OUTCOME OF USING THE SUPER MARIO EFFECT IN E-LEARNING

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ABSTRACT

In Today's Uncertain World, Online Modes of Teaching and E-Learning have become the new normal after situations such as the Global Pandemic and such. Most Students Prefer to learn new concepts with the help of the internet since it provides a better insight into the concept they are trying to learn compared to the traditional classroom. Although self-discipline is very much essential for a proper session of distraction-free learning, this method of learning has proven itself very useful to a lot of students as well as teachers. However, the major drawback of this method is that when learning concepts on the internet it is very much essential to keep a track of your understanding. Although E-learning sites provide questions in between modules to check your ability they are often not taken into much consideration. So to overcome this problem we can utilize a method called the "Super Mario Effect". Super Mario is a game where a player progressively learns about the game's various traps and power-ups, and each time the player has lost their(in the game) life and restarted the level he plays through the level with a new level of understanding. This cycle of failure and learning makes it easier for a new player to understand the game much more quickly. The same method can be implemented in our online mode of learning as well, Where the student cannot pass through a module unless and until they have cleared the corresponding test, And, if at any point the student fails to get a passing mark in a test module then the whole lesson would restart to make sure the student gets hold of the proper answers to the questions. This way of learning can improve not only the understanding capacity of the students but also it can help full in training their capacity to retain the information learned to a much better extent.

Keywords: *Super Mario Effect, E-Learning, Tests, Online Assessment.*

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I. Introduction

The Legacy of the traditional education system has been held up strong for a long time. But in recent times after the global pandemic, the approach toward education has changed. Students using applications like "Zoom" and "Google Meet" to attend classes and sites like "Youtube", "Byjus", "Vedantu" and "Khan Academy" have made it easy for students to learn even during prolonged quarantine. The World has realized how students can be educated properly even when they stay at home. With this new era of learning, there are certainly a lot of shortcomings and drawbacks such as "lack of interest", "Procrastination" and "Excessive Screen-time" but the Advantages are also plenty when compared to the traditional method of learning. A Student can have a more"Convenient", "Flexible", "Affordable" and"Customised" learning experience.

Due to the advent of online classes, the process of teaching has also drastically changed itself to adapt to new ways of teaching. Teachers have started to make recorded videos to teach their students with the help of tools like pen tablets and whiteboards. Most of the online lessons taken by students were recorded sessions during the start of the pandemic and even after the pandemic, the number of students learning with the help of recorded videos and practice questions has only increased drastically.

So to make the method of learning through recorded videos this paper compares how the application of the "Super Mario Effect" while learning through recorded videos. "Super Mario Effect" is a psychological trick to help achieve success by exploiting the power of repetition. The concept is that if you fail X number of times then you have crossed X steps in the process to success.

II. Super Mario Effect

Super Mario is a platformer game developed and published by Nintendo in 1983. The Objective of the game was for the player to traverse the main character "Mario" through a series of platforms and obstacles to reach the end of each level. The special part of this game was that it was hard for players to traverse the main character through the maze of platforms and enemies to the end of the level to reach the flag that triggered the end of the level. The game was made even tough to beat since each time the player made a mistake and lost a life the game would reset itself to the start of the level. Despite the fact that this made the game annoying,players somehow wanted to reach the end of the level after the amount of effort they have put so far into reaching the goal. Since the player learned a new fact about the level each time they were killed by an enemy or fell to their

death into a trapdoor, They, had one more arrow in their quiver to complete the level. The sense of accomplishment a player earns at the end of the level keeps them wanting more. The fact that we can learn from this game is that when triggered properly we can use our frustration and sense of failure to trick our brain to do more complex and complicated tasks with ease. The repetitive cycle of failure,learning, and applying the knowledge gained from previous failures to tackle problems helps the brain get a good grasp of any concept.

