Use of a Student Response System in primary schools – an empirical study

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Abstract

This paper reports a pilot study for a student response system used in an English school. The technology used is the "Wireless Response System" SRS developed at Huddersfield University, and the learning activities were conducted in Mathematics and English classes. The results of the study in the school were successful, evidenced by the data collected, and the children and teachers were interested in using it. We conclude that the SRS can assist teachers in classroom teaching at primary school level, especially in the observations of engagement and effectiveness of students' learning.

1. Introduction

A Student Response System – SRS – is popular in educational communities, especially in Northern American and European universities where it has been in use for more than 20 years [1-18]. Anthony et al. used SRS to evaluate students' perceptions of the Socrative application [6], Suzanne et al. addressed the learning effectiveness of SRS [7], and Nicholas et al. discuss student engagement when using an SRS [8], Melody's article argued about the advantages and disadvantages of using SRS [9], and Grez et al. talked about using SRS to improve the presentation skills [10]. George provided some interesting facts relating to teaching students how to think [11], and his article could be a good inspiration for using SRS to improve teaching. It follows that although some arguments for using or not using the system are still the subject of debate – e.g. commercial products are not cost effective, devices are not flexible, networks are not reliable, there are some barriers to staff familiarity with the technologies – the contributions to the higher educational institutes are generally acceptable [5].

Unlike traditional use of SRS in higher education, this paper reports an empirical study of using SRS in an English primary school. The children involved were from age 7 to 11 years old, reading in key stage 2 (KS2), and at the end of KS2 the children take an academic assessment (SATs) in English and Mathematics. For English, the spelling, punctuation and grammar (so called "SPaG"), comprehension form one of children's main learning tasks. For both subjects, teachers follow the requirements of national curriculum.

2. Technology employed

The project was carried out in the Linthwaite Clough Junior Infant and Early Years School, in Huddersfield in the UK. Several groups of pupils, including one consisting of academically able children, were organised to join the project. Using the SRS for Mathematics learning was arranged as the first activity, and then learning SPaG as the second.

The technology used is a system developed in Huddersfield University. The system has been supported by four EU grants since 2009 and has

been used in more than 10 EU universities, colleges and industrial companies. As it is a research project, the detailed technical development has been reported to the funders and academic outcomes have been published in international journals and conferences [12-16].

To support the school to conduct the project, the University provided several handheld devices to the school. The teachers also used their own devices, including netbooks. For the trial, the University provided free software for both staff and pupils to use.

3. Data collection

The data were collected from the two activities, using the SRS for students learning Mathematics and English.

3.1. Data collected from learning Mathematics

Several sessions were conducted by the teachers. Figure 1 shows the four children who attended the activities, and a session which used a multiple choice question, where once the question is initiated by the teacher, three children answered 'C', and one answered 'D'. The options are from A to D, and no child selected 'B' or 'D'.

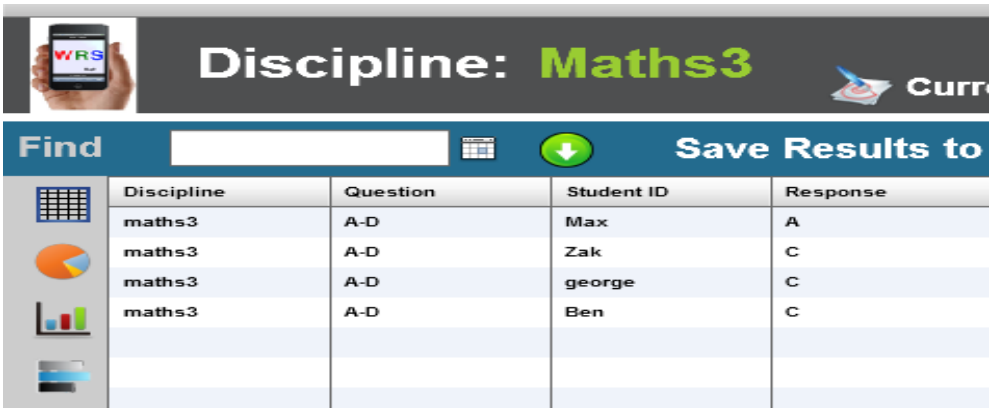


Figure 1. Learning mathematics using WRS – case one

Figure 2 shows a different distribution of children's answers, for a different question.

