Interaction Design: Weather App

Task 1: Requirements and Data Gathering

1. Identify an appropriate primary stakeholder

Primary Stakeholder:
- Children
- Aged 7-9
- English speaking

2. Describe your primary stakeholder

Children are less experienced with the weather so they may not grasp the high-level abstractions provided by conventional weather apps. This applies in particular to 7-9 year olds. Key features of this primary stakeholder are that they are the youngest possible target target group that can be expected to be able to read. As a consequence, they will be able to consume simple interfaces that contain text. On the other hand, their vocabulary tends to be limited to plain, simple words[1]. This means that they will receive well interfaces that are based on either simple language, or on images and effects.

Since children cannot think abstractly until age 9[2], they will take the audiovisual effects provided by an app literally. As an example, a button with a rainy cloud may invoke expectations of rain to occur in some form.

Furthermore, children are not particularly well-versed with concepts like probability and units of measurement. Also, children would also struggle to understand these unfamiliar concepts independently; any information presented to them must be immediately familiar to them, or must be accompanied by some helpful information to aid their understanding.

They tend to be less patient and easily distracted, so we will have to prioritise responsiveness. In order for the application to engage the child and maintain its attention, the interface cannot remain static for too long.

With regards to their interaction with apps, children tend to have less well-developed hand-eye coordination, and so controls / buttons need to be bigger /

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[1] https://www.theliteracybug.com/stages-of-literacy
[2] https://uxstudioteam.com/ux-blog/design-for-kids/

eye-catching. Because their motor skills are not as well-developed yet, mobile / tablet gestures such as pinching, swiping, double-tapping, long presses, and other multi-touch gestures should be avoided as much as possible[3]. In other words, physical interactions with the app should be limited to single taps as much as possible, and in obvious locations.

Children as a group are more inquisitive and open to new concepts than adults. By providing them with more, accessible, learning options, we can help them choose the areas that interest them the most. This can help sculpt the people they become as adults, and their areas of interest in later life.

By choosing children, we can help them use technology to improve their interactions with the real world. As a lot of people are focused on how kids are becoming trapped inside with tablets/phones, creating an app that can provide encouragement to go outside, while educating its users, should be well received.

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[3] https://www.nngroup.com/articles/children-ux-physical-development/

3. Identify and describe wider stakeholders

List of Stakeholders

Tier	Stakeholders
Primary	7-9 Year Old English Speaking Children
Secondary	- Parents - Weather API Provider - Children's Friends
Tertiary	- School Teachers
Facilitating	- Parents - Our Team
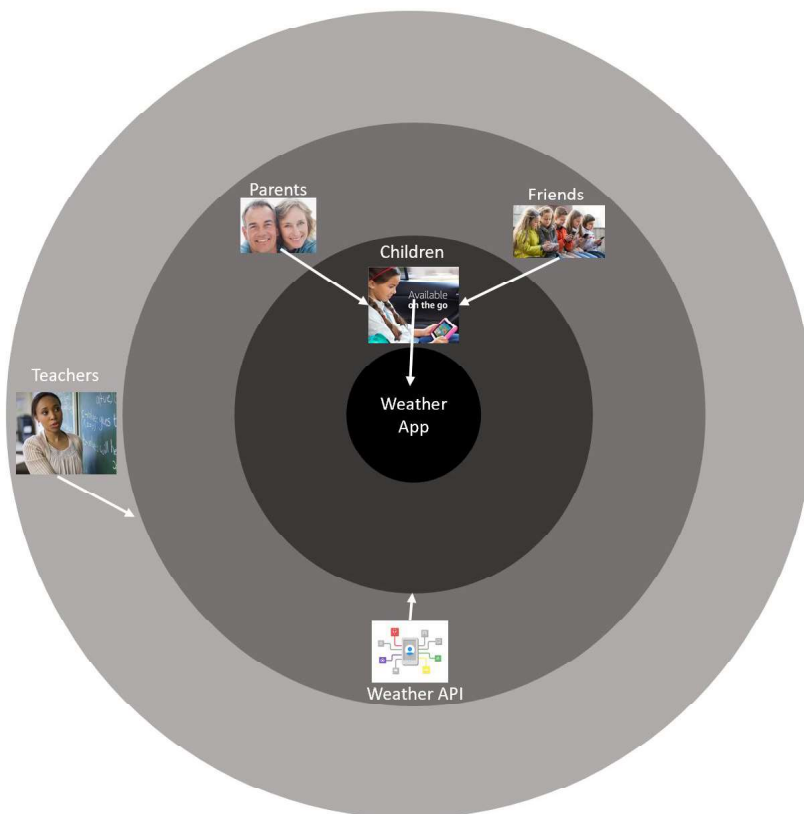
Primary Stakeholders

Children: Described in 2.

