WWF Free Rivers

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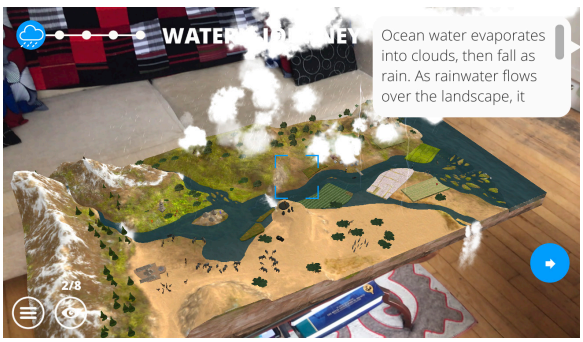
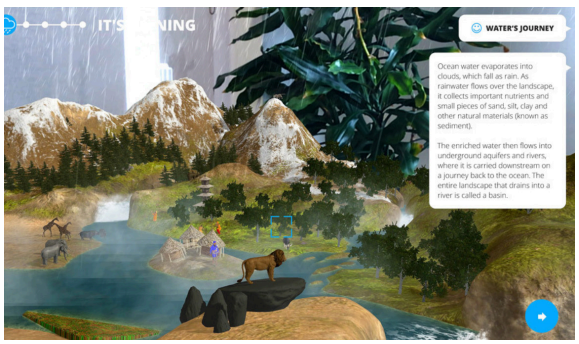
Date: Aug 2019

Project name: WWF Free Rivers
Project owner: WWF
Release date: 2018
Locale: USA, Global
Languages: English, Spanish, French, Russian, Hindi, Mandarin
URL: https://www.worldwildlife.org/pages/explore-wwf-free-rivers-a-new-augmented-reality-app
http://www.onebigrobot.com/work/wwf-free-rivers
XR medium: AR
Hazards: N/A
Activity: Awareness raising
Age group: 4+





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#1
Project Background

Free Rivers is an augmented reality (AR) experience which was born from the desire to illustrate what the future could look like if rivers are not kept free flowing and protected. This idea first came about when a World Wildlife Fund (WWF) team was visiting the Luangwa river in Zambia in 2017, where a dam was proposed that would have had negative consequences for people and the environment. As they were investigating local community perspectives on the dam, they noticed that while those living in close proximity to the river were more aware of the negative consequences it would have, those further away from the river but who would still be displaced by the dam project were unable to envisage how this would impact them. Immediately following this visit, Apple announced the AR Kit, and the idea of an immersive experience that could bring this intangible concept to life was born.

WWF collaborated with One Big Robot, a visual communication and design agency that works on scientific and social issues, to bring this idea to life, in a six month process that concluded just after World Water Day, March 27, 2018. The Free Rivers AR app was one of the apps featured in Apple's March 2018 keynote event in Chicago, and highlighted several times in the Apple store, increasing exposure and positively affecting download rates.

The App is described by the Apple App store as:

"WWF Free Rivers puts an entire landscape in your hands. Through this immersive, augmented reality experience, you'll discover a river that flows through the lives of people and wildlife, and how their homes depend on those flows. Dam the river to see what happens, and then try different options for sustainable development that keeps the river healthy and flowing. Collect stories of people and animals along the way!"

The app creates an entire river system in the users living room and gives a birds-eye view of habitats, such as a river basin, a rainforest, and a mountain region. Within the experience, users learn through navigation and narration about why free flowing rivers are so important, what happens when they are not well managed, and how development can still happen, but sustainably.

#2
Aims & Rationale

WWF Free Rivers was created to raise awareness on the following:

- To "make people care and think about rivers" as a critical but consistently undervalued part of our planet.
- To demonstrate that the protection of nature and development can go hand in hand, and that sustainable development is possible. For example, in the app when the user places the dam in a different location, and generates energy from solar as well as hydropower, the impact on nature is vastly reduced.

#3
Audience

WWF Free Rivers is targeted at the general public and at children and young people. The age restrictions stipulated on the app stores are 4+ on the Apple store and 12+ on the Google Play store. WWF have found that children under 12 are using the app, despite initially targeting users over 12. AR screen based gaming or fantasy experiences (mobile, tablet, computer or gaming console) are advised from 4+ if used for short periods (under five minutes).

