DESIGN OF GAME FOR BUILDING FUNDAMENTAL CALCULUS SKILLS IN MATH 3

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Abstract: *School game is nature way to help kids learning and practicing in Math, English, Scient…. In this paper, we will introduce on idea; story of game; how to design Sprites, objects for animation; how to code for players interacting and controlling objects. The contents of game also are set up base on the problems in the 3th grade math. Game is also published on the internet, so the educators, parents may use this game in the work of education.*

Keywords*: School game, education game, math game*

1. INTRODUCTION

In the modern society, with popularity of computer and internet, the kids became infatuated game. Game is great tools for relaxing, it always attracts kids. They can play game everywhere, every time event in the class. In the game, kids are taken apart of characters and experienced hardship missions. The kid's infatuation of game also has affected negatively their learning. In other hand, the kids always consider learning as forced missions that they must be finished in the supervision of teachers or parents. In this situation, school game is good solutions. It is not only a teaching media but also natural way to make motivation for learning [1,2,3, 4].

School games are designed for educational purposes, that provides a fun environment for kids to interact with learning missions. While playing game, the kids are required fundamental knowledges and flexible control skills to win. The learning missions are designed as mission of game, so the kids will do them as playing game. After game, the kid's knowledges are expended, understood more deeply… and their skills are practiced [5, 6]. In fact, it is fun way to learn math, English or science… and the kids are always interest and enjoy learning with games [7].

Nowadays, the new 3th grade curriculum of math requires kids to have more knowledges and skills of calculation for building creative competencies [8]. These knowledges are not very hard, but for practicing, the kids have to repeat them many times, so it bores kids. What is right method for this situation? The school game for math 3 is a solution. In this game, we focus on fundamental calculus skills as add, subtract, multiply or divide. For enhancing kid's potential of quick calculation, every mission is designed

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as combining of two calculations. The missions of game are chosen randomly from library, so player is not bored by game.

In the digitization of school, the school Games may contribute as a digital partner. This game is free on the internet [9], so the kids can play (learn) every time and everywhere. The educators or parents can encourage kids play these games as doing homework or competition between groups in the class.

In this Game, The Scratch 3.0 is chosen as designing and coding language. It is always free and available in more than 70 languages [10]. By visual drawing and coding frameworks, that allows people easily creating games or animations.

2. RESEARCH CONTENT

2.1. Implementation of game

2.1.1. Story of Game

The players control monkey to find his favourite fruits, these fruits are corresponded to the number in his head. In each cycle of game, this number is chosen randomly from library. Each site of fruit has a sign with operations are written on. Some of operations have final result as the same as number in the head of monkeys. The rest operations are not the same. If the player control monkey to get right site, the game will bonus player 2 points. If not, the game will punish player 3 points. In one cycle, if the total point of player is 10 points, the player will be assessed excellent. If the number of points is greater than zero and less than 10, the player is assessed accepted. The number of points is less than -3, the player will be assessed defeated and game over.

The movement of monkey is controlled by arrow keys on the keyboard. To start a new game by press space bar button. For getting the desired fruits, control monkey to pass over those sites. At the true sites, no problem happens. There are some booms in the false sites, if the monkey passes over, they will be exploded. It means that, you have been punished 3 points.

2.1.2 Design of objects

In the Costume Tab of Scratch 3.0, all of vector objects are sketched up with available tools. The objects are designed in many Sprite. Sprite of monkey key object, that contents images for animation of monkey. Name this Sprite is ‘Sprite-monkey’. Sprites of question content images of operation, fruits and boom. they are called ‘Sprite1’, ‘Sprite2’, …. ‘Sprite8’. Each costume in one Sprite is designed for a question.

In the ‘Sprite-monkey’, for moving of monkey on four directions: up, down, left and right, the images of monkey are designed into four groups. The first group for moving up,

it contents four vector images from costume 1 to costume 4 and they are sketched as the following figure.

Figure 1: *The costumes 1-4 for moving up direction of monkey*

The second group contents four images for moving down, they are from Costume 5 to Costume 8 and sketched as

Figure 2: *The costumes 5-8 for moving down direction of monkey*

The third and fourth groups for moving left and right, these groups contents also four images. Due to symmetry of the image groups, the images may be flipped vertically. The costumes from 9 to 12 are designed for moving right and costume from 13 to 16 for moving left.