Secondary Stakeholders

Parents: Parents are the main guides, influencers, and controllers of the children. They often control the tablet/phone of their child. This means that they may have to authorize the download of the app, or even initiate it themselves. They will not directly interact with the app on a regular basis, but may briefly evaluate its quality. They will receive output from the system, like their child informing them that they may need a coat when going out as it could rain. They facilitate the design by performing maintenance when the child cannot.

Weather API provider: The Weather API provider feeds the app with weather data, such as predicted temperature, humidity and wind levels for the next n days, but also potentially secondary health data such as pollution and pollen levels. They provide all dynamic data to our app. They are a secondary stakeholder as they produce input for the system.

Children's friends: These are, usually, also children. This increases our target market by peer-to-peer advertising.

Tertiary Stakeholders

School teachers/social workers: These group of stakeholders are particularly interested in the educational growth of the children under their charge. Teachers may view the app as a possible educational tool for children to learn about the weather, and concepts such as temperature and probability. This can influence the likelihood of children picking up the app and using it.

Facilitating Stakeholders

Parents: Described above.

Our team: Our team is involved in the system's design, development and maintenance. We will be affected by a successful interaction through financial rewards. We provide the static data for our app, such as educational facts, etc.

4. Choose appropriate techniques to gather data about your stakeholders

Questionnaires

We will use questionnaires to gather data. Questionnaires will be used for parents, as they have adequate literacy skills to answer a questionnaire, and we can reach a larger group of people this way with less time and resources.

Interview

Furthermore, we will interview a teacher of 7-9 year olds. They have up-close knowledge of what these children can and can't do with technology, and experience with their literacy levels and interests. The questions will mainly focus on a child's perspectives on weather, technology, and learning in general.

Researching Similar Products

We also chose to analyse a combination of weather apps and apps directed at children. This method would allow us to observe what app features would appeal to children, and then attempt to reverse-engineer the process and elucidate trends or particular features of our primary audience.

Weather Apps	Weather Apps for Children	Apps for Children
- Google Assistant - iOS Built-In Weather App	- MP Weather - Weather Duck	- YouTube Kids - CBBC Buzz

5. Describe the results of your data gathering and provide visualisation of the analyses

Most children learn to read by 6 or 7 years of age[4]. This means that our initial range of 7-9 is reasonable. We don't want to aim for a large range since children develop so quickly that their requirements will also change rapidly.

Researching Similar Products

Apps that were built for children did either have a completely non-textual interface, or displayed the text in a big, handwritten-looking font. Likewise, they contained few interactive elements: When they did, they were big buttons. The apps for children all contained some sort of central living creature that interacts with the user. There is a split between parent and child interface, enforced with technical measures such as age verification. Unexpected was the frequency of ads, and their type: We encountered screen-covering pop-up ads, which a child might not know how to close, as well as ads for Casino apps, which seem inappropriate. This may be because our sample did not include any paid apps.

The general weather apps that we examined did both focus on a simplistic overview of the weather, prioritizing a single metric (temperature) together with an iconized representation of the current weather. There was a surprising amount of artistical variation in these icons, ranging from minimalist line drawings to realistic animations. The weather apps had location switches tightly integrated in their interfaces.

Interview

From the interview, we learnt that for our age group, their interaction with the weather is very basic, and there is sufficient scope for education on how their lives are affected by weather, which might not be something they consider much at that age group.

What was surprising is that the teacher noted the need for hands-on activity to supplement audio and visual media for education, which cannot be provided directly by a digital app. However, we can consider encouraging children to go out and do activities or make their own observations about the weather. Also, the teacher noted a need for frequent affirmation to keep them motivated.

Another concern that we did not initially consider is that typing at that age would be quite uncomfortable for them. Hence, things like typing in their location to find regionalised weather forecasts would not be helpful, and in fact make their experience using the app more frustrating than helpful.

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[4] https://www.healthychildren.org/english/ages-stages/preschool/pages/helping-your-child-learn-to-read.aspx

Out of the 14 samples, the majority reported that their children used their own devices. This means that the front page in the app store should be primarily addressing the children. The device usage statistic suggests optimizing for phones. The usage statistic shows that currently, children are not well-acquainted with weather apps. This suggests that there is a market niche, but it also suggests that current apps in this market may not serve well as examples. The answers to the most important features in educational weather app provide useful inspiration: In particular, three answers suggest explaining climate phenomenons such as rainbows and climate change.