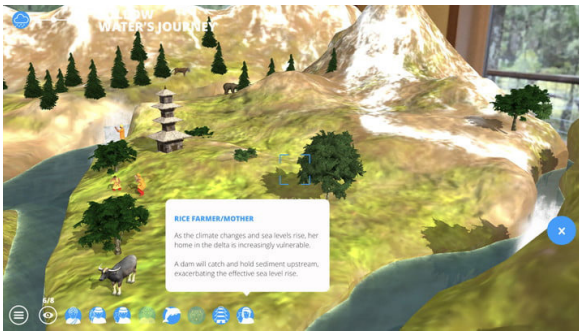
The app was initially designed to educate and inspire decision-makers such as government officials, river basin managers,and technical experts who weigh in on development that occurs on or near rivers. During the design process WWF recognised the opportunity to make it simple enough for students, and were pleasantly surprised when it also resonated with younger children.

#4
Experience

WWF Free Rivers was designed with a river system that incorporates features from across all continents, so that it could be representative of a river system globally. Designing an experience that was as accurate as possible was important for the WWF team and they worked closely with scientists from each of the real-world biomes that would be featured in the app to make sure all the plants and animals were truly based on reality. As you travel down the river you pass through the Himalayan mountains, tropical jungles, the African Savannah, South American grasslands and Southeast Asian deltas.

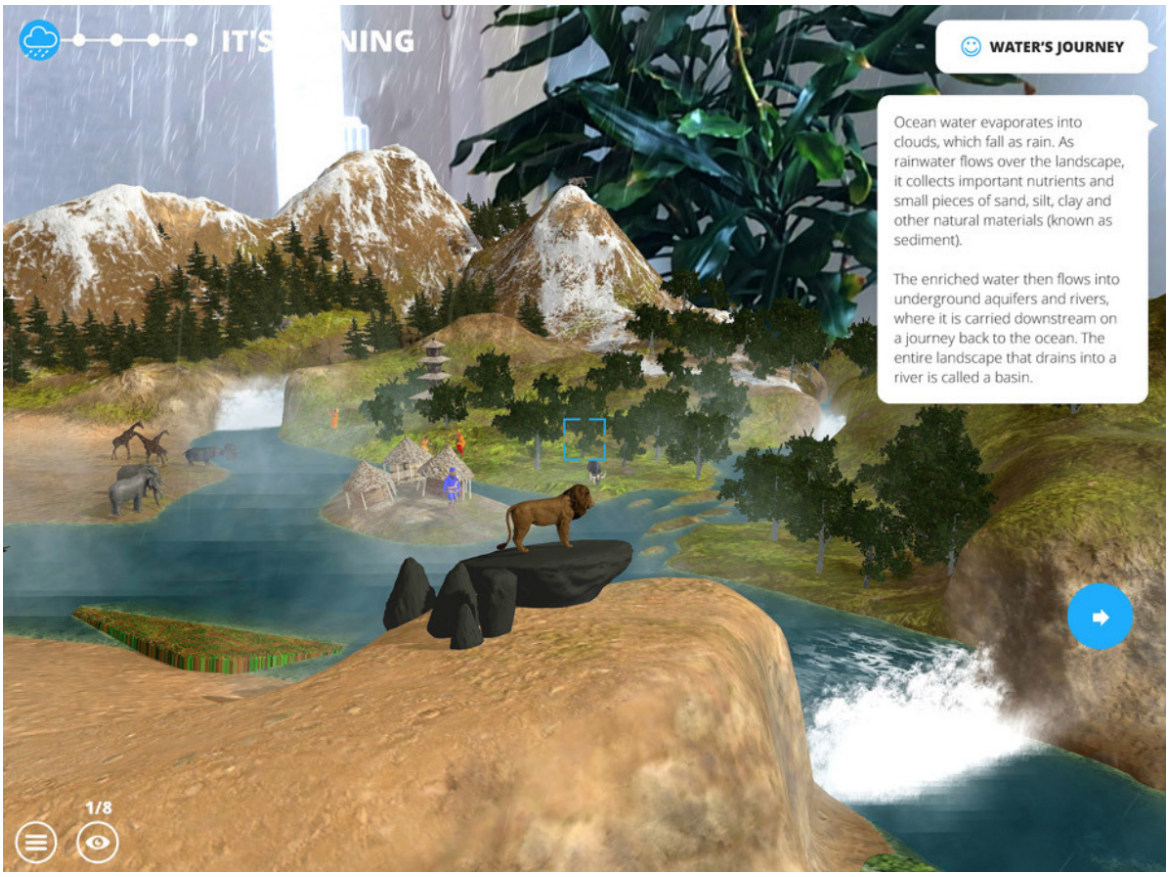
The set up and use process involves:

- Free app downloads from Apple or Google app stores.
- Find a flat surface that's well-lit so that the programme can recognize where you're placing the landscape.
- The scene then appears on the table and you're able to zoom in, move around.
- Tap on icons for more information, (via helpful floating tips that appear) for example bodies of water or different animals and people. Each scene along the course of the river has multiple things to see. At the end of reading about an icon, tap the check mark and the counter will go up.
- At the bottom of the app, there's a counter that keeps track of how many found throughout the time in the app.
- Learn about nature and people by clicking on the icons for example "Rice Farmer/Mother," whose home in the delta becomes increasingly vulnerable with climate change and sea rises.



Key functionalities include:

- Gamification: this increases engagement and also makes the user physically move around which has positive impacts on learning outcomes with a more immersive experience. Digital games have the potential to shift users and audiences from passive spectators to active participants who interact with the content.
- Decision making: The user can dam the river to see in accelerated time what happens, and then try a sustainable energy mix that keeps the river connected but still satisfies growing energy demands.
- Storytelling/narration: the narration element provides more detailed information on how wildlife, people and entire landscapes depend on healthy, flowing rivers. As users explore the AR view, a narrator explains how river dams affect farming, animals, and human inhabitants. The narrator also discusses solutions, helping to find a positive outlook.
- Simple interface: The user interface was deliberately kept minimal and markers over the object are used to lead people through the story. They followed the principle of "less is more" in the AR app design.
- Translation: the App is available in 6 languages: English, French, Spanish, Russian, Hindi and Mandarin.



#5
Technology

WWF Free Rivers was made with the Unity games engine. It is available for free on both the Apple's App store and Google Play store. It functions on iPhone, iPod Touch, iPad and Android and needs the minimum software requirements of iOS 11.3 or later and Android 8.0 and up. The experience on a tablet device is preferable as the larger screen improves the immersive experience. The app uses markerless AR technology to show its contents. Upon launch it requires to point at any flat surface to create an anchor in the real world to display 3D and interactive content.

It is currently at version 1.3 and has a size of 447.90 MB. WWF own the rights to the app.

One Big Robot, the agency who built the app, update it based on requests by WWF. This to date has included:

- Post-launch update on performance and for the translation into other languages.
- Five months after the launch, a completely new feature was added: map visualisation feature, that includes layers for free flowing rivers, and explains via the map feature information about protected areas and free flowing rivers. This also included adding in the big animals feature (to learn more about specific species).
- Future update planned: adding different scenarios of real rivers (Danube and Ganges).

#6
Production & Distribution

Production process

The production process began with an analysis of what the main aims were and where AR could add value towards achieving these aims (see aims and rationale below).

WWF decided to focus on AR for the following reasons:

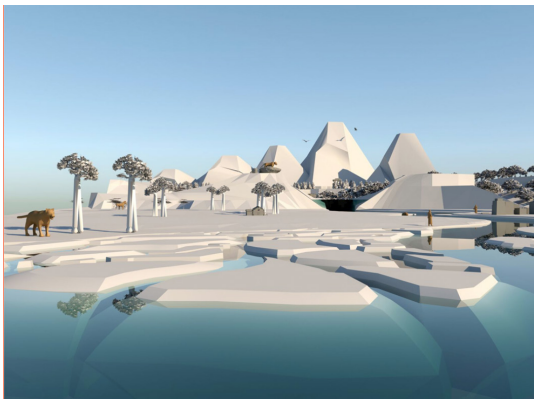
- The predicted impacts on awareness raising (not proven at the time of development because of AR being new)
- The “wow” factor of AR, being one of the very first AR apps produced
- More accessible than virtual reality (VR)
- Less expensive that VR to produce
- The timing with the Apple announcement of launching AR on iOS, as AR was now going to be in the hands of millions of people with iphones

Production in partnership with One Big Robot took place on an accelerated timeline, taking only six months from concept to delivery. This swift process was part due to the eight year relationship between WWF and One Big Robot. Notwithstanding it was a complicated process and a learning experience, as the One Big Robot and WWF team were one of the first explorers of AR.

The first model was made out of legos in a basement and then brought to life over the six month period. Feedback was given at various stages by WWF scientists to ensure accuracy of the content.

One Big Robot created a moodboard to find the right look and feel for the experience where they laid out references for every single element and then build a 3D storyboard to have an audiovisual approach to the experience. To design the landscapes, the used geometric mesh of the terrain and applied overlays of texture.

