

Smartphones for Inquiry Based Science Education

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TESTOCK 255348177



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FizziQ



FONDATION
La main à la pâte



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AIRBUS FOUNDATION

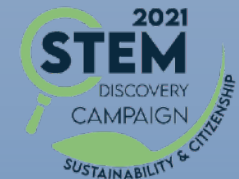
DISCOVERY
SPACE



Requirements for IBSE

Which scientific instruments for IBSE ?

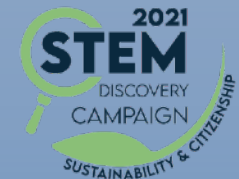
- Widely available and affordable
- Accurate
- Transportable and easy to set up
- Engaging
- Facilitating collaborative work
- Easy to maintain and upgrade



Smartphones transform societies

Smartphones transform most human activities thanks to :

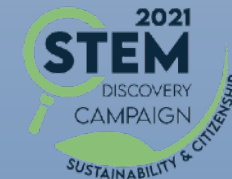
- Powerful hand held devices
- Affordable
- Mobile data 1.5G/3G/4G/5G
- Data and cloud storage
- App stores and open source
- Social networks



Smartphones will transform IBSE

Smartphones have all assets to make perfect IBSE instruments:

- ✓ • Largely available and affordable
- ✓ • Accurate
- ✓ • Transportable and easy to set up
- ✓ • Engaging
- ✓ • Enabling collaborative work
- ✓ • Easy to maintain and upgrade



Applications



Phyphox



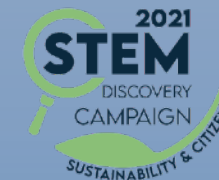
Science Journal



Physics Toolbox



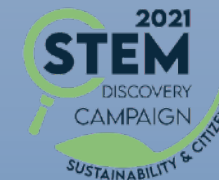
FizziQ



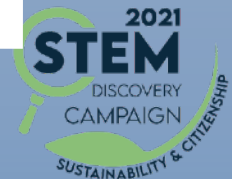
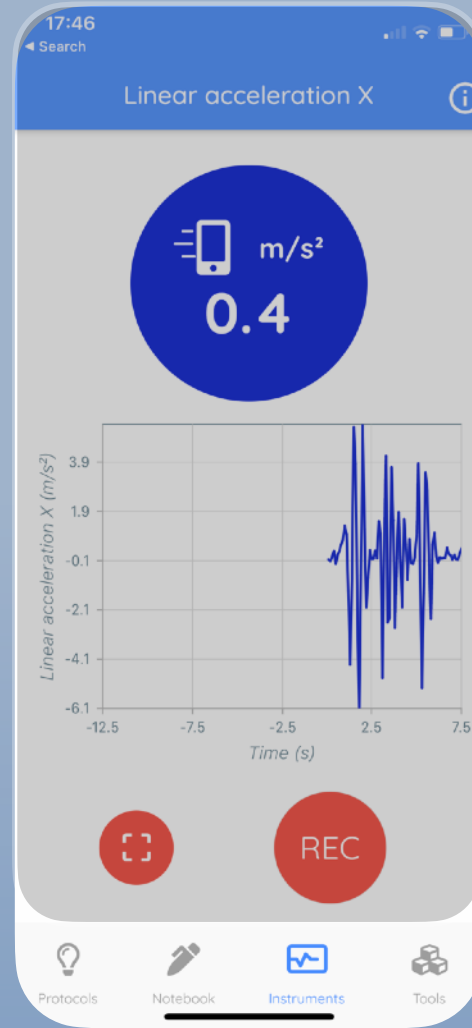
Introducing FizziQ



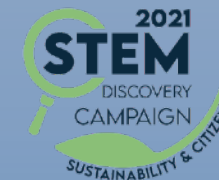
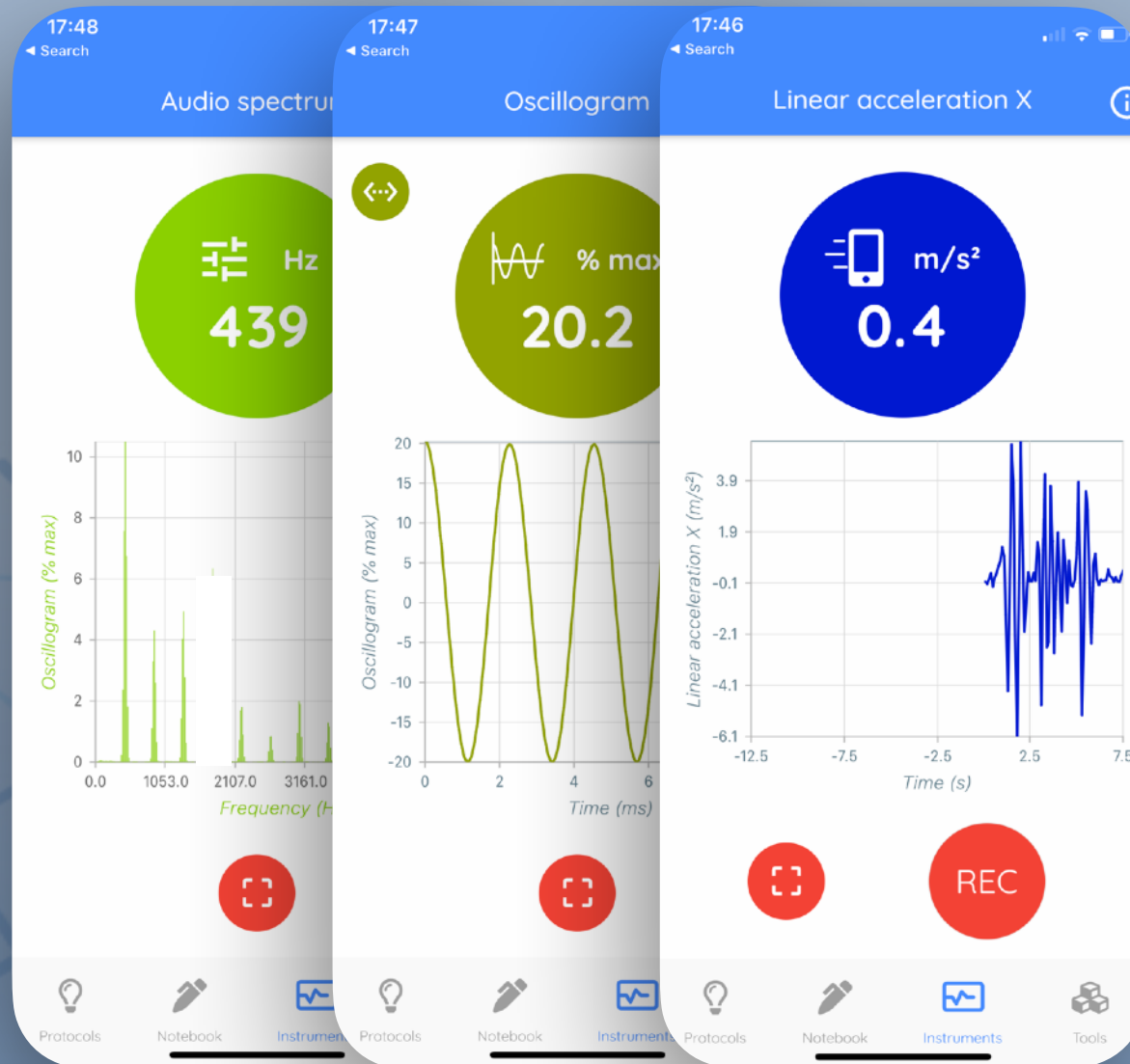
- Free with no sharing of personal data
- Highly engaging interface
- More than 30 types of measures (light, color, sound, movement, ...)
- Notebook with text, photo and tables
- Export PDF, CSV, FIZ
- Experimentation tools (synthesizer, sound library, dual recording, ...)
- Experimentation Protocols
- Created in partnership with the Foundation La main à la pâte