Drawing parallels to the game, the student represents Mario. Just like how Mario is inexperienced in the game, the student also might have less knowledge of the concept they are going to learn. The concept resembles the game where we have many hurdles and levels to cross to reach the goal.

Every level in the game is represented by a segment of the concept where the student watches the video and answers the questions. Here we divided the topic into smaller segments so that every student gets deeper knowledge of the segments. It also makes sure that the student is not pressured into learning heavy concepts vaguely. Clearing the smaller segments will keep the student motivated to complete the other levels as well as give them confidence that they can master the concept. The questions could represent both the trap doors as well as the power-ups present in the game. If the student answers the questions correctly, they easily pass to the next level. But, if they fail to get the correct answer, the assessment goes back to the first page, and hence, the student ends upgoing back to the first segment. This happens so that the student can see where they have made the mistake and if necessary, learn the concept again and answer the questions. In the game, as Mario keeps clearing the levels, he becomes stronger and the player becomes aware of the locations of coins and power-ups. Similarly, as the student completes every segment in the concept, he becomes stronger in the topic. Though there may be failures, it is an opportunity for the student to rectify their mistakes and re-learn the concept in a better way. The final goal in the game is to rescue princess peach from king Koopa aka browser (the villain). In our scenario, princess peach is our strength in the concept which is determined by our scores on the overall test. Here, the test for the entire concept resembles Browser. After learning the concept using the super Mario effect, the scores on the test are highly likely to improve and the student will be relatively stronger in the concept just like how Mario reaches his goal, the student also can strengthen themselves in the concept that they have been lagging in

III. Using Super Mario Effect For Learning

A. Preparation of the material

First, the lesson to be learned has to be split into smaller sections that seem comfortable to learn at a time. Then each section is to be allocated a set of practice questions. This is the preparation that is required to implement and use the "Super Mario Effect" for learning a new concept.

B. Learning using the "Super Mario Effect"

- To start the student has to learn the first segment and answer its corresponding questions.
- Then the student has to check for errors in the questions answered by them.
- In case the student gets an answer wrong then the student must start all over from the first segments.
- If the student gets the right answers to all the given questions, then the student can continue to the next section.
- In any circumstance, if the student fails to answer a given question, then the student has to start all over again from the first segment.
- The following are the basic steps to use the "Super Mario Effect"for learning.
- Even if the student feels frustrated due to the large amount of repetitive work, the progress made so far by him/her will help them stay motivated long enough to finish the lesson.

IV. Method

The method used to implement the "Super Mario Effect" for use in online learning involves the use of "Google Forms"and Videos from "YouTube".

Step 1:

Topics to be taught or learned are decided and video material is collected for the same. We decided to use the topics "Basics of Scheduling" and "Processes and Threads" from "Operating Systems" to be used as the material. We Searched the internet to compare pre-recorded videos to use for the Experiment. After much comparison, we ended up choosing videos from a youtube channel called "Neso Academy". The reason for choosing this channel was that they had easily understandable videos that used simple English to convey the information properly. The reason for choosing these two topics was that they both had a similar level of complexity. This helped us maintain a fair ground for comparison of the conventional method and the one that involves the use of the "Super Mario Effect".

Step 2:

We went through the entire set of recorded material and filtered the essential videos from the practice problems. Then each of the chosen segments was analyzed and five questions were prepared from each segment. Each segment had five different types of questions from different levels of difficulty. The questions were also prepared in a way such that each one required a different level of understanding to answer properly. The Questions were of a multiple-choice type to be easily integrated into "Google Forms".

Step 3:

The chosen questions and video segments were uploaded in the correct sequence to the google form. The "Section" function was used to separate the videos and questions. The sections were arranged in the order of "Video Segment" and "Corresponding Questions". To implement the looping part of the method we used the google form "Proceed to Section" feature to loop the flow of the form to the starting page if and when any question is answered wrong.