Working with One Big Robot was a positive experience for WWF, who have worked with them on many occasions. The agency specialises in science and social good so were better briefed on the issues, and they provided in kind development for some of the time they used, keeping costs lower than an AR experience of this caliber would normally take to produce. It was internally funded and approached as an experiment by both sides.



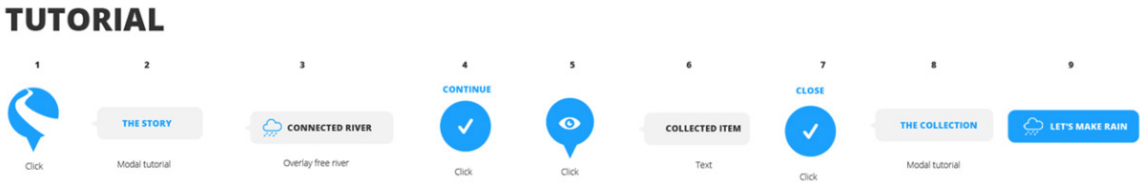
The production process coincided with broader work that the organisation was conducting to put together a list of non-sustainable development proposed for free-flowing rivers across the world. This meant that there was a range of learning coming from this project at the same time as the app was being designed that could be taken, embedded in the app, and then rolled out via a broader advocacy campaign. This allowed the content of the app to be more realistic and WWF staff working on the ground in these research locations could identify with the app and use it in their stakeholder engagement and advocacy efforts on the ground.

Challenges

From One Big Robot's side, the design process was challenging as it was one of the first educational AR apps. According to One Big Robot:

"One of the most complicated factors on the project was understanding how people were using AR when there were practically no educational AR apps created when we started.
Being a pioneer is fun, but it made us work and rework on all the flow of UI and UX."

One Big Robot worked intensively on the design of the user experience and the flow of contents to get it right, building wireframes of usability for the app:



[Images from One Big Robot's website: http://www.onebigrobot.com/]
There was an extensive iteration process to get the usability and design of the app right - this was more intensive for the Free Rivers team given the fact that AR was so new.

This iteration process was mostly absorbed by One Big Robot. From WWF's side, no major challenges were identified in the production process and WWF have said that they would not do anything different in a production process like this next time. They took steps back to evaluate and correct the app as they went through the process which resulted in a more polished and higher quality final output. For example, the first iteration of the app was too weighted because of the importance that everything be scientifically accurate, and had to reduced in size. This sacrifice on precision was necessary to make the product viable.

Launch and distribution

WWF Free Rivers was launched in the US by Apple at an event to highlight creativity in education, in Chicago in March 2018. A presentation of the launch is available[1]. This was the first time that Apple released AR applications on iOS and therefore there was a huge amount of interest in the launch. WWF launched the app after this initial event. Apple put a large amount of time and resources into the launch, and there was a huge advocacy campaign around it. It is now available on both Apple and Android phones and tablets, on the Apple and Google stores, and has been disseminated in 5 languages. The app is still featured on Apple.com's AR page (in the US). Free Rivers has received the highest number of downloads from the US and China[2].

In addition to distribution via the app stores, WWF distribute the app as part of their educational work, integrated into their Dolphin Classroom Toolkit[3] on freshwater and use this in significant, water-focused professional events such as the Stockholm International Water Institute's World Water Week, the International Rivers Symposium, and the World Water Forum.

1 https://www.youtube.com/watch?time_continue=7&v=uG2HiraKM-Y

2 According to One Big Robot, China is the global leader in AR

3 The Dolphin Classroom Toolkit is part of Wild Classroom is a growing library of species-focused toolkits produced by WWF, aligned to US national education standards, that can be used to enhance children's learning inside or outside of a traditional learning environment.

#7
Outcomes and Future Planning

The app has had a total of almost two million downloads. It receives feedback on the Apple app and Google Play stores in the form of user reviews. It is currently rated 4.8 out of 5 on the Google Play store (12 reviews total) and 3.7 out of 5 on the App store (131 reviews total). WWF points to these app store reviews as their primary source of evaluating the app, and based on this feedback that they track they have made updates to the app.

Most of the negative reviews have to do with negative opinions of AR more generally rather than with the app and content. For example, one user questions whether AR is adding anything to this experience when videos could be used instead. User suggestions for improvement include: wider breadth of content, both in the design of the habitats and storytelling; making the characters moving, to increase the interactive environment; enlarging the content and the font. User favourite features include the storytelling, being able to physically move around to explore the scenario and the vivid clear design.