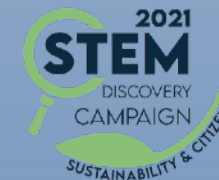
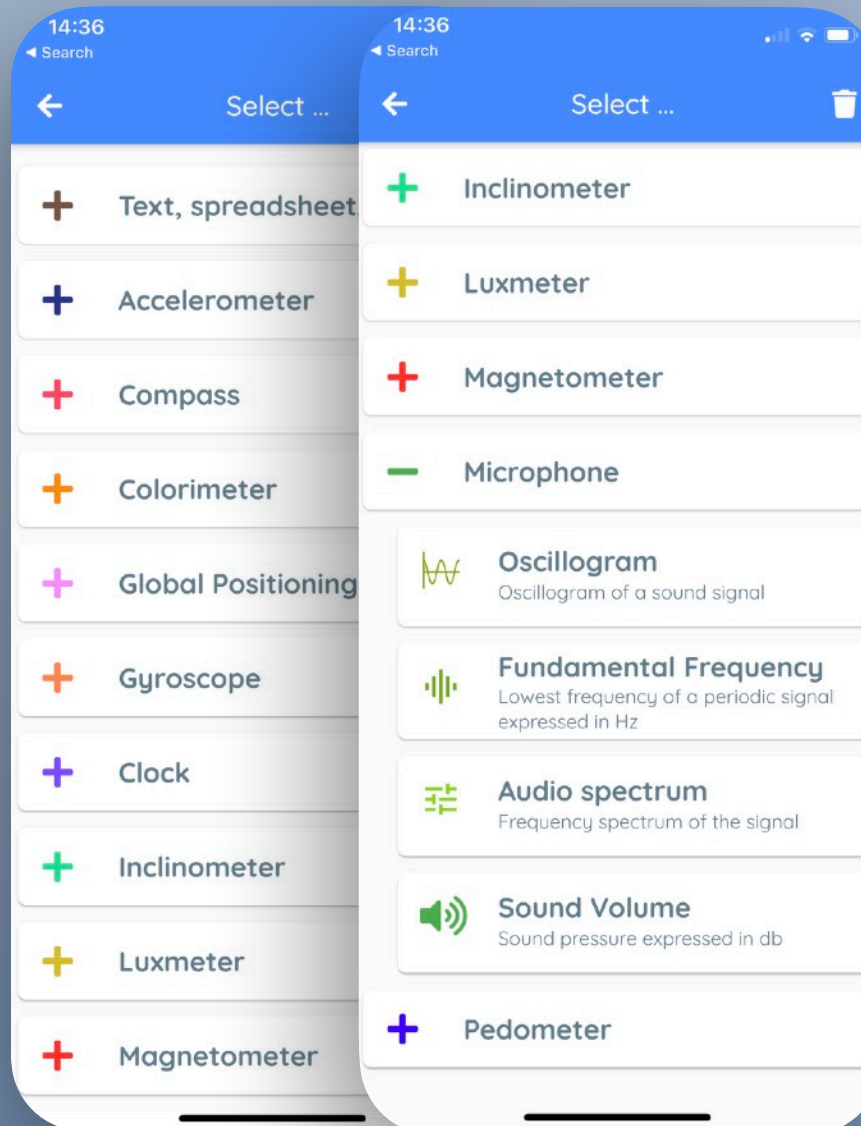
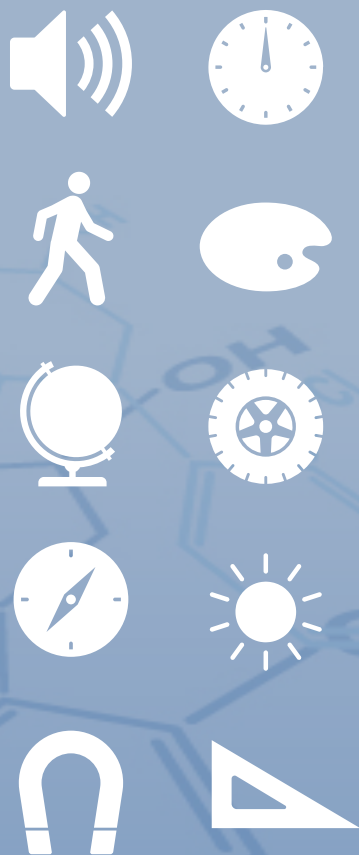
Ergonomic



Instruments



Measures

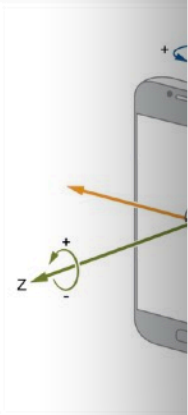


Information

14:36
◀ Search

< Rot

A gyroscope is an instrument that measures the orientation of an object in space. Gyroscopes are used in the navigation of airplanes and spacecraft. They allow them to detect and correct for pointing up, down or sideways. A gyroscope consists of a spinning wheel that rotates around a fixed point. The rotation of the wheel is used to measure the orientation of the object and the speed at which it spins one way or the other.

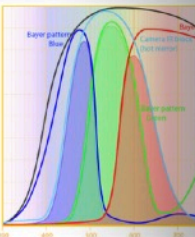


Your smartphone has a gyroscope that can measure the orientation of the phone and the speed at which it spins one way or the other.

14:36
◀ Search

< Color sp

The English scientist James Clerk Maxwell was the first to discover that light is made of monochromatic colors. The colors of the rainbow are blue, green, yellow, orange, red, and violet. These colors are sufficient to reproduce all the sensations of color. The human eye is made of detectors of color that have particular sensitivity to these colors.



Your mobile makes measurements of the colors of the light that it sees. It ensures that the image it produces is a good representation of the colors that are represented in the real world. It compares different colors and ensures that the image is a good representation of the colors that are represented in the real world.

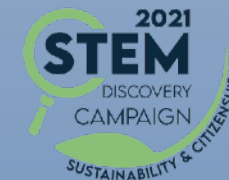
14:36
◀ Search

< Sound Volume

The sound level meter measures the sound volume picked up by the microphone. It is expressed in decibels, or dB. The data update rate is greater than 250 hertz, that is, 250 measurements per second.

