Design Studio 1



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Customer Prompt

Your client is RobotKid, a new company that aims to help kids who cannot attend school be part of school as much as possible. RobotKid is a software company, and in particular wants to leverage existing telerobots to provide an outstanding experience that goes beyond 'just being there'.

The company has sought you and your team out, because you are excellent designers. All of the software design is in your hands, as RobotKid has the idea protected (meaning no competition), but has no idea how to actually design the software.

Audience

Audience - Introduction

As a group we wanted to focus on keeping the nature of people in mind, this would help us refine the design into the best possible version, which is the most useful.

Audience - Nature of People

Diversity: The team wanted to focus on the diversity of people at the school site. This meant getting a better understanding of some of the people that typically work at a school. This background research was extremely helpful in identifying audience members we as a team would not have otherwise identified by using only our existing background knowledge. We were able to accomplish this by reviewing the directories of some local Irvine Unified School District school websites

School Site Audience Research

Elementary Schools

<u>Turtle Rock Elementary School</u>: https://turtlerock.iusd.org/directory/all/ <u>Vista Verde Elementary School</u>: https://vistaverde.iusd.org/directory/all/

Middle Schools

<u>Lakeside Middle School</u>: https://lakeside.iusd.org/directory/all

Santiago Hills Middle School: https://santiagohills.iusd.org/directory/all

High Schools

<u>University High School</u>: https://universityhigh.iusd.org/directory/all

By looking through the directories of these various school sites we were able to get a better understanding of the diversity in schools. It also helped differentiate some of the various roles distinct to either elementary, middle, and high schools.

Indiscernibility: The team also discussed and reviewed the indiscernibility of our subject. We will never be able to place ourselves in the shoes of a child that is unable to attend school. We are able to approximate what they might be feeling but it is inherently difficult to fully understand that kind of situation. From these discussions, we decided that a child's social needs would need to be addressed in any solution. This means understanding that a school experience is more than education, but a very social experience where children create friendships and learn from each other each day. Our final design attempted to embody this spirit by incorporating games into the design. This is an attempt to bridge the social separation that a child might experience using existing telepresence solutions.

Familiarity: In addressing the original design solution we understood that existing telepresence solutions are somewhat awkward. Our background research uncovered instances of children bullying the robot, or being hostile to its presence. Veronica Newhart a UCI postdoctoral fellow discovered that children would smear ketchup over the robot, or stick "kick me" stickers on the robot. Our final design kept these findings in mind. In our software solution, we designed it to promote empathy between the user and his/her fellow classmates.

Volatility: In terms of volatility we as a team discussed that the concept of a child attending school via telepresence software is almost non-existent. Our research indicates that districts hire "Home and hospital" teachers to address the needs of home-bound or hospital-bound students.

Home and Hospital Instruction: https://www.cde.ca.gov/sp/eo/hh/

Existing law requires each person subject to compulsory education to attend full-time school or continuation school. The Home and Hospital Instruction Program (California Education Code Section 48206.3) serves students who incur a temporary disability, which makes attendance in the regular day classes or alternative education program impossible or inadvisable. The district in which the home or residential health facility is located is responsible for instructing and educating pupils who must be hospitalized or remain at home due to a temporary but extended illness or disability. There is no provision in statute that specifically addresses instructional content; however, the goal of home or hospital instruction should be maintenance of the pupil's former level of performance while recovering.

This means our software is radically reimagining the experience that a sick or home-bound child would experience normally. This process will force existing staff members to reinterpret and modify opinions regarding how these kinds of children are taught.

Audience - RobotKid's Identified Audience Members

Students

Students are the most important focal point in RobotKid's set of audience members. They will be interacting with and using the software personally and often depending on their situation. Generally, students can be understood as students who attend either elementary, middle, or high school

Types of Students

- Students who Use RobotKid Away from School: Children who would otherwise not be able to be physically present in the classroom due to a specific and identifiable constraint.
 - Weather: Students unable to attend school due to weather conditions. These conditions can include snow days, excessive heat, or hazardous air quality.
 - Notoriety: Students unable to attend school due to notoriety or celebrity status.
 - Health: Students unable to attend school due to health concerns.
- Students Present in School: To expand the experience and improve outcomes the student's friends and peers must also be accounted for in the design. They will be socially interacting with the telepresence student as they normally would. Students interacting with the student using RobotKid should be considered an audience member as studies have shown that a crucial aspect of developing telepresence software is including natural feeling social interactions with student's classmates. ¹

Educators

Educators are those individuals teaching children using telepresence robots. These educators will be interacting directly throughout the day with children using these systems. Typically they will be required to interact with both telepresence robots, as well as the children physically present in the classroom. Further research identified a variety of different types of educators that may or may not change how they interact with the telepresence robot and associated software solution.