6. Requirements development

Aims:

Their primary goal is to know what the weather is, and to help educate them on weather-related concepts that can be applied to other areas of their education. A secondary goal is to produce the correct response to the weather situation (bring an umbrella, put suncream on, etc.).

Sources of satisfaction:

They gain satisfaction from the app doing what they expect it to do (i.e. app works according to intuition), without being overburdened. Thus, a simplistic interface (buttons instead of text fields) can be beneficial. They also derive satisfaction from giving the correct response to questions from parents, friends, or teachers, and receiving encouragement or affirmation.They also get frustrated when they are in the middle of an interesting activity and they get interrupted by external factors (e.g. time).

Knowledge and skills:

Large disparity in knowledge and skills to navigate through apps between children and their parents. In terms of manipulating mobile tablets and devices, they are also not as adept in using all the possible gestures such as multi touch, press and hold, or swiping in a particular direction. From our interview, we also learnt that typing on a tablet is something children might not be particularly skilled in yet.

Attitudes to work:

Children in this age group are often exposed to a wide range of stimuli and constantly encounter new things. With the increased propensity of parents interacting with tablets and phone devices, children would be curious about tablets and apps in general and would be interested to pick up and try out new apps.

However, this also means that they can be easily distracted by other things, such as games or videos on the device. This means that our app has to be interesting enough to graph their attention and interest them enough to want to re-use the app.

Work-group attributes:

In addition to their general interest toward technology in general, 7-9 year olds are generally excited to use technology, as we discovered through our interview. However, for almost half of the children, their ability to use the app is very much predicated on their parents' willingness to install the app. Hence the app must appeal both to children and their parents to convince them to install and use the weather app.

Nature of activities:

A 7-9 year old's day-to-day activities are majorly determined by their parents and peers, but outside of school would tend to be less structured. They would only want to find what the weather is if asked by others (parents, teachers, friends, etc.). Hence this activity tends to not be spontaneous but in response to others, and would tend to not explore beyond what was asked of them.

Responsibility:

In the scenario described above, where a parent is the one asking the child to find out about the weather, the child has a responsibility of sorts to give an appropriate and reasonable answer the parent. In the context of the app, this means that the metrics and information presented to the child must be as unambiguous as possible and cannot leave any room for misinterpretation. From the questionnaire, we learned that to at least some parens, privacy is of great importance. In-app data gathering, if any, should happen completely anonymized.

Working conditions:

The weather app would most likely be used at home, or if outdoors, would be accompanied by their parents. However, both parents and children would prefer for the children to be able to navigate through the app by themselves as much as possible, with parents only intervening when children are particularly stuck.

7. Provide a final list of functional and non-functional requirements based on the information above.

Functional:
- → Provide the current temperature
- → Provide basic weather information (sunny, windy, rainy)
- → Provide some means to teach students about weather to a limited extent (such as comparing temperature, activities to do in weather)
- → Provide a basic list of activities to do in each weather
- → Give a short weather forecast (up to ±3 days)
- → Implement privacy-respecting measures.

Non-functional:
- → Data is sourced from weather API, stored for as long as the app is open
- → Must have some means to capture and maintain attention
  - ◆ Frequent positive feedback back to the user in the form of affirmation or encouragement
  - ◆ Use of cartoon characters, animations, and sound effects to help grab attention
- → Simpler language and information presented in bite-sized amounts
  - ◆ Figures and numbers need not be extremely precise
- → Navigating through the app should be very simple and intuitive
  - ◆ Can safely assume an adult would be present to perform more complex operations like settings and configurations
  - ◆ Restrict to single taps and avoid typing as much as possible
  - ◆ Buttons should be larger in size, and easily noticeable

Appendix 1: Gathered Research

In this section we are including all of the data that we have gathered, in a complete form, together with the questions used for the questionnaire and the interview. This is prior to the analysis of the data in 5, but post deciding what data to gather in 4.

Researching Similar Products

MP Weather

Educational app that provides a simulated weather engine that the user can play with, and see the effects in a comic world.
- No text at all (except for the title).
- Main menu contains two buttons: A single, central play button that is blinking and cannot be missed. A smaller, static button in the corner, made for parents. App asks for an age confirmation when that button is clicked
- Colorful interface. Every interaction is animating a humanized deer.
- Buttons are blinking regularly.

