category across subjects. Cutts suggests the shortest time of 2 minutes and the longest time of 5 minutes are required per question with some exceptions in which up to 15 minutes is needed. In an equivalent IT type subject Miri students recommended 6-10 questions per hour. Our research noted few references were made as to the time it took to ask questions and two students from 41 (IT unit) mentioned the wait time as being unsatisfactory.

Students stated they learnt from their wrong response. It stimulated their curiosity, they were motivated to understand the mistake "the lecturer will explain and that makes me think harder" (student 1 Accounting); "If my answer is wrong I get instant feedback that removes my misunderstanding" (student 18, Accounting); "Yes I can remember it forever" (Student 13 Maths/Commerce). "Makes me remember longer because the impression is deep towards the error I made" (Student 4 RSW). "I learn … not to choose my answers by guessing but to choose answers wisely & understand the needs of the question" (Student 2 IT). A variety of related learning strategies were applied when students made an error, however these were by the minority of students. Responses included "ask why my answer is wrong, relate it to the reading material and finally try a quite similar question to see that I have understood fully" (Student 1 Acc); "go back and read the materials again" student 5 Acc); ask my friends for clarification (Student 10 Acc); " I re-read and try to find the answer in the text or ask my friends" (Student 7 IT).

The durability or memory of information over time as an outcome of using *Keepad* was unconfirmed. The history of their learning strategies indicated problems in remembering all the questions and answers because they were not able to write them immediately. However some students were aware of the impact of this approach to learning, its impact for remembering information over time and were able to articulate their thoughts. One IT student said they "may not remember the information fully but would have a rough idea about it" (Student 2) indicating a conceptual approach to learning instead of memorising the anatomical detail. Another student indicated "the fact that using KP is fun, to answer questions is fun and exciting, it helps make the learning last" (Student 26 IT). Yet another said "the experience is rare so I am able to remember" (Student 3 RSW).

The investigation into understanding how students felt ARS helped transfer information from lecturer to student was hampered by students inability to articulate and lack of understanding of the question. They believed you learn if you memorise. However, some indicated repetition, as when the lecturer repeats and explains the question and answer. Many indicated the graph of responses helps. One student said that attempting the question followed by an explanation helped to retain information, possibly indicating that problem solving stimulated their thinking and provided a focus. Fun was listed as a motivator to remembering.

Construct 5: Only one class used *Keepad* in an interactive way. Students were encouraged to discuss the alternate responses with those beside them and make a group response. Very few students discussed questions with friends after class. A surprising finding emerged through interviews in which some students suppressed their answer, even though they believed it was right because of the need to be in the

majority answer, even if that answer was wrong. This is even more surprising given their answer was made anonymously.

In conclusion and in response to the research questions it appears the multicultural Asian student population generally perceived ARS very positively in their learning. The loss of face – a characteristic thought to describe CHC learners was evident, despite the anonymity of responses. The identification of 'getting through the content' by some students remains an issue to be addressed.

Although all questionnaires could not be identified by a personal name, students were very reticent in responding to the open ended questions which pursued their use of ARS in learning. Most responses were completed with 'no comment'. The cluster group interviews helped confirm the use of ARS by their lecturers was useful in their learning. However, without more comparative uses by the students themselves, interpretation to this research question is limited.

Discussion

Several specific issues were identified from the collation and interpretation of all data. Irrespective of the limited use of interactivity in the approaches to using *Keepad*, one clear issue emerges from this study. Asian students and their lecturers are at crossroads in the andragogy of ARS. Some students believe too much time is spent implementing ARS at the expense of covering course content. McCabe (2004) has identified possible resistance due to time spent on introducing the questions, collecting responses, discussing answers, giving hints, providing feedback and explaining solutions. Some lecturers have not used the questioning strategy as the pivot for the design of interactive lectures or tutorials. On the other hand the majority of students had readily embraced the pedagogy with great optimism because of its impact on their learning, and not necessarily course coverage, although this still remained a concern. It seems students were using different criterion to judge the effectiveness of ARS. In a multicultural Asian context it seems a balance is required which respects student's history of learning approaches.