Types of Educators

¹ https://www.informatics.uci.edu/from-homebound-to-school-bound-with-telepresence-robots/

- *Elementary Teachers:* Elementary teachers are typically involved in teaching the entirety of the state curriculum for their students. This means that the typical elementary teacher will be in charge of teaching math, English, science, and other subjects identified in the state-specific curriculum.
- Special Education Teachers: The team's research indicates that there are a variety of different kinds of special education teachers. Each with slightly different roles and responsibilities.
 - Special Day Class Teacher (Mild/Moderate Disabilities): These teachers are in charge of teaching a modified curriculum to children identified with mild/moderate developmental disabilities. Disabilities include but are not limited to autism, ADHD, and ADD.
 - Special Day Class Teacher (Moderate/Severe Disabilities) These teachers are in charge of teaching *life skills* to students with profound disabilities. Disabilities include but are not limited to down syndrome, emotional disturbance, and depression.
 - Resource Specialist Program Teacher (RSP Teachers): These teachers are
 considered special education teachers who are tasked with serving students who
 perform far below expectations but who are otherwise capable of learning an
 age-appropriate curriculum.
- *Middle-School Teachers* (6 9th Grade): Middle school teachers typically teach 2 or fewer subjects. Children in middle school normally have 'periods' in which they are responsible for attending a specific school subject. Differentiating between subjects will allow the team to better understand the unique requirements needed to teach each subject.
 - Mathematics Teachers: Math teachers typically teach 2 classes of mathematics unique to the grade level of the student. The curriculum heavily uses the whiteboard to provide students the example of different math concepts, as well as math-oriented diagrams and graphs. These unique needs will need to be addressed in the final software solution.
 - Science Teachers: Science teachers typically teach their curriculum by example, as well as utilizing the whiteboard. A middle school science curriculum will also typically be very hands-on. The team's software solution will have to acknowledge this as a possible design constraint.
 - English / Language Arts Teachers: English and language arts teachers typically
 work with their students closely and rely on having students practice concepts on
 their own under their guidance and direction. This will require the software and
 student to participate in in-class activities as much as possible.
 - Social Studies Teachers: Teaching method similar to English teachers, and will also extensively use a whiteboard to demonstrate core concepts.

- *High School Teachers (Single-Subject Teachers)*: These kinds of teachers have similar roles to middle school teachers. Each will interact with their respective students differently and also have different requirements. These differences will be important to keep in mind for the final software solution.
 - Math / Science / English Language Arts Teachers: Similar roles to their middle-school equivalents.
- Substitute Teachers (Elementary, Middle School, High School, Special Education): Substitute teachers will also be required to interact with RobotKid regularly. This will require substitute teachers to be familiar with the software and interacting with the student using the RobotKid. The presence of a substitute teacher should not mean that the child using the RobotKid will not be able to attend school that day.

Paraeducators

School site personnel will also be interacting directly with the children using telepresence robots. Our team's background research discovered that there is a large and impactful group of professionals who interact with school children on a daily basis -- who are not necessarily the child's teacher. This large and diverse group of people needs to be accounted for and thoughtfully addressed in terms of RobotKid's audience.

Types of Paraeducators

- *Tutors*: Elementary school classes have in-class tutors. These tutors are responsible for working closely with teachers to reinforce concepts or help struggling students. These tutors will interact with the telepresence robot both in a small group setting or on a more personal 1-1 basis. If a student using a RobotKid needs assistance, the tutor will be expected to be able to tutor the student *through* the RobotKid's telepresence software.
- *Yard Duties*: While not being physically present, children will still be expected to socialize during free time/recess periods, yard duties will interact with these robots during these times. Yard duties will also be largely responsible for monitoring the use and safety of the RobotKid during recess.
- Cafeteria Staff: Eating lunch is an important social aspect of school, cafeteria staff will also have direct interaction with these robots as a result.

Classified School Staff

Research indicates that there is also a large and diverse group of professionals who can be generally addressed as 'classified' school staff. Classified staff typically interact with students in a more personal manner, meaning more often than not communication will occur one-on-one.

