# WIRELESS RESPONSE SYSTEMS, INTERACTIVITY AND COLLABORATION WITH INTERACTIVE WHITEBOARDS: TOWARDS A NEW CLASS DYNAMIC

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**ABSTRACT**

This paper examines the use of Wireless user-response technology in classrooms, specifically focussing on how the power relationship between student and teacher can be transformed. The main focus of the paper is a consideration of this relationship in the context of recent developments in Learning Science, or the study of the cognitive processes of the human mind during learning.

## INTRODUCTION

One of the key factors, if not *the* most important component, in learning is motivation. Until recently motivation has been largely viewed as a cognitive issue linked with the content and delivery of the learning experience, or with sociocultural factors. Students are unmotivated because content and presentation is a dull, stale shadow of the media-rich experience they encounter on a daily basis outside class, or they are unmotivated because they are socially or economically disengaged from the overt and implied goals of education (achievement and insertion within the dominant ideology). While these factors are undoubtedly correct, recent discoveries in neuroscience also suggest that the key contributing factor for motivation is rooted in emotion. At a purely physical level the parts of the brain that create 'fight or flight' responses take precedence over all other cognitive functions. A mind that is stressed cannot learn, whether the stress is immediate (being put on the spot by a teacher) or persistent (stress caused by sociocultural factors outside the immediate classroom). Boring classes in a learning environment over which the learner has no control compounds stress and severely depresses the will and ability to learn.

Interactive whiteboard technology has revolutionized classroom practice in many countries, especially in the UK where sustained government investment has resulted in a penetration rate of over 90% of schools. A recent BECTA (2007) report on the implementation of Interactive Whiteboards in British Primary schools concluded that prolonged use of the board led to achievement gains in core subjects (English, Maths and Science). Interactive Whiteboards motivate and entertain media-sophisticated students to a far greater degree than conventional delivery methods. Yet while the technology does have positive benefits within the learning space

there is a danger that it may become nothing more than a sophisticated presentation tool that places the teacher in the centre. Students return to the role of impressed but largely passive observers who watch the screen in the same way they watch a television. A skillful teacher can mitigate against this charge but there is still a danger that an Interactive Whiteboard can become a crutch for mediocre one-way learning.

One solution to this danger, and to issues surrounding motivation, is the introduction of user response systems. In this case each student has a wireless voting device that allows them to communicate with the Interactive Whiteboard or PC and projector at the front of the class. Simpler models allow students to choose from a range of options (Promethean's Activote system, for example, enables users to select from A to F by pressing a key). More complex models allow a variety of responses to be sent - Multiple choice, items in rank or short pieces of text. Promethean's Activexpression is one example of the latter. Activexpression allows students to send multiple choice input, rank items in order, make choices on a variety of Likert scales and input short pieces of text. The teacher uses software on her computer to communicate with Activexpression, sending information on the type of activity and the range of allowable responses (for example, multiple choice with a range of answers from A to D). Students then respond and their answers are sent to the computer where they can be displayed, either on an Interactive Whiteboard or on a screen via a projector. Responses can be displayed in a variety of ways. Percentages showing which proportion of students can be shown in bar- or pie-chart format (percentages or pie-charts showing which proportion of students gave which answer) or as individual responses. The system also shows response times in seconds. This has a number of possible applications. It allows for the introduction of speed-based competitions for individuals or student groups. Students who answer correctly in a couple of seconds are probably finding the work too easy. Students who get the answer wrong in a few seconds need to slow down a little and think before answering. Responses can be named or anonymous, and results can be saved to a database or spreadsheet, where they can be tracked over time.

One question that is often raised is why not enable student's mobile phones with a software plug-in that allows them to text or message the screen? A well-designed and dedicated user response system ensures that the student can only use the various functions of the unit when it is unlocked by the teacher or the Interactive Whiteboard. This avoids class management issues and distractions that will inevitably arise if learners are allowed or encouraged to use their own mobile phones in class.

Research and classroom experience show that user response systems are extremely motivating. Students that were previously too shy, bored or disengaged to take part in a class are enthusiastic about using the system. One example showing the effectiveness of user response systems is Queen Elizabeth College in New Zealand (Promethean, 2007). One group of students was identified as performing below the national level of achievement for reading. A dedicated class was formed and the Activote user response system incorporated into teaching, both as a method of informal opinion-gathering during class and for formal assessment. One of the key foci of the teachers was motivation as the students were largely reluctant learners. The

effect of the user-response system on the pupils' motivation was profound, especially in the case of one student who had previously been actively disengaged from the learning situation. By giving him the responsibility of managing the distribution and use of Activotes the teacher was able to re-integrate him into the learning situation. Overall the group's scores improved dramatically as the teacher indicated, "Integrating Activote within the reading programme has helped accelerate the students' learning beyond expectations. They are now on track to achieve the New Zealand Certificate in Education for English, where they might not have before".