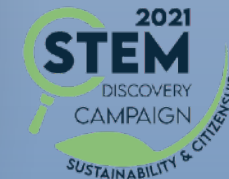
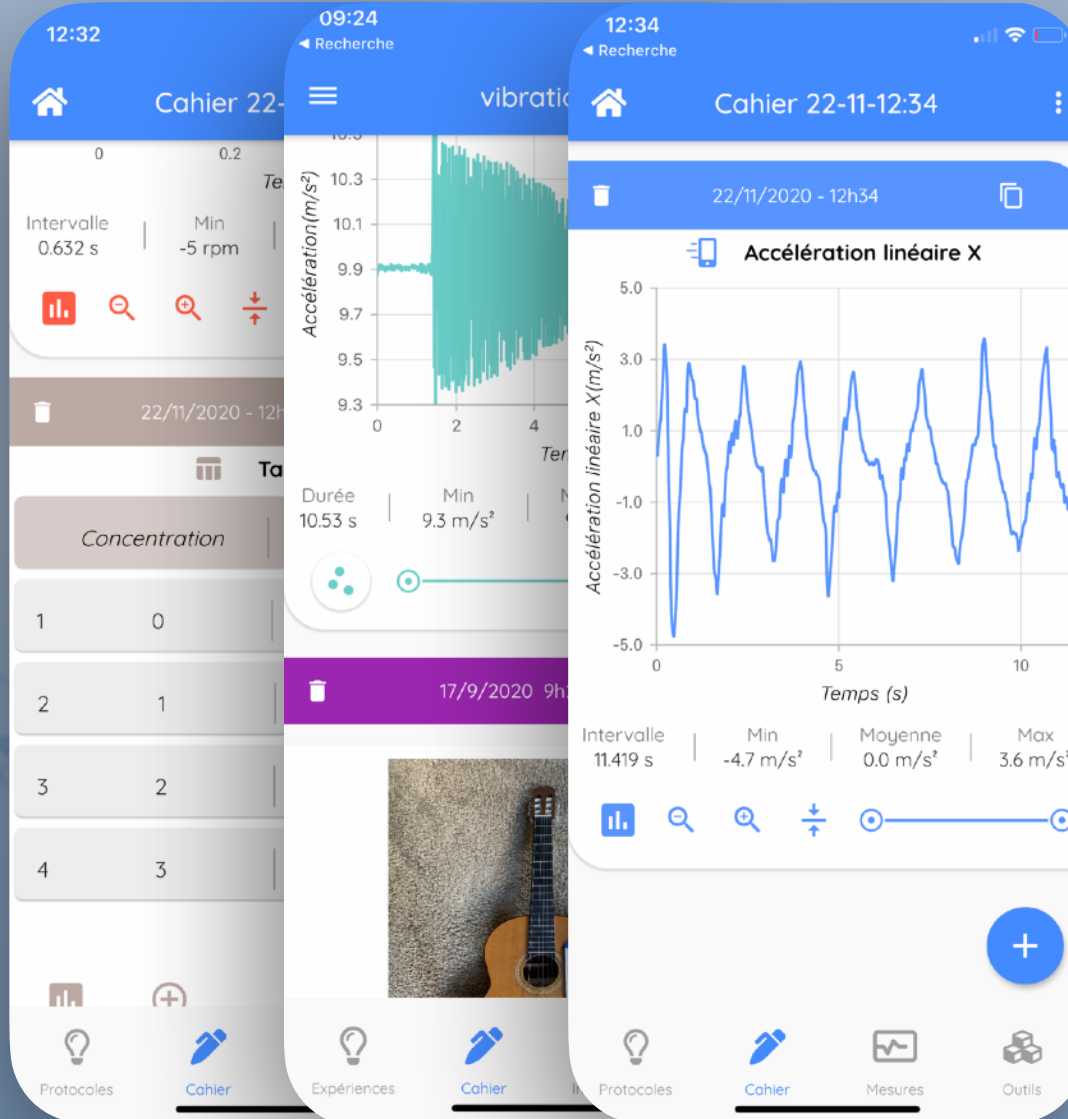
The decibel scale is logarithmic: a 40dB source is 100 times louder than a 20dB source. The quietest sound a human ear can hear is zero decibels. Ordinary conversation reaches around 60 dB, sound from a mixer is often 90 dB, and sounds above 140 dB are painful to the human ear. Continuous exposure to sounds over 90 dB can cause hearing loss.

Smartphones have more or less sensitive microphones, and the volume measurement will vary from one to another. The software calibrates the device so that the loudest sound seen on a period of time of either 90 dB and the quieter is 20 dB. It therefore produces a measure of the relative power of the sound rather than as an absolute measure.

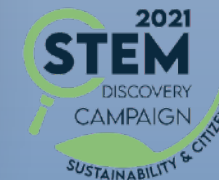
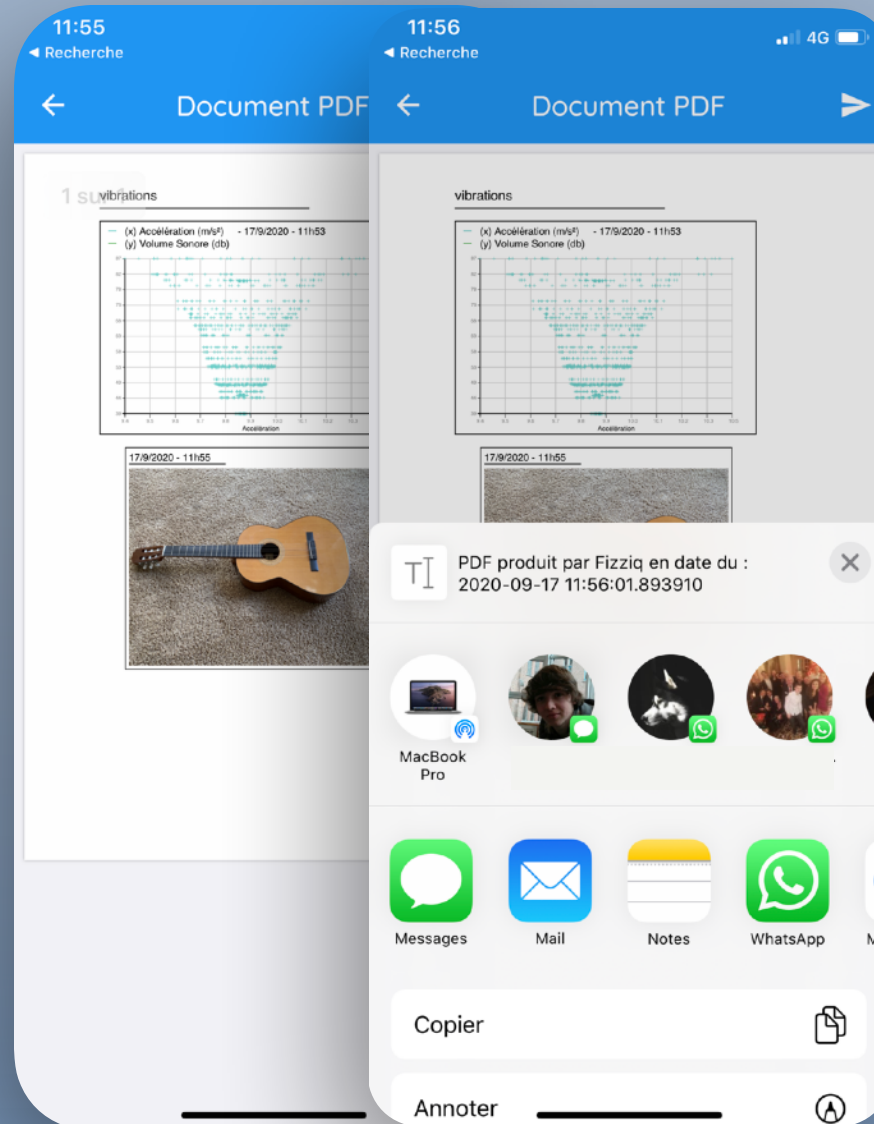


Notebook

Graphs
Text
Photos
Tables

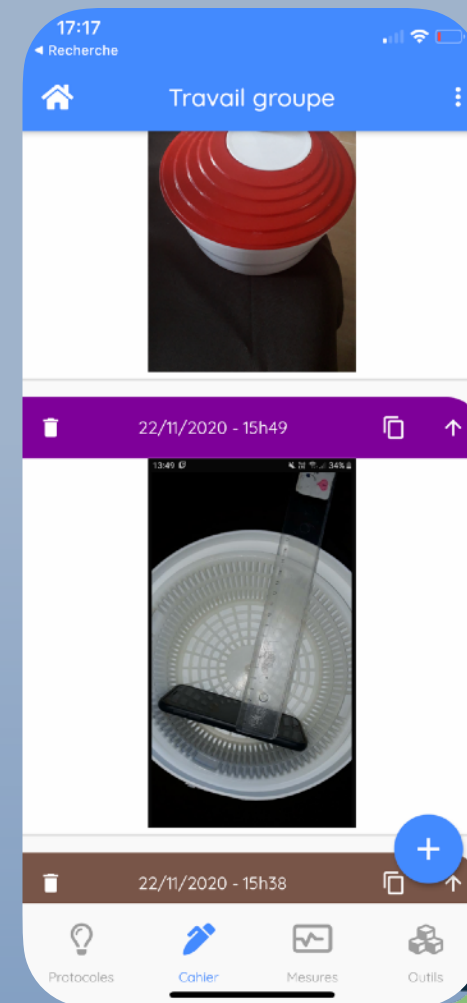
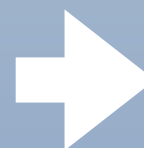
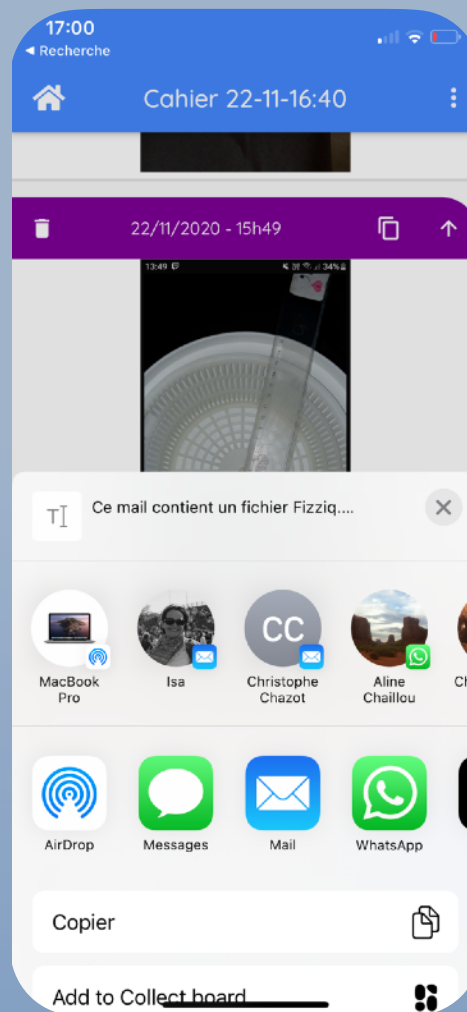
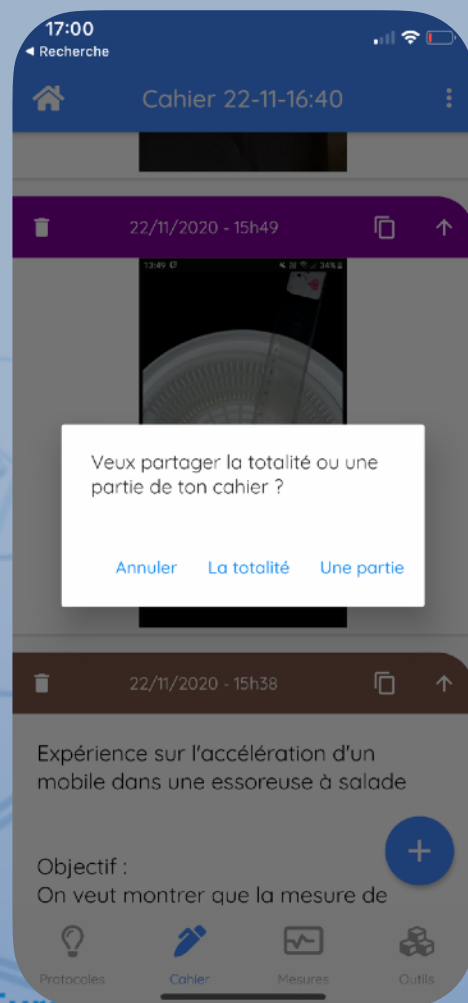


Export



Share

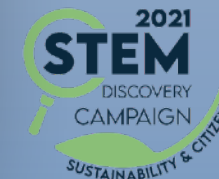
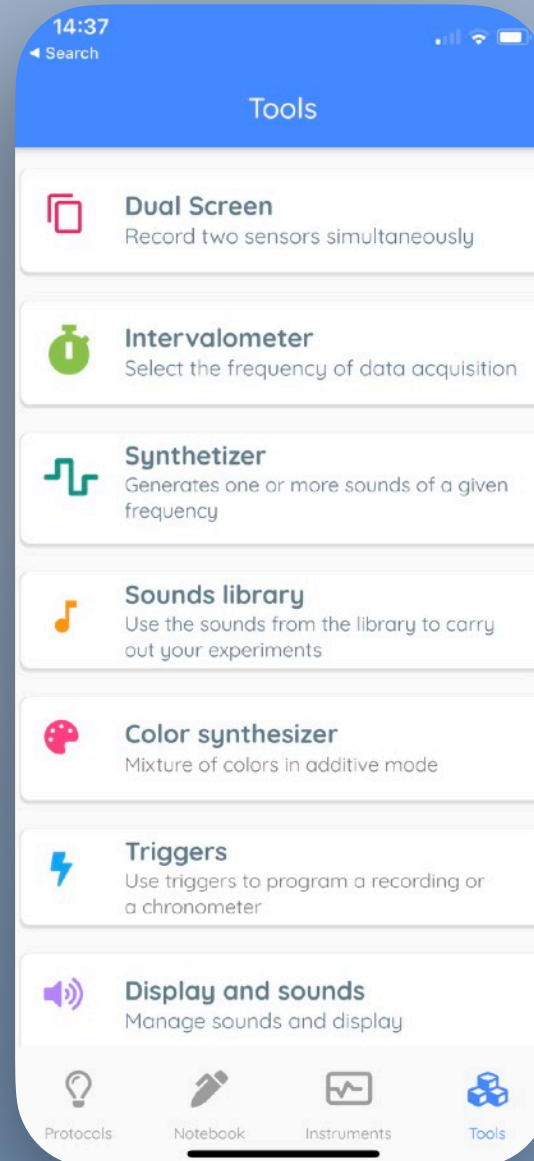
1



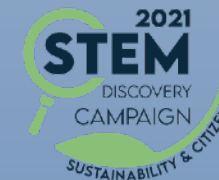
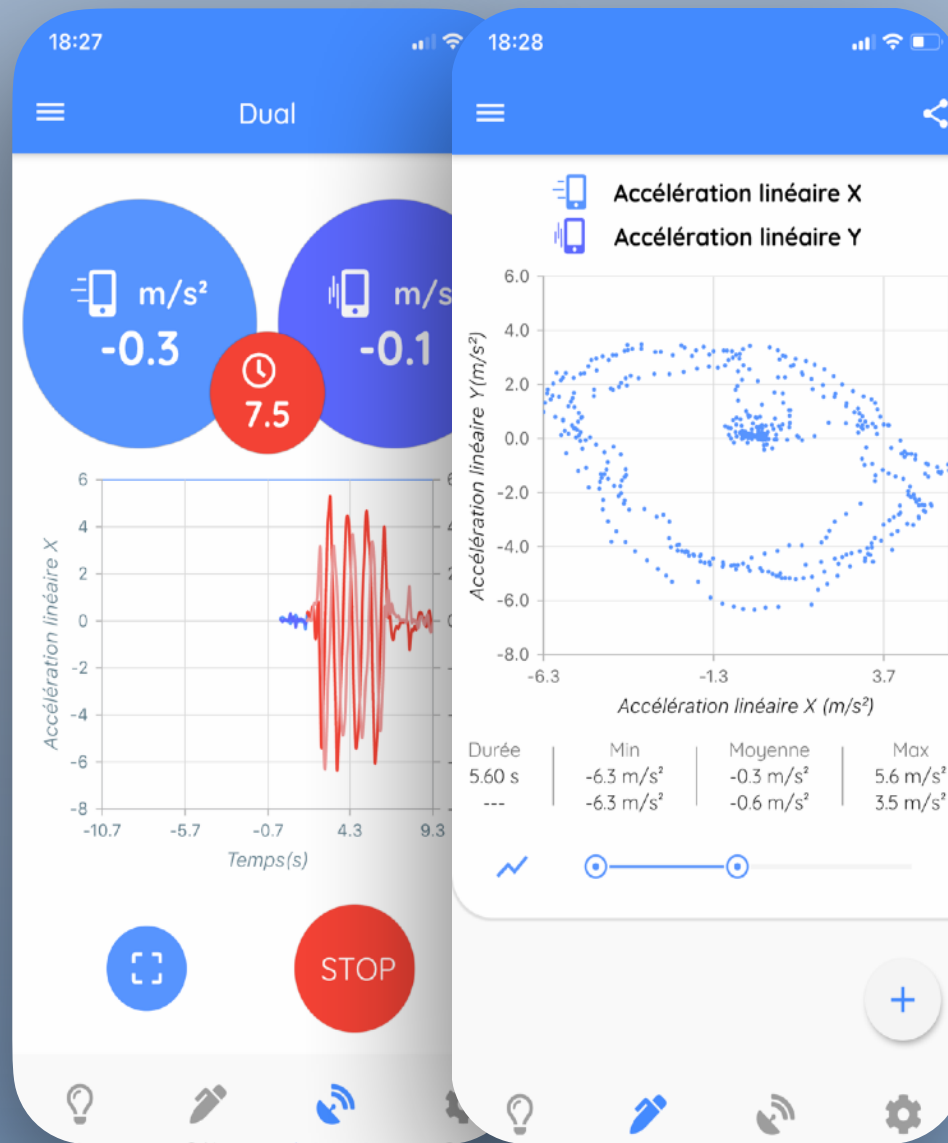
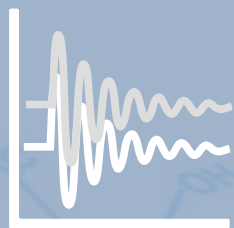
2



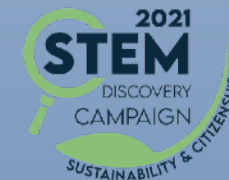
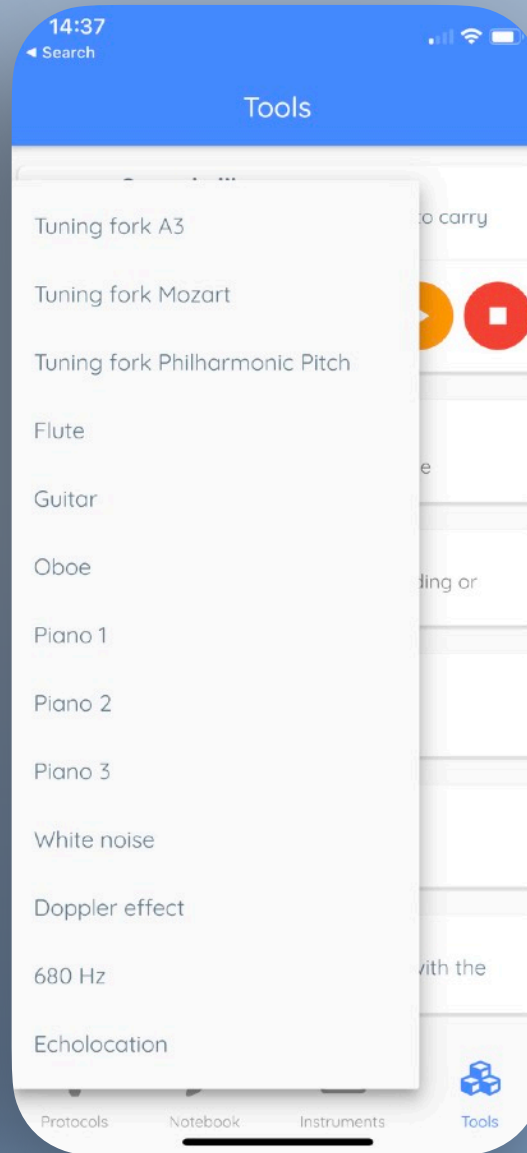
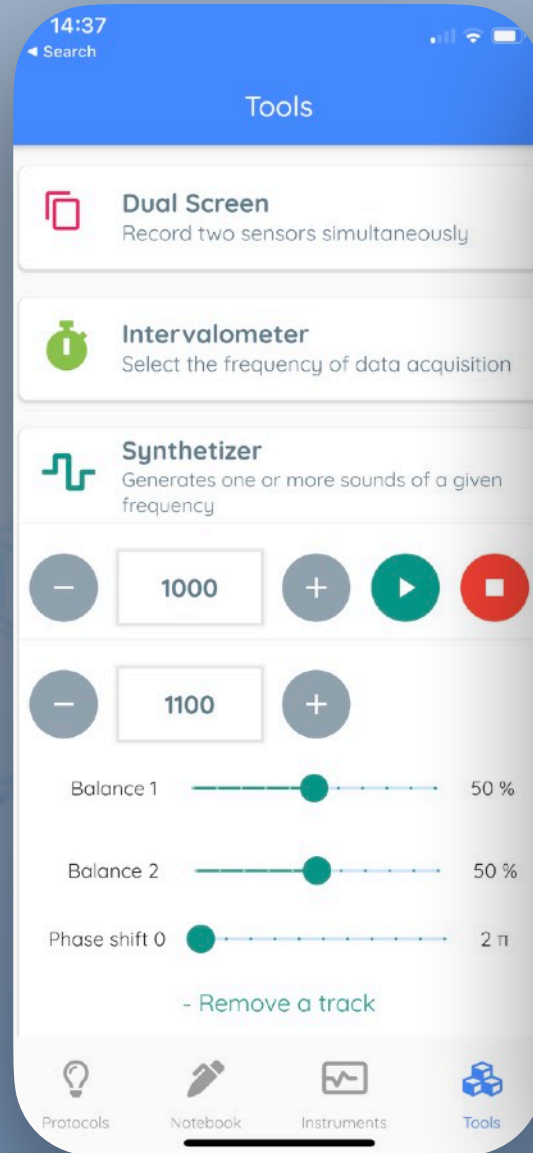
Experimentation



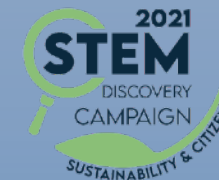
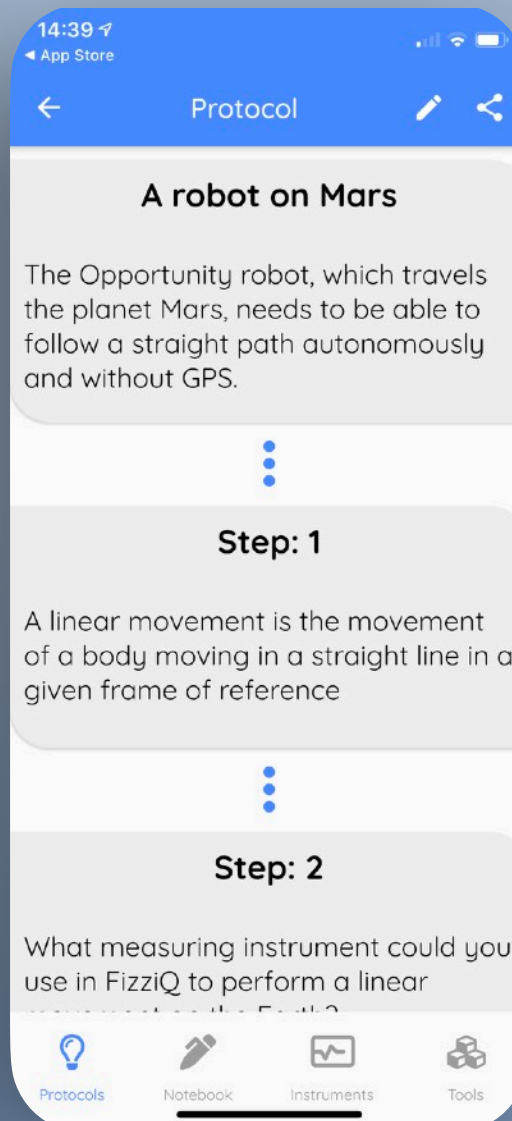
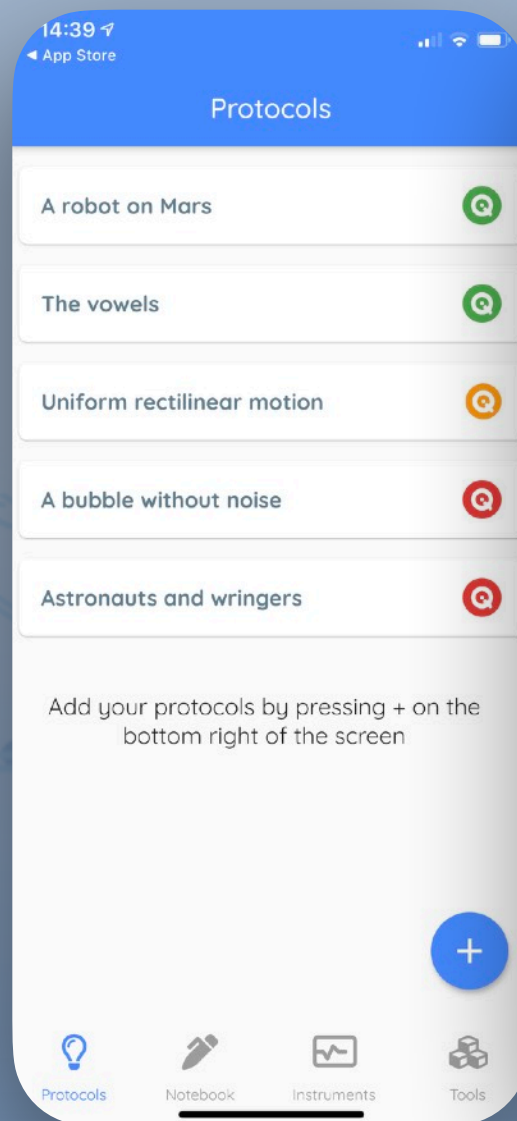
Dual recording



