

Khel

(gamifying education)

Gamification of Education

Rajya Shiksha Kendra,
Govt. of Madhya Pradesh

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Preface

This project gamification of education was organized by RSK (Rajya Shiksha Kendra), Govt of Madhya Pradesh and conducted by IDC, IIT Bombay. This project focuses on providing supplementary material for government schools of Madhya Pradesh. Prime objective of this project was to explore off-line as well as on-line/digital medium and design/gamify the course content which is being taught in the schools.

Studies suggest that reading, writing or arithmetic has not improved or gone down, at the same time rate of enrollment in private schools gone up as compared to government school in recent years. RSK realized the need of better study material which can improve the learning process and make it more engaging than mere textbooks.

Idea of this project is project to make learning more engaging and light hearted so that they can meet other challenges which these schools are facing over several years. It needs to be addressed that there are abundant material already available in this domain, but not reaching to the children of these school.

Acknowledgment

I would like to express my thanks of gratitude to Prof. Uday Athavankar as well as Rajya Shiksha Kendra who gave me the opportunity to do this wonderful project 'Gamification of Education', which also helped me in doing a lot of study and I came to know about so many new things for which I am really thankful to them. I got chance to meet several new people, and know new organizations those are working in same field for over decades. Presentation and interaction with these organization certainly brought a new dimension to look in to a subject and work on it.

Secondly i would like to Ms. Bhavana Nabar and Ms. Sharmila Bijoor, who has been a constant support throughout this project.

Lastly i would like to thank my group members Ms. Bobby Ekka and Ms. Nandhini E for being enthusiastic, co-operative and team players to finish this task in limited time frame.

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photo courtesy: Shubhangi Salinkar

Why Gamify?

Facts and figures

The Indian Express:
Government panel suggests measures to reduce weight of school bags (April 29, 2015 Mumbai)

The eight member committee has submitted five observations and 44 recommendations in its report. According to the report, over 58 per cent of students below 10 years of age have mild muscle pain while 75 per cent of those below 12 years of age were found to be falling ill and having fever from time to time due to heavy bags .

“Medical experts too have issued alerts about the toll it (heavy bags) takes on the health of students. Many committees were formed and reports were submitted at state and national levels on the issue. Experts considered options ranging from ‘no school bags for kids’ to restrictions of the weight of school bags to 10 per cent of the weight of the student. However, hardly any measures were implemented. I visited a few schools and even weighed the bags. We formed a panel to come up with a solution,” said Education Minister Vinod Tawde.

Kendriya Vidyalaya No. 3 Air Force - II Jamnagar
<http://www.kv3af2jamnagar.org/innerpage.php?pagename=cmp>

[13] To reduce the weight of bags for the children, Dr. C. K. Arya suggested preparing a well-planned subject wise, time table and instructing the students to follow the same accurately so as to prevent extra load of books. He advised to following practices which would help to reduce weight of bags.

Gamification in Education: What, How, Why Bother?
<http://www.academia.edu/570970/>

Motivation and engagement are major challenges for the American educational system (Bridgeland, Dilulio, & Morison, 2006). American schools also face a shockingly high dropout rate: approximately 1.2 million students fail to graduate from high school each year (All4Ed, 2010). Intuition suggests that gamification may be able to motivate students to learn better and to care more about school..



The Walk of Life - Game
Exhibition at Bhau Daji Lad Museum

Here at one place we are trying to improve the quality education and reduce the burden of studies from the students. At the same time there is a need to provide basic educational tools and study material to our many of the government schools of India. The project 'Gamification of Education' which was conducted by Rajya Shiksha Kendra, Govt. of Madhya Pradesh was looking to fulfill this very need of our government schools and address the limitations which our education system has in remote areas. Rajya Shiksha Kendra's delegates when visited IDC, they came with a purpose of providing effective study material for primary level education of the children in government schools of Madhya Pradesh.

As many of the theories suggests that children learn many of the things while playing amongst each other. They learn from each other, as every individual comes from different backgrounds and different family set-up. Learning a particular thing may vary from person to person, as small kids learn most of the things from their family and then from their friend circle.

because we love Games!

So, Idea was for conducting this workshop or project that if children pick things from each other quickly, then why not learning should be done in that manner. When learning will be fun, children will be interacting with each other. Course structure and course content provided in the text books fulfills the need of what they are suppose to learn at particular age so that can get higher education and at the end they might get a good job.