User response systems allow students to actively engage in class with minimum risk. For many students answering or speaking in public is simply too intimidating an experience, it creates precisely the kind of stress that generates a negative emotional response, which in turn severely compromises the mind's ability to learn. Students experiencing this on a regular basis disengage or avoid involvement in any class activities whatsoever. User response systems allow them to maintain their anonymity so that they can contribute to the lesson or take part in assessments without the immediate fear of embarrassment if they get the answer wrong. Anyone who has taught foreign language classes in Asian universities will immediately recognize a situation where the fear of losing face reduces the vast majority of the class into silent, hesitant and passive learners. The danger for any teacher in this situation is to focus on the voluble few and make the assumption that confidence in speaking equates to ability. User response systems re-integrate every member of the class so that a more accurate and immediate knowledge of everyone's understanding can be acquired, either on the fly or stored to a database for later assessment. The systems can also be used by students and teachers to change the flow of a lesson as learners give feedback on the fly. If a class is proceeding too quickly or too slowly, students can ask for the speed to be changed. A teacher can poll her class to find out if a difficult concept has been understood and get immediate feedback. Previously this kind of information was based on a hunch as to whether the smiling and nodding few meant that all the students understood and not just the able ones, or had to wait until formal or informal testing, by which time it was often too late.

So far these benefits are largely teacher-centered, which potentially opens user response systems up to charges that they, like Interactive Whiteboards, re-assert the traditional power-balance between instructor and learner and become little more than entertaining special effects that enhance the position of the educator and turn the students into passive observers who occasionally push buttons. Yet there is a wider context in which user response systems can be seen as part of a re-alignment of the education space, both with the rapid growth of technological user-centered learning and recent developments in neuroscience. It is especially in the tentative findings of the latter that we can identify the real significance for user response systems for personal and personalized learning.

**CONCLUSION**

The last seven years have seen a revolution in our understanding of the way in which the mind processes and remembers information. This is largely thanks to massive strides in the development of brain scanning techniques which allow for the non-invasive monitoring of brain

activity. The discipline is still very much in its infancy. As the OECD report “Understanding the Brain: The Birth of a Learning Science” stresses, "There are few instances where neuroscientific findings, however rich intellectually and promising for the future, can be used categorically to justify specific recommendations for policy or practice … we should beware of simplistic or reductionist approaches, which may grab headlines or offer lucrative opportunities but which are a distortion the the knowledge base" (p. 157). There are, however, three key conclusions that can be tentatively formulated based on research done so far.

1. The human brain is highly plastic. It's internal neuronal pathways can be changed, re-routed and re-built to a significant degree throughout the life of an individual mind.

2. The brain's cognitive functions operate through the creation of synaptic networks, or massive connective webs between neurons.

3. Emotion has a huge impact on higher cognitive skills. Basically, emotion overrides cognition, especially stressful emotions brought on by ‘fight or flight’ responses.

While the first two conclusions have long-term implications for the development of new ‘brain-friendly’ pedagogies and accompanying technologies, the third conclusion has immediate and significant relevance in the construction of learning environments and the student/teacher relationships within classrooms. As we have already discussed, at the most fundamental level optimum learning occurs in a safe, stress-free environment where the student does not feel threatened. Secondly, a student who can determine the flow of the teaching situation to a greater of lesser degree will learn more effectively as they will feel more ‘in control’. Finally a motivated student will also learn to a far greater degree than an unmotivated one. Although this may seem like stating the obvious it is only with the recent developments in learning science that evidence for the key relationship between emotion and motivation can be clearly seen.

Hyperlinking, emotional intelligence and the concept of brain plasticity are key influences in the formation of personal learning spaces. A web of knowledge, personal networks and virtual ‘exoselves’ extends both the hyperlinked cognitive space of the mind and increases the fluidity of knowledge and its applications accessible by the individual. A personal learning space allows for the creation of an entirely risk-free safety-zone which increases the ability of cognition to operate free of negative emotion. We are already seeing the formation of vast networks of personal and virtual learning spaces within social networking sites, Wikis and blogs. The transformation of wireless response systems into networked systems capable of both creating personal learning spaces (possibly in PDA format) and networking with the vast range of Web 2.0 technologies will help to transform the class experience into one in which the student can feel safe and in control at both a cognitive and emotional level.

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