

**Ask the audience – just a bit of fun
or a valuable learning tool?**

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INTRODUCTION

This research project arose from two linked problems I had experienced year after year in my GCSE Psychology class.

- In starter or plenary activities the students didn't always participate. They had a tendency to just say 'I don't know' or 'I didn't get to that one'.
- Vocal students often dominated questioning, leaving me unsure of the quieter students' understanding of new topics.

I had attended several training sessions where Audience Response Systems (ARS) had been used as either part of the training or as an evaluation tool at the end. I saw how the trainees were willing to 'have a go' at responding to questions, how this brought some interactivity into the sessions and how it seemed useful for evaluation. A simple internet search provided me with enough evidence that ARS increased participation and promoted discussion and I felt that this could be the answer to my problem. Thus my Action Research project was born.

Context

These students were taking GCSE Psychology as part of a full-time course at college. Generally they were taking this subject, at this level, either because:

- they didn't get the required GCSE grades to be able to take AS level Psychology (*the requirement is at least five GCSEs at grade C or above, including English (language), Maths (ideally) and Science at grade D or above*); or
- they were a small group of students who were taking a full level 2 programme because their average GCSE score was between 3.0 and 5.0. Most of these students did not necessarily want to take GCSE Psychology, but due to the limited number of pre-A level courses offered by the college, they opted for it in order to fill their timetable.

Also within this year's cohort were two second-year students who had chosen the subject at this level because they wanted to concentrate on their A2 subjects and were reluctant to take on a new AS subject.

Furthermore, for the first time, there were seven Nepalese students, which added to the challenge of increasing participation as they are traditionally passive in Question & Answer (Q&A) sessions.

What is ARS?

An audience response system is software that uses hand-held remote answering devices to give all members of a class the opportunity to respond to questions displayed on the presentation screen and offers teachers a means to gain real-time feedback from their students. Best known from the 'Who wants to be a millionaire?' game show, these systems are now being used more frequently in education. An ARS allows participants to privately select their answer to a question and group responses can be shown. The data is collected for later analysis.

"ARS is an innovative, fun and confidential way of collecting information from groups of people..... ARS gives respondents a unique opportunity to respond to questions in a group setting anonymously and confidentially, and collects responses instantly." (Easton, 2009 pp. 6-13).

So why use ARS?

Advantages include: encouraging participation, increasing retention, and adding excitement for the students as well as immediate feedback to answers to the whole group for evaluation purposes – or at least this seems to be the promise, as this quotation from Draper, S.W (2005, Feb 20) suggests:

To "engage" the students i.e. not only to wake them up and cheer them up, but to get their minds working on the subject matter, and so to prompt learning.

1. Simple questions to check understanding: "SAQs" (self-assessment questions) to give "formative feedback" to both students and presenter.
2. Using responses (e.g. proportion who got it right) to switch what you do next: "contingent teaching" that is adapted on the spot to the group.
3. Brain teasers to initiate discussion (because generating arguments (for and against alternative answers) is a powerful promoter of learning.

Literature Review

The idea that students must be active in their learning goes back as far as John Dewey (1916), who first said that students learn best by doing and that learning is an active process. Vast amounts of research later back his idea, showing that academic achievement is positively correlated to the amount of participation students have in the learning process. Pratton & Hales (1986) define active participation as "the result of a deliberate and conscious attempt on the part of a teacher to cause students to participate overtly in the lesson". (pp.211)

Increasing student participation by way of active student responding methods, such as true/false cards or 'hands up', has been shown to improve student performance (Gardner et al 1994). However, these methods are susceptible to the influence of social conformity. Students are likely to wait to see how others in the class are responding before submitting their answer, giving the teacher the illusion that the students are 'getting it' when they are not.

Graham et al (2007), in their study of active learning in higher education, show that previous research has had mixed results on whether ARS improves student performance, but they also state that:

Although these studies showed mixed results, most studies that looked at indirect measures of student learning (including levels of participation and engagement) found positive results.(pp. 237)

The results of their surveys showed that 64% of their participants (n=688) said that they were hesitant to ask questions in class when they weren't confident of their own understanding. Of these, 90.8% felt the ARS helped them to participate in class.