Types of Classified School Staff

- *School Psychologists:* These individuals will interact directly to administer psychological testing other school psychologist duties.
- *Speech-Language Pathologists:* Children using telepresence robots who also have a speech disorder will need to work closely with their assigned speech-language pathologists.
- *School Counselors:* School counselors will need to interact directly and privately with children using telepresence robots to ensure they are being adequately supported.
- IT Staff: Staff that will be interacting directly with RobotKid either to diagnose minor technical issues or to train staff on how to use the technology.

Medical Professionals in Charge of Child's Care

There will often be medical professionals in charge of a child's care while they are in school. Often the option for a child to use telepresence software will require the doctor's approval. A child's health and safety will always be important to RobotKid and its use.

Types of Medical Professionals

- *Doctors*: Doctors who will be in charge of the treatment of any child who has special needs to know the technical details of RobotKid as they might have to directly interact will it. Also, to evaluate if the child is benefiting through RobotKid, doctors need to know how effectively RobotKid can be used.
- *Child Therapist*: Therapists who will be in charge of treating children with special needs such as behavioral, emotional, or mental disorders might have to interact with RobotKid directly. In addition, they might need to communicate with children's doctors about measuring patients' progress through the usage of RobotKid. In order to do such, the therapist will need to interact with RobotKid on a regular basis.

Other Stakeholders

- Doctors:

Doctors, in general, need to have some basic knowledge about RobotKid's
functionality in order to help children, as doctors might be recommending
RobotKid to their patients who have special needs but never used RobotKid
before.

- Parents:

- Parents will be involved in coordinating with school site professionals to get their child the care they need. This includes coordinating how long a RobotKid will be needed and approving the use of telepresence software. They will need to be comfortable allowing their child to use RobotKid

Goals

- To provide an enhanced experience for users beyond simply "being there."
 - Software should engage users with their friends/educators creating an enjoyable experience for all audience members.
- To expand the functionality of existing telepresence robots to offer users a more immersive, engaging, and productive experience.
 - Immersive Experience: Children should be able to feel as if they were really at school.
 - Students should be able to engage with their teachers and friends easily and effortlessly.
 - The learning experience users receive through telepresence technology should be equal to the education they would have received if they were physically present.
- Accessibility for all children.
 - The software should be accessible to all children with all types of disabilities including but not limited to physical handicaps, visual, and hearing handicaps.
- RobotKid software shall provide adequate control over their learning environment:
 - Software should be able to zoom into details, enhance the volume, and clearly be able to pick up all forms of written or verbal communication.
- RobotKid software should enable the student to signal a 'raise hand' notification or call attention to staff or other peers when needed.
 - Software should enable students to ask questions when appropriate and needed, and to call attention to their peers.
- Software should follow all local, state and federal regulations at all times.
 - Districts occasionally regulate surveillance protocols to ensure safety.
- RobotKid shall provide an excellent learning experience.
 - RobotKid should strive to provide a learning experience that allows users to achieve their maximum academic potential.

Constraints

- RobotKid will function the best only where there are no severe weather conditions.

- If numerous students use RobotKid at once, It might become slow in its functionality.
- Battery Life: Battery life will be a primary constraint in implementing both hardware and software solutions.
- Technical Issues: Technical issues are expected, the system will have a 'help button' functionality to help users recover from these kinds of issues.
- Data Connection: Connection quality and speed will also be a major issue regarding some of the more data-intensive software solutions.
- Privacy Laws, and Consent Laws Regarding A/V Recording: RoboKid will be constrained by any applicable local, state, or federal laws limiting the use of cameras or A/V recording hardware.

Assumptions

- RobotKid telepresence robots should be able to last throughout the course of a full school day.
 - Software will balance battery life to minimize power consumption when possible and maximize running time.
- Teacher will be sufficiently technologically literate to provide minor technical support to student(s) using RobotKid.
 - If teachers are properly trained regarding technical support in order to fix minor issues with RobotKid, it might prevent an interruption in the class environment since
 - If RobotKid does not function properly, teachers of the class will have to stop giving the lecture and look for resources to solve this issue. If teachers are knowledgeable enough to fix some basic technical issues, they can solve the problem quickly and that might assist to prevent substantial interruption in the class environment.
- Class size is limited to 40 students or less.
 - The expected number of students in one class where RobotKid will be used will be limited to a maximum of 40 students as it is assumed that in a small classroom a child who will be using the RobotKid will communicate and interact with the classroom efficiently than in a large classroom.