Many a times thing which goes missing is whether children are understanding the concept or idea of why they are being taught these many things in which many of them may not be interested. If they are studying something what it is it's core purpose, and when then don't find that reason of learning so many things they become afraid of that subject or content. Well everything may not be explained at that very little age, or even elders don't understand the reason they start moving away from the well structured course curriculum provided by the schools and education system.

Context provided by RSK

In Madhya Pradesh there are so many school where a school setup is not promising enough for providing proper school education. Here are few points which were needed to be taken into account:

- Lack of number of teachers in schools.
- Teachers of government has to perform other tacks to perform apart from merely teaching schools.
- Single teacher is supposed to teach different subjects to different classes.
- Schools don't have separate classes for different standards.
- Parents are not educated enough to teach their child at home.
- Children who come to these schools are mostly underprivileged society.
- Parents of the kids can not afford education of better schools as many of the come because of mid-day meal provided by the government.

Gamifying Education will first reduce the fear of text heavy books, where reading itself is an big enough task to perform. Children love games and if education get served to them in playful environment it will attract them and keep them involved for longer period of time.

When children are in primary classes they learn basics which remains with them for lifetime. Number and Number system, Alphabets, Words, forming sentences, grammar of language. At primary level of learning, redundancy plays a vital role in education. More they will be involved, the more they will absorb, and will improve their understanding as well as their skills.

So, why not Games?



What to Gamify?

In primary education suggested by Madhya Pradesh government, children are expected to get familiar with particular operators in particular standard as well they must be able to use these operators where solution or result of a problem may not go above numerical values suggested by the RSK.

Since these are operators and without operators mathematics can not exist. So it becomes important from starting to know and understand the working process of these operators. As children progress to higher standards they need to operators and how it helps in solving day to day problems.

Table suggests to what all the operator children gets familiar in their primary education as per their standard in which they study.
source: by RSK, Madhya Pradesh

Addition (+)
Subtraction (-)
Multiplication (x)
Division (÷)

Standard	Operators	Numerical Value
1st	$+$, $-$	1-19
2nd	$+$, $-$, $\times$	up to 99
3rd	$+$, $-$, $\times$, $\div$	up to 999
4th	$+$, $-$, $\times$, $\div$	up to 9999
5th	$+$, $-$, $\times$, $\div$	up to 9999999

Standard 1st

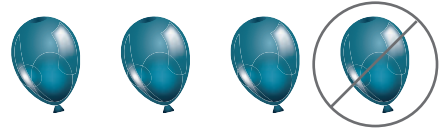
- Identifying numbers 1-20
- Writing numbers
- Tens and Units digit
- Addition by counting

जोड़ो

	2
	+ 3
	5

- Subtraction by counting

घटाओ

	
4 - 1 = 3	

- Numbers in ascending and descending order

Standard 2nd

- Identifying numbers up to 99
- Carrying over and borrowing system

①	द. ई.
39	3 13
4 3	
+ 26	- 16
65	27

- Mathematical problems with context for addition and subtraction
- Introduction to Multiplication



$$2 + 2 + 2 = 6$$

$$2 \times 3 = 6$$

Standard 3rd

- The Value of Numbers < >
- Three digit Addition and Subtraction where solution should be below 999

$\begin{array}{r} 367 \\ 245 \\ + 289 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ 367 \\ 245 \\ + 289 \\ \hline 1 \end{array}$
$\begin{array}{r} 2 \quad 2 \\ 367 \\ 245 \\ + 289 \\ \hline 01 \end{array}$	$\begin{array}{r} 2 \quad 2 \\ 367 \\ 245 \\ + 289 \\ \hline 901 \end{array}$

- Complexity of addition and subtraction by finding out missing numbers
- Tables till 10
- Multiplication with carry over

$\begin{array}{r} 13 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 13 \\ \times 5 \\ \hline 15 \end{array} \leftarrow (3 \times 5)$
$\begin{array}{r} 13 \\ \times 5 \\ \hline 15 \\ 50 \end{array} \leftarrow (10 \times 5)$	$\begin{array}{r} 13 \\ \times 5 \\ \hline 15 \\ + 50 \\ \hline 65 \end{array}$

- Introduction of division through subtraction
- Introduction to measurement, time and money