Panayiotidis & Masikunas (2005) spent two years pioneering the use of Electronic Voting Systems (EVS) at Kingston University. The study was in response to perceived problems with the traditional lecture format common at university. These problems included: lack of participation by students, lack of immediate feedback to students and little opportunity for lecturers to test students' understanding before moving on to the next topic. They believed that EVS could enhance student learning in several ways: firstly, that students get immediate feedback; secondly, they benefit from the discussion that takes place; and thirdly, they get to see the responses from the rest of the group. Their results showed that students enjoyed learning in this way, and liked the instant feedback. Teachers liked the live participation and student engagement and felt the students were more motivated to learn. They concluded that 'the deployment of EVS turned the lecture event into a 'win-win' situation for both students and lecturers'. In addition they claim that the students who used the EVS in lectures performed better than those who didn't use it, and that there was a sustained increase in their attendance at lectures.

The instant feedback received by both students and teachers has also been shown to have a positive effect in the classroom. Feedback provides students with information on their performance which can then be used for improvement. Effective student feedback not only provides verification (whether their answer was correct), but it also elaboration (an explanation as to why their answer is correct or not).

Conoley et al (2006) set out to find an answer to their research question: "Do students receiving feedback through an audience response system have higher achievement scores than those who receive feedback through non-technology based methods?" Their results showed that using the ARS as the primary feedback method did result in improved student achievement.

All of this research has been carried out with university level students and very little has been done with school-aged pupils. The REVEAL (Review of Electronic Voting and an Evaluation of uses within Assessment and Learning) project led by The Midlands Leadership Centre, University of Wolverhampton, encompassed schools from 10 local authorities across the UK, all using one model of audience response system called Activote. Their findings included:

- Learners like the immediate feedback to questions and knowing by the end of a lesson how well they have performed.
- Interviews with learners and other collected data suggest that they are excited by the ARS and respond positively to using the equipment.
- Within the research data, Activote has been highly rated by staff and learners as a tool for motivation and engagement.
- Questionnaire respondents report that an ARS can encourage learner interaction, involvement and participation - a view that is supported by the interviews with teachers and learners and lesson observations.
- Teachers suggest that working in anonymous mode removes the fear of public failure and encourages learners who wouldn't usually participate.

A case study from the Optivote website also shows positive findings from both GCSE and AS/2 level students. At the end of this year-long study advantages were described as:

- The ability to quickly and effectively test all students on a broad range of the factual content of the topic.
- The opportunity to offer a variety of very similar answers to test depth of knowledge and encourage students to pay attention to precision.
- Analysis of group and individual performance to provide feedback on possible areas of weakness.

It was also noted that 'Of particular benefit to low ability sets...Optivote can be used as an easy way of providing repetition of key points, key vocabulary, definitions, etc'.

In conclusion, this study showed that 99% of the pupils enjoyed using the Optivote system and 97% believed that it helped them to learn the work.

Most research has been carried out in America and the UK with very little focus on cultural differences. Beeks (2006), cited in Graham et al, notes that students from other cultures are often not used to responding instantaneously and are worried about answering incorrectly:

Encouraging students to participate during class time is important to facilitate the learning process and encourage deep learning to take place. However, students with certain cultural and education backgrounds are often reluctant to participate in class discussion. (pp.237)

Beeks, in Graham et al, concludes: 'this study demonstrates that the PRS has benefits in terms of increasing and maintaining student participation and attention levels. If the PRS is used in *anonymous*

mode it has the added benefit of giving students the opportunity to contribute to discussions anonymously, increasing their confidence to participate more widely in class discussions’.

In their study Panayiotidis & Masikunas also recognise that cultural differences impact upon participation in the classroom:

“In some cultures, neither teamwork, nor competitiveness is promoted. Also, some of our students come from strict family backgrounds – “right” opinions are valued and “wrong” statements are discouraged; this can be an obstacle in active engagement in lectures.”

They found that the use of an ARS helped to bring together nationalities and cultures.

METHODS USED

Firstly, I had to learn how to use the college ARS – Optivote. Their website was no help as there were no tutorials available; however, an IT Technician within college had produced a ‘getting started’ booklet which helped enormously. After learning the basics I ‘played around’ with the programme and soon learnt the skills that I needed.

Secondly, I had to create a bank of questions with multiple choice answers. This was harder than I anticipated as I found it difficult to keep finding two wrong answers that wouldn’t confuse students but equally wouldn’t be too easy.

I introduced the system to the students from the first lesson and allocated a numbered handset to each one. They remembered their number immediately and collected their handset with no fuss at the beginning of each lesson thereafter. By their always using the same handset, I was able to see after the lesson exactly where each individual’s strengths and weaknesses were.