Ideas

• <u>SmartBoard Integration:</u> <u>https://support.smarttech.com/hardware/interactive-whiteboards</u>

- <u>Microsoft Adaptive Controller Integration:</u>
 https://www.xbox.com/en-CA/xbox-one/accessories/controllers/xbox-adaptive-controller
- Quadrapalegic / Spinal Injury Assistive Device Integration: https://spinalpedia.com/learn/assistive-technology-at-home-driving/assistive-technology
- Smart Home Device Integration (Google Home, Alexa, Apple Hub): Integrating with smart home devices might allow RobotKid to better serve its users. Alarms, dictation technology, and other smart device capabilities can be used.
- <u>Health Monitor Integration</u>: Wearables that help people keep track of health information might be integrated into the design. This would help teachers or health professionals better ascertain whether the child needs extra support.
- AR / VR Integration: Instead of relying on traditional screens and tablets, a more immersive experience would be achievable by leveraging existing AR/VR technologies. Off the shelf brands such as Oculus Go / Rift are possible alternatives to screens.

Alternative Designs

Alternative 1 - Robotkid Touchscreen

Decision Making Process (Why the team did not choose this design): This was an appealing design because lots of kids are already familiar with tablets, specifically iPads. We chose to not move forward with design because the team decided that a tablet-based approach would complicate the interaction between the user and the robotic hardware. A tablet-based design does not easily lend itself to intuitively being able to control intricate hardware. Research indicates that many of the accessibility solutions available on the market are not compatible with tablet-based OS's. The team wanted to focus on creating a product that would afford the greatest amount of accessibility.

Description: Screen shows the main UI interface for the single-user mode. This alternative differs from the original by leveraging tablet technology. This design focuses on creating a more familiar kind of interaction with the user. Many children already own or are familiar with iPads. This design leverages that familiarity to create a more intuitive and stress-free user experience



Icon Image	Icon Description
	Menu Button (Toggle): Hamburger menu, can be clicked for drop-down menus.
Clear Mode	Clear Mode (Toggle): When the icon is filled with light green color, the clear mode is turned on. Clear mode is a more distraction-free interface.
•	Microphone Icon: Icon that shows if the microphone is on or off.
	Video Icon: Record button for lectures, slider button indicates if it's recording is either on or off.
4)	Volume Control Slider: Slider that the user can use to control the volume of the audio.



User Screen: Real-time video call with user

Alternative 2 - Robotkid Multi-User Interface

Decision Making Process (Why the team did not choose this design): The idea of a multi-user interface arose as a realization that there may be a limited quantity of RobotKids per school or classroom. If two children or more from the same class were absent, then both can share a RobotKid. This involves many more factors than our final design, which assumes that there will be one RobotKid per user. This alternative would have to consider possible cases such as socialization outside of the classroom, which questions functionality such as which student is in control of RobotKid. Accommodating for these cases potentially strays away from the necessity to provide an outstanding experience to the user, which made the team decide to focus on other alternatives.

Description: Screen shows the main UI interface for the multiple users mode. For this design, we were considering funding constraints in the design. For some school districts with limited financial resources, it might make more sense to implement a RobotKid alternative that could be shared among multiple users. This design would primarily address instances where there are not enough RobotKids for every child to be able to attend school. This particular design would allow a maximum of 4 users to use the software at any given time.



Icon Image	Icon Description
	Menu Button (Toggle): Hamburger menu, can be clicked for drop-down menus. Clicking on the menu will toggle an expanded menu of options available to the user.
User 3 User 4	Multiple Users Screen: Real-time video call with multiple users. Each user will be viewable to other users. This implementation promotes a sense of community and teamwork. An important focus of RobotKid is the social aspect.
User S Controlling	Control Indicator: Shows which user is controlling the RobotKid currently (Shows user name with red bold font). This icon will minimize the inherent conflict that comes with multiple users using a single RobotKid. This toggle will allow only one user to control the device at a time.
Clear Mode	Clear Mode (Toggle): When the icon is filled with light green color, the clear mode is turned on. When clear mode is engaged the screen is 'cleared' away revealing a more distraction-free experience.

•	Microphone Icon: Icon that shows if the microphone is on or off.
	Video Icon: Record button for lectures, slider button indicates if it's recording or not.
	Volume Control Slider: Slider that the user can use to control the level of the audio volume.