Standard 4th

- Four digit operations

$$\begin{array}{r} \text{ह. सै. द. ई.} \\ 2172 \\ + 1426 \\ \hline \end{array}$$

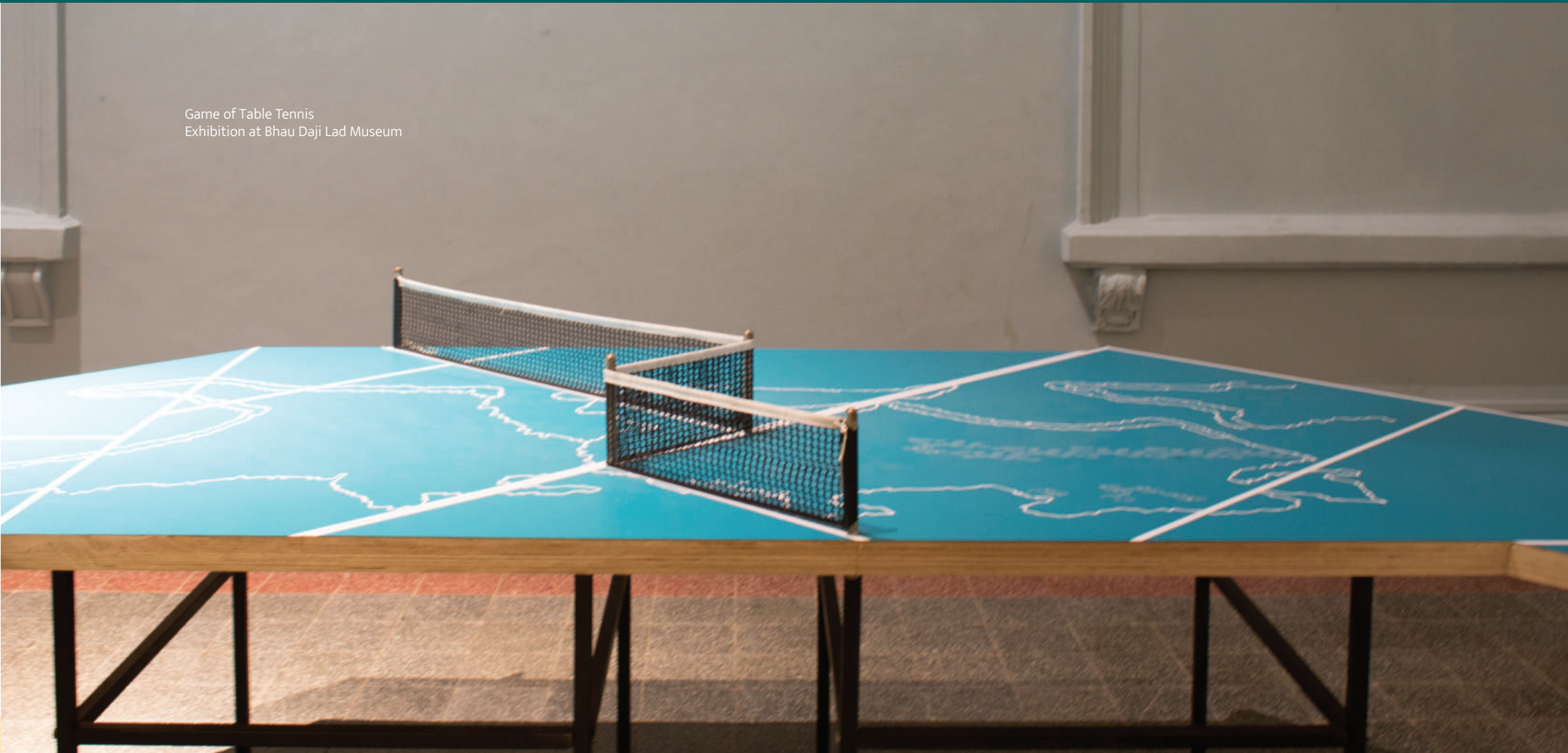
- Addition, Subtraction, Multiplication and Division where results should be below 9999
- Dual operation
i.e. Addition and then subtraction
Multiplication and then addition
Multiplication and then Subtraction
- Understanding the relationship between Division and Multiplication
- Complex division
- Context based operation

Standard 5th

- Multiple operations
- Context based with operation, with measurement, money, time, geometry, fraction, decimal, profit & loss, percentage

How to Gamify?