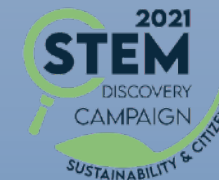
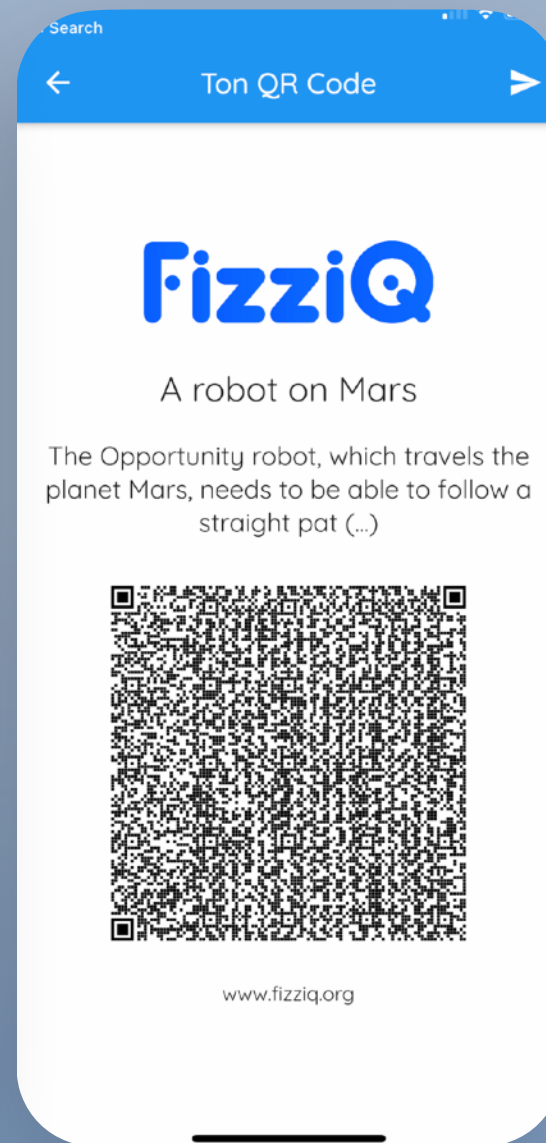
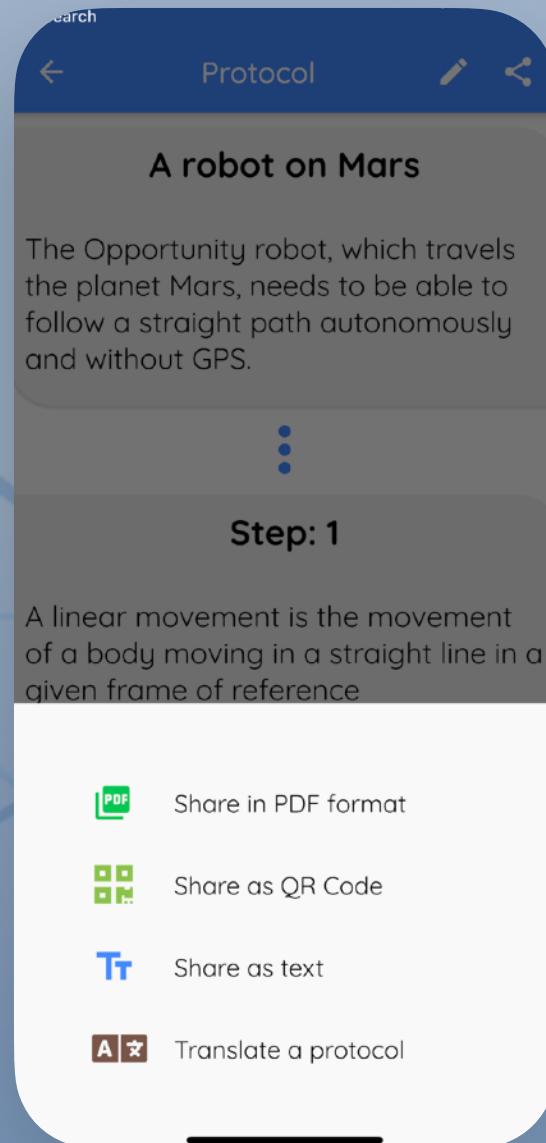
Synthesizer and sound library



Experimental protocols



Protocols creation and sharing



Resources - La main à la pâte



FONDATION
La main à la pâte

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FIZZIQ - Tablet / smartphone application

FizziQ, a free application that transforms any tablet or smartphone into a portable laboratory to develop active science practice.



- [FIZZIQ APPLICATION OVERVIEW](#)
- [DOWNLOAD](#)
- [USING THE FIZZIQ APPLICATION IN THE CLASSROOM](#)
- [CONTACT AND INFORMATION](#)

FIZZIQ APPLICATION OVERVIEW

Transform your tablet / smartphone into a portable laboratory!

Smartphones and tablets are now part of the student's daily environment. However, they are often limited to their usual uses, even though they are equipped with numerous sensors and processors that are particularly well suited to experimental sciences to be carried out in the classroom or at home. It is with this in mind that the *La main à la pâte* Foundation has joined forces with the French startup *Trapeze digital*, which has developed an application that takes advantage of the sensors and the ergonomics of these digital media in order to promote the scientific approach of middle and high school students.

Appropriate scientific concepts, exchange, share

This new application, free of charge and without personal data storage, significantly extends the functionalities of existing apps thanks to a simple, modern and attractive interface allowing the student to experimentally appropriate concepts related to sound, light, movement... It allows the sending of individual reports, the exchange of results between students and with the teacher, and the archiving of observations as well as their analysis with office software. Finally, thanks to the sharing of protocols, this application also allows the educational community to create a library of royalty-free experiments.

Discover the many features offered by FizziQ



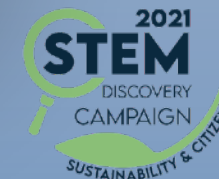
- FizziQ application website: <https://en.fizziq.org>

DOWNLOAD

Download FizziQ, free of charge and without personal data storage (compliant with the RGPD) :



www.fondation-lamap.org/en/fizziq



Resources - FizziQ.org

www.fizziq.org

The screenshot shows the FizziQ.org website interface. At the top, there is a navigation bar with links for Features, Experiments, Blog, and Videos. A search bar and a language dropdown are also present. Below the navigation bar is a filter dropdown menu set to 'All experiments'. The main content area displays a grid of six experiment cards, each with a thumbnail image, a title, and a brief description. The cards are arranged in two rows of three. The first row includes 'Acoustic beats' (a person in a dark room with red light), 'Sound speed' (a jet flying through a cloud), and 'Linear acceleration' (a group of runners on a track). The second row includes 'Astronauts and spinners' (an astronaut in a white suit), 'It's uellow, it's ualu ...' (a car on a road with a yellow triangle warning sign), and 'Build uour own oedometer' (a person's legs running on a track). Each card has a blue arrow pointing to the right below it.

FizziQ Features Experiments Blog Videos

All experiments

Acoustic beats
Analyzes an acoustic effect that is used by many electronic music artists

Sound speed
How precisely will you estimate the speed of sound ?

Linear acceleration
Learn about the concept of linear acceleration and how to measure it

Astronauts and spinners

It's uellow, it's ualu ...

