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Student Response Systems: Do nursing students prefer coloured paper or digital solutions?

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Background: Many components of our courses are replaced by more flexible formats accessible via a computer. The time where students and teacher meet each other face to face is used to methods with lots of student activity. The aim of the study was to investigate different formats for interaction via student response systems (SRS) in a large class environment where some students participate live, other via a live video connection. A simple SRS system using coloured pieces of paper was compared with a digital system where students used tablets, smartphones or computers.

Methods: 104 second year nursing students answered a simple survey about perceived learning outcome from the analog and digital solutions after introductory lectures in medicine and pharmacology in the autumn of 2013. The survey was administered on paper to each student immediately after the introductory lectures, and was also available digitally via Survey monkey (www.surveymonkey.com). The students were asked to rate the learning when using the different methods on scales from 0 (no learning) to 4 (huge learning impact), and were invited to give further comments on advantages or disadvantages with the two systems.

The digital SRS system used is made by one2act (www.one2act.no). The students in this course had tried the system once before, about three months before the lectures where the evaluation was made. The coloured paper and the SRS system were used on two consecutive days.

No IT equipment was made available to the students from the University College, as we knew that almost all students do own a portable unit with internet access. We asked the students beforehand to bring such a unit on these specific days. In the system made by

one2act, it is possible to answer questions via several different units: Smartphones, tablets or laptops. In the classroom, we saw that most students used their smartphones. The basic setup in this SRS system is that a question with some possible answers is presented to the students. A counter is started by the lecturer when the students appear ready. Next, buttons with the different alternatives (a, b, c, etc.) are presented on the student's smartphone. The students are then asked to choose among the possible answers before the timer reaches zero. Next, a graph showing the combined results from the whole class is presented on the main screen, visible for everyone.

The questions asked were classical multiple choice questions with one correct answer and three false answers. The timer was set on 20 seconds most of the time. After presentation of results, some time was used to discuss the answer with the students. When almost all students chose the right answer, this discussion was brief. On the other hand, the following discussion could be quite comprehensive and followed by a new vote before the right answer was finally revealed in cases where the answers suggested that many students were confused.

The subjects for the multiple choice questions were picked from themes discussed in the lecture during the preceding 15-20 minutes, preferentially formulated in a way where the students had to use what they had learnt in a new way. The intention was to use this as a kind of rapid repetitions to try to consolidate new learning.

The setup of the exercise with the coloured paper was basically done in the same way. A4 paper cards in yellow, red, green and blue were cut in four, brought by the lecturer to the classroom and distributed among the students. Questions asked were the same sort of multiple choice questions with one right answer. The countdown was done manually by the lecturer for 5-10 seconds, and it was stressed that everyone should raise the card at a coordinated time and try to hide their choice until this moment, to make it harder to figure out what paper to pick from the others' choice of colour.

Another topic discussed in this paper is whether presence in the classroom or participation via videolink affect the students' evaluation of these two different student response systems. A proportion of the class does not travel to the auditorium in Elverum, but follow the education at the local hospital in Kongsvinger 1.5 hours away via a videolink. These students can see and hear the teacher with quite high image and sound quality. The teacher can see the students participating via videolink on a small screen, and these students can turn on a microphone to ask questions or give feedback.

Results: 94 of the participants had experienced both systems. 10 preferred the analog version, 31 preferred the digital version, while 53 students gave both systems an equal rating.

Students' preference: Analog or digital voting system?

Prefer analog	Both systems equal rating	Prefer digital
10 (11%)	53 (56%)	31 (33%)

How would you evaluate your amount of learning from the analog and digital systems?

	No learning	Little	Medium	Big	Huge
Analog system	1 (1%)	4 (4%)	23 (24%)	44 (45%)	25 (26%)
Digital system	0 (0%)	2 (2%)	16 (18%)	52 (52%)	31 (30%)

The students felt that they learned from both systems. It appeared to be a tendency to prefer the digital system, but for most students, the difference was small.

The next thing we looked at in our data was whether there was any significant difference in rating between the students participating via videolink and the students who were physically in the auditorium.