This makes it in a way such that only when a student gets all the questions correct, they will be able to complete the lesson. The most important step was to modify the function of the previous button in the google form as students can bypass the looping feature by using the previous button. The settings were changed to disable the function of the previous button.

Step 4:

The final changes were made to the setting of the google form to accept only one response from a student. This helped us a lot at the end when the data was analyzed as it did not require the filtering of data at the time of analysis. The settings to generate an excel spreadsheet using the response to the questions were also turned on to collect the data and import it into "Juypter Note Book" later for analysis. Additionally, the mail id of each student was collected to make a correlation of the data much easier while it is being analyzed.

Step 5:

This last step involved the use of the "Shorten URL" function to shorten the link of the google form for easier circulation. The form was also finalized and a time limit was set. The choices of the form's questions were also set to shuffle to prevent the student from copying from friends.

With this last step the form was finalized and the URL to access the form was shared with the students who participated in this experiment.

Step 6:

Once the Link to the two forms (Form 1 without the use of the "Super Mario Effect" and Form 2 with the use of the "Super Mario Effect") where shared, we started monitoring the analytics tab to watch over the responses of the students and to have a check over any unusual change in responses. After the time limit of the links expired, the data was converted to two separate excel sheets and was uploaded to “Juypter Note Book” for further analysis.

Analysis of Data Collected

The data that was collected in the Spread Sheet was cleaned and uploaded into JuypterNoteBook for further analysis.

A combination of Pandas and Matplotlib packages where used to analyze the data.

- First the Data from both the normal test on the Basics of scheduling and the test conducted after using the "Super Mario Effect"to teach the concepts of Processes and threads.
- From now on let us refer to the first data set as Before Effect and the second data set as after effect.
- Here is the Summary of Both the data sets of marks scored before and after using the super Mario effect

  Before Effect:

	Email	Total_Score
0	aishwariyaa@student.tce.edu	4
1	anugayathri@student.tce.edu	10
2	balasivam@student.tce.edu	10
3	balasundaram@student.tce.edu	6
4	dhaneshwar@student.tce.edu	6
5	duraisamy@student.tce.edu	6
6	fathimafirose@student.tce.edu	8
7	hariharinni@student.tce.edu	10
8	harshiniv@student.tce.edu	10
9	hirthick@student.tce.edu	8
10	hiruthik@student.tce.edu	6
11	jayalakshmir@student.tce.edu	2
12	jayshnee@student.tce.edu	6
13	kaveens@student.tce.edu	10
14	msaravanakumar1@student.tce.edu	8
15	narmadhar@student.tce.edu	10
16	pnandhini@student.tce.edu	6
17	sathyasai@student.tce.edu	6
18	sharanb@student.tce.edu	10
19	shyamsundarm@student.tce.edu	8
20	sivaguru@student.tce.edu	6
21	sujan@student.tce.edu	8
22	sweathasm@student.tce.edu	8
23	varshal@student.tce.edu	10
24	vinikshaa@student.tce.edu	10
25	vinothar@student.tce.edu	10

After Effect:

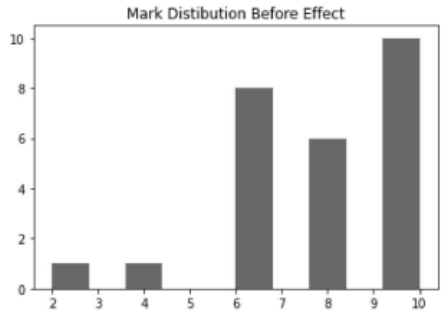
	Email	Total_Score
0	aishwariyaa@student.tce.edu	6
1	anugayathri@student.tce.edu	9
2	balasivam@student.tce.edu	8
3	balasundaram@student.tce.edu	9
4	dhaneshwar@student.tce.edu	9
5	duraisamy@student.tce.edu	7
6	fathimafirose@student.tce.edu	8
7	hariharinni@student.tce.edu	9
8	harshiniv@student.tce.edu	9
9	hirthick@student.tce.edu	8
10	hiruthik@student.tce.edu	7
11	jayalakshmir@student.tce.edu	8
12	jayshnee@student.tce.edu	8
13	kaveens@student.tce.edu	7
14	msaravanakumar1@student.tce.edu	8
15	narmadhar@student.tce.edu	9
16	pnandhini@student.tce.edu	6
17	sathyasai@student.tce.edu	9
18	sharanb@student.tce.edu	7
19	shyamsundarm@student.tce.edu	6
20	sivaguru@student.tce.edu	9
21	sujan@student.tce.edu	9
22	sweathasm@student.tce.edu	8
23	varshal@student.tce.edu	6
24	vinikshaa@student.tce.edu	6
25	vinothar@student.tce.edu	10