I used the ARS in different ways and did, in fact, adapt its use as the course progressed. Initially my idea was to use it as an assessment tool at either the beginning or end of every lesson. This, however, was not practical because of time issues which I will discuss later in my findings. I soon realised that it was more beneficial to use the system at the end of every subtopic and generally focus the questions around a particular study or theory.

In the beginning the questions were standard multiple choice with the students picking the correct answer from A, B or C. As the course progressed, I introduced definition matching whereby students had to choose the correct definition for the word presented. Finally, I tried “true” or “false” questions with the students having to say whether a fact was true or false.

As each topic within the course has several studies and theories that the students need to know, but the teaching of these can take several weeks, I decided to revisit each set of Optivote questions to see how much the students had remembered. Similarly, as the exams approached (May), I realised that it may be beneficial to revisit the sessions again to recap the facts. The Milgram study below is an example of this:

The Milgram study is only a small part of the Social Psychology topic in which students need to learn at least 6 different studies. Using this example, the students first responded on 23rd September, then recapped a week later. They were presented with same questions again in a revision session on 31st March. See appendix 1 for an example of this.

Table 1 - Percentage scores achieved by each student in each of the three Milgram teaching sessions.

The data for each student and each session was automatically stored in a database so I was able to compare the scores between sessions and between students. By the end of the project I was curious as to how much the use of this method had helped my students remember the facts, so I compared their end-of- topic assessment scores with those of a similar group (the control group) who had not used an ARS.

Finally, I created an evaluation questionnaire in which the students had to answer “yes”, “no”, or “don’t know” to each statement to gauge their opinion of using the ARS.

FINDINGS

The most important finding (in line with my original goal) was that no students present failed to answer a question in any of the voting sessions. Therefore, I had no problem with participation when using the ARS as a method of gauging students’ understanding.

A more surprising finding was the value of this tool for generating discussion. The voting sessions were never the quick starter or plenary session as in my original idea. The real benefit was the way in which I and the students were able to discuss right and wrong answers without them feeling failures as their responses had been anonymous.

When voting sessions were repeated several classes later, 100% of the students got the same or a higher percentage of answers correct. However, when comparing their ARS grades from the sessions that combine to make a complete end-of-topic written assessment, only 52% achieved the same or a higher percentage score. (see appendix 1)

When near the end of the course the voting sessions were repeated as a means of revision, 67% of students achieved a score equal to or higher than at least one previous attempt.

Using a similar class as a control group, and calculating a group mean for each end-of-topic assessment, the experimental group had a higher mean for every assessment (see appendix 2).

Feedback from the students was collected via the ARS, whereby students were asked to respond “yes”, “no” or “don’t know” to various questions. Comments were also collected in the traditional way by asking them to write them down.

Table 1 shows the ARS questions and responses:

	Yes %	No %	Don't Know %
Did you enjoy using the voting system?	80	13.3	6.7
Do you feel that you have benefited from using the voting system?	60	6.7	33.3
Do you feel that using the voting system has had any beneficial effect on your understanding of each topic?	80	0	20
Do you feel that using the voting system has had any beneficial effect on your academic progress?	40	20	40
Do you feel that using the voting system has encouraged you to answer every question?	66.7	20	13.3
Do you think using the voting system would be of benefit in other subjects?	80	13.3	6.7
Has your confidence in answering questions improved because of using the voting system	66.7	13.3	20
Has repeating the voting sessions helped with your revision?	86.7	6.7	6.7
Has repeating each voting session helped you remember the facts?	73.3	13.3	13.3

Table 1 – Percentage of student responses to each evaluation question.

It is clear that the majority of the class did enjoy using the ARS and found it beneficial not only for learning new concepts but also for revision. It should be noted that one student (6.7%) answered “don’t know” for every question while another answered “no” for every question except “Do you feel the voting system has had any beneficial effect on your understanding of each topic?”

