How Can Virtual Reality Help Kids Escape the Confines of Hospitals by Entering New Worlds?

New Mexico SuperComputing Challenge

Final Report

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Executive Summary

Hospitalization is a challenging experience for anyone, but for children, it can be especially isolating. A prolonged hospital stay means not just physical discomfort but also a deep sense of disconnection from their peers, family, and the world outside. If this occurs during a school year, children often experience the significant challenge in keeping up with the academic workload. Further, they miss out on extracurricular activities and other experiences that help shape their lives.The result is often having to repeat classes, or even dropping out of school.

In this report, we describe our work toward providing an full, immersive Virtual Reality educational environment designed for children who require medium to long term hospitalization, and perhaps prolonged recovery at home. The work described herein represents our initial explorations, providing a foundation for continued work. Our ultimate goal is to provide students and teachers with the technological capabilities for virtually staying engaged with their school work as well as social interactions with other students and teachers.

Please note that parts of this report were generated using chatGPT, the output of which was then tailored to our specific work.[1]

[1] https://chat.openai.com/chat

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Overview

Hospitalization is a challenging experience for anyone, but for children, it can be especially isolating (Freina and Ott, 2015). For many young patients, a prolonged hospital stay means not just physical discomfort but also a deep sense of disconnection from their peers, family, and the world outside. They miss out on school, extracurricular activities, and the usual experiences that help shape their lives. Instead of being able to engage with the world in a meaningful way, they are confined to sterile hospital rooms, often feeling removed from the normal flow of childhood life.

This physical isolation extends into the emotional and intellectual realms. As days, weeks, and sometimes months pass, students fall behind academically. They struggle to keep up with lessons, complete assignments, and maintain their grades. Teachers, who may only be able to communicate with hospitalized students through fragmented and inconsistent methods, find it difficult to offer the continuous support these students need. The result is an educational setback that can feel insurmountable. Based on my survey students they needed 9 days to catch up after a 7 day hospital stay

The emotional effects are just as serious. Missing out on experiences with friends, activities, and school can lead to feelings of loneliness, anxiety, and depression. Even though they are physically in a place of healing, emotionally, children may feel like they are in a place of stagnation. Additionally, the fear of returning to school after an extended absence—knowing they are behind and out of sync with their classmates—can make the prospect of recovery seem even more daunting.

The stress of being isolated in a hospital, combined with academic struggles and the emotional toll, makes recovery even more difficult. Children may start to associate hospitals with negativity, exacerbating feelings of stress and discomfort. And once they are discharged, reintegration into school can be just as challenging, as they may need extra help to catch up and readjust to their social and academic lives.

Our Approach

To address these issues, we propose the creation of a Virtual Reality (VR) platform specifically tailored to hospitalized children. This VR environment would aim to reduce the stress and isolation caused by extended hospital stays, while simultaneously helping children maintain their academic progress. By offering an engaging, interactive space where they can continue learning and exploring, VR can provide a much-needed escape for children, allowing them to venture beyond the confines of their hospital rooms.

The VR platform will combine education with exploration, offering virtual experiences that replicate the world outside the hospital walls. It will not only focus on delivering academic content, but will also provide immersive recreational experiences that can boost emotional well-being. This combination of education and fun can make the learning process more meaningful and enjoyable for children, helping them stay connected to their peers and the world they are temporarily disconnected from.

One of the key benefits of this VR environment is that it will allow hospitalized children to experience a sense of normalcy, even during their recovery. For example, children can virtually visit their favorite places—parks, zoos, museums, or even outer

space—while staying in their hospital beds. These virtual excursions will provide moments of joy and discovery, which can help reduce feelings of boredom and isolation, making their time in the hospital more bearable.

By using VR, children will also be able to engage in educational activities, such as interactive lessons, quizzes, and games, all of which are designed to help them keep up with schoolwork in a fun and non-stressful way. This approach will reduce the anxiety many children feel about falling behind academically, and provide them with a sense of continuity, so they don't feel entirely disconnected from their schooling.

In addition, the VR platform will allow children to experience moments of "boredom" that can be used for reflective thinking and emotional processing. By encouraging downtime and moments of introspection, the system helps kids not only stay engaged with their learning but also allows them the space to reflect on their experiences and recover emotionally. This blend of academic engagement, exploration, and emotional processing could play a key role in supporting both their academic success and physical recovery.

Note that there is a strong overlap with real time streaming of school classes and activities. However, real time engagement by a student experiencing challenging health issues is often interrupted by medical treatment requirements, including physical therapy sessions and medication effects. A VR system can pause the real time streaming, allowing for re-engagement without interruption.

The Impact

The impact of our proposed VR system extends far beyond academics. First and foremost, the system will help children maintain their educational progress, reducing the anxiety that often accompanies a return to school after an extended hospital stay. By using immersive experiences that align with the curriculum, children will be able to continue their lessons in a meaningful way, making it easier for them to reintegrate into school life after their hospital discharge.