Game of Table Tennis
Exhibition at Bhau Daji Lad Museum





Visit to Hamleys

- Understanding Basic Shapes



- Identifying these from the surroundings



Project brief by Rajya Shiksha Kendra Team



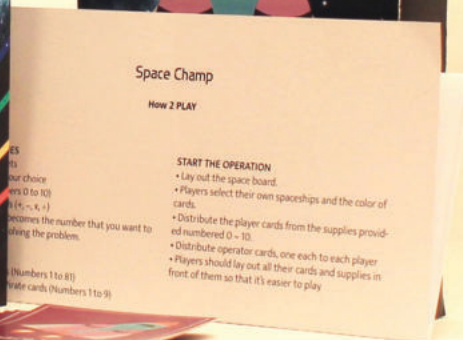
Frugal Games



Visit to AMAN DAY CARE centre



Board game designing and testing



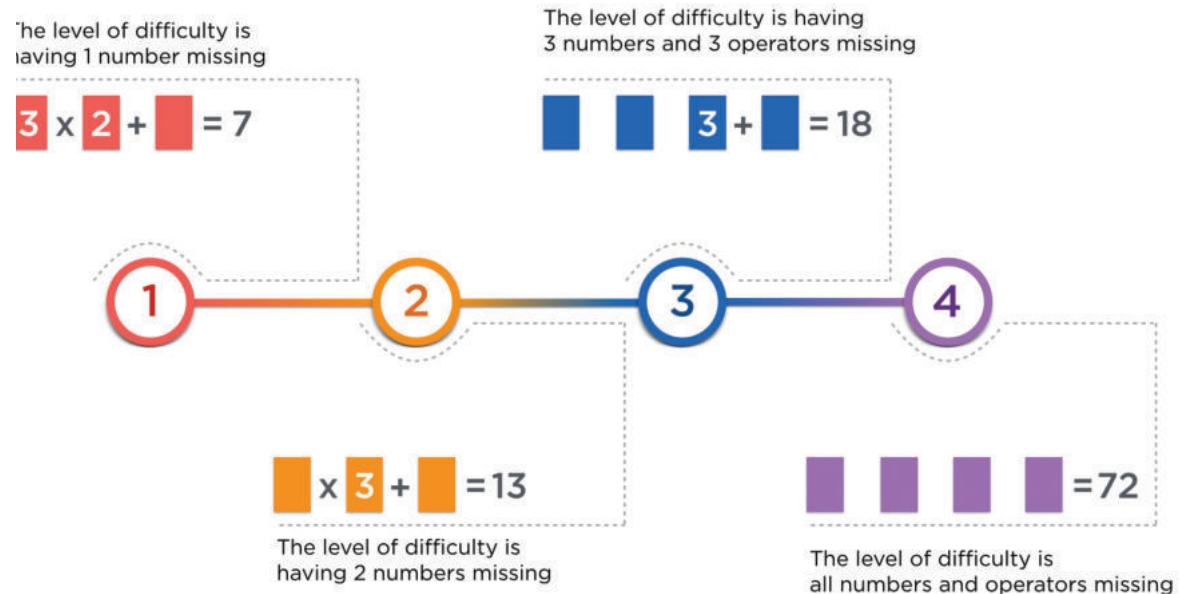
Its Gamified!

Space Champ an Introduction

Space Champ is 4 player board game combined with card game. It can be played between minimum of 2 players and maximum of 4 players. Game is designed for the players of age group 8 years and above.

The box of this board game contains

- 1 Game Board
- 4 Spaceship of your choice
- 11 cards x 4 colors (Numbers 0 to 10)
- 4 x 4 Operator cards (+, -, x, ÷)
- 4 Magic card
- 81 Meteor Cards (Numbers 1 to 81)
- Pirate cards (Numbers 1 to 9)



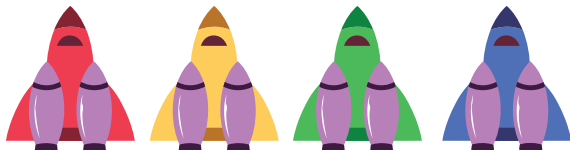
Game Play

The game starts with the take-off round. All the other players except the player whose turn is to play picks a card for him from the meteor cards. They time it for 30 seconds and the player needs to solve the equation using 2 operators or more within the given time.