Build uour own oedometer



In class

18:06

Search

Protocol

Astronauts and wringers

In the movie The Right Stuff, the astronauts are put through stress tests. Try to understand these tests with a salad spinner

Step: 1

To be sure that astronauts withstand strong accelerations, they are subjected to the centrifuge test

Step: 2

In this test, a capsule in which the astronaut is located turns faster and

Protocols

Notebook

Instruments

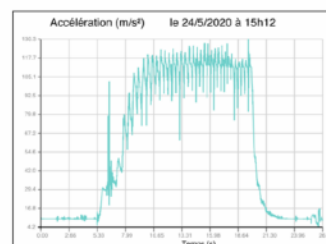
Tools

Astronautes et essoreuse

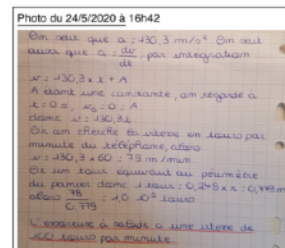
Astronautes et essoreuse - Cassandra Le Roux

On sait que un astronaute peut être capable de subir une accélération de 12g ce qui équivaut à 12 fois son poids. Pour expliquer ce résultat, on peut utiliser la seconde loi de Newton qui dit que la somme des forces extérieures subies par notre système, ici l'astronaute ou le téléphone, est égale à l'accélération multipliée par la masse. Dans un repère supposé galiléen, notre système est soumis uniquement à son poids (les frottements sont négligés dans la centrifugeuse ou dans le vide, comme il n'y a pas de frottements). Le poids vaut sa masse multipliée par g . Ici, un astronaute subit une force égale à 12 fois son poids alors, après simplification, l'accélération est égale à 12g.

Nous allons faire une expérience avec l'essoreuse afin de déterminer si un astronaute survivrait à l'intérieur. Nous allons utiliser l'essoreuse ci-dessous et mesurer à l'aide de l'accéléromètre du téléphone, l'accélération. Nous déterminerons ensuite si cette accélération est supérieure, inférieure ou égale à 12g.



À cette accélération, un astronaute n'aurait pas survécu car il peut subir que jusqu'à 12g soit 117,7 m/s², ce qui est largement inférieur à 130,3 m/s², environ 13,3g.



D'après les calculs précédents, pour une même vitesse, plus le panier sera grand, plus l'accélération de l'essoreuse à salade sera importante.

On peut en déduire que, pour une centrifugeuse, plus la distance entre l'astronaute

Document PDF

Cahier 22-11-16:40



Document PDF



Expérience sur l'accélération d'un mobile dans une essoreuse à salade

Objectif :

On veut montrer que la mesure de l'accélération d'un mobile dans une essoreuse à salade peut se vérifier par le calcul à l'aide d'une propriété du repère de Frenet. On veut aussi savoir si un homme peut supporter l'accélération subie par le mobile lors de l'expérience.

Protocole :

On va premièrement mesurer l'accélération d'un mobile (ici le téléphone qui sert d'objet de mesure). On place le téléphone dans l'essoreuse et on le bloque contre une paroi.

On lance la mesure et on fait tourner le téléphone avec l'essoreuse pendant environ 6 secondes.

On obtient alors une accélération dans l'axe z de 85 m/s² que l'on repère avec le curseur sur l'application Fizziq.

Expérience sur Fizziq.

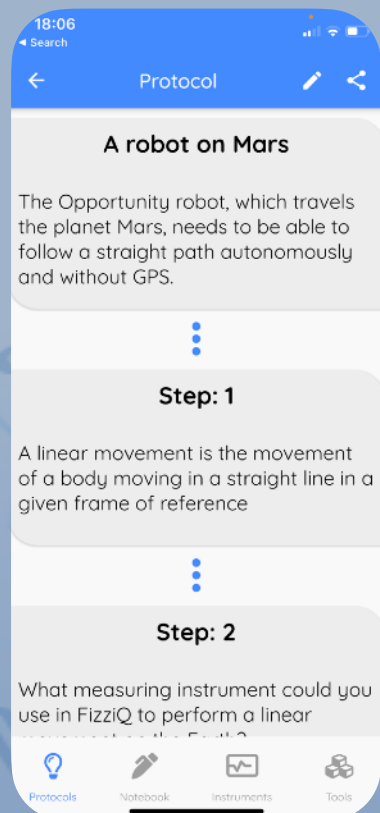
On cherche ensuite à vérifier l'accélération du mobile par le calcul en utilisant une propriété du repère de Frenet qui nous dit que l'accélération dans le sens de la trajectoire autour d'un point fixe vaut : $(v^2)/R$

Ici R est la distance entre le centre de l'essoreuse et le centre du téléphone. R vaut ici 5 cm soit 0,05 m.

On cherche aussi à calculer la vitesse à laquelle l'essoreuse fait tourner le téléphone :

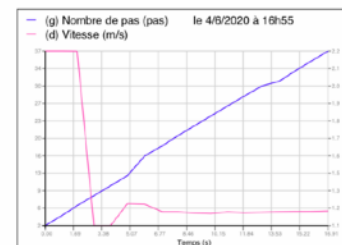


At home

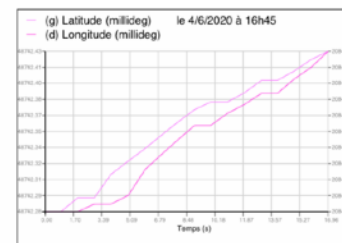


marcher en ligne droite

l'objectif est de marcher en ligne droite et avec une vitesse constante



on peut voir que le nombre de pas augmente de façon continue et uniformément, aussi la vitesse est uniforme partir de la 5e seconde, je marche de marche de façon uniforme

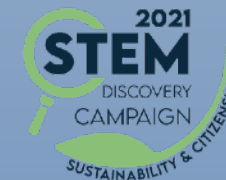


on peut constater que les valeurs de la latitude et celles de la longitude augmentent progressivement et en même temps, on peut donc en déduire que je marche en diagonale par rapport aux axes de la terre, cependant je marche bien et bien sûr une ligne droite puisque ces deux droite augmentent en même temps, aussi la rue est droite... (voir la photo ci après)



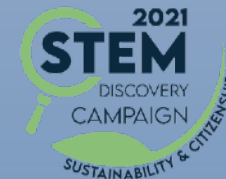
Voici la photo de la rue dans laquelle j'ai effectué mes expériences

CONCLUSION : je peux en conclure que j'ai réussi le défi grâce à ces multiples expériences

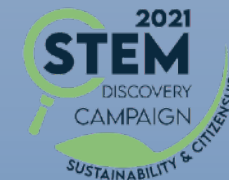


Using smartphones in class

- 1 - Be confident
- 2 - Put the Laptops on airplane mode
- 3 - Encourage group work
- 4 - Let students familiarize themselves with the tool
- 5 - Choose an adapted experiment protocol
- 6 - Request a final report

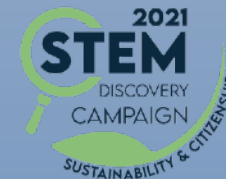


Questions



Have a go!

- Open FizziQ
- Go to : www.fizziq.org/test
- Try the different test
- After 10 minutes we reconvene



Thank you!



SCIENTIX

The community for science
education in Europe

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