Key learnings

The following are key learnings that the WWF and the One Big Robot team took away from the process of building their first AR app:

- *AR works well for the education community*. WWF was surprised at the uptake and amount of coverage that Free Rivers received, in teachers' newsletters and educational press. *"The decision makers of tomorrow"* were an unexpected audience. WWF have embraced Free Rivers as an educational tool as a result, and it is part of their Wild Classroom[4] Kit on water.
- *The technology is second nature for the new generation:* WWF were surprised at how easily it permeated young audiences. Although they created it more with middle and high schools in mind, they have found that much younger children are using it and that it resonates strongly with younger ages.
- *AR (and other immersive technologies)*

4 *Wild Classroom is a growing library of species-focused toolkits produced by WWF, aligned to US national education standards, that can be used to enhance children's learning inside or outside of a traditional learning environment.*

is a more creative way to get otherwise complicated or less interesting concepts out to the public

- *TThe attention from Apple made a big difference to the roll out and without Apple it might have had a much slower uptake.*

WWF and One Big Robot were at the launch of AR on Apple, and interviewed by the media in the days following the launch; Apple featured the app in the app store on their top lists.

Future planning

WWF aims to turn this experience into something even more immersive and interactive. Firstly, they would like to have a teacher model of the experience, where multiple players can interact using different tablets/phones in the same river basin in a mixed reality experience. They would like to be able to take this experience to specific locations and be able to show what they would look like when flooded, for example to the people in Zambia who originally inspired the production of Free Rivers. As technology progresses and AR headsets like Magic Leap become more accessible and affordable, WWF would like to turn the experience into a wearable one.

Content-wise WWF would like to build different customised river scenarios in order to personalise the experience, rather than using one generic one. They would also like to cut down on the amount of words used to improve the learning experience, as these were written by scientists not educators.

In the meantime WWF plan to continue to use Free Rivers as part of their education packages around the world, and at major conferences and events, integrated with their work on rivers.

#8
Internal Evaluation and Learnings

Process

The process of developing WWF Free Rivers was efficient and cost effective, however there were various factors that played in their favour, including pro-bono work by One Big Robot and the willingness of WWF to take risks on new technologies and ideas before they are tried and tested.

As the WWF project manager highlights:

"At WWF we get permission to test things to know if they will work, even if they might fail."

WWF Free Rivers is one of the first AR apps released by Apple and therefore there was no guarantee of success, but WWF did have the assurance of high distribution figures given the partnership with Apple and the resulting marketing and exposure.

The production team worked closely with WWF scientists and therefore there is a high level of scientific accuracy in the content. There was however no direct consultation with people affected by dams or living close to major rivers, despite the original concept of the app originating from community consultations and a desire to be able to better depict future scenarios of poor river management to them. Nor was there consultation with the education community or students, although this was primarily due to the education community not being the original target audience. The uptake by the education community was a surprise and a success and future plans include capitalising on this to provide a more immersive, multiplayer educational experiences.

One Big Robot found user testing to be challenging because AR was so new and it took some time to learn how to use it. They adapted the user testing process, that spanned a three month period, to be very instruction based. The user testing process shifted the app from an experience where the users discovers things to a sequential series of events that the user follows in order to explain the story. The final month of testing with Apple was a complicated but learning process for the team.

Product and features

Despite being one of the first AR apps on iOS, WWF Free Rivers is well designed, with high quality graphics, accurately designed people, plants, ecosystems and animals, and clear, vivid visuals. The narration feature and information bubbles guide the user through the experience and the need to physically walk around, contributing to long term memory retention. Together these functions increase the quality of the user experience, immerse the user in the learning and increase the impact on learning outcomes. AR has proven to have a positive effect on learning performance, visualisation skills and the learning experience[5] and the limited amount of feedback available on the user experience suggests that this is predominantly the case with *Free Rivers*.

The primary aim of the app is to raise awareness, rather than asking people to take any direct action or train them in a particular skill. However the gaming function allows for a higher level of interactivity and possibility to move the dam and see the consequences on people and the ecosystem adds a small decision making element to the experience, showing the consequences of unsustainable development. This in turn impacts the knowledge retention of users. AR is still new enough to provide user motivation and a "wow" factor to the general public and students.

Tablet or phone AR experiences with gaming or fantasy content are suitable for ages 4+ as long as restricted to short time periods under five minutes. AR is usually recommended for ages 7+ as long as the content is gaming, fantasy, low shocking realistic scenarios/simulations and it is used under adult supervision. Free Rivers fits into this 7+ category, so any use for children under seven should come with additional guidance.