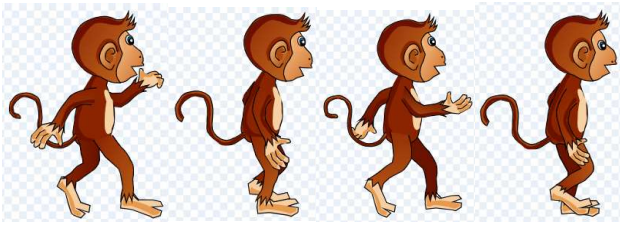

Figure3: *The costumes 9-12 for moving right direction of monkey*

The Sprites of question are designed similarly. Each costume is one question and numbered from 1 to 50 sites are designed as fruits or boom.

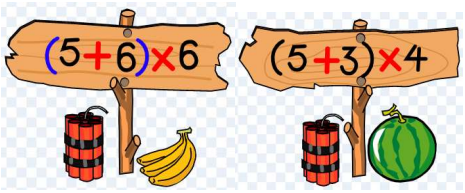

Figure 4: *The costumes in the Sprite of question*

2.1.3. Code of Game

Due to there are 50 questions in this game, so Costume of question in each Sprite is numbered from 1 to 50. The variable key in each Sprite is array of 50 elements. Each key of costume is only True or False. The answer in the head of monkey is also array of 50 elements. Whenever game start, the monkey thinks of a number randomly in the answer library. The follow chart for starting game is given as below

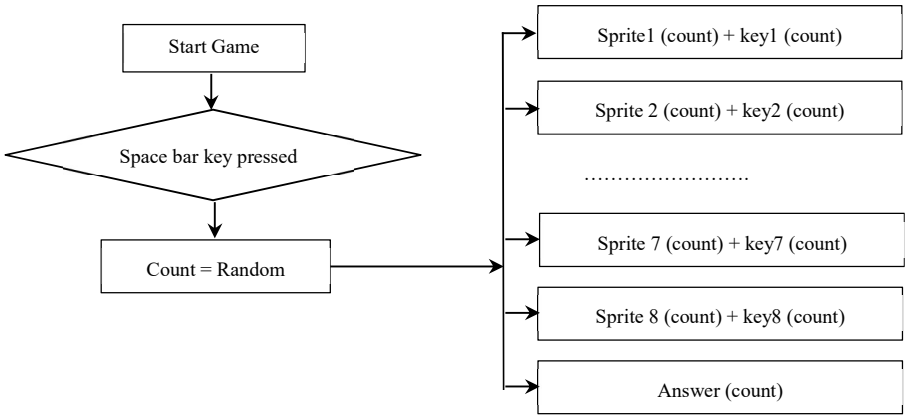

Figure 5*: The follow chart for starting game*

For updating all of activities in the game, the 'Sprite-monkey' is coded in an infinite loop. Game always checks state of arrow keys and update position of 'Sprite-monkey'. In the moving up direction, repeat from costume 1 to 4 until key '↑' no longer being pressed and the position of Sprite-monkey is updated continuously. The other direction is coded in similar way.

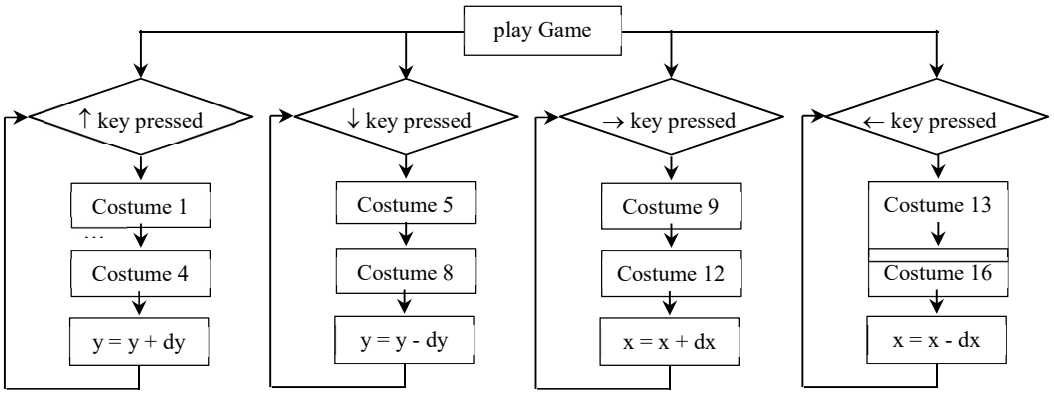

Figure 6: *The follow chart for animating of the monkey*

While updating of monkey position, the Game always checks distance from 'Sprite-monkey' to every Sprites of question (Sprite1, Sprite2, …, Sprite8) for catching answers. If the distance is small enough, the Game will continue checking that answer is true or false. The point is up dated after catching answer. If the player started with two false answers continuously, the game is over.