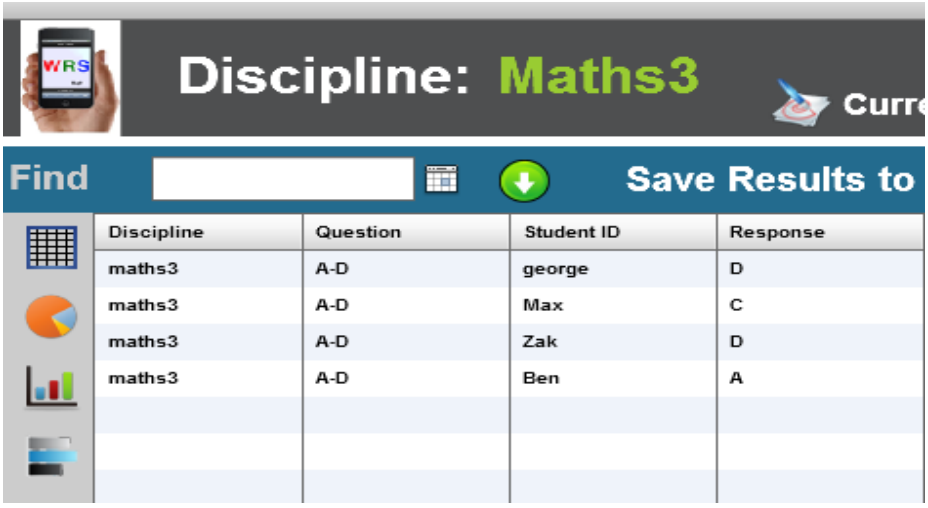
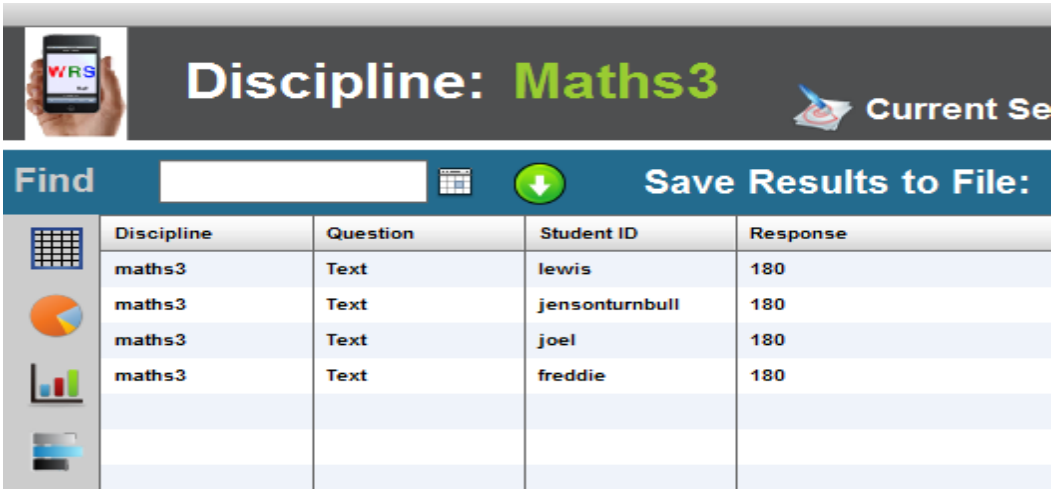


Figure 2. Learning mathematics using WRS – case two

Numeracy is part of children's learning components at key stage 2. Figure 3 illustrates numeric answers input by the children – in this case, all the children agreed that 180 should be the answer of the given question.



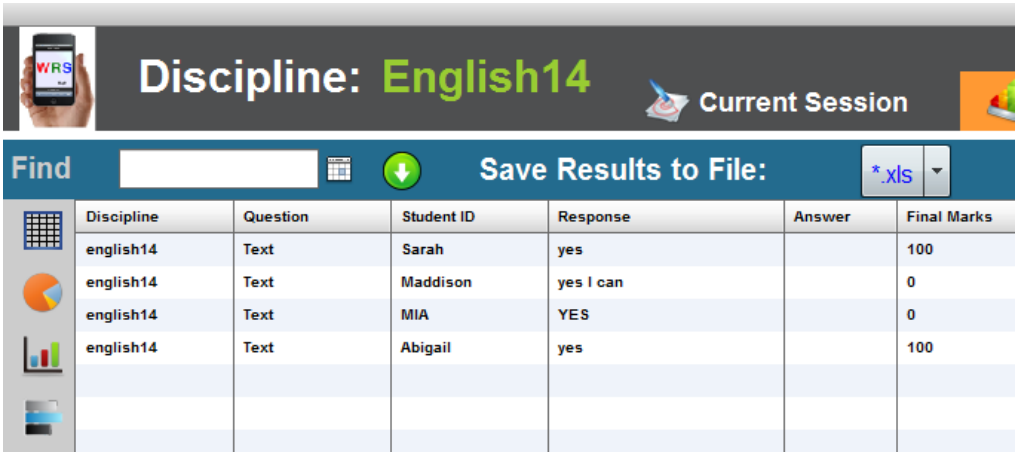
Discipline	Question	Student ID	Response
maths3	Text	lewis	180
maths3	Text	jensonturnbull	180
maths3	Text	joel	180
maths3	Text	freddie	180

Figure 3. Learning mathematics using WRS – case three

3.2. Data collected from learning English

Learning English was the second activity, and the following evidences how SPaG learning is delivered in the classroom using the SRS.

