

**Manhattanville in West Harlem Implementation Plan Report
October 15, 2021 Submission**

Declaration Reference and Key Data

Obligation Section Number: **5.07(c)(i)**

Obligation Title: **Mind Brain Behavior K-12 Education Center**

Obligation Page Number: **52**

Obligation Trigger: **Issuance of TCO for Development Site 2**

Obligation Start Date: **August 25, 2016**

Obligation End Date: **25 Years from Commencement of the Education Center's Full Operation**

Obligation Status: **In Compliance**

Obligation

Mind Brain Behavior K-12 Education Center. CU shall locate within Development Site 2 (the proposed Jerome L. Greene Science Center) to be constructed in Stage 1 a Center to educate the community about diseases that affect the mind and brain as well as the advances being studied by CU's faculty and researchers. The Center shall encourage and design programs for local elementary, junior high school, and high school students. The Center shall commence operation upon issuance of the temporary certificate of occupancy for the Jerome L. Greene Science Center and operate for a 25-year period from commencement of full operation.

* The center opened to the public in February 2017. Therefore, this obligation will be in effect until 2042, 25 years from the commencement of the center's full operation.

Evidence of Compliance

1. Press release and/or announcement about center opening
2. Link to website
3. Annual report
4. Signage at Jerome L. Greene Science Center

Columbia University's Implementation Plan and all supporting documentation are made available on the Columbia Neighbors Webpage at <https://neighbors.columbia.edu/content/community-commitments>.


Public Programs at the Zuckerman Institute

Science and community come together at Columbia's Mortimer B. Zuckerman Mind Brain Behavior Institute

The Zuckerman Institute is delighted to call Manhattanville home and eager to share with our neighbors the challenge and excitement of learning how our minds and brains work. Our Education Lab, located near the 129th Street entrance of the Jerome L. Greene Science Center, is open year round and hosts a variety of hands-on brain science programs. Designed with feedback from the community, these programs harness the groundbreaking research of the institute in creative ways for school children, families, after-school groups, teachers and adults. Contact us to learn more about our programs; we have only just begun!

Community Brain Expo

What does a human brain feel like? Come find out at the Zuckerman Institute's Community Brain Expo. We invite our neighbors to join us for this free public event, held every spring, which features head-scratching demonstrations and mind-boggling activities for every age. Visitors put their minds to the test as they learn about how we see the world around us, how our memories work and other fundamental aspects of the mind and brain. Led by actual scientists, the event is organized by Columbia University Neuroscience Outreach, a group of Columbia graduate students devoted to sharing brain science with the public. The event is held in celebration of Brain Awareness Week.



The Zuckerman Institute's
Kelley Remole explains brain
science to a group of students.
Credit: Columbia University



Visitors at the Zuckerman Institute's 2016 Community Brain Expo. Credit: Michael DeVito



2016 BRAINYACs show off posters presenting their research. Credit: Zuckerman Institute

BRAINYAC: Brain Research Apprenticeships in New York at Columbia

Hands-on experience in a laboratory is essential for preparing today's youth to become tomorrow's scientists. With this in mind, the Zuckerman Institute's Brain Research Apprenticeships in New York at Columbia (BRAINYAC) program provides an immersive science research experience in which high school students train and work in neuroscience laboratories at Columbia University. The BRAINYAC program is open to students from select partner programs and schools that serve students in Upper Manhattan and the Bronx. Each student is matched with a Columbia neuroscientist, a mentor who guides the student through a research project. Students come away from the experience with an enhanced understanding of how laboratory research leads to transformative discovery, exposure to a professional academic environment and a stronger connection to science as a career. BRAINYAC receives generous support from the Pinkerton Foundation and the Stavros Niarchos Foundation.

