Smartphones as Clickers for Hearing Impaired Students: An Exploratory Study

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Introduction

Clickers or QRS (Quick Response Systems) have been used widely in classrooms for many different purposes. Their main benefits include having instantaneous feedback and more engagement. Despite their benefits, QRS have disadvantages. For instance, teachers encounter difficulties engaging their students with hearing disability in classroom activities. They also find a hard time communicating with their deaf students due to their lack of proficiency in using sign language. Yet, no research has explored the use of smartphones as clickers to alleviate those problems. With their wide spreading among students and educators nowadays, it is possible that smartphones can be used as a mean of communication between teachers and students. The main purpose of this project is to provide a preliminary assessment on the use of smartphones as clickers with hearing impaired students. Students were surveyed to know their impressions and attitudes. Teachers were interviewed to know their opinions about the use of smartphones as clickers in their classrooms with their students. The study tried to draw some conclusions and recommendations regarding the intervention.

The introduction of Quick Response Systems (QRS) into class has had a positive impact on learning of students. QRS facilitates student success and academic performance with regards to content area achievement. The system is also vital in the development of students' thinking skills which enhances their motivation to learn and retain new information (Erika & Gulchak, 2013). The Use of QRS in

classrooms help the deaf students engage with their teachers during learning. The main features of QRS are having instantaneous feedback and more engagement (Fisher, 2014). The problem with clickers is that it makes it difficult for teachers to engage with students with hearing problems in classrooms. Teachers also experience a hard time to communicate with deaf students since they are not proficient in using sign language (Fike & Lucio, 2012). In spite of use of Smartphone as clickers having the ability to address these problems, no research has been done to explore the use of the Smartphone as clickers. The main purpose of this project is to provide a preliminary assessment on the use of smartphones as clickers with hearing impaired students.

Several studies have been done that cover the application of clickers in the educational setting. Some of these studies (Beatty, 2004; Caldwell, 2007; Draper & Brown, 2004; MacGeorge et al., 2007) highlight the benefits of clickers such as helping students engage with classrooms during learning, enhancing students' overall communication and helping teachers to create student-centred classrooms.

In a review conducted by Fies and Marshall (2006) in which 24 publications were used, these two researchers found out the use of clickers to improve student attendance, and participation perceptions of class interactivity frequently appeared in the publications. For the later benefit, the students felt they interacted and engaged more with the class and learning was enjoyable. Fisher (2014) argues that clickers help teachers to be aware of how well students understand certain concepts and this improves student understanding of instruction.

In a study conducted by Caldwell (2007) in which Caldwell focused on the application of clickers in large enrollment classes, this author found out that clickers

improved classroom interactivity, helped teachers know the level of preparation of students and find out how students understood the concepts.

Overly, clickers help students with hearing disabilities to understand instruction and improve their response, participation, and engagement with the class which ultimately improves their academic performance.

METHOD

Overview of use of Smartphones as clickers

Smartphones can be a powerful response system for students with hearing disability. They are flexible, easy to use and allow teachers to attach student names to electronic questions even for large classes (more than 30 students) (Keengwe, 2015). Figure 1 illustrates the use of the Smartphone as clickers where a teacher poses a multiple-choice question. To achieve this, a teacher may ask the question by mouth or write it on the board. Students are given answers which may range from A to E once a teacher taps "Multiple Choice." When a student selects an answer, this displays a bar graph in the teacher's Smartphone, and the student's Smartphone goes back into the waiting mode.

Figure 1: Use of smartphone as clickers for multiple questions

Source: suefrantz.com

Research population

The research involved 25 deaf students and two teachers of a technical college level. The reason for including teachers in this project was to collect data about their view of use of smartphones clickers in classes. To assess the extent to which the clickers had an impact on student learning, two types of tests were carried out; pre and post testing. The demographic statistics of the students are shown in Table 1.

Mean age	19.3
Minimum age	18
Maximum age	27
Median age	19
Students over 39 years of age	0
Number of Survey Respondents	25

Table 1: Demographic characteristics of respondents

Procedure and Method of collecting data:

The project used both a qualitative and quantitative approach of data collection. A quantitative approach involved using questionnaires to collect from the students. For the qualitative approach, data was collected from teachers using interviews. The researcher interviewed two teachers about the use of smartphones as clickers in classes of students with hearing problems. The questions asked to the teacher only focused five key areas; the speed, quality of integration, their comfort, views and challenges they experience when they use clickers in the classrooms. Teachers were asked to recommend any practices that may make use of clickers in classroom better. Majority of interview questions were adopted in line with some few changes from Fuller.

For the students, the researcher issued Smartphones to the deaf and the blind students during the spring semester of 2016. Students were guided to learn how Smartphones can

be used as clickers. With the provided Smartphones, students used these Smartphones to answer questions that their teachers asked. By giving respondents the Smartphones, this removed the financial burden for respondents to have Smartphones which in one way or the other could have affected their perceptions about the use of Smartphones as clickers. For the first week of class, every student was assigned a unique identification number. Students used their assigned identification numbers with their Smartphones throughout the semester. Every identification number was registered to the student in a computer-based database of every teacher. After every learning session, students returned the Smartphones, which they had used as clickers. At the end of the semester, they were given questionnaires to collect data about how they regarded the use of the smartphone as clickers.