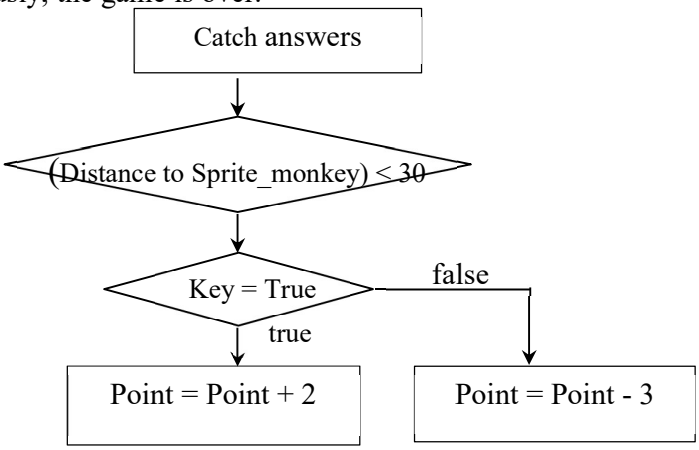

Figure 7: *The follow chart for catching answer*

2.2. Results and discussion

Thanks to Scratch 3.0, the Game has been finished. The interface of game is friendly and match to psychology of the 3th grade kids. The instruction of game is introduced briefly on the interface, where

- Press icon 'green flag' to start Game
- Press 'Space bar' key to restart a new challenge
- Use 'arrow' key to move monkey

- Pass over one site to catching the answer.

- Press icon 'pink Octagon' to stop Game.

The game allows players to control monkey move everywhere they want. It makes them interesting, active and no bored. In the short time, Game requires kids calculate quickly, exactly… operations and control monkey flexibly. This is way, the kids interact with knowledge and skills. Learn with games help kids refresh their mind renew methods of study. In the playing game, the kids always love playing to earn points, win games and get higher scores. It is nature way to enhance knowledge and skills.

Figure 8: *The Interface of Game*

3. CONCLUSIONS

The story of game is performed successfully with Scratch 3.0, where objects as monkey, sign of calculus, fruits, dynamite… are sketched by hand and coded for interacting with them. These library of objects, codes and game are shared in https://scratch.mit.edu/projects/772051207/ [9] as a contribution to Scratch community and published on the internet https://sites.google.com/hpu2.edu.vn/schoolgame-nguyenthelam/trang-ch%E1%BB%A7?authuser=1 [10]

Our School game is easy to control 'monkey' to get objectives. In each cycle of game, it always requires player calculating many calculuses as quickly as possible. It is natural way to learn knowledges and practice skills of calculation in math 3.

The educators, parents should encourage kids playing this game at home, at school or in the education contests.

Declaration of Competing Interest

In the future, author wish to improve account of player for game. In this account, the player must sign on, the achieved results, time or date … will be saved as education data. Base on this data, the educators, parents can manage or support kids.

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XÂY DỰNG GAME CHO HÌNH THÀNH VÀ RÈN LUYỆN KỸ NĂNG TÍNH TOÁN CƠ BẢN TRONG MÔN TOÁN LỚP 3

Nguyễn Thế Lâm

Tóm tắt: *Game trong nhà trường là một phương pháp tự nhiên giúp trẻ học và rèn luyện trong các môn Toán, Tiếng Anh, Khoa học… Trong bài báo này, chúng tôi gới thiệu về ý tưởng, kịch bản game, làm thể nào để thiết kết các con vật, đối tượng và làm thế nào viết mã code cho người chơi tương tác, điều khiển được với các đói tượng. Nội dung của game được xây dựng dựa trên hệ thống các bài tập trong SGK toán lướp 3. Game cũng đã được công bố trên internet, nên các thày cô giáo, các bậc phụ huynh có thể sử dụng game của chúng tôi trong các công tác giáo dục.*

Từ khóa: *Game trong nhà trường, game giáo dục, game môn toán*

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