Comments made by the students included: seven students saying it was “fun to use”; six students saying it “helped them to remember the facts”; three students mentioning that it was “helpful for revision”; and two students saying that it “encourages everyone to answer”. Other comments were:

“It makes me think hard about the answers”;

“It encourages me to answer all the questions”;

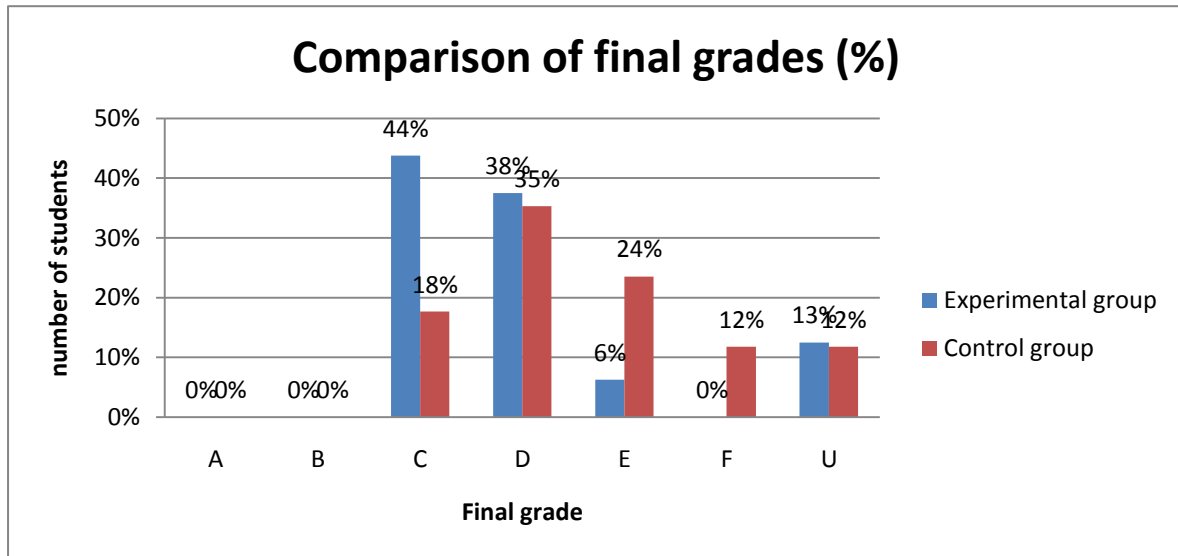
“I understand more when it is put on the board”;

“Could we have more questions on statistics, as they are hard to remember?”

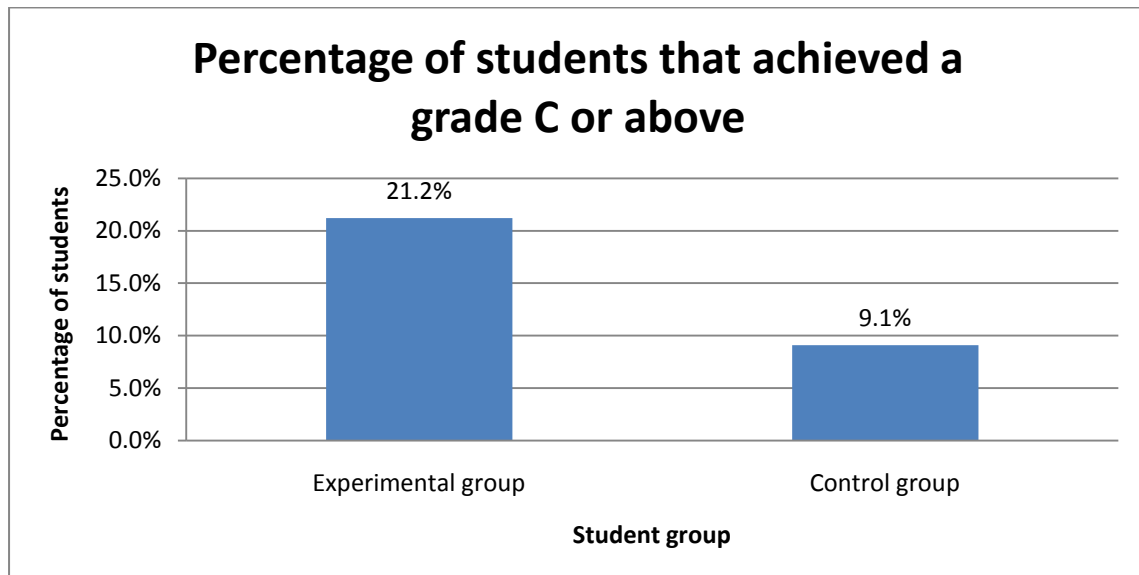
Only a few less favourable comments were made such as: “It doesn’t help” and “it isn’t as good as posters”.

