

## Usability Study-BinaryKids

**Explanation given to users:** BinaryKids in its current state is a prototype for an education application that teaches middle school-aged students about binary numbers and their importance. It has 4 main parts, an introduction to binary numbers, a decimal to binary number conversion tutorial, a binary to decimal number conversion tutorial, and a snake game to test conversion skills (at point of first usability study, card game is not incorporated into application architecture).

### User One\*:

Name: Katie Brennan

Demographic:

- Senior in the College
- American Studies Major
- Age 21
- No computer science experience
- No exposure to binary numbers
- Hasn't taken a math class since high school

### User Two\*:

Name: Maayan Jaffe

Demographic:

- Senior in the SFS
- STIA Major
- Age 21
- Some computer science experience
- Some understanding of binary numbers
- Hasn't taken a math class since high school

### User Three\*\*:

Name: Carolyn Lehman

Demographic:

- Senior in the College
- American Studies Major
- Age 22
- Some computer science experience, went to science High School
- Understanding of binary numbers
- Has taken some math classes in college, studies education

\*Despite the fact that these users are not in BinaryKids' target demographic, we believed they were a semi-accurate representation of students who might use BinaryKids in that they had very limited exposure to binary numbers and had not taken advanced math or computer science classes.

**\*\*This user was meant to represent not the target audience, but perhaps a teacher who might want to use the tutorial as a supplement to the curriculum. Feedback was gathered to see whether the tutorial might be able to be realistically implemented in a classroom setting.**

**Survey:** Conducted via Google Forms. For readability, we copied the questions and responses into this word document. The questions were meant to assess the degree to which the interface was intuitive, and whether the material was presented in an educational and constructive way.

**Questions:**

1. On a scale from 1-5 (1 being none at all, 5 being a lot), how much did you learn using this application?
  - 1: nothing
  - 2: very little
  - 3: one new thing
  - 4: several new things
  - 5: a lot
2. On a scale from 1-5 (3 being perfect) how would you rate the amount of text per screen?
  - 1: too little
  - 2: could be more
  - 3: the right amount
  - 4: a little overcrowding
  - 5: way too much
3. The different components of the application (titles, text, buttons, instructions) were easy to see and read.
  - 1: strongly disagree
  - 2: disagree
  - 3: neutral
  - 4: agree
  - 5: strongly agree
4. It was easy to keep track of the progress I was making in completing tutorials.
  - 1: strongly disagree
  - 2: disagree
  - 3: neutral
  - 4: agree
  - 5: strongly agree
5. The application got boring after a while.
  - 1: strongly disagree
  - 2: disagree
  - 3: neutral

- 4: agree
  - 5: strongly agree
6. The animations made the concepts clearer and easier to understand.
- 1: strongly disagree
  - 2: disagree
  - 3: neutral
  - 4: agree
  - 5: strongly agree
7. Navigating from page to page, back to the start screen, and closing the application was straightforward and intuitive.
- 1: strongly disagree
  - 2: disagree
  - 3: neutral
  - 4: agree
  - 5: strongly agree
8. On a scale from 1-5, how clear were the instructions of the application?
- 1: extremely unclear
  - 2: unclear
  - 3: neutral
  - 4: clear
  - 5: very clear
9. On a scale from 1-5, how clear was the purpose of the application?
- 1: extremely unclear
  - 2: unclear
  - 3: neutral
  - 4: clear
  - 5: very clear
10. The snake game allowed me to successfully apply what I had learned about binary/decimal conversion to get correct answers and get a high score.
- 1: strongly disagree
  - 2: disagree
  - 3: neutral
  - 4: agree
  - 5: strongly agree
11. What did you like most about this application?
12. What did you like least about this application?
13. Can you suggest any improvements to the interfaces?

**Reponses-Carolyn Lehman**

**Notes while playing:** Was confused by the inconsistencies in graphics, animation, and got bored after a while.

1. 3-one new thing
2. 2-could be more
3. 3-neutral
4. 2-disagree
5. 5-strongly agree
6. 5-strongly agree
7. 2-disagree
8. 2-unclear
9. 4-clear
10. 1-strongly disagree
11. If I were a teacher, I'd like the idea of having some sort of interactive exercise to supplement binary numbers teaching that students could go through at their own pace. The animations are a good idea, and they should be slow and deliberate to really walk a student through the process.
12. The colors and the fonts are not inviting and "pretty." Try to make it more fun and whimsical.
13. As I said before, make it user friendly. Middle school students are older, but still need to be engaged and entertained while learning a foreign concept. This should definitely be marketed as a supplement to classroom teaching, not a replacement.

**Reponses-Maayan Jaffe**

**Notes while playing:** Didn't lose focus or interest through the tutorial, but really didn't think the game contributed to the application overall.

1. 4 – several new things
2. 1—too little
3. 2 – disagree
4. 2 – disagree
5. 2—disagree
6. 4—agree
7. 5—strongly agree
8. 5—very clear
9. 5—very clear
10. 1—strongly disagree
11. Good idea. Seems like a good way to ease younger students into real-world applications of math and computer science. I liked the light on off thing where you saw what the 1 and 0 mean and the technology/social media connection.
12. The snake game is too hard and not really relevant. You walk people through examples but then make them play this super hard,

unwinnable game, and so this might end up dissuading students who think it's too hard. Make it easier!

13. Think about the target audience more maybe? Instructions and concepts were clear to me, but I don't know whether they would make sense to a little kid.

**Response 3: Carolyn Lehman**

1. 2 – very little
2. 2—could be more
3. 2 – disagree
4. 2 – disagree
5. 2—disagree
6. 4—agree
7. 5—strongly agree
8. 5—very clear
9. 5—very clear
10. 1—strongly disagree
11. Good idea. Seems like a good way to ease younger students into real-world applications of math and computer science. I liked the light on off thing where you saw what the 1 and 0 mean and the technology/social media connection.
12. The snake game is too hard and not really relevant. You walk people through examples but then make them play this super hard, unwinnable game, and so this might end up dissuading students who think it's too hard. Make it easier!
13. Think about the target audience more maybe? Instructions and concepts were clear to me, but I don't know whether they would make sense to a little kid.

**Summary:**

Response to the application was mixed, an indication that there is considerable work to be done in refining the structure and content of the application to make it a pleasant and constructive learning experience.

The most negative response was to that of the snake game, and the consensus seemed to be that it was too hard for anyone, let alone a middle school student, to do conversions in their head and navigate a snake around a screen towards the right digit at the same time.

Commentary was positive about the overall structure of the application, and users tended to like that the application gave users context about why what they were learning was important before launching into the more technical aspects of binary numbers. Implementing the back button and changing some navigational elements after our Thursday meeting with Professor Singh seemed to also have a positive impact.

As a result of this feedback, next steps are to create a standardized graphical structure (fonts, colors, graphics) for all pages, refine the educational content to flow better and make the application more intuitive, and revamp the snake game into a completely new game that is of an appropriate level for middle school students and allows users to actually test what they've learned rather than just playing a game.