After getting across the take-off round, all the players need to surrender their 0 and 10 cards.

The game is played turn wise henceforth. In case during the game there's confusion whether the other player solved the equation in time or not, the player has the choice to take up the challenge. While taking challenge he needs to solve another equation from the meteor card, which the other players chose. He/she needs to solve in 15 seconds. In case he loses, he moves a point back.

If anyone is attacked by any of the space attacks has to follow the rules given above during the play.



METEOR CARDS



From 1 - 81

PIRATE CARDS



From 1 - 9

OPERATOR CARDS



$+$ $-$ $\times$ $\div$

MAGIC CARDS



SPACE ATTACKS

Take off - Pick a card from meteor card deck. Each player has to form an equation in 30 seconds to take off their spaceships. If not, spaceship does not take off.

Lightning attack - If a player lands here, he/she picks up a meteor card and shouts out the number. All the players solve the equation individually. The one who gets the equation earliest, moves his/her spaceship one step ahead.

Shooting Star - Well, shooting star does attack you but in a good way. If a player lands here, he/she picks up a meteor card and has to solve the equation in 15 seconds. If solved within time, they get to move two steps ahead in one go.

Pirate attack - If a player is attacked by the pirates, he/she picks a card from the pirate cards and must form an equation using division operator. If failed he/she goes one step back.

Alien attack - When a player is attacked by the aliens, all the players need to solve the equation, but with the use of cards from their neighbor except operator cards. No one can use their own cards.

Black-hole - This is the last challenge on the game board. Challenge is to form an equation using all the four operator ($+$, $-$, $\times$, $\div$). If he/she is able to form an equation, he/she moves ahead and game ends for all.