This research was unable to go beyond ascertaining student's motivation and to identify the quality and motivation of the students who readily embrace ARS and those who resist the technology. Conceptual questions are more likely to promote high-level learning than simple knowledge-based questions (McCabe, 2004) and promote greater rigour. Could it be that the questions were not of a high enough quality to enhance or support their learning? Does the level of question have relationship to resistance? Are the questions more suitable to the less able and committed student, the one who supports the traditional approach in which the lecturer provides all the information? Integrated with question quality are the explanation, other probing questions, and the length and quality of discussions. Further, is the quality and pitch of the explanation and/or discussion too trivial for these high level students? Is there too much repetition? What are the needs of high level students and how might their pattern of response and interaction differ to other students? Does any resistance highlight the need to better understand the role of feedback and group participation in order to mediate and guide participation in ARS contexts, or is there a level of resistance to be expected in any context? (Beatty et al., 2006) position ARS within Question Driven Instruction (QDI), ensuring that teaching and learning remain at the forefront of the rationale to adopt ARS. Their question cycle, an iterative process of "*question posing, deliberation, commitment to an answer, and discussion*" (p.96), requires an agile teacher who teaches rather tests, and which can promote interaction supported by ARS. They have recognised the difference in teaching style between delivery of content and developing understanding of content, the latter requiring the teacher to mediate discussion and manage dynamic interactions, interpreting students' responses, modelling learning and making real-time decisions related to students' learning. Although this research affirmed its positive role in the process of learning it has raised questions requiring further research.

Another important issue was the possibility of the inclusion of an 'I don't know' alternative answer. Would this be a more effective strategy to provide feedback to the lecturer? When students are faced with a choice between four or five distractors in a multiple choice question, they may be forced into guessing an answer. It is proposed that an 'I don't know' category may enable students to indicate they don't know which may provide more accurate feedback to the lecturer about the knowledge and understanding of the students. On the other hand would they select such a category as a way to save face? Even though no one else would know which answer they selected it appears they personally know and selecting a wrong answer may be seen by them to be undesirable. Such an issue needs to be further investigated.

The socialisation and interaction occurring when *Keepad* is used in groups requires further consideration as does theories of learning to explain the effect of using *Keepad*. Arriving at consensus in this multicultural context needs further exploration. The finding that some students were willing to be wrong

in order to feel accepted within their cohort is somewhat disturbing and theories of learning must accommodate this finding. The socialisation of the university's students and their need to belong challenges the sociocultural theory proffered by Penuel et al., (2006) to explain some student's participative approaches. Reference to the psychological needs of gifted students may offer an alternative explanation.

It is concluded *Keepad* has been an effective technology to assist students in their learning as well as providing choices for them. The application of ARS technology fundamentally supports a process approach to learning and is not useful for covering extant content. The delivery of conceptual content appears to be exciting and fun at this initial stage but with further understanding of its implementation within the specific Asian multicultural context considered alongside the experience of lecturers, additional approaches can be developed to strengthen its acceptance and powerful role in learning.

References

Banks, D. (Ed.), *Audience response systems in higher education: Applications and cases*. Hershey PA: Information Science Publishing.

Barron, P., & Arcodi, C. (2002). Linking learning style preferences and ethnicity: International students studying hospitality and tourism management in Australia. *Journal of Hospitality, Leisure, Sport and Tourism Education,* 1 (2), 15-27.

Biggs, J., B. (2003). *Teaching for quality learning at university*. 2nd Edition. Buckingham: Society for Research into Higher Education: Open University Press.

Beatty, I. D., Leonard, W. J., Gerace, W. J., & Dufresne, R. J. (2006). Question driven instruction: Teaching science (Well) with an Audience Response System. In D. Banks (Ed.), *Audience Response Systems in Higher Education: Applications and Cases (Chapter VII)*. Hershey PA: Information Science Publishing.

Bernama, (2005). Higher Education Revolution during 9th Malaysian Plan. http://www.bernama.com/bernama/v3/news_lite.php?id=172154. [viewed 5 October, 2007].

Burton, K. (2004) Interactive PowerPoints: Is there any point in giving power to students? Law - Murdoch University Electronic Journal Of Law Issn 1321-8247 Volume 11 Number 4 (December 2004) Copyright E Law and authorftp://law.murdoch.edu.au/pub/elaw-issues/v11n4/burton114.txt http://www.murdoch.edu.au/elaw/issues/v11n4/burton114.html [viewed 29 July, 2007].

Crouch, C. H. & Mazur, E. (2001). Peer instruction: Ten years of experience and results. *American Journal of Physics*, 69 (9), 970-209. http://campus.umr.edu/newfac/nfts/current/calendar/presentations/MazurActiveLearning.pdf . [viewed 29 July, 2007].

Duncan, D. (2005). *Clickers in the classroom.* San Francisco: Pearson Addison Wesley.

Fagen, A. P., Crouch, C. H., & Mazur, E. (2002). Peer instruction: Results from a range of classrooms. *The Physics Teacher*, 40, 206-209. http://oregonstate.edu/itcc/wgs/ARS/PTE00206.pdf [viewed on 29 July, 2007].

Hake, R. R. (1998). Interactive engagement vs traditional methods: A six thousand student survey of mechanics test data for introductory physics courses. *American Journal of Physics,* 66, 64-74.

Horowitz, H. M. (1988). Student response systems: Interaction in a classroom environment. http://www.aclass.com.tw/ReTech/download/IBM_interactivity_in_classrooms.pdf [viewed 29 July, 2007].