Nine items were used in measuring the importance of clickers in educational learning. The responses relied on a 5-point Likert scale which 'strongly disagree" and 'strongly agree" were indicated by 1 and five respectively. 3 is a midpoint scale indicating a neutral response.

Methods of Analyzing Data:

The researcher used a quantitative approach of data analysis. Measures of dispersion such as the mean, median, mode and standard deviation were obtained to aid in determining the respondents' view of the use of clickers in classrooms. The analyzed data was represented in a Table form for easy comparison and interpretation.

RESULTS

	Item number	Scale Midpoint	Mean	Std	Criterion	Item number	Criterion mean	Criterion Std	Internal Reliability test Cronbach's α
1 I would like to see clickers used more widely in my class	1	3	4.45	0.89	Satisfaction (2 items)	1,2	4.30	0.82	
2 I enjoyed using the clickers	2	3	4.15	0.75					
3 Using the clicker improves my understanding of the instruction	3	3	3.90	0.85	Perceived increases in performance (2 items)	3,4	3.90	0.84	
4 Using clicker helped me do better in this class	4	3	3.90	0.85					
5 I was more likely to respond/participate/engage with the class because of the clickers	5	3	4.10	0.91	Effect of using smartphone as clickers on participation (1 item)	5	4.10	0.91	
6 Using the clickers helped highlight concepts/content areas I needed to study more	6	3	3.95	0.89	Feedback (1 item)	6	3.95	0.89	0.89
7 Learning to operate my smartphone as a clicker is easy for me	7	3	3.95	0.94	Ease of Use (3 items)	7,8 and 9	4.17	0.78	
8 I find it easy to get my smartphone to do what I want it to do when I use it as clicker	8	3	4.30	0.66					
9 It is easy for me to become skillful at using my smartphone as clicker next time I use again	9	3	4.25	0.72					
	1-9	3.00	4.11	0.84	Overall (9 items)	1-9	4.11	0.84	

Table 2: Data collection

	Item #	1	2	3	4	5	6	7	8	9
Subject (n=25)										
S1		5	5	4	4	5	5	5	4	5
S2		4	4	4	3	5	3	5	4	4
S3		3	4	3	4	3	4	3	4	3
S4		4	4	4	4	4	4	4	4	4
S5		5	5	5	5	5	4	5	5	5
S6		2	2	2	2	4	2	2	3	3
S7		4	5	4	5	4	5	4	5	4
S8		5	4	5	4	5	4	5	4	5
S9		5	5	4	5	3	4	3	4	5
S10		5	4	3	3	4	4	4	5	5
S11		3	4	5	4	3	3	5	5	4
S12		5	4	5	4	5	5	5	5	5
S13		5	4	4	5	4	5	4	4	4
S14		5	4	3	4	3	4	3	4	3
S15		5	4	3	3	4	4	4	3	4
S16		4	3	3	4	2	2	3	4	4
S17		5	5	4	3	5	4	3	5	4
S18		5	5	5	5	5	5	5	5	5
S19		5	4	4	4	4	4	4	5	4
S20		5	4	4	3	5	4	3	4	5
Internal Reliability test Cronbach's α	0.89									

Table 3: Rating of the nine items by each student

n	Do you have a smart phone	Do you have mobile data service	Do you have WiFi at home	Post-test score	Pre-test
1	1	1	1	Total Score (0-100)	%
2	1	0	1	100	100
3	1	0	1	63	40
4	1	1	1	100	100
5	1	1	1	63	40
6	1	0	1	75	60
7	1	0	1	100	100
8	1	1	0	65	55
9	1	1	1	100	100
10	1	0	1	100	100
11	1	0	1	63	40
12	1	1	1	100	100

n	Do you have a smart phone	Do you have mobile data service	Do you have WiFi at home	Post-test score	Pre-test
13	1	1	1	63	40
14	1	0	1	75	60
15	1	0	1	100	100
16	1	1	0	65	55
17	1	1	1	100	100
18	1	0	1	100	100
19	1	0	1	63	40
20	1	1	1	100	100
21	1	1	1	63	40
22	1	0	1	75	60
23	1	0	1	100	100
24	1	1	0	65	55
25	1	1	1	100	100

Table 4: Pre and Post-test score for the 25 students
Note: 1 indicates Yes while '0' indicates 'No.'

DISCUSSION

The results indicated that students wanted clickers to be used in classrooms were likely to participate in the class and agreed with the statement that "using the clickers improves my understanding of the instruction." The results demonstrate the benefits of clickers such as helping students improve their academic performance and engage/participate in the class (Wankel, 2013). These results were expected and were largely consistent with the research literature that was early covered. With respect to clickers, these results are encouraging. However, it is imperative to note that these good results are not only attributed to clickers, and the technology in context should be taken into consideration. For instance, Smartphones were used as clickers which students unanimously admitted that using Smartphones as clickers was easy.