PLAYING CARDS



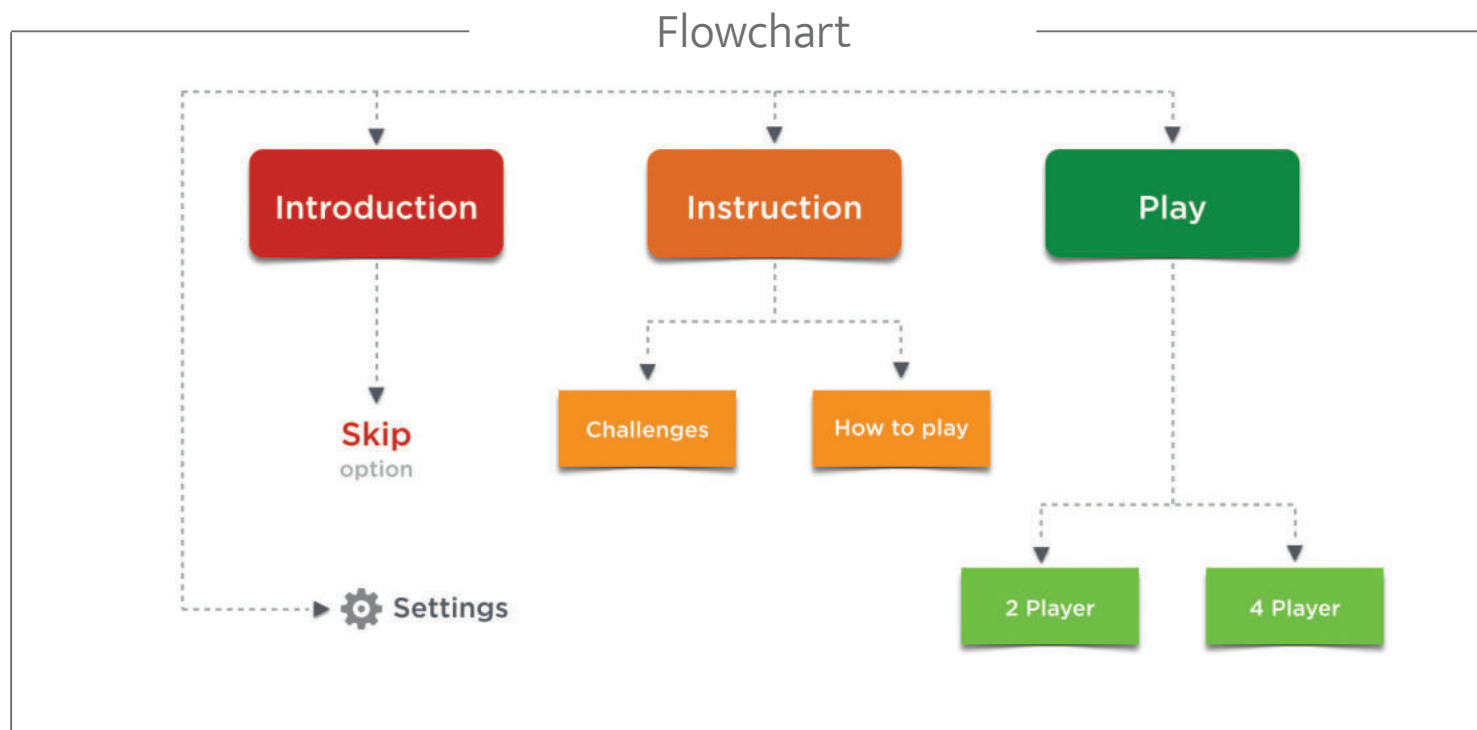
FROM 0 - 10

Skip >

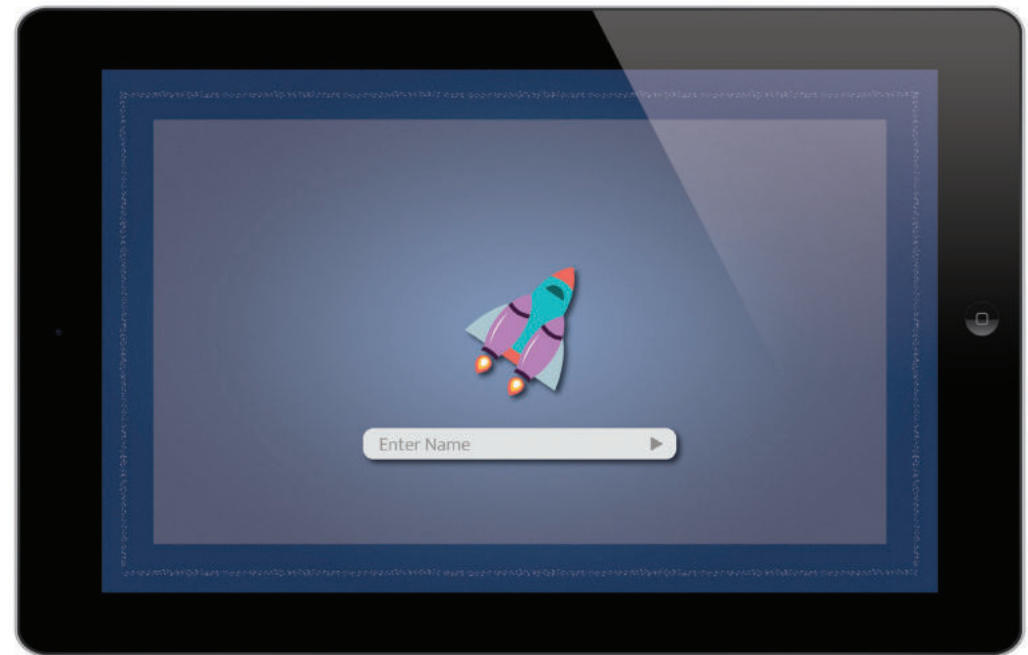
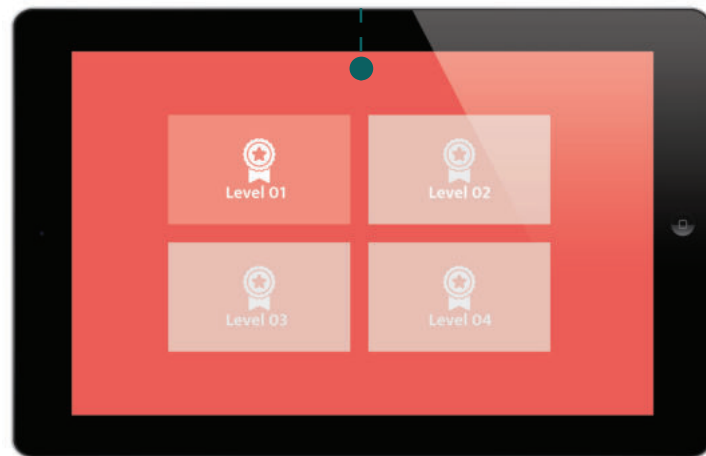
Space Champ

Welcome to the game of the lost. The adventure is the journey from nowhere in the big universe back to the earth. Quest will include uncertain dangers that lurks around in the galaxy. Once you enter this exciting journey back to earth you will have to face and tackle all the attacks, by defeating them with your skills and reflexes.