For more information about the public programs at Columbia's Zuckerman Institute, please contact:

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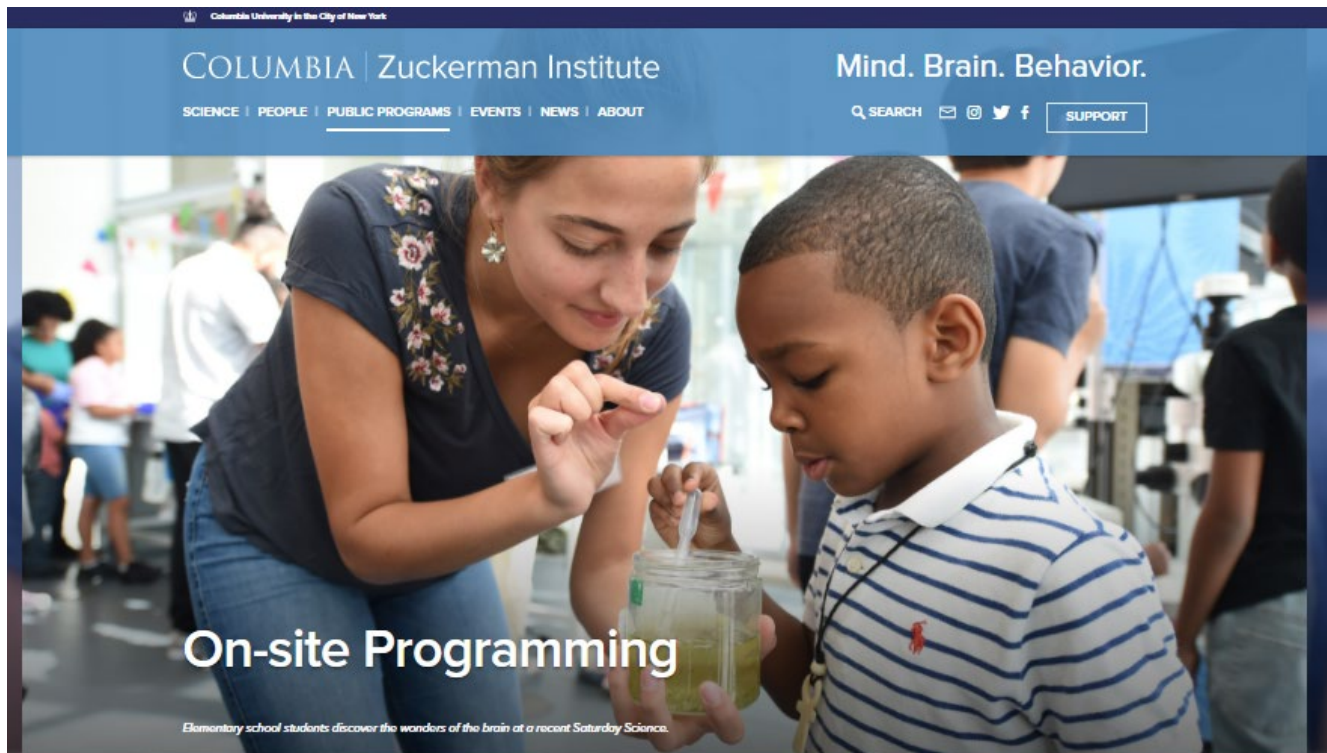
Brain Insight Lectures and Teacher-Scholar Program

At the Brain Insight Lectures, free and open to the public, eminent Columbia scientists and scholars examine how brain science intersects with everyday life. Speakers have included Olajide Williams, MD, who spoke about how to prevent strokes in communities of color and Frances Champagne, PhD, discussed how our early experiences shape our behavior. Upcoming lecture by Thomas M. Jessell, PhD, will share his groundbreaking work on the neuroscience of movement. These lectures are the scientific cornerstone of our Teacher-Scholar Program, which introduces middle and high school science teachers in New York City to cutting-edge brain science for the duration of the school year. Using the lectures as case studies, the teachers participate in workshops and create a lesson plan each semester that brings neuroscience back to their classrooms. Teachers who complete the program emerge with greater knowledge of neuroscience, a deeper understanding of the scientific process and a toolbox of concrete ways to implement their knowledge in the classroom. These programs are made possible with generous support from the Stavros Niarchos Foundation.

Mind Brain Behavior K-12 Education Center

Link to website:

<https://zuckermaninstitute.columbia.edu/education-lab>



Explore Science With Us

We normally host a variety of hands-on brain science programs in the Jerome L. Greene Science Center, located at 609 W 129th St. Designed with feedback from the community, these programs harness the groundbreaking research of the Institute in creative ways for school children, families, after-school groups and adults. Please see below for a list of our current on-site programs.

Much of our on-site programming has been suspended due to the COVID-19 pandemic. Please visit our main [Public Programs](#) page for a list of online programming, as well as virtual resources for students, families and adults.

Annual Report: Mind Brain Behavior K-12 Education Center

State Submission Reporting Period: **October 2020 - September 2021**

The ground floor of the Jerome L. Greene Science Center is open to all and is a neighborhood-based resource for brain science education. On February 11, 2017, the Mind Brain Behavior K12 Education center opened, called the Education Lab. Education programs bring together groundbreaking research in creative and exciting ways for school children, families, adults and teachers. Located near the 129th Street entrance to the building, this 1,500 square foot space was designed to resemble the scientific research laboratories of the Zuckerman Institute.

Saturday Science

One of the Institute's programs at the Education Lab is Saturday Science – a themed free event for students, families and community groups held once a month through the school year. Saturday Science activities and demonstrations are engaging and informative, providing launching points for further exploration, reflection and discovery.

Due to the COVID-19 pandemic this program has been transitioned to a virtual platform for the time being. Five *Saturday Science at Home* Zoom activity days were held on the following dates during this reporting period: November 7, November 14, November 21, March 20, and June 14. As part of these events 650 science kits were distributed to key locations in the community (schools and libraries). Over 100 families participated in the live events, and the videos accompanying the events have received 490 views on YouTube. The majority of attendees were families who had previously participated in Saturday Science family days and from schools in the local community. There were a few families who moved during the pandemic but still participated from outside of the NYC area.

Brain Insight Lectures

The Zuckerman Institute's free public lecture series, the Stavros Niarchos Foundation Brain Insight Lectures, examines ways that brain science intersects with everyday life. Each lecture features a Columbia researcher whose approaches to the science of brain and mind resonate with a public audience. The lectures, offered four times a year, are the scientific cornerstone of the Stavros Niarchos Foundation Teacher-Scholar program, a competitive program that introduces high school science teachers in New York City to cutting-edge brain science for the duration of a school year. This series is beyond the requirement of Columbia's commitment.

During this reporting period, there were three events were held through a virtual platform due to the COVID-19 pandemic. They were held on the following dates: November 10 2020, February 9 2021, and April 7 2021. The events collectively had 798 live participants and over 1100 views on YouTube afterwards.

Public Programming

Between the period of October 2020 through September 2021, the Education Lab remained closed to visitors due to the COVID-19 pandemic. All of the programs that operated in the Education Lab shifted to virtual platforms. These programs include BRAINYAC (the high school internship program described in the Youth Internships annual report), Saturday Science at Home, the Brain Insight Teacher-Scholar program and lecture series, collaborative community events with partners such as the National Jazz Museum in Harlem, Arts & Minds, The Dance Theater of Harlem, and The Studio Museum. The Education Lab team hosted a total number of 1034 events for a total of 1537 hours of science programming for the public. This number also includes activities hosted by our partner program, the independently operated BioBus, Inc.

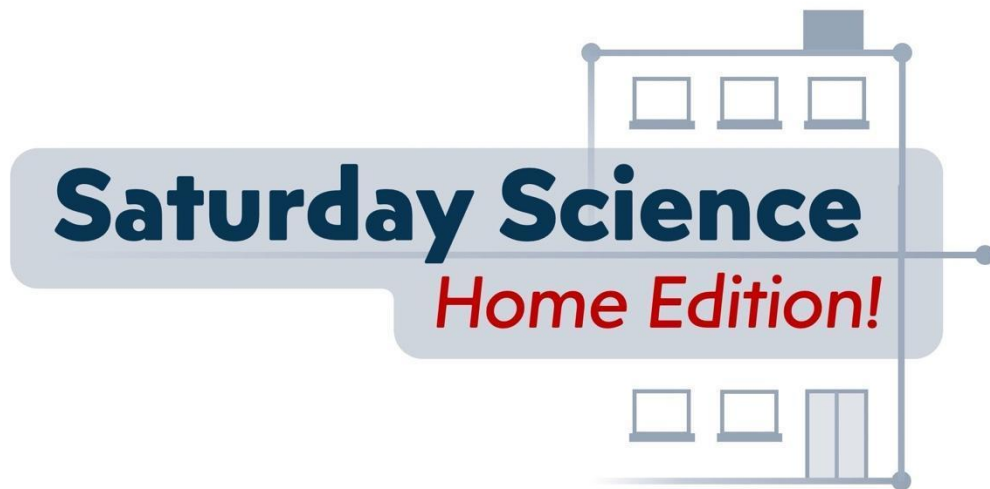
Program Outreach

Each program has a customized publicity strategy built on targeting communities in upper Manhattan and the South Bronx. For example, the Zuckerman Institute publicizes Saturday Science to reach students, families, teachers and community members in upper Manhattan and the South Bronx. Local schools, libraries and community organizations such as Manhattanville Community Center and YMCA Harlem and are informed of this free, fun-filled event electronically via email and through printed flyers.

The Brain Insight Teacher-Scholar Program is publicized each spring during its application period to schools in the local community and city-wide via emails and posts to specific mailing lists including I Teach NYC, Math for America, STEM Teachers NYC. Flyers are shared by email with schools including KIPP Infinity Charter School, PS 036 Margaret Douglas, PS 129 John H Finley, Academy for Social Action, Frederick Douglass Academy II Secondary School, Opportunity Charter School, PS 149 Sojourner Truth, PS 165 Robert E Simon, Wadleigh Secondary School for the Performing Arts, Thurgood Marshall Academy, A. Philip Randolph Campus High School, Harlem Renaissance High School, IS 223 Mott Hall High School, Urban Assembly for the Performing Arts, and Eagle Academy.

Additional Supporting Documentation

- Copies of Saturday Science flyers
- Copy of Brain Insight Teacher-Scholar Program flyer



Saturday Science is an open house where children and their families can experience neuroscience through hands-on learning, and this year we've gone virtual!

We've made activity kits, which comes in a reusable drawstring bag and contains supplies for three engaging lessons, plus a face mask, hand sanitizer, and other goodies! To receive one, visit your local library (for a listing go to bit.ly/satsci21)

Instructions are included in each kit, but you're also invited to our **At-Home Zoom Day on Saturday, March 20, 2-4pm!** Head to bit.ly/satsci21 to join a call where Columbia scientists will demonstrate each activity and share more about their work!

Can't make it to our remote event? We will also upload videos to our webpage that show just what to do! Check back in the weeks following our Zoom Day to find those resources at the link above.

Saturday Science is brought to you by the Zuckerman Institute, BioBus, Columbia University Neuroscience Outreach and Columbia Neuroscience Society with generous sponsorship from Apple Bank and the Dana Foundation.



COLUMBIA | Zuckerman Institute
MORTIMER B. ZUCKERMAN MIND BRAIN BEHAVIOR INSTITUTE





Saturday Science

Home Edition!

también en
español –
¡mira adentro!

Neuroscience Activity Instructions

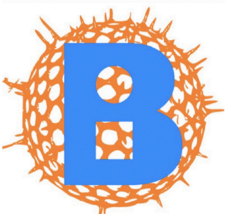
Complete these activities with us live at **2pm** on **March 20**, or find video tutorials here!

bit.ly/satsci21

And head here for more information about other virtual events!

bit.ly/virtualbrains

(Be sure to save the jelly beans for Activity 3!)





Activity 1: Test Your Touch



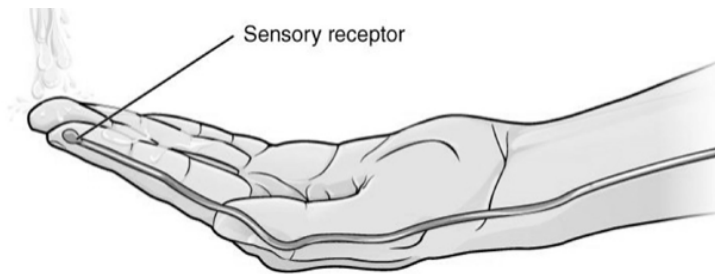
Use a special device to test your sense of touch—and find where on your body it's the strongest!

Materials:

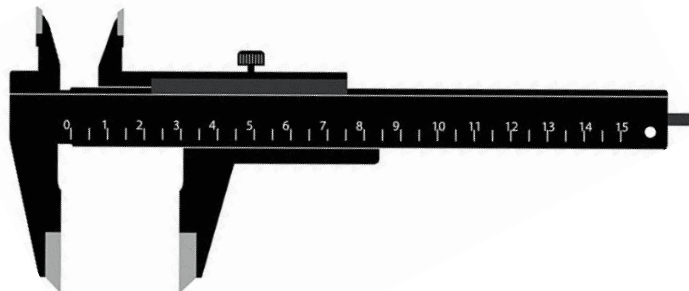
- *Caliper* (ruler with a slider)

Join us on **Mar. 20** at **2pm** to do this activity together! bit.ly/satsci21

1. Your body senses the outside world with special cells called *neurons*. The neurons in your skin that sense when you are touched are called *sensory receptors*, and each one tells your brain when your body is touched in a specific area around it.

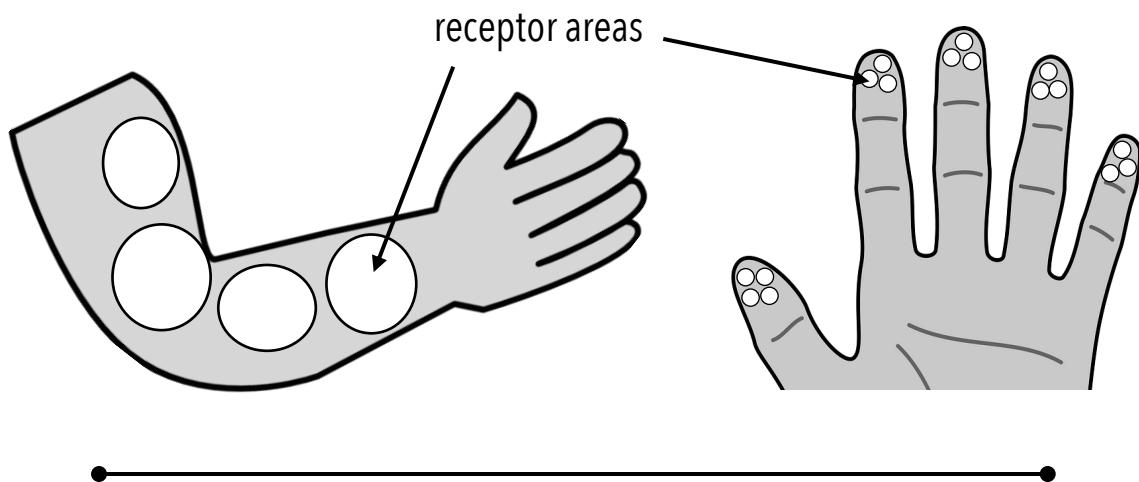


2. One way to test how well these receptors work is to see whether they can sense the difference between one and two points. A device called a *caliper*, which measures the distance between two points, is perfect for this task. (But be careful, it's pointy!)



3. Move the slider of your caliper until the two big points are **5** centimeters (cm) apart. Then, place the two points gently on your arm. Do you feel both points?

4. Slide the point inward until the two are **3** cm apart. Place them again on your arm. What do you feel now? Repeat once more, testing at **1** cm apart. Has anything changed? Do you still feel both points?
5. Try these tests once more on the back of your neck, and then again on your fingertip. Where was it easiest to tell the points apart? The hardest?
6. Some parts of your body sense the points better because of their **number** of sensory receptors and the **size** of the areas they sense. Your arm has fewer receptors that cover larger areas, so if both points are near just one, the brain can't tell the difference!



Think about it: For a body part with lots of sensory receptors, do you think the brain needs more or less space to process its signals? For one with few receptors?

Further fun: Test a friend or a family member! Have them close their eyes and guess whether they are feeling one or two points on different parts of the body. Just be gentle when using the caliper!





Activity 2: Synapse Toss



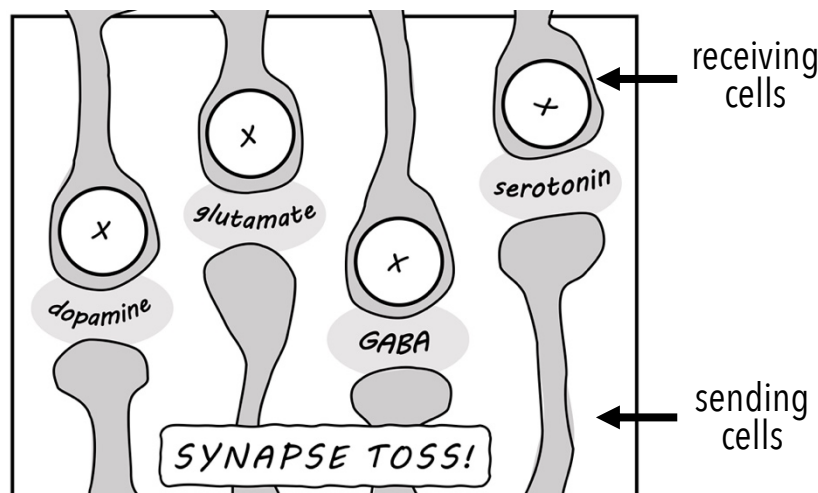
Test your aim in a fun tabletop game, and learn how your brain cells talk to each other while you play!

Materials:

- Game board
- Cups
- Pom poms
- Velcro dots

Join us on **Mar. 20** at **2pm** to do this activity together! bit.ly/satsci21

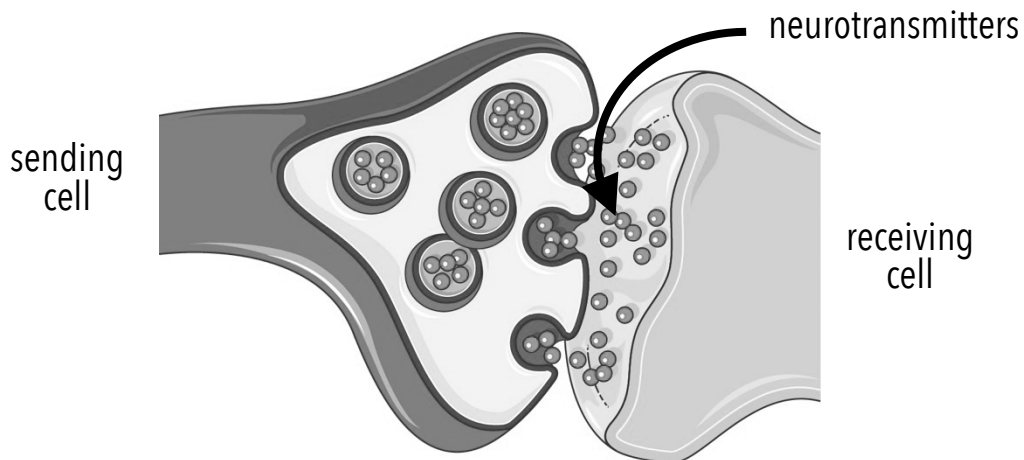
- 1.** In your nervous system, your brain cells signal to each other through *synapses*, or little gaps between the ends of cells. Brain cells use chemicals called *neurotransmitters* to send all sorts of messages to each other across these gaps. Some tell the next cell to pass along a signal, and some tell it not to!
- 2.** Take out your gameboard. Using your pairs of Velcro sticky dots (some rough and some soft), stick a soft dot in the middle of each circle, on each **X**.
- 3.** Next, stick a rough dot on the bottom of each of your four cups and place them on the circles. Push a little from the back of your board to attach them.
- 4.** Your game is now assembled! But before you play, let's learn what this has to do with your brain!



You are one set of brain cells, and your game board is another, connected by synapses. See the names near the circles on the board? Each one is a neurotransmitter that tells the other cells what to do. Your pom poms are these chemicals, and each cup of the same color detects them. Get them in the cups that match, or their signals won't be heard!

5. Now move the board away a few feet and start throwing. See how many you can throw correctly before running out!

This is how a synapse looks close up! Remember, you're throwing little packets of chemicals, and the cups are their detectors.



Think about it: If there were more cups of one color, would it be easier or harder to toss the pom poms in? What if there were more pom poms of that color? By changing the number of receptors and neurotransmitters, synapses can grow stronger or weaker, making it easier or harder to send a signal across.

Further fun: Challenge yourself by moving farther away from the board, or ask your family and friends to play Synapse Toss too!





Activity 3: Sneaky Senses



See how your senses can affect each other by having a snack, a sniff, and more!

Materials:

- Packet of jelly beans

Join us on **Mar. 20** at **2pm** to do this activity together! bit.ly/satsci21

1. Open your packet of jelly beans and lay them on a clean surface. Which colors do you see? Can you guess which flavors the jelly beans might be?



2. Hold your nose closed and chew one jelly bean. Don't swallow it yet. How much taste does it have? Can you tell what flavor it is?
3. Now open your nose, keep chewing, and swallow. How tasty is it now? Do you have a better guess of the flavor?
4. This time, place one jelly bean in your mouth without chewing. Crush a second jelly bean of a different color between your fingers, and smell the crushed jelly bean while chewing the first. Which flavor is stronger? Can you tell the difference between the two? Try this out on the rest of your jelly beans!
5. These are examples of how your body parts work together to sense the world. It turns out that your smell makes up a large part of your taste. How might your vision help your taste too? (For example, does a brown tomato seem as tasty?)

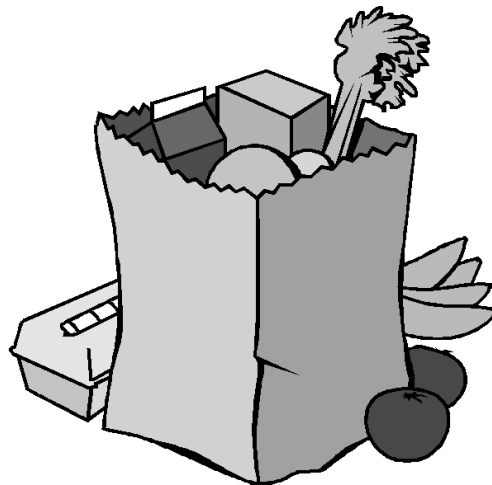
6. Check out another example by watching the video at this link, or by scanning this code with a phone camera. You hear the same noise, but your brain thinks it is changing, just because you're seeing a different mouth move!

[bit.ly/
sneakysenses](https://bit.ly/sneakysenses)



Think about it: When your eyes are closed, your ears are covered by headphones, or your nose is stuffed, how does the world change? Do any other senses get stronger when you can't see or hear?

Further fun: With permission and some help, set up a taste test of food around your house. Close your eyes, plug your nose, and have a family member or friend feed you a piece of food. Can you tell what it is? Unplug your nose and try again. Does the smell help? Feel the texture of the food—that's a sense too!





Actividad 1: Prueba tu Toque



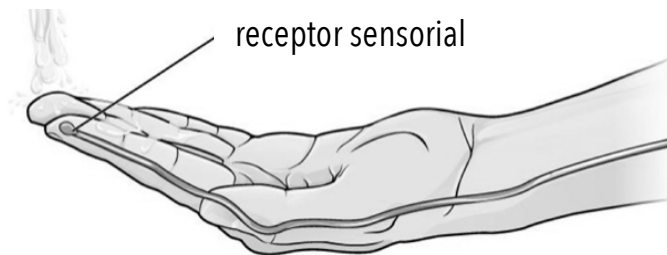
Utilice una herramienta para probar su sentido del tacto y descubra en qué parte de su cuerpo es más sensitiva.

Materiales:

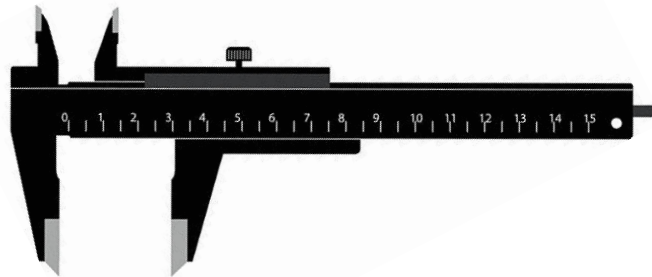
- *Pinza* (regla con un control deslizante)

¡Únase a nosotros el **20 de marzo** a las **2 pm** para hacer esta actividad juntos! bit.ly/satsci21

1. Su cuerpo detecta el mundo exterior con células especiales llamadas *neuronas*. Las neuronas de tu piel que detectan cuando tocas algo se llaman *receptores sensoriales*, y cada una le dice a tu cerebro cuando tu cuerpo es tocado en un área específica a su alrededor.

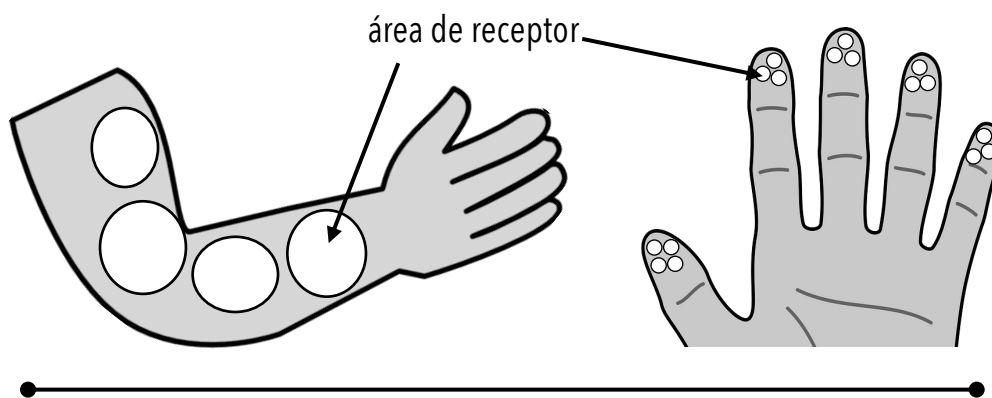


2. Una forma de probar qué tan bien funcionan estos receptores es ver si pueden sentir la diferencia entre uno y dos puntos. Una herramienta llamado *pinza*, que mide la distancia entre dos puntos, es perfecto para esta tarea. (¡Pero ten cuidado, es puntiaguda!)



3. Mueva el control deslizante de la pinza hasta que los dos puntos estén separados por **5 centímetros (cm)**. Luego, coloque los dos puntos suavemente en su brazo. ¿Sientes ambos puntos?

4. Deslice el punto de la pinza hacia adentro hasta que los dos estén separados por **3** cm. Colócalos de nuevo en tu brazo. ¿Que sientes ahora? Repita una vez más, probando a **1** cm de distancia. ¿Ha cambiado algo? ¿Aún sientes ambos puntos?
5. Pruebe estas direcciones una vez más en la parte posterior de su cuello y luego nuevamente en la punta de su dedo. ¿Dónde fue más fácil diferenