# Analyzing instant messaging environment as a learning-teaching tool

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**Abstract:** Instant messaging environments (like Whatsapp, Telegram and Chat activity in OLPC) are popular among children. Simple rule-based games are often played and enjoyed in these environments. Considering these engaging aspects, we built a similar learning environment in our study, to make arithmetic learning fun. This paper shows results of two cycles of ongoing design-based research, using simple rule-based educational games built in instant messaging environment. Fifteen tribal school students (from 3rd and 4th grade) participated in the first cycle, and 21 urban school students (4th grade) participated in the second cycle. At the end of the second cycle, we found that children enjoyed playing games and their arithmetic skills improved significantly ($p = 0.0068$). This paper also discusses the challenges faced by the researcher during the study, and the strategies designed to tackle these challenges.

**Keywords:** Analyzing; Messaging; Learning-teaching tool

## 1. Introduction

Games are often used as an educational tool, because they make the learning process a fun activity (Kirriemuir & McFarlane, 2004). Yet games go farther than that, it has been reported that educational games affect four motivational components: attention, relevance, confidence, and satisfaction (Klein & Freitag, 1991). Positive effects of games on motivation are gender neutral (Klein & Freitag, 1991). Games provide an interesting context for situating educational concepts. Learning in the context of solving complex problems not only helps the learner in retaining more information, the learner also tends to perform better at solving problems (Bransford, Sherwood, Hasselbring, Kinzer, & Williams, 1990). Advent of computers in classroom has created new possibilities, such as multi-user educational games, and effective communication between students and teachers.

In traditional classroom there are limitations to inter-student and student-teacher communication. If all of them speak together it creates chaos. But this problem can be solved with networked computers. Student can communicate effectively with each other and the teacher, using text-based messaging environments.

We observed that chatting environments (like Whatsapp, Telelgram, and Chat activity in One-Laptop-Per-Child (OLPC[1])) are very popular among students. Hence, we created an arithmetic learning game, based on the chat environment. In the following section, we describe in brief a study, where we tested this.

## *1.1. DBR cycle-0 (Pilot)*

The pilot study was conducted with 15 students from 3rd and 4th grade (age group 8-12 years), who belonged to a primary school in a tribal village in India. The students played Chat game on XO[2] laptops given by the OLPC Foundation for an intervention period of six months.

Semi-structured personal interviews were conducted to check the understanding of students both before and after the intervention. Data analysis showed that after intervention, along with improvement in arithmetic skill's, students designed different strategies to solve the addition and subtraction problems with more accuracy and speed. They also learned to use multiplication as a special case of addition, and enjoyed the number games in chat environment (Shaikh, Nagarjuna, & Chandrasekharan, 2013).

The chat game used in our pilot study had some limitations, for example, there were no features for evaluation of performance in the game, and no record of game transaction was maintained. To overcome these limitations, we decided to convert the chat application into a full-fledged number game by adding some features. In this paper, we report the process of development and testing of this chat-based number game, ChatStudio.

## *1.2. DBR cycle-1*

### ***Context and participants***

This study was conducted in a suburban school in Mumbai. It is a semi-government school, where the medium of instruction is vernacular (Marathi). A single teacher teaches all the subjects to this grade. The researcher acted as a part-time teacher during the course of the study. 21 students from grade 4 (age group 9-11 years) participated in the study. The group consisted of 15 boys and 6 girls.

### ***Study design***

We followed design-based research (DBR) methodology for our research project. We chose DBR because it provides the flexibility of changing application design during the course of the study, it is especially important in studies where one is exploring possibilities for creating novel learning and teaching environments (Sutherland, 2004; Barab & Squire, 2004; The Design-Based Research Collective, 2003).

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1 "One Laptop per Child." 2009. 7 Apr. 2016 <http://one.laptop.org/>

2 "XO laptop - One Laptop per Child." 2007. 7 Apr. 2016 <http://laptop.org/laptop/>

Fig. 1 depicts the study design we followed. Our initial design was based on the insights from DBR cycle-0 (pilot study), which we improved over the course of the study through repeated cycles of trials in the classroom and development in the lab. Fig. 2 shows an example of a number game. There were around 40 classroom sessions (each session = 45 minutes) where students played the number games.

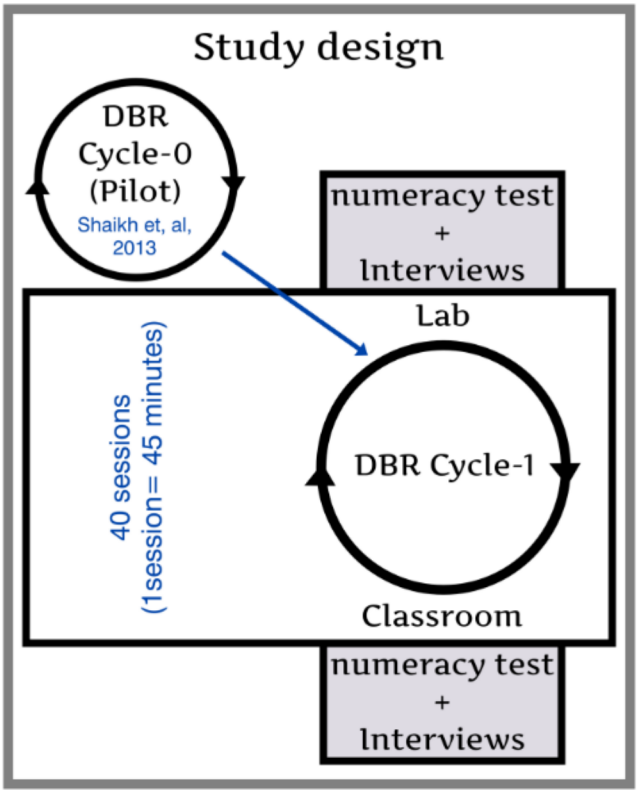


**Fig. 1.** Study design

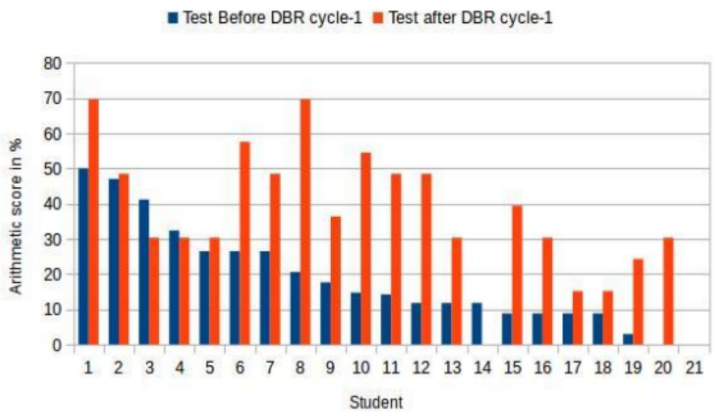


**Fig. 3.** Results from DBR cycle-1

### *1.3. Results from DBR cycle-1*

During DBR cycle-1, we collected process data including computer logs, audio recordings of each session, audio recordings of interviews, and field notes. We also collected test scores of students on arithmetic proficiency tests, at the beginning and the end of DBR cycle-1. We are in the process of analyzing the process data and have very preliminary results to report at this point of time. Students' performance in two arithmetic proficiency tests showed that students' arithmetic skills have improved significantly (p= 0.0068). Fig. 3 shows results from DBR cycle-1.