Reviews:
- Parent appreciates graphical details and informativeness. Practices with their son for some test. Positively mentions "funny surprises".
- Parent criticises unavailability in German.
- Parent appreciates level of detail and "fun".

Google Assistant

Standard Weather widget on Android:
- Present on the Always On display of Pixel phones. Displays temperature + simple drawing of weather.
- Further information is accessible by clicking.
- Effectively performs a Google search asking for the weather, then shows you the result - very familiar interface.
- Easy access for your current location, and it makes the Google search weather widget very familiar for when you want to see the weather in another place.
- Accessible via voice for hands free access, which allows it to be used in situations like driving.

Reviews:
- 'I love google and am a full google home. The assistant is great… and lets me know… weather.' - as a further note, it is quite hard to find a review of this, as it is effectively a minor built in feature in the OS.

iOS Built-In Weather app

Built-In Weather app on iOS.

- Swipe between weather views for different places.
- Each weather view provides location and temperature on top, filling ⅔ of the screen. Followed by Weekly overview. Followed by various statistics such as wind speed, chance of rain, humidity, etc.
- Background imitates current light and weather conditions at the location.

Reviews: None.

Weather Duck

Children's app that tells you the weather and advises you on what to wear.
- Requires location access prior to loading.
- Main view contains a duck with a speech bubble.
- Colorful font, comic sans-ish.

Reviews: None.

Youtube Kids

A curated version of the YouTube app with tighter parental control and only videos appropriate for kids.
- Setup process requires a parent (or just anyone that knows what 4x5 is)
- Interface is much simpler than normal YouTube but contains many cartoon characters and is much less minimalistic
- Seems to be aimed at children younger than our target audience.

CBBC Buzz

A social media app for the target audience of CBBC, which is wide at 6-12. The app consists of fan material from CBBC viewers, like fan drawings and short repeating videos.
- Safety features - the username is randomly generated to avoid any hidden foul language.
- A minimalistic interface with few buttons and intuitive for anyone to use. You just scroll through content forever.
- The app allows kids to communicate in a safe and pretty anonymous way. You would hope that the moderation requirements for allowing custom pictures and designs are thoroughly considered.
- The most important buttons

Interview

Questions about the weather:

1. In general, to what extent are children aged 7-9 taught about the weather? What sort of knowledge and concepts would you expect them to know and what would you not expect them to know?

There is no explicit teaching of the weather to these kids. Weather is only introduced or briefly mentioned during story telling. Even then it is only for a brief moment at the beginning of the story or during the story where the kids just listened or read together that sentence where weather is mentioned. For example at the opening of the story, One bright sunny day………" Some teachers may elaborate to younger kids about 7 or 8 years of age the meaning of bright and sunny or rainy and cloudy. Kids at 9 years of age are expected to know what it means.

The kids of that age know about sunny, rainy, bright or cloudy but no more than that. Unless the story is about the weather. They know how it feels how and looks like in the local context as they only get to experience the sunny and rainy weather. Not so much on cloudy or windy. We would not expect them to know the reasons for the weather or change in weather, like heavy rain from the monsoon seasons and so on. Most of the time we expect them to know what it looks like and feels like for sunny and rainy weather. They would not have experienced the hail, snow, etc. and we don't expect them to know how it feels like or look like except for the more privileged kids who travel frequently. That is only about, say 2 % in class of about 40 pupils who would have experienced snow. Other than that, for stormy or fogging weather they would not have known much about it as they would not have travelled to such places with such weather and thus no opportunity for experiences.

2. How detailed would you describe the weather to a 7-9 year old? How much detail would you include or exclude?

What it looks like and feels like, perhaps using pictures or videos to explain the weather. And how it affects the environment, for example like drought or floods. But they wouldn't be exposed to the details of how, for example rain, rainbow is formed (except in Science lessons, probably from 10 years old). Same for other weather conditions like snow, hailstorm, etc. It's just a brief explanation of the weather being such because of the country's location, for example, all kids would probably know (9 years of age and above) that countries in the west have 4 seasons. Unless the kids come from a very supportive family and they would have read widely, they would not understand.

Details would probably be a simple explanation with diagrams or videos on how a weather condition is formed but excluding the scientific facts. Interesting graphics and not wordy explanations would be able to hold the kid's attention. In the local context it is only relevant and interesting to the kids if they could see and experience the weather. (exclude snow, hailstorm, etc.)