Figure 4 shows that two children answered the question perfectly and were awarded a mark of 100. Two children input the answers different to the required answer and received a mark of zero.



Discipline	Question	Student ID	Response	Answer	Final Marks
english14	Text	Sarah	yes		100
english14	Text	Maddison	yes I can		0
english14	Text	MIA	YES		0
english14	Text	Abigail	yes		100

Figure 4. Learning English using WRS – case one

Evidence for learning spelling and grammar is shown in Figures 5 and 6. The children entering the correct answer were awarded a mark of 100.

The first answer is wrong because the input should not have been capitalised.

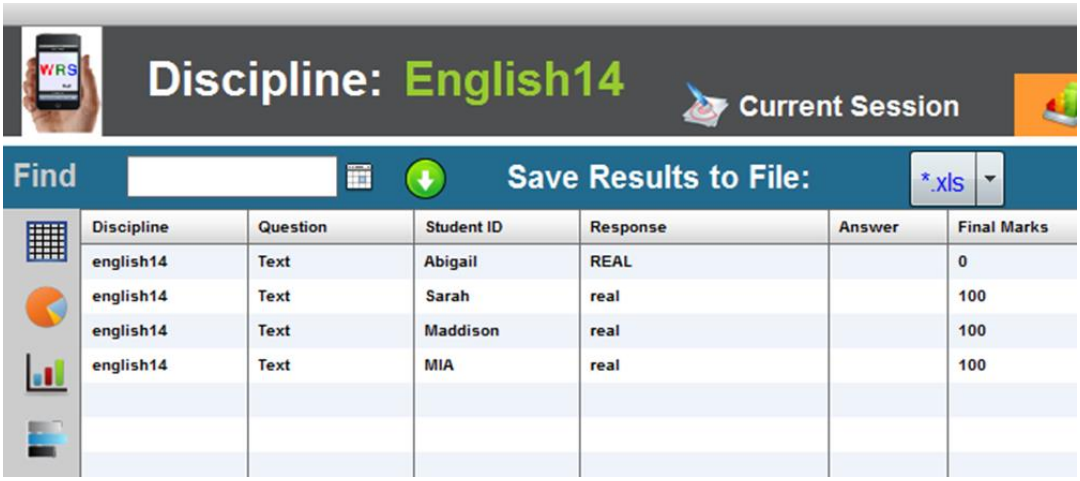


Figure 5. Learning English using WRS – case two

4. Discussion

Generally speaking, the technology used in the school was successful as reported from the teachers [19]. With the teacher's guidance, the children are interested in using it to acquire the knowledge required for numeracy and literacy.

The activities can assist teachers to observe learning behaviour in a measurable way, as shown in the marked results in Figures 4 and 5, and shows that the teacher can immediately identify who answered questions correctly and who answered wrongly (see Figures 1 to 5).

Pedagogically, the learning model in the school is teacher oriented and kids are listening to the teachers. Thus, the pupils found it relatively easy to engage in the activities, while in universities, learners are relatively independent, thus, the engagement issue is always a challenge, as discussed by Nicholas et al [8]. Meanwhile, the learning effectiveness has been observed as the results can be viewed at the time of the running the class. The children may receive the necessary support in time if they have not understood the lesson. This point agrees with Suzanne et al. [7].

The technology, to some extent, may help teachers to teach based on the capabilities of children, see Figures 3 and 5. Thus, the children's great potential can be observed because the evidence has shown that one group of pupils always performed well with given questions. This group of children can be identified as able children. Meanwhile, the children who need additional help can be identified as well, according to the subject that they need the help with, e.g. is it fraction in Mathematics or spelling, punctuation or grammar in English?

However, the project is a pilot study. The system is still not perfect and needs further improvement in terms of data visualisation and integration of data analytic tools.

5. Conclusion

The pilot trials of SRS conducted in the English School were well organised and coherent, which resulted in a successful outcome. We can therefore draw the following conclusions.

1. The learning effectiveness of using the SRS has been observed in the classroom and potential bright pupils could be identified easily.
2. The engagement of pupils has worked well, although the learning models for children are different from those for adults.
3. The SRS needs further research to move forward, especially for data visualization and data analytic tool integration.