AR means more freedom of movement with no cable, and greater awareness of the space around the user, making it safe for use in schools and with younger audiences. The gaming element allows users to interact with and shape the content to see the consequences of their decisions (for example placing a damn on the river). The range of options and branching storylines is minimal, with only a few options for the user. This was kept deliberately simple by the developers to deliver their key messages and this is effective in transmitting and retaining them.

5 *A Review of Research on Augmented Reality in Education: Advantages and Applications. Saidin, Halim, Yahaya, 2015.*

Content

WWF Free Rivers is successful in turning a serious and often negatively portrayed topic (global river problems) into something both hopeful and realistic between the beauty of the ecosystem design, the narrator's positive tone and proactive solutions embedded in the storyboard. The result is that the topic is light enough for children and other users to absorb the information without feeling overwhelmed. Additionally, showing sustainable energy and development alternatives is more realistic than saying no to all development. It is solutions focussed, which gives WWF Free Riv-

ers a more hopeful than catastrophic vibe despite the challenges rivers face globally. This contributes positively towards information retention and awareness raising.

The app was not specifically targeted at children, and therefore the content was not produced with education specialists, but with scientists. Although it has been a success with the education community, the app could have benefited from a content design process that involved students and teachers.

The app does not contain a specific call to action as an awareness raising tool. This could be seen as a missed opportunity not to have it tied to a specific fundraising or educational campaign. It is however integrated into the Dolphin Classroom Toolkit on freshwater.

Translation of the content from English into five other languages is a strong feature of the app, particularly because the languages that were chosen cover huge parts of the world that are experiencing major challenges to free flowing rivers. Future plans to customise the content by building river basins for the Danube and the Ganges with further increase personal connectivity to the content.

Scalability

Once the appwas developed in English and translated into five other languages, it became highly scalable in countries where these languages are spoken, due to its low cost and lack of technical expertise needed to use. It is free to download and works on any relatively new phones or tablets (iOS 11.3 or later and Android 8.0 and up). It functions on technology that schools in the US are likely to already have and is accessible to almost all ages.

This makes it highly scalable in the primary country of distribution (United States) but would not necessarily be the case in other parts of the world. The choice of AR over VR means sacrificing immersion for a technology that is more accessible financially and technically to the public and to a broader range of ages and is therefore more scalable

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Effectiveness

The main aim of the app is clear: to raise awareness of a defined set of key messages. It can be inferred that between the high number of app downloads and users and positive user feedback on the Apple and Google stores, this has been achieved with those who used the app. There is not enough evidence or formal evaluations to thoroughly evaluate if these downloads translated into measurable impacts.

Key Learnings of Relevance for SBDRR

This case study is of relevance to the future work of GDPC in XR despite focussing only on raising awareness because it is a highly successful example of an AR app that has been used extensively in schools. AR is proven to be effective with school children and this case study highlights that it is an affordable modality for awareness raising and communicating concepts that are not normally considered interesting, harnessing the wow factor that AR continues to hold. The app has been highly successful with the education community and had huge numbers of downloads - over two million - particularly in the US and China, although it is difficult to distill how much promotion by Apple impacted on this From the developers experience, they can see AR working well for school based disaster preparedness.

Top takeaways

- Organisational openness to taking risks on new ideas or technology is key to innovation. Joint collaboration between parties that understand the risks, the challenges and are willing to go where no one else has gone is key.
- AR can have excellent uptake by the educational community. This type of application supporting broader teaching outcomes is successful with children and young people.
- Appealing visuals plus gamified content increases use of application and positively impacts on awareness raising.
- AR apps downloadable on major app stores, with only a phone or tablet required increases uptake.
- The design process is lengthy, with good cooperation needed between developers and the owner, and multiple iterations to get the content right.
- AR app downloadable on major app stores, with only a phone or tablet required increases uptake
- The design process is lengthy, with good cooperation needed between developers and the owner, and multiple iterations to get the content right
- Having an established and ongoing relationship with a digital agency that can help to keep costs down and continue to update and refine as user feedback is gathered is beneficial. This is particularly the case with XR apps as they can be expensive to develop.
- ARas a tabletop experience continues to have value even as the technology behind AR in the real world becomes more accessible (i.e. overlaying simulation on the users' real surroundings). In this case it allows users to virtually travel to and experience other parts of the world.

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