Hu, J., Bertok, P., Hamilton, M., White, G., Duff, A., & Cutts, Q. (2006). Wireless interactive teaching by using Keypad-Based ARS (Chapter XIV). In D. Banks (Ed.), *Audience Response Systems in Higher Education: Applications and Cases*. Hershey PA: Information Science Publishing.

Hunt, A., Irving, A., Read, M. & Knight S., (2003). Supporting learning with a group Decision Support System (2003). Proceedings of the 20th Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE) file http://www.adelaide.edu.au/ascilite2003/docs/pdf/37.pdf. [viewed 29 July, 2007].

Judson, E., & Sawada, D. (2006). Audience response systems: Insipid contrivances or inspiring tools? In *Audience Response Systems in Higher Education: Applications and Cases (Chapter II)*. Hershey PA: Information Science Publishing.

Keepad Interactive. http://www.keepad.com/home.php [viewed 5 October, 2007].

Littlewood, W. (1999). Defining and developing autonomy in East Asian contexts. *Applied Linguistics,* 20 (1), 71-94.

Mazur, E. (1997). *Peer instruction: A user's manual*. Upper Saddle River, NJ: Prentice Hall Inc.

McCabe, E. M. (2004). Teaching mathematics in an interactive classroom. http://www.umtc.ac.uk/umtc2004/brief/2004_Brief_2.htm [viewed 29 July, 2007].

Mitchell, C. (2001). PRS Support System - A Summer Project http://grumps.dcs.gla.ac.uk/papers/PRS_Support_System3.doc. [viewed 14 Aug 2007].
Park, C. C. (2000). Learning style preferences of Southeast Asian students. *Urban Education*, 35, 245-268.
Penuel, W. R., Abrahamson, L., & Roschelle, J. (2006). Theorizing the transformed classroom: Sociocultural interpretation of the effects of Audience Response Systems in Higher Education. In D. Banks (Ed.), *Audience Response Systems in Higher Education: Applications and Cases (Chapter XIII)*. Hershey PA: Information Science Publishing.
Pollock, S. (2005). Fighting the fade: Student engagement in large peer-instruction classes. In D. Duncan, *Clickers in the Classroom*. San Fransisco: Pearson Addison Wesley.
Q, Su.(date unknown) *Teaching innovation using a computerised Audience Response System*. Ohio State University. http://telr.osu.edu/clickers/teaching/ideas.htm . [viewed 14 Aug 2007].
Roberts, T. (2006). *Self, peer and group assessment in e-learning.* London: Information Science Publishing.
Rogoff, B. (1995). Observing sociocultural activity on three planes: Participatory appropriation, guided participation, and apprenticeship (pp139-164). In J. Wertsch, P. del Rio & A. Alvarez (Eds.), *Sociocultural studies of mind*. Cambridge: Cambridge University Press.
Rogoff, B. (2003). *The Cultural Nature of Human Development*. New York NY: Oxford University Press.
Rogoff, B., Baker-Sennett, J., Lacasa, P., & Goldsmith, D. (1995). Development through participation in sociocultural activity. In J. Goodnow, P. Miller & K. F (Eds.), *Cultural practices as contexts for development*. San Francisco, CA: Jossey-Bass.
Robertson, L. J. (2000). Twelve tips for using a computerized interactive audience response system. *Medical Teacher*, 22 (3), 237-239. http://cidd.mansfield.ohio-state.edu/workshops/documentation/twelvetips.pdf [viewed on 29 July, 2007]
Smith P. J., & Smith, S. N. (1999). Differences between Chinese and Australian students: some implications for distance educators. *Distance Education,* 20 (1), 64-80.
Students. (2005-2006). Verbal reports and conversations with the Director of Teaching and Learning, Miri, Sarawak.
Trees, A., & Jackson, M. (2003). The learning environment in clicker classrooms: student processes of learning and involvement in large courses using student response systems. In D. Duncan, *Clickers in the Classroom*. San Fransisco: Pearson Addison Wesley.
Wilkinson L. (2006). The significance of silence: Differences in meaning, learning styles, and teaching strategies in cross-cultural settings. *Psychologia* 49 (2), 74-88.
Woods, H. A., & Chiu, C. (2003). Teaching with CRS. General best practices for using clickers http://www.fctl.ucf.edu/crs/teachingwith.html [viewed 29 July, 2007].

Rozz Albon
Curtin University of Technology, Western Australia
r.albon@curtin.edu.au
Tony Jewels
Queensland University of Technology, Queensland
t.jewels@qut.edu.au

Please cite as: Albon, R. & Jewels, T. (2007). The impact of audience response systems in a multicultural Asian context. In *ICT: Providing choices for learners and learning. Proceedings ascilite Singapore 2007*. http://www.ascilite.org.au/conferences/singapore07/procs/albon.pdf