With respect to the statement whether students wanted clickers to be used more in class, they agreed with this statement. Out of 20 students, 13 of them strongly agreed, 4

of them agreed, 2 were neutral and its only one student who disagreed with the statement (Table 3). This brought the mean to be 4.45 (Table 2). They also indicated to enjoy using clickers is classroom (mean 4.15). For the statements using the clickers improves my understanding of instruction and clickers helped me do better in class, they had the same mean (3.90). 3.90 is close to 4 indicating that they agreed with these statements. This can be explained using information processing theory, which places attention as the foundation of information. According to this theory, when learners pay attention to new information, this facilitates movement of information from the sensory register to the working memory with the aim of being stored permanently (Kaur, 2012). When clickers are used to answer questions and receive immediate feedback, this keeps the students' attention. Students also get an opportunity of discussing the logic used in determining correct answers ultimately improving their class performance (Ng & Cumming, 2015). For item 6 and item 7, the mean was 3.95 which indicate that students only agreed that using clickers they helped highlight concepts/content areas they needed to study more and learning to operate their smartphones as a clicker was easy for them. Of all the students, its only one student who was neutral and disagreed with all the nine items indicating that probably he/she didn't like clickers and believed that clickers may not assist him/her in education (see S6 in Table 3).

In terms of the possession of Smartphones, all the students agreed to have a Smartphone. 13 had mobile data service, and 22 agreed to have WiFi at their homes (Table 4). The post-test scores for all the students were higher than the pre-test scores. The mean for the pretest scores is 71.4 while that of the post-test scores is 79.92 and the difference indicates the effect of the intervention program. The higher

mean for post-test scores than pretest scores indicates that by introducing the technology where Smartphone are used as clickers, this enabled 100% of students to get smartphones, 52% of them to access mobile data service and 88% of them to access the Wi-Fi at home than before.

In line with the interviews, teachers indicated that there were no logistical issues at all. Logistical issues in this case include fear of losing clickers, remembering to carry clickers to class, problems of reading the screen, clickers get damaged easily and more time required to issue and collect clickers during the learning session. These results were expected owing that students carry their own smartphones instead of dedicated clickers. As pointed by one of the teachers, the possibility of students to experience any of the above logistical issues was extremely low when students used smartphones as clickers. Additionally, teachers were happy by the fact that using smartphones as clickers with free software application made it easy for them to use the clicker technology in classrooms. This removed the need for the school to buy the smartphones which is expensive.

CONCLUSION

In summary, this research focused on the benefits of using Smartphones as clickers in learning of students with hearing impairments. The findings demonstrated that students regarded clickers to be important in helping them to understand instruction, participate in the class and highlight concepts/content areas they needed to study more. Students also reported that learning how to operate Smartphones as clickers was easy for them. They also found it easy getting their Smartphones to do what they wanted them to do as clickers and it was easy for them to gain skills about how they can use the Smartphone as clickers when they use such phones for the second time.

Teachers indicated that there were no logistical issues at all related to use of clickers in class. They also indicated that using smartphones clickers with free software application was to be used in classrooms and removed the financial burden of the school having to purchase the smartphones.

Clickers have been regarded as a powerful tool that enhances student learning. Khosrowpour (2017) mentions that using clickers helps to make deaf students more engaged with the class than the traditional methods of teaching students with hearing disabilities. Incorporating clickers into a class make students enjoy learning and do better in class. Clickers provide a quick way of getting feedback from students and teachers about the learning process. By getting immediate feedback, this enables students to build the courage to relate their degree of understanding to that of their colleagues (Keough, 2012). With clickers making it difficult for teachers to engage with and communicate with students with hearing problems in classrooms, this calls for an alternative approach such as Smartphones. The advantage of Smartphones as clickers is that they are easy to use and can be easily made to do what users want them to do. However, to conclude that Smartphones can be a perfect solution to address challenges presented by clickers, further research is required in future work.

RECOMMENDATIONS OF FUTURE STUDIES

Using smartphones as clickers with free software application made it easy for teachers to use the clicker technology in classrooms eliminating the need for the school to buy needed equipment. As with any other technology, problems associated with use of smartphones as clickers can be frustrating and time consuming. Teachers would require more time preparing questions and setting up the technology in class. Results of this project indicate that

students consider using smartphones to be easy, but it still needs to be learned. There are benefits of using smartphones as clickers since this eliminates some of the problems brought by clickers. It is imperative to mention that the effectiveness of using clickers depends on how teachers make use of this technology, for instance, by using smartphones. Studies about use of clickers have been done, though there is little work about the use of smartphones as clickers. Therefore, this project recommends future studies to focus on use of smartphones as clickers. Future studies could also need to determine if using smartphones as clickers can enhance student learning than the traditional lecture method. This would be also a good future research with subjects like hearing impaired students.

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