Final Design - RobotKid with Desktop Version Single User

<u>User Interface - Screen 1</u>

Description: The user interface depicted in *Screen 1* can be understood as the user's primary user interface. This screen showcases several key features. Key features include a "Clear Mode" that will allow students a distraction-free lecture. In this mode, students will be able to follow along with the teacher's lecture/lesson. Another key feature to the design is the minimalist icon-display set, this design allows users to interact more naturally with their classmates. Each icon or button is described in detail below the image of *Screen 1*.



Icon Image	Icon Description
The state of the s	Mirrored Video Feed (User-Facing): Displays live recording of the user who is using RobotKid remotely.
	Menu Button (Untoggled): Button that displays a drop-down menu when clicked.

Clear Mode	Clear Mode Button: Button indicating whether Clear Mode is on. When the background is gray, Clear Mode is turned off.
P	Speaker Mode Button: Indicates whether the user's microphone is active or muted
	Volume Control Slider: Slider that user can use to control the volume of the audio
3:20 pm 10/20/2019	System Status Indicators: Informative icons that describe the status of the system. In order from left to right: battery indicator displaying how much battery RobotKid has, icon displaying the current WiFi signal strength, and current time and date.
	Lecture Mode Recording Icon: States whether lecture mode is on. Top icon signals that the current video feed from the school is being recorded for offline use. Bottom button slider
LEC	Lecture Mode Toggle Switch (Toggled): Switches Lecture Mode from on to off. Button is switched to off.
	Call for Attention Button: Toggles RobotKid's LED light to turn on

Screen 1 - Feature Details

• Lecture Mode

- Recording Lecture
 - File is saved in a common video file format such as MP4 for easier playback.

- Wanted to save recording of the lecture as an additional educational resource
- Supports giving the student a better educational experience because they can now refer to the lecture outside of RobotKid
- Supports accommodation for those who want to look back at the lecture at their own leisure/comfort
- LED on RobotKid/Call for Attention Button
 - RobotKid has an LED that turns on to signal attention to the teacher
 - User is able to toggle click on the button to turn on/off light
 - Done when the user wants to call for attention to the educator
 - Ex: Teacher asks if someone knows the answer. User wants to answer, so they toggle on the LED via the button. Teacher calls on them, and the user is able to answer
- Turning Lecture Mode On/Off
 - Want to ensure that lecture mode is not needed for the duration of the day, so offered a way to turn off the mode
 - User would want to socialize with friends, which is not the intention of Lecture Mode
- Volume Control
 - User can control the audio volume coming from the lecture
- Live Recording of Student
 - Provides feedback to user
 - Shows that their live recording feed is working
 - Either that the WiFi signal is good or that their webcam is working
 - Shows users how their screen looks like to the people viewing via RobotKid's physical UI
 - User would prefer this live recording option since by viewing his or her interaction and collaboration with other people who are not physically present with him or her, it will give the user encouragement and satisfaction of actually being in the environment and with the people.

<u>User Interface 1 - Screen 2</u>

Description: Screen shows the UI in Clear Mode. All UI icons, except for the Clear Mode and Menu Buttons, are removed during this mode. The concept of clear mode was to create a

version of the design that would allow for distraction-free learning. While one of our goals was to create a fun and engaging experience for the user, the team also recognized at times that during lectures there would need to be a 'clear mode.' This design effectively captures what we believe the essence of the product to be, a versatile system that you can engage other people with but also at its core a system that allows a young person to remain focused on the learning as well.



Icon Image	Icon Description
	Menu Button (Toggle): Button that displays a drop-down menu when clicked. The Menu has been clicked and is showing the drop-down button
Clear Mode	Clear Mode Button (Engaged): Button indicating whether Clear Mode is on. When the background is green, Clear Mode is turned on.
Settings	Settings Button: Displays various options and preferences, including brightness, connection status, etc

Games	Checkers Chess Connect Four Tic Tac Toe	Games Button (Expanded): Provides four games that can be played between the user and another person (who is present with the RobotKid)
С	olor	Color Button: Opens up color customization options for the UI
Accessibility		Accessibility: Displays various accessibility features including smartboard integration (for notetaking) and integration with Microsoft's Adaptive Xbox Controller to allow children of varying abilities to use the RobotKid.
Help		Help Button: Provides the user with a phone number for technical difficulties as well as the option to open a live chat client to directly discuss with the school's IT department.