3. What concepts relating to the weather would be useful to teach to a 7-9 year old? How applicable are these concepts to other topics they are learning about?

What it looks like and feels like (ages 7 to 9)
For example, in hot weather, the leaves would be dry and wrinkled, the grass would turn yellow, etc. in cold weather, the need to put on more clothing, etc.

How it affects people and environment
For example, during snowfall, the inconveniences of transportation, plantation, mobility, food, work, Harsh conditions affecting the livelihood of people, (e.g. they can only fish during certain seasons), health, etc.

Adaptability to the change in weather
In the cold weather the need to have a fireplace, heater in the house, hot weather, air conditioners, etc.

Advantages and disadvantages of weather conditions
Hot weather, easier to do laundry, certain crops grow well in certain weather conditions.
Using the sunlight for solar energy for homes, etc., Preservation of food in cold conditions.

Questions about education / teaching:
1. What are the best ways for children to learn effectively? Would using both visual and audio media be better to teach children than just using visual stimuli?

Multi-sensory approaches to cater to the different learning styles of the children. Hands on activities which are tactile and visual aids like attractive posters, and video clips that are age appropriate. Also because of their age, they need to be mobile in the classroom. Getting them to move around to touch, feel, watch and participate would instill the joy of learning in them as they remember better by being involved.

Both visual and audio media would be better for children as they need to see real life action.

2. What are the things that these children get frustrated by when learning? And how do they get satisfaction from the things they learn?

Feel frustrated when:
● the things presented to them are too wordy, detailed and boring and if they do not get the opportunity to try certain things (due to limited resources, lack of time) when it's an activity based lesson.
● Get fidgety when sitting and listening to teaching for more than 30 minutes.
● Get upset when an interesting concept gets interrupted due to break time (recess) and when there isn't sufficient time to finish the teaching or learning.
● Other reasons would be when these children have special needs like ADHD (Attention Deficit Hyperactivity Disorder)

They get satisfaction when:
- they have the opportunity to do the things that they like,
- they feel that they understand the concepts taught
- they are able to demonstrate or verbalize the things that they have learnt
- get a reasonable score in assessments
- affirmation, encouragement from teachers, parents and peers

Questions about technology:

1. What is the general attitude of children toward IT devices? Are they very enthusiastic and excited or are they more lackadaisical?

They love ICT. They enjoy playing games or watching Youtube on IT devices. About 90% of children in class of 40 pupils watch Youtube or play video games daily.
They are enthusiastic and excited especially when there is something new to watch or play.

2. How often do children use IT resources for educational purposes?

In schools for children aged 7 to 9,
Teachers use ICT in the classroom almost every day for teaching for an hour for each subject (English, Math, Science, Chinese)
Children using IT devices for learning in the classroom about 3 times a week in total for all subjects.
Children using IT devices at home about twice a week for educational purposes.

3. What are some difficulties children might face when using mobile or tablet apps? Have they been able to effectively and comfortably use gestures (swiping, double tapping, multi-touch, etc)?
- Logging onto the tablets (forgot password)
- Inaccurate keying in of characters
- Unable to effectively type words, using only one finger or 2 fingers (can't do touch typing)
- Unsure of how to navigate websites. (when they are stuck, they couldn't go back to homepage)
- Unable to follow instructions, probably due to their limited vocabulary, especially for the 7 year olds

4. What sort of things (cartoon characters, animations) can help capture and maintain their attention for the app?

Cartoon or hero characters that they have recently encountered, for example, superheroes, Marvel's Avengers, Despicable Me's minions, etc.
Animations (familiar cartoon characters) with sound effects will certainly capture their attention, or things like explosives or applause when they win or lose a game, including rewards, points.

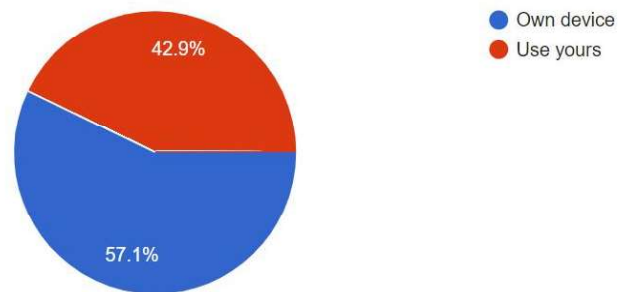# Questionnaire

Link to the questionnaire:
https://docs.google.com/forms/d/e/1FAIpQLSfi4_vS5ad1zSo5j6hzjX7G-PcMh9yPhg
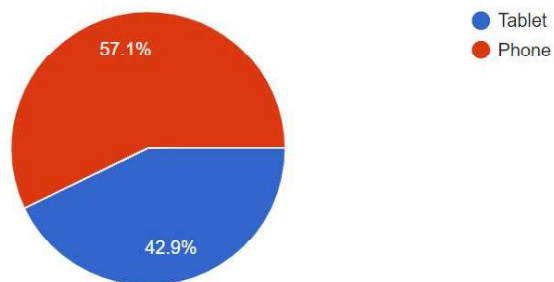rWvg9dKvKBe4Ii8A/viewform

Participants: 14 Parents.