How would you evaluate your amount of learning from the analog systems?

	No learning	Little	Medium	Big	Huge
Videolink student	1 (5%)	0 (0%)	7 (33%)	9 (43%)	4 (19%)
Physically in classroom	0 (0%)	4 (5%)	16 (21%)	35 (46%)	21 (28%)

How would you evaluate your amount of learning from the digital SRS system?

	No learning	Little	Medium	Big	Huge
Videolink student	0 (0%)	1 (5%)	8 (36%)	5 (23%)	8 (36%)
Physically in classroom	0 (0%)	1 (1%)	8 (10%)	47 (60%)	23 (29%)

To summarize, the students participating via a video link rated the methods at about the same levels as the students participating live in the auditorium.

The further comments from the students stressed two main points: The advantage of the digital version most frequently mentioned was the ability to give answers anonymously, the main advantage of the analog model was unbeatable ease of use. Several students stated that these methods really helped them to retain knowledge.

We did not do any quantitative registration of the number of students answering each question in this study, but the impression by the lecturer was that a clear majority of the class, always over 70%, usually over 90%, answered each single question.

Discussion: Our nursing students perceived that they learned from both systems. It appeared to be a tendency that they preferred the digital system, but the difference was small. Both systems used multiple choice questions. It is plausible that it was the use of questions that facilitated learning and not necessarily the use of SRS. The assertion is supported by the pedagogical phenomenon called self-explanation. The use of multiple choice questions and responding in-class could have enhanced the nursing students' ability to explain to themselves, which were the right and the wrong answers to teachers' questions. Students learn more when they have to explain to for themselves what they are studying (Strømsø 2014). Kay and LeSage (2009) underline that use of SRS in the classroom does not guarantee improved student learning. It is the implementation of pedagogical methods in combination with SRS that influences the students' perception of learning. Evidence also implies that students' perception of learning is affected by the teachers' enthusiasm and level commitment when using SRS (Nielsen, Hansen, Stav 2013). On the other hand, the students' perception of learning with SRS may also be explained as a novelty effect. Several studies showed that nursing students reported that it was fun to use SRS (Meedazan & Fisher 2009; Smith & Rosenkoetter 2009). Furthermore, nursing students report that they learn more when SRS is used. However, findings from several studies (Patterson et al. 2010; Stein et al. 2006) do not support the nursing students claim.

Our results indicated that the main advantage with digital SRS compared to the analog SRS was that nursing students could respond anonymously to the questions raised by the teacher. Previous studies (Fifer 2012; Patterson et al. 2009; Porter & Tousman 2010) that investigated nursing students experiences with the use of digital SRS, found that being able to respond anonymously was perceived as an important benefit with this system. Being able to respond to questions anonymously appears to facilitate participations from students that do not normally respond in-class (Lantz 2010). For nursing students it is important that other students and the teacher do not know that they answered incorrectly (Patterson et al. 2009). Due to anonymity students could become more willing to choose an incorrect answer when they are unsure about the correct one (Draper & Brown 2004; Jensen et al. 2009). In contrast, when nursing student used coloured paper solution to respond, they could have looked at other students before they chose their own answer and responded. Furthermore, evidence suggests that students think that responding by holding up a response card is too public and could decrease the number of students that are willing to respond (Lantz 2010).

In our study, nursing students reported that the main advantage with the analog SRS solution was that it was easy to use. Evaluation of students' experiences with the use of the SRS made by one2act showed that technical difficulties, such as students' tablets, smartphones or computers that were not able to connect to the server, were aspects that could negatively affect students' experiences of the system. Technical problems could probably prevent students from using the digital SRS (Nilesen, Hansen, Stav 2013). Teachers that want to use the digital SRS need specific training before they can use the system. On the other hand, use of coloured paper solution is not affected by technical difficulties or requires any specific training in beforehand. In addition, there are virtually no costs related to the use of the coloured paper solution for either the students or the university college.

Keywords: Curriculum Innovation, course design, QA in e-learning.

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