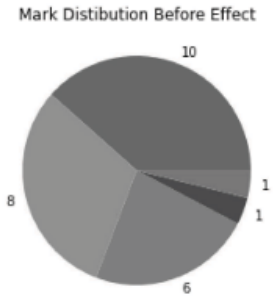
- The average of the total marks scored by the set of students who have participated in the collection of data is 77.69% Before using the effect and 78.84%. The Formula used for the calculation of the average is :

$$A = \frac{1}{n}\sum_{i=1}^{n} a_i$$

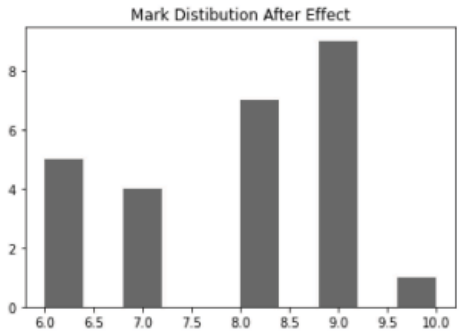
- Here is the graphical representation of both data sets

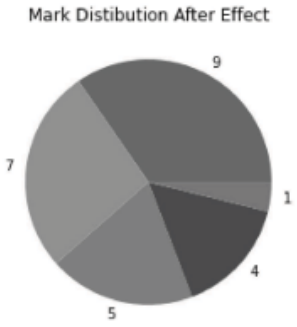
Before Effect:





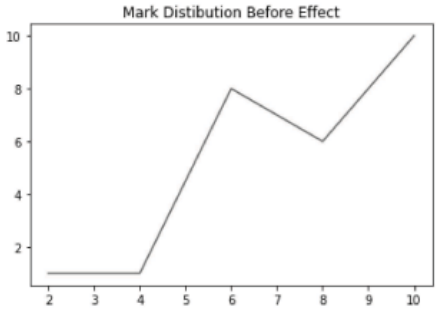
After Effect:



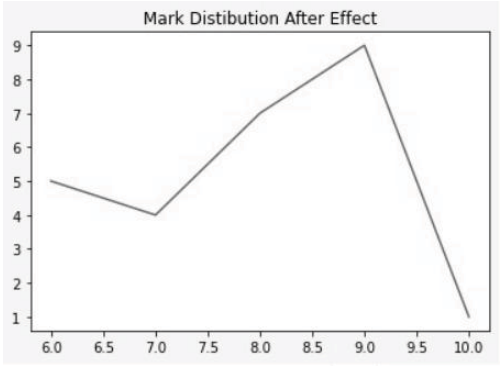


- Here is the general distribution of marks of the two data sets

Before Effect:



After Effect:



- The Difference in the Highest marks in both scenarios is non-existent. But the difference in the lowest marks of both scenarios is 40%. From this, we can have a conclusion that the use of the "Super Mario Effect" has greatly benefited the students who had a below-average score, to begin with, while they conventionally learned the topics by the use of only recorded videos.