Screen 2 - Feature Details

Drop-Down Menu:

Settings

 Settings display properties that user can use for different functionalities of the system such as toolbar, shortcut key, internet connection, etc. In addition, allows using commands such as autosave, set a property, etc.

Games

 Four types of games a user is allowed to play, Checkers, Chess, Connect Four and Tic Tac Toe. Games are intended to be educational and/or mentally stimulating. However, during "lecture mode" games are unable to be opened to deter distractions.

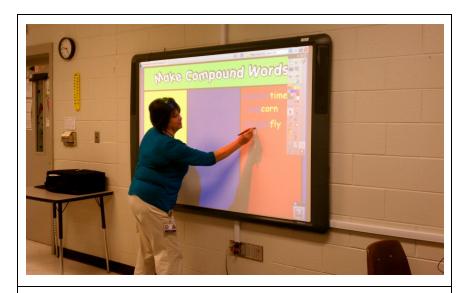
• Color

• Students can change the color of UI icons to give a sense of their own personality in the software.

Accessibility

• This button is where RobotKid's software will utilize the latest in-classroom technologies to allow children of all types of disabilities to use the RobotKid.

SmartBoard Integration ²: If the classroom is equipped with a SmartBoard, RobotKid's software is capable of integrating with the teacher's smartboard. This will allow students of all abilities to follow along with what the teacher is writing on the whiteboard -- regardless of their ability to write on their own.



"Promethean Board" (smartboard technology) being used by a second-grade teacher. Whatever she is writing on the board the RobotKid will receive as well.

Xbox Adaptive Controller Integration³: Microsoft has been developing this controller to allow people of every ability to use and enjoy their hardware components. It is compatible with Windows 10 which RobotKid will run on. By leveraging existing technology RobotKid will be able to introduce technology that they are already familiar with. The adaptive version of the controller will allow more students to use and enjoy RobotKid.

² https://www.prometheanworld.com/

³ https://www.xbox.com/en-CA/xbox-one/accessories/controllers/xbox-adaptive-controller



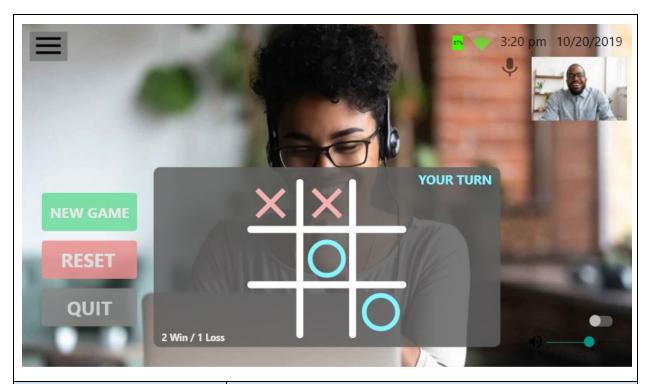
A student using Microsoft's Adaptive Controller technology, compatible with RobotKid's software.

Help

• Help documentation will allow the student to get any assistance in using RobotKid effectively.

<u>User Interface 1 - Screen 3</u>

Description: Screen displays one of the four games being played with another student. This displays a window with a game board and related actions. In incorporating games into the system we wanted to create something a child would be able to engage with his classmates with. An important aspect of outstanding school experiences are the friends and memories you make with your classmates. Our final design places heavy emphasis on this dynamic, as we believe it gets to the essence of the design proposal.



Icon Image	Icon Description
NEW GAME	New Game Button: Start a new game.
RESET	Reset Button: Resets the current game
QUIT	Quit Button: Quits the game
	Lecture Mode Toggle Switch (Toggled): Switches Lecture Mode from on to off. Button is switched to off.

Screen 3 - Feature Details

Games

• Intended for the user and their friends to interact beyond just talking via the video live recording

Game board

■ Users can interact with this game board as they normally would the software itself, with the mouse and keyboard (or other accessibility controllers, if applicable). Other players interacting with the user will use the touchscreen that the robot will be equipped with.

Actions

- *New Game*: Starts a new round of the game. All statistics, such as wins or losses, will be preserved.
- *Reset*: Starts a new round of the game. All statistics, such as wins or losses, will be reset.
- Quit: Quits the current game. Game UI disappears.

• Lecture Mode

- When lecture mode is disabled, the software will no longer be recording the video feed the user receives. The LED signal button is also disabled while out of lecture mode.
- Users can now have access to the "games" feature from the menu.