In August there was a pleasant surprise when the final results were published – the class that had used the ARS had a 26.2% higher pass rate (grade C or above) than the control group. Graph 1 shows the percentage of students in each group (2 exams and 1 piece of coursework) that achieved each grade. This clearly shows that a higher percentage of students in the experimental group achieved a pass grade of C than in the control group. For actual data see Appendix 3

Graph 2 shows the percentage of students in both groups that achieved a pass of C or above. This again clearly shows that more students in the experimental group achieved a pass.



Graph 1



Graph 2

DISCUSSION

My original aim for this study was to find a method of gauging learning that both the students and I could use easily within a lesson. In addition, I was hoping for a tool that would actually enhance the learning experience for my level 2 students by increasing participation.

Bloom's Taxonomy identifies three domains of learning, each of which is organised as a series of levels or pre-requisites. It is suggested that one cannot effectively address higher levels until the lower levels have been covered.

The Cognitive domain is the most-used of the domains, referring to knowledge structures (although merely "knowing the facts" is its bottom level). These structures can be viewed as a sequence of progressive contextualisation of the material.

Below is Figure 1 outlining the levels within the cognitive domain. The ARS can be used at all levels and, although I used them in this study at the first three levels and only touched on the higher three, there is scope for incorporating more activities.

Bloom's Taxonomy - Cognitive Domain

level	category or 'level'	Behaviour Descriptions	Examples
1	Knowledge	recall or recognise information	MCQ to check understanding of the basis principles learnt
2	Comprehension	understand meaning, re-state data in one's own words	Definition matching to check understanding of key vocabulary
3	Application	use or apply knowledge, use knowledge in response to real circumstances	Real-life examples are used to check students can apply their knowledge
4	Analysis	interpret elements, structure, construction,	Deconstruct studies to check students ability to analysis research
5	Synthesis (create/build)	develop new models, approaches, ideas; creative thinking,	Students write their own MCQ and present to the rest of the group
6	Evaluation	assess effectiveness of whole concepts; critical thinking,	Students are given model answers and grade them according the marking criteria

Figure 1 Uses of the ARS in accordance with Bloom's Taxonomy

At the fourth level (analysis) the ARS could be used to deconstruct the studies/theories/cases by compiling in-depth questions about data collection, data analysis, links to other topics, etc.

At the fifth level (synthesis) the students can write their own questions, including wrong answers and present them to the rest of the class.

At the sixth and final level (evaluation) the ARS can be used to grade model exam answers using the marking criteria.

The uses for this system are vast and for this project I only used it in a very basic way as my focus was on getting my students to participate.

My results certainly back the research by Panayiotidis & Masikunas, cited in the introduction. Using the ARS did increase participation and the students enjoyed getting instant feedback on their responses.

It was this instant feedback that may have been a two-fold factor in the achievement of the final grades. Firstly, students are able to identify their weak areas of knowledge or skills, allowing them to focus on these areas for revision. Secondly and perhaps most importantly, it allowed me to adapt my delivery as the course progressed. In class we could incorporate more activities on a particular topic if the ARS feedback showed that students hadn't quite 'got it' yet.

From my own observations, as well as the evaluation questionnaire, it was clear that students felt more confident in answering, knowing that the responses were anonymous. This was particularly true of the female Nepalese students who all participated using the ARS but rarely answered a direct question at other times. This backs up the research previously cited by Beeks in Graham et al (2006).

While this is all positive, there are some drawbacks to using this system, namely that all the questions are in multiple choice (MC) formats. The GCSE exam this year, like many exams, does not consist of MC questions, therefore cannot predict exam performance, nor can it be used for exam practice. Another drawback is the time it takes to compose a bank of MCQ. At the beginning of the project I was motivated to compose such a bank, but this motivation waned nearer the end. I did, however, find that once written the questions could be transferred onto Moodle as a quiz.

CONCLUSION

The data collected clearly shows that:

1. Students enjoyed using the voting system (80%);
2. Students felt it helped them learn each topic (80%);
3. Repeating sessions helped students get higher scores (100%);
4. Students got higher assessment grades than the control group;
5. Students felt it helped them remember facts (73%).
6. Significantly more students in the ARS group achieved an overall grade of C or above (26.2%)

However, the ARS added more to each session than can be quantified – it added fun and interactivity to the lessons.