VI. Results from Collected Data

- The usage of the "Super Mario Effect" to teach students the concepts showed an increase of 1.15% in the average marks of the students.
- **Outliers:** The Number of students below the score of 50% reduced drastically after implementing the “Super Mario Effect” to teach them.
- **Outliers:** The highest total also dropped from 100% to 90%.This indicates that this method is not suited for people who can have a good understanding of the topics even without the need for such methods.By following such methods they tend to drop their normal score by a significant amount.
- The overall number of students who got a decent score (above 60%) saw an increase in the count after using the effect.
- The number of students that participated in the experiment where 30 but only about 26 people made it to the end of the lesson in the given time.This indicates that this method takes longer for slow learners to use.
- Despite the number of students with better scores have increased as a result of the effect, the graphs clearly indicate that this learning methodology has not affected the students who already had a good score on the normal test.So this method is best suitable for use by students with average and below-average marks.
- The effect only had a slight negative impact on the students with good scores.So students with good scores are better off using their own method of learning to score better.
- The Effect has also proven itself in improving the students who needed just a little bit to perform and give above-average results.
- Though the increase in the average of the entire set of students is only 1.15% the number of students who have got better marks has increased.This can be seen clearly in the above-mentioned graphs and charts.
- The Number of Students who got the answer correct for the harder questions in the forms saw an increase after the use of the “Super Mario Effect”.

VII. Insights from Collected Data

- This method of learning has a proven effect on students who have a score that is average or below average.

- The use of the "Super Mario Effect" has made it easy for most slow learners to gain a better understanding of the given topic faster.
- The “Super Mario Effect” does not have any significant effect on the students who already have a good score.
- Despite being a little bit more time-consuming than other conventional methods of learning using recorded material, the use of the “Super Mario Effect” is definitely more helpful for a better and easier understanding of a given concept.
- The “Super Mario Effect” is in no way a substitute to live online classes or Physical Classes, it’s just a better method that can be used by students who use recorded sessions to learn concepts to get a better understanding of the concepts.
- The “Super Mario Effect” is best suited for students
  who have good self-discipline because, procrastination while using this method for learning will lead to a waste of time due to the flow of the learning method.

VIII. Conclusion

As we can clearly see from the results derived this method is definitely useful to bring a better understanding to students while using recorded videos to teach. Despite the method not being helpful for students with good grasping power, this method has proven to be very useful when teaching students with an average and below-average scores.

The major problems with the use of this method at this point are:

- All the material has to be prepared manually by the teacher and has to be manually uploaded to google forms. This process can be time-consuming and hectic if it has to be followed on a regular basis.
- The Video content for lessons might not always be available on youtube and might need to be created by the teacher in order to use it with this method of teaching, as a result, the process can become even more time-consuming to finish.
- The repetitive nature of the lesson when answered wrong can lead to students getting frustrated and quitting mid-lesson due to the lack of concentration. Thus, this can affect the learning of students with a low attention span or students with problems like ADHD.
- In places, with low internet bandwidth, it might not always be possible to view the videos repetitively due to the large amount of buffering

- Some topics might not be compatible with the flow of this method of learning. Example: Topics with lots of numerical problems that require working out
- (or) Topics that require descriptive answers to evaluate properly

The Solutions to some of the problems that can be created in the future to improve this method further:

- The creation of an automated system to scrape the web for questions and videos to get appropriate content can be useful when preparing the material. This solution can be created with the help of NLP(Natural Language Processing) and Web Data Extraction APIs.
- The construction of a custom framework to implement the teaching method can also benefit the teachers who create the content. The framework can be made in such a way that the videos required can be downloaded and played repeatedly without the requirement for an internet connection. The creation of such a framework also bypasses the need to rely on google forms for collecting, storing, viewing, and evaluating the necessary contents.
- Such a framework can be created by using a combination of front-end and back-end APIs. This system has to support the looping function between sections and also has to maintain a database of video segments and questions to work successfully.

Other future improvements to the method can be to add a loop counter and make the lesson stop after certain cycles to prevent the students from getting demotivated

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