Lets go
Digital!









Lightning Bolt

Objective of this round is to solve as many equation possible in 30 seconds and collecting the lightning bolts for every right equation formed. Lightning bolts can be used to increase players time by 10 seconds, while it can be used to reduce the opponent time by 5 seconds.

Game-play

Lightning bolts can be dragged and placed in the center of the board to increase the time which will increase the player's time by 10 second. To decrease the opponents time duration it can be thrown towards the opponent.

Note: It can be collected only in this round and can't be used in this round.

Shooting Star

Shooting star is basically a bonus round.

Game-play

Game-play remains the same, except there will not be any time duration. In this round who so ever solves or forms the equations earliest gets to move 2 station ahead in the galaxy, while rest remains at the same spot.





Pirate Attack

In this round each player must use a division sign to solve the equation. Failing to solve the equation given time he/she suppose to move 2 station back in the galaxy.

Alien Attack

When there is an alien attack the cards of deck gets shuffled with each other. The challenge is solve or form the equation without using their own cards.





Black Hole

In the Black hole round will have only one set of number cards from 1 to 9, which will be juggling in the screen. Players has to compete against their opponent to collect the numbers from juggling bubbles and drag them to their side to form the equation.

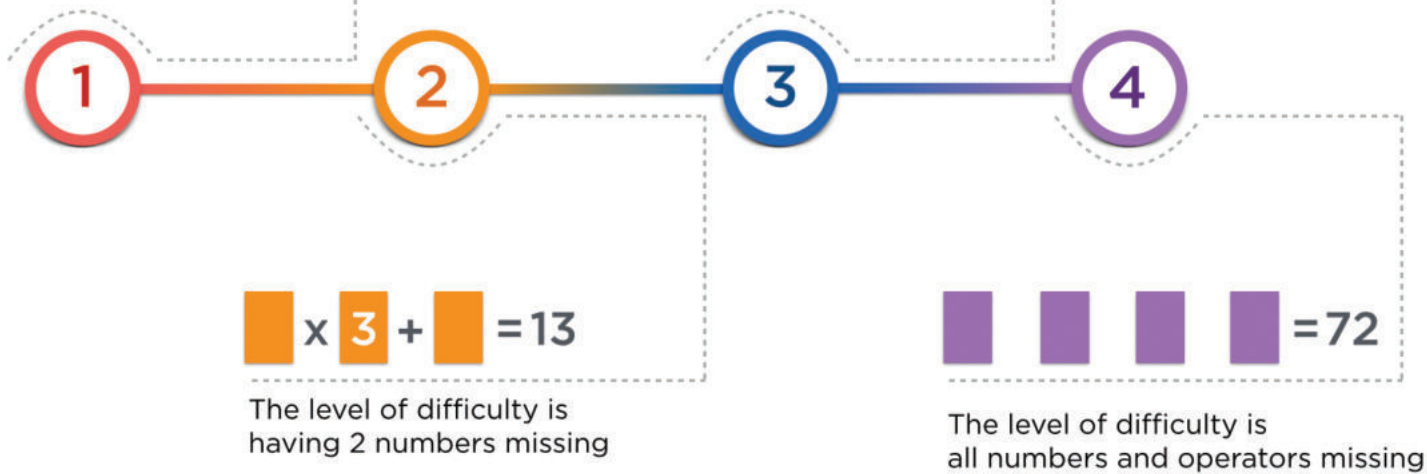
Levels

The level of difficulty is having 1 number missing

$$3 \times 2 + \square = 7$$

The level of difficulty is having 3 numbers and 3 operators missing

$$\square \square \square 3 + \square = 18$$



Conclusion

Collaborative working with children made huge difference in knowing children and understanding how and what do they think, like, engage and appreciate.

Concepts were constantly got refined and improved with continuous feedback.

Gamification can develop an interesting culture of learning and sharing of ideas.

Abundant material of the same domain is available in the market, which doesn't reaches to appropriate place.

Government and Non-government organizations are working on this direction for several years.