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References

[1]. Roger C. Lowery, Teaching and Learning with Interactive Student Response Systems: A Comparison of Commercial Products in the

[2]. Higher-Education Market, Computing and Information Science, Mendeley, 2005

[3]. Beaty, I., Transforming Student Learning with Classroom Communication System. Research Bulletin, 3, 2-13. 2004

[4]. Lina Nayak, Joseph P. Erinjeri, Audience *Response Systems* in Medical *Student* Education Benefit Learners and Presenters, Product review, Academic Radiology, Volume 15, Issue 3, March 2008, Pages 383-389

[5]. Nathaniel J. Hunsu, Olusola Adesope, Dan James Bayly, A meta-analysis of the effects of audience *response systems* (clicker-based technologies) on cognition and affect, Research article, Computers & Education, Volume 94, March 2016, Pages 102-119

[6]. Anthony J. Guarascio, Branden D. Nemecek, David E. Zimmerman, Evaluation of *students*' perceptions of the Socrative application versus a traditional *student response system* and its impact on classroom engagement, Short communication, Currents in Pharmacy Teaching and Learning, Volume 9, Issue 5, September 2017, Pages 808-812

[7]. Suzanne M. Galal, John K. Mayberry, Emily Chan, Jace Hargis, Jenna Halilovic Technology vs. pedagogy: Instructional effectiveness and *student* perceptions of a *student response system*,Research article, Currents in Pharmacy Teaching and Learning, Volume 7, Issue 5, September–October 2015, Pages 590-598

[8]. Nicholas J. Thomas, Eric A. Brown, Lisa Y. Thomas, Use of *student response* and engagement *systems* in the collegiate classroom: An educational resources review, Research article, Journal of Hospitality, Leisure, Sport & Tourism Education, Volume 17, November 2015, Pages 59-61

[9]. Melody T. Fisher, Still fighting the good fight: An analysis of *student* activism and institutional *response*, Research article, Public Relations Review, Volume 44, Issue 1, March 2018, Pages 22-27

[10]. De Grez, Valcke, Berings Student response system and learning oral presentation skills, Open access, Research article, Procedia - Social and Behavioral Sciences, Volume 2, Issue 2, 2010, Pages 1786-1789,

[11]. George E. Mobus, Teaching systems thinking to general education students, Research article, Ecological Modelling, Volume 373, 10 April 2018, Pages 13-21

[12]. Lu, J., Meng, Z., Lu, G. and Stav, J. (2010) 'A New Approach in Improving Operational Efficiency of Wireless Response System'. *In: IEEE 10th International Conference on Computer and Information Technology (CIT), 2010*. : IEEE. pp. 2676-2683. ISBN 9781424475476

[13]. Zhaozong Meng, Joan Lu, Integrating Technical Advance in Mobile Devices to Enhance the Information Retrieval in Mobile Learning (pages 61-85), International Journal of Information Retrieval Research (IJIRR) 4(1), ISSN: 2155-6377|EISSN: 2155-6385|DOI: 10.4018/IJIRR

[14]. Pein, R., Lu, J. and Stav, J. (2009) 'Integrating Mobile Computing Solutions into Distance Learning Environments'. *In: International Conference on Mobile Communications and Pervasive Computing (MCPC 2009), 23rd-25th March 2009*, Leipzig, Germany

[15]. Meng, Z. and Lu, J. (2011) 'Opportunities of Interactive Learning Systems with Evolutions in Mobile Devices: A Case Study'. *In: Proceedings of the 2011 International Conference on Internet Computing ICOMP 2011*. : CSREA Press. pp. 238-244. ISBN 1601321864

[16]. Meng, Z. and Lu, J. (2011) 'Implementing the Emerging Mobile Technologies in Facilitating Mobile Exam System'. *In: 2nd International Conference on Networking and Information Technology*. Hong Kong,

China: IACSIT Press. pp. 80-88. ISBN 978-981-07-0680-7

[17]. Lu, J (2012) Learning with Mobile Technologies, Handheld Devices, and Smart Phones: Innovative Methods . Hershey, PA , USA: IGI Global. ISBN 9781466609365

[18]. Manga, Faisal and Lu, Joan (2013) *An Investigation in the Impact of Mobile Learning on today's Educational Environment.* In: Proceedings of the 2013 International Conference on e-Learning, e-Business, Enterprise Information Systems, and e-Government. EEE (2013). WorldComp 2013, pp. 130-135. ISBN 1601322402

[19]. Yusaf, M & Robert, J, WRS reports, Linthwaite Clough JI&EY Schools, 2016