Results:

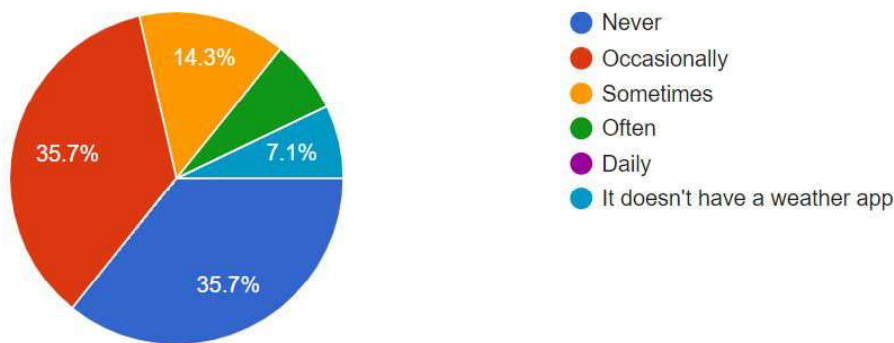## Does your child have their own device or do they use yours?
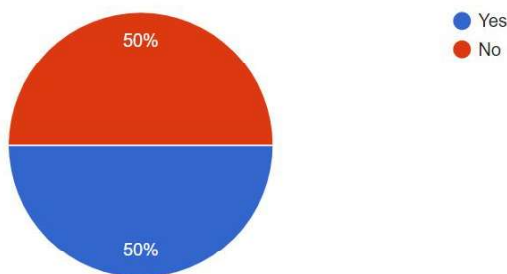
14 responses

- Own device
- Use yours

42.9%
57.1%

What device does your child use?

14 responses

- Tablet
- Phone

57.1%
42.9%

How often does your child use the weather app?

14 responses

- ● Never
- ● Occasionally
- ● Sometimes
- ● Often
- ● Daily
- ● It doesn't have a weather app

14.3%
35.7%
7.1%
35.7%

Do you encourage you child to use educational apps?
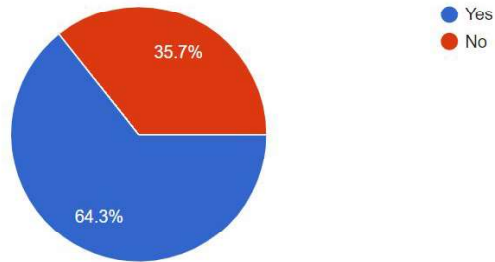
14 responses

- ● Yes
- ● No

50%
50%

What educational apps does your child enjoy using?

11 responses

As my child is a big fan of Japanese culture, she enjoys learning Japanese on Duolingo
Youtube Kids
learning language apps
Don't know
Kahoot
Elsa based medical games
Curious World
The school one
App
YouTube for video information on certain topics.
World of Peppa pig

Would you encourage your child to use an educational weather app?

14 responses

- Yes
- No

35.7%

64.3%

What do you think would be the most important feature in an educational weather app?

14 responses

Maybe the reasons for which the weather is changing? For example sort of explanation about weather fronts.

to get children interested in the weather and its impact on people's performance, mood and so on or/and: to give the weather forecast and encourage children to use the sunny weather. in other words: to motivate them to go out and do some outdoor activities (those proposals and ideas shouldn't be general, this wouldn't work. the children then need ideas which are specific for their hometown/county.)

so, under certain conditions i would encourage my children to use an educational weather app.

Not being too complicated, only give the temperature and if its raining not pressure ect.

characters from TV ect that they like

Getting the weather right

Teaching them about climate change

Easy to use interface

Simple words.

Being fun so that they want to use it

Thorough explanations of the meteorological reasons behind certain climatic events.

I don't think kids care about weather.

Shouldn't steal data

They know enough about the weather at this point. Apps like the built in iOS Weather app on their phone are great.

telling them why rainbows exist