I personally have gained a lot from this project. It has given me the impetus to investigate something that I was eager to use and the incentive to carry it through. Writing the MCQ has made me look at the exact skills the students need to be successful. I have also had to hone my reflective skills and take action throughout the project. This meant realising I needed to change my methods at a very early stage and also to add a method at a very late stage, but this is what action research is about – having the freedom to change as the project develops.

So finally, would I do it again? Absolutely; and will I continue to do the ARS? Definitely!

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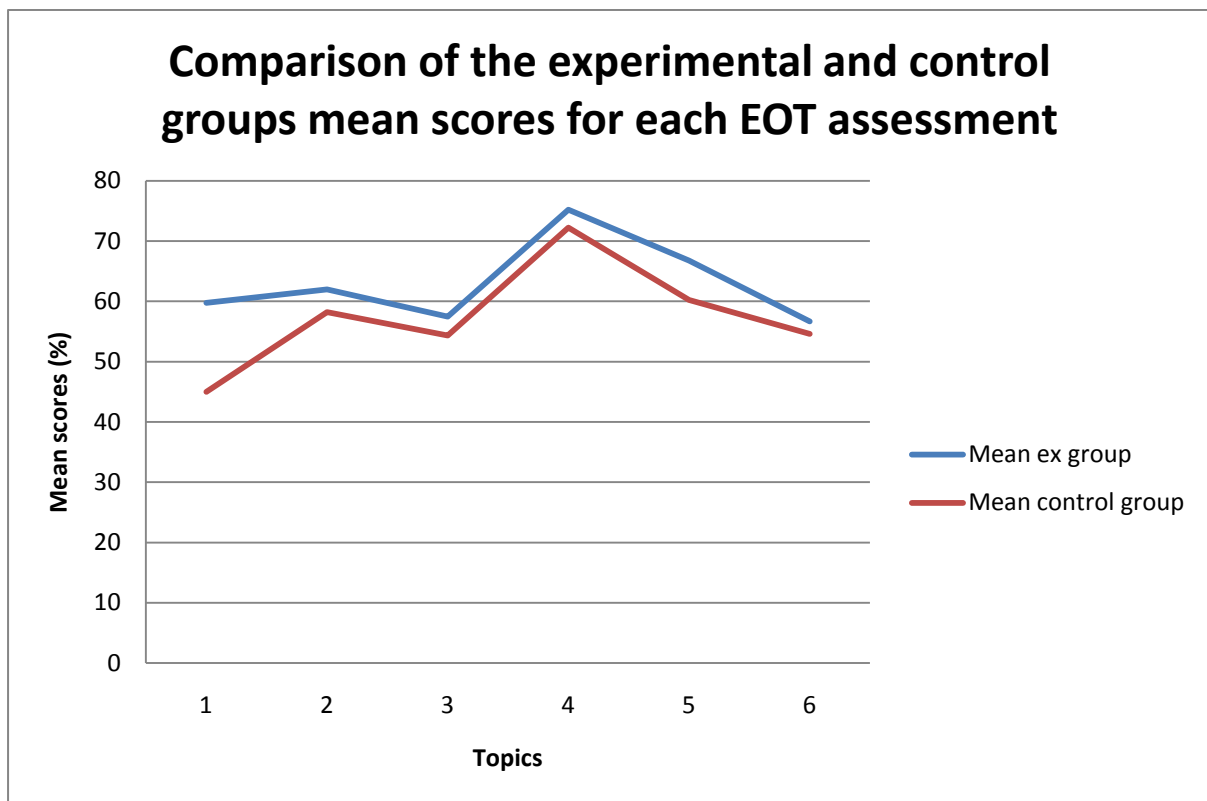
<http://www.revealproject.org>

<http://www.optivote.com/CaseStudies/ChilWellSchool.htm>

Appendix 1

	Milgram 23/9	Milgram 30/9	Milgram 31/3
	1st attempt	2nd attempt	revision session
Student 1	70	100	70
Student 2	90	100	100
Student 3	80	0	80
Student 4	90	90	90
Student 5	70	90	0
Student 6	60	100	90
Student 7	60	100	90
Student 8	70	100	0
Student 9	90	90	80
Student 10	80	100	0
Student 11	40	90	100
Student 12	80	100	60
Student 13	80	80	90
Student 14	60	80	90
Student 15	80	80	90
Student 16	70	100	100

Appendix 2



Appendix 3

