**Design Document for Shapes! An educational game for children**

https://xiaoyu-iid.github.io/Comp20-semester-project/

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**Part I: Game Specifications**

**Objectives:** To familiarize children with geometric shapes, colors, animals, etc. through playing

NOTE1: later changed to shapes only, due to development capability restrictions

**Target users:** Children aged 2-8

Children in this age group are generally categorized into “early childhood” in pedagogy. Early childhood is the key stage of a child’s physical, social, and emotional development.

* Children in this age group start to follow simple instructions, and are especially expected to focus on tasks.
* Children in this age group start to acquire knowledge through trials and failures2.
* Children in this age group, especially the younger ones, has the need to acquire basic worldly knowledge, such as object identification3.
* Children in this age group could utilize the game as their first engagements with computers and the web.

**Supporting Theories:** theories about play in early childhood education

* Play is an important factor in children’s cognitive development.
* Piaget defined play as assimilation, or the child's efforts to incorporate the surroundings into his or her own perceptions. In Piaget’s theory (1962), play reflects what the child has already learned but does not necessarily teach the child anything new. In light of this, play is a "process reflective of emerging symbolic development, but contributing little to it"4.
* In conclusion, our game should not focus on the amount of information it offers; it should focus on an interesting, engaging repetitive process of knowledge reinforcement.

**Content:** An online game featuring object identification, where each correct identification increments the score received by the user. A ranking system is also needed.

* Required: a child-friendly environment (specified in Part II), including gaming interface, fonts and text sizes, appropriate music and sound effects, etc.
* Required: simplistic but fascinating gaming process. The gaming process should be easy for children to understand and practice, but cannot be unchallenging so that user interest might be lost.
* Required: a secure login system to identify each user, upon which a ranking system can be established.
* Required: a secure back-end database so that login information is kept private.
* Optional: mobile adaptability. Mobile adaptability, due to the limitation of screen size, might not be a good representation (NOTE: we did it anyway because it is required for the project.)
* Optional: geolocation. With geolocation, we might rank users with other players in a certain radius. However, a local/global ranking system does not interfere with the user’s learning/perception process.
* Optional: game feedback and guidance. According to Chiasson and Gutwin1, children’s education through play can be greatly facilitated by feedback and guidance. In future updates, the game might seek development of more active engagement with its users.

**Technology:** the game should render on an online webpage with a Heroku platform for deployment and database. It should support all major browsers and all major mobile representations.

**Part II: Designing the Game**

**Game features design:**

* The game will have 3 to 5 different shapes for identification. Important shapes for children to learn are limited, which include circles, triangles (equilateral ones and non-equilateral ones), quadrilaterals (especially parallelograms, squares, trapezoids), pentagons, and beyond. With this and the screen size considered, the game chooses trapezoids, parallelograms, and triangles as its first stage.
* The game will utilize the “arcade physics” section in phaser.io2. Utilizing arcade physics could simplify object development in development; it also ensures that object movement is predictable and easily perceived by target users.
* The game will feature cheerful background music appropriate for a playing environment. The game will also provide sound effects in each action (such as game starting or ending, each correct or incorrect object selection, etc.)
* The game will use clear, simple inline instructions as advised by Phil Stuart3. Users are supposed to choose objects according to these inline instructions.
* The game will have moderate speed and object numbers, which should be mildly challenging to target users, but not hard enough to be obstacles.
* The game will reward each correct object identification with “Score.” The game will record each incorrect identification by decrementing “Lives.”
* The game will not record missed objects, due to positive reinforcement theories4.
* The game will have an end stage by presenting users with his/her score, and link to his/her ranking.

**Game Graphic design:**

* Color

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| Daylight Mode:   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | | Garden Mode:   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |
| Stargazing Mode:   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | | Candy Mode:   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |
| Vintage Mode:   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | | Patriot Mode:   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  |  |  |  |  | |

NOTE:

Polling on color scheme preferences among children was designed and was meant to be conducted with students in Boston University Early Childhood Learning Lab (Echo Chen and Alissa Winter), who conduct field research in the Lab and Bowman Elementary School, Lexington, MA.

However, the plan was eventually not carried out due to time constraints of development, and availability of research conducted for students in elementary school. In development, the final color scheme was a combination of “Stargazing Mode” and “Vintage Mode,” due to preferences of all four developers.

* Mockups

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| NOTE: These mockups were made on moqups.com before game development.  There was meant to be an interactive side toolbar for user profile and rankings on the left.  Additionally, demonstration of score and ranking were designed to be according to correct identification rate. The ranking standards were changed to scores after studying the positive reinforcement theories mentioned before. | |

* Web Interfaces

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| NOTE: Later, due to security concerns, the signin/signup page was changed into a Facebook Login Button, incorporated into the pre-gaming page with a “Start Game” button.  Consequently, the left section designed to place profiles and scores were eliminated. Also in development, scores only show up after calling the backend server, thus we decided to display score and ranking after each game to minimize server calls. |
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| NOTE: The design of the global leaderboard highly relied on Bootstrap, a responsive framework for web design. The data presentation was not ideal, limited by Bootstrap features and developent capabilities. |
| Disclaimer: The Shapes! logo and “a game for education” slogan is designed by Siming Chen. |

* Mobile UI Designs

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**Part III: Future Development Strategies**

**Testing:**

The game will need field research and testing to make sure that the objective: facilitating children with geometric shapes. Research should be conducted to ensure that:

* + The game’s rules and instructions can be easily understood by target users, who are children aged 2-8.
  + How the game is played could be remembered and practiced by target users with ease.
  + Through gaming and repetitive reminding process in the game, target users acquire better distinguishment between shapes.
  + The game interface, including color schemes, movement models, sound effects, background music, etc. are amiable for recreational purposes and enough to attain interest of target users.

**Future Development:**

The game as it is now is with good intentions and virtue, but is rather simplistic, thus has limited value for education. The game embodies great potential and several directions for future development. Possible directions include:

* Different, progressive levels of play. Progression could include different arcade physics patterns, different speed, increased number of objects, randomized instructions inside a game, etc.
* Different interface (color schemes, sound effects, background music, etc.) for users to choose from.
* Voice-over and other accessibility changes for users with disability

Broader visions:

* Based on the fact that the game is ranking its users according to their geolocation, the game could consider providing message board functions on early-childhood education according to user location and preferences. This feature is aimed to engage parents with a need to raise child education concerns and questions, while promoting the game itself to a broader audience.
* Given the game’s educational purposes, once more thoroughly developed, the game could seek integration to child education systems.

**Part IV: Disclaimer**

Shapes! An educational game for children can be viewed at https://xiaoyu-iid.github.io/Comp20-semester-project/ both on desktop and mobile devices. The game itself is a web programming project by Siming Chen, Xiaoyu Shi, Jialu Wei and Tianyu Zhu. The original Github repository was disassembled so currently I am hosting the game on my Github.

In terms of game development, I worked with Siming Chen on front-end game interface. My respective focus was arcade physics and server communication.

That being said, the idea behind the game was defined, elaborated, and researched solely by myself. The features, color designs, and mockups, are all designed and made by myself. The connection between the game and BU Early Childhood Learning Lab (ECLL) is established by myself and a few student researchers in ECLL.

This document was put together in February, 2017, according to my design notes before game development. It has not been published or circulated.

Siming Chen designed the “Shapes!” logo and “a game for education” slogan. The final color scheme was selected by us four desperate, compromising developers.