

DIGITAL GAMING: A DATA COLLECTION TOOL FOR RESEARCHING DYSCALCULIA.

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Abstract:

Dyscalculia is a type of learning disability in which students have difficulty in understanding and applying arithmetical concepts and skills. They fail to recall the operations to be performed on observing mathematical symbols. ICT has proved to be a valuable tool to help these students, but further research is required in this area. A study on 141 students between the ages of 16-22 revealed that they spend time on playing digital games every day and about 66% of them are interested in learning mathematics through gaming. This paper attempts to find if and how games can be used to collect data in order to facilitate learning for students with dyscalculia.

Keywords: Dyscalculia, ICT, Data Collection, Digital Gaming.

INTRODUCTION:

Learning disabilities are neurological disorders that make it difficult for individuals to acquire certain academic and social skills. The Department for Education, UK, defines dyscalculia as ‘A condition that affects the ability to acquire arithmetical skills. Dyscalculia learners may have difficulty in understanding simple number concepts, lack an intuitive grasp of numbers, and have problems learning number facts and procedures. Even if they produce a correct answer or use a correct method, they may do so mechanically and without confidence.’

A situation analysis for primary schools in Kenya showed that ICT can be used for assisting Dyscalculia students (Waiganjo and Sarah, 2013). Much interactive software is available in the market which can help such students. But most of the software is expensive and not available easily in India. Hence more research is required in this area in order to develop software catering to the Indian education system.

Of late there have been various studies to suggest that video games and other types of digital games may play a big role in education. A study was done on how mode of play in an educational mathematics video game impacts learning, performance and motivation (Plass, O’Keefe, et.al, 2013). The study supports a social context design pattern that emphasizes competitive modes of play over collaborative and individual play for games aimed at developing arithmetic skill fluency.

Hence this study attempts to find if gaming can be used to collect information about dyscalculia students and if yes, how this data can be collected through games.

EARLIER STUDY:

An earlier study on dyscalculia students by the author had revealed that these students face difficulties with counting and calculations, such as determining the larger among two numbers, interpreting mathematical symbols, or realising whether they have come to the solution or not. Approximately 4% to 6% of the population suffers from Dyscalculia; however in majority of cases it goes undetected. Screening software is available in hospitals which can be used to detect the learning disability, but not every parent (whose child is slow in

arithmetic) goes in for testing. Most parents assume that their ward is just dumb or plain lazy. Hence it is possible that the student never realises that he has the disability but he is able to finish his education by just passing in the subject or choosing subjects where arithmetic skills are not required.

DIGITAL GAMES:

In this digital era, almost every child plays digital games. They can be video games, online games, multiplayer games, or downloadable ones on mobile phones. A study on 141 students between the ages of 16-22 revealed that they spend time on playing digital games every day and around 43% prefer playing multi player games to individual games. 61% of the students said that they would be interested in playing a game if they knew that it would enhance their math skills. 66% replied that they are interested in learning mathematics through gaming.

Hence, it is suggested if a student manages to pass high school in spite of having dyscalculia, he can still be assisted in pursuing higher education of his choice involving mathematical subjects by making use of digital games. Dr. Mark Griffiths from Nottingham Trent University has stated that video games show considerable success when they are designed to address a specific problem. (Griffiths, 2002)

SUGGESTED APPROACH:

First of all, the digital and video games should be created in English as well as regional languages. Secondly, we want to collect information about what kind of difficulty the student is facing exactly. For example if the student has difficulty in interpreting symbols, i.e. he “sees” ‘ Σ ’, but fails to interpret it as the sum of numbers. So the game can involve keeping score using the sigma symbol. Or a game can be designed where the player has to collect objects worth different amounts and the symbol shows the amount he has collected in total. If the student who is playing the game finds difficulty in looking at his score, we can assume that he is failing to make a connection between the symbol and the operation.

As a second example, some students have difficulty in judging whether they have completed the problem and arrived at a solution or not. Here games can be designed where the student has to reach a specific target. If he still plays the game after achieving the target, we can find out about his problem area.

For instance, a website ‘coolmath4kids.com’ has games for all children to help learn mathematics. One of the games is called ‘Alien Addition’ wherein the child hits at spaceships with the correct total. Here the ‘+’ symbol is used in the game. Another game called ‘Meteor multiplication’ is on the same lines with ‘x’ sign. A child can be made to play both games one after the other. If, after playing addition game with a good score he makes mistakes with the multiplication game, we can deduce that he is having difficulty understanding the symbol. But here we first have to make sure that the child knows multiplication tables and can recite them orally.

‘Grand Slam Math’ is a game on ‘mathplayground.com’ which asks mathematical operator problems as a word problem. After the child has played alien addition successfully, he can be asked to play grand slam math. If the child faces difficulty in playing, we can conclude that the child is not able to grasp the concept of addition and correlate it with the ‘+’ symbol. Here it will be necessary to first check that the child otherwise understands paragraphs.

‘Compare fractions’ is another game on the same website wherein the student is comparing between two fractions using ‘<’, ‘>’, ‘=’ operators. The child should be monitored and asked to say the cross products aloud. After correctly answering the product value, if he still makes an error in choosing the correct symbol, it is clear that the child is struggling with symbols.

These available games can thus be used pinpoint the difficulties these students face. Then the students can be made to play these games in class in groups, thus encouraging the social but competitive aspect and data can be collected about their specific problems. Once the problems are identified, further efforts can be taken to develop games and software which can help them in overcoming their problem. For example, in the ‘Meteor Multiplication’ game, an audio can be added which explains to the child that the numbers have to be multiplied by giving an oral example at the beginning of the game.

Also, many of these games are only for kids. It is seen that students with dyscalculia somehow manage to clear their school exams by taking lower math levels. In junior college they sometimes have an option to choose non-math subjects, but later in Degree College generally math is one of the mandatory subjects. These students then face difficulties in clearing the subject. Not enough software and games are available for dealing with higher level math. For example, there are some games to guess 'Correlation' using scatter plots, but not on actually how to calculate the correlation.

CONCLUSION:

An earlier study found the type of difficulties a dyscalculia student faces while performing arithmetical operations. This study reveals that students spend time on playing digital games every day and are interested in playing math related multiplayer games. Hence students can be encouraged to play these games in school and the instructor can monitor them to reveals the type of difficulty the student is facing. Hence data can be collected for individual student for his specific difficulty. This will then help in assisting the child to overcome it. Thus gaming can be used as a data collection tool to pinpoint the type of difficulty the child is facing.

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