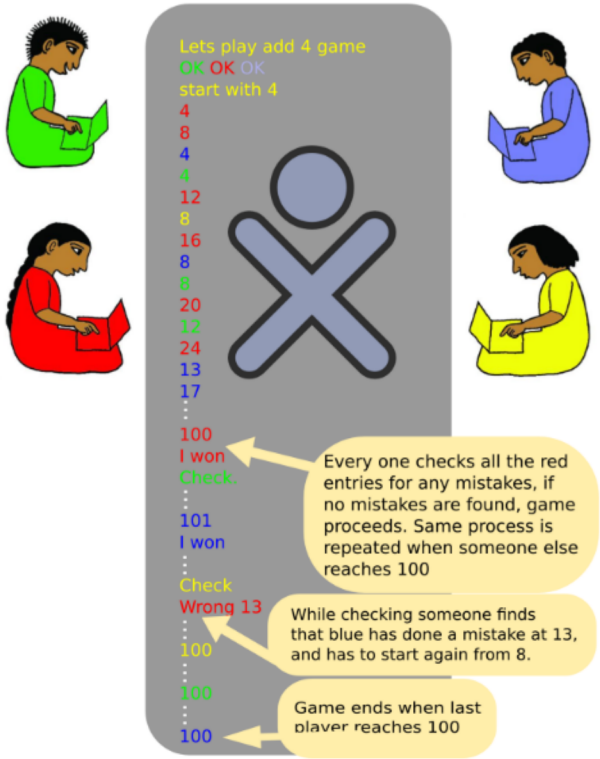


**Fig. 2.** An example of a number game (Shaikh et al., 2013).
(*All four students discuss and decide to play 'add 4' game. The game starts. Everyone starts adding 4 to the starting number (here zero) repeatedly. Red declares she won, as she reached first three digit number in the series. Everyone stops for a while and check if Red did any mistake. No mistake found. Game continues. Now Blue declares he won. Everyone checks if he made any mistakes, Red finds that Blue wrote 13 instead of 12. Blue has to go one step back and start addition from 8 again. Game continues, this cycle repeats till everyone reaches three digit number in that series*)

## 2. Challenges faced and strategies designed

In DBR cycle-0 we observed that the number game in Chat activity was very popular among students and it helped in their learning. Students played the game, and they enjoyed it. But there was no feature in the game to see their progress over time. We realized the importance of adding new features to the game, so that students and their

teacher could monitor the progress over time. With this aim, we started DBR cycle-1. The biggest challenge we faced during DBR cycle-1 was to make sure that while adding extra features to the game, we do not lose the enjoyment aspect of the game. According to our previous analysis, we realized that the fun was due to speed, visibility, and engagement (Shaikh, Nagarjuna, & Chandrasekharan, 2013). At the same time, the game was designed based on educational principles, and we aimed to make the game environment conducive for learning and to find proper indicators to assess the learning. Throughout the DBR cycle-1, we tried to balance these two aspects of fun and evaluation of learning in the game.

For example, we added a feature to the game to evaluate each student's performance in a game session. We observed that all the students didn't finish their game simultaneously, so if we used the evaluation button early, then some students would be left behind; and if we waited till everyone finished, then other students would get bored. To tackle this problem, we decided to have many evaluation cycles instead of one. Thus, to keep the students engaged, especially the ones who finished early, we added one more rule to the game, that they can check others' answers on their computer screen, and they earn points if they identify the mistakes made by other students. It solved the problem of faster students getting bored because they had nothing to do, and slower students got more time to finish their game.

Another feature let student choose roles: either participant or mentor. Initially, we wanted the possibility of any student becoming a mentor at any point in the game. But in the field trials, we observed that there were too many issues with this mode; students got confused, and the application was not able to handle more than one mentor. To address this issue, we decided to have two different versions of the application, one for the mentor and another for the participant. It solved the problem but we ended up losing the fun element. Now any student couldn't just go and choose to be a mentor; instead s/he had to request the mentor to play a game which s/he wanted. And most of the time the teacher was the mentor.

Guidelines by Kirriemuir and McFarlane (2004), based on their review work, helped us immensely. We used them as a framework to evaluate every change/addition in our game. The guidelines are as follows:

1. A task that player can complete
2. Focusing on the task
3. A task with clear goals
4. Immediate feedback
5. Deep but effortless involvement
6. Exercising a sense of control over ones action

As school students and the teacher were participants in our study and we used to go to school to test our application, we faced lots of problems. School had a life of its own. Many programs were going on simultaneously. We would add some feature to the game, and wanted to test it with the students. But students would be busy, or not in a mood to participate in our activities when they were tired, sad, or excited due to another preceding activity. Due to these issues, the testing got delayed, it further delayed the application development, and as a result we ended up extending our study. We could not work out a way around these problems.

## 3. Conclusion

In this paper, we have reported various aspects (design, implementation, results, challenges faced and strategies designed to tackle these) of an ongoing design-based research project. Our results from both the cycles show that instant messaging environment has the potential of becoming a fun-filled learning-teaching tool. Detailed analysis of data collected during the study (computer logs, audio recordings, interviews, and field notes) is in progress. At the end of analysis, we expect to find out what actually happens in ChatStudio, and what features of the design helped in learning.

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