Beyond academic benefits, the immersive nature of VR can significantly improve mental health and pain management (Jerdan, Grindle, van Woerden, Kamel Boulos, 2018). As mentioned, the isolation of hospitalization can lead to loneliness, stress, and even depression. By offering children an opportunity to connect with the world outside their hospital rooms, VR experiences can provide them with a sense of connection to life beyond the hospital. The joy of visiting new places, interacting with virtual characters, or exploring new environments can offer much-needed relief from the monotony of hospital life.

Additionally, these VR experiences can have a positive effect on children's mental health by giving them a sense of control over their environment (Hu-Au & Lee, 2017). In many cases, children in the hospital have little say in their daily routines, treatments, and surroundings. VR offers them the opportunity to take charge of their experiences, whether by choosing which virtual locations to visit, what lessons to engage in, or how

they wish to interact with the system. This sense of agency is essential in supporting resilience and emotional well-being during recovery.

Lastly, by combining educational content with opportunities for exploration, VR experiences can make learning more engaging and enjoyable (Hu-Au & Lee, 2017). The idea of taking a trip to outer space while learning about the solar system, or visiting a virtual zoo to study animals, makes education come alive. This sense of fun can help children rediscover their love of learning, turning what could be a stressful and isolating experience into one that is exciting and full of possibilities.

Measuring Impact

To understand how well the VR system is working, we will use a data-driven approach to assess its effectiveness. This will involve collecting data from hospitalized students, including the number of students, the average length of their stays, and their academic outcomes during and after their hospitalizations. This information will help us evaluate how hospital stays impact the education of children and determine whether the VR platform is making a meaningful difference.

We will also collect qualitative feedback from children, parents, and healthcare professionals. This feedback will provide valuable insights into how the VR experiences are helping children feel more engaged, less isolated, and more connected to their educational journey. By gathering a range of feedback, we can refine and improve the platform to ensure it meets the needs of hospitalized children as effectively as possible.

Additionally, statistical analyses will be used to determine whether the VR system has a positive impact on children's academic performance and emotional well-being. By comparing the performance of students who use the VR platform with those who do not, we will be able to assess the platform's effectiveness in helping children stay on track academically, reduce feelings of isolation, and improve mental health outcomes.

Next Steps

To move forward with the development of this VR platform, we will take the following steps:

1. **Engage with UNM Children's Hospital**: We will collaborate with UNM Children's Hospital to present our vision and gather input from key stakeholders, including nurses, parents, and hospitalized children. By conducting surveys and interviews, we can learn more about their educational needs, recreational preferences, and ideas for enhancing their hospital experience. This input will be critical in developing a system that truly meets their needs.
2. **Explore Technology Options**: We will research the best VR technologies that are user-friendly, durable, and compatible with educational content. Companies such as Best Buy and Apple may offer affordable or donated equipment, which will help make this initiative more accessible. Identifying the best hardware and software options will ensure a seamless user experience.
3. **Analyze Data**: Insights gathered from surveys and interviews will help us identify trends in educational gaps and recreational needs. By analyzing this data, we can tailor the VR content to address specific challenges and interests, ensuring that the platform is as effective and engaging as possible.

4. **Design the VR Experience**: We will develop prototypes of the VR environment, including virtual classroom simulations, interactive lessons, and immersive experiences like virtual trips to parks, museums, or outer space. By combining educational content with captivating exploration, we will create a platform that encourages curiosity, joy, and a deeper connection to the world outside the hospital.

Impactful Innovation

Our proposed VR platform has the potential to transform the experience of hospitalized children. By offering an escape from the confines of the hospital room, it can help students stay on track academically, provide emotional support, and foster a sense of connection to the world outside. This initiative represents a bold step forward in the integration of technology and education, with the ability to bring hope, resilience, and a sense of normalcy to children facing one of the most challenging experiences of their lives. Through this project, we hope to create a future where hospitalization is not synonymous with isolation, but with opportunities for learning, exploration, and growth.

Future work

The ultimate goal of our work is to provide a full immersive VR experience environment for students dealing with health situations so that they can keep up with their school work as well feel a part of the school experience. As discussed above, this year’s work represents our initial investigations for this project. In this section we briefly describe our future work.

In the short term, we will continue to develop our VR system and experiment with it in our school environment, adding to capabilities based on feed back from our use reserves .

In the medium term we will:

- Explore the capabilities of some academic VR apps, such as NearPod (https://nearpod.com/) and EdgeNuity (https://www.imaginelearning.com/)

- Increase engagement with eCademy (https://ecademy.aps.edu/), an online high school in Albuquerque.

- Engage a STEM school in Albuquerque that currently uses VR.

- Continue to work with educators at the University of New Mexico Children's Hospital.

- Investigate how to regular the use of VR by students working independently.

- Engage with groups that are currently using the technological capabilities that we see necessary for creating an immersive experience. These include a New Mexico movie studio that uses 360 degree visualization capabilities.

- Engage with corporations that have programs for providing the equipment necessary to our goals.

Our long term goal is to combine the pieces described in this report into a single, coherent technology. We will then experiment with our system, attempting to simulate the environment a student would experience during hospitalization or home health care. If possible, we will test our system with children in hospitals or in home health care. This will require ensuring that the requirements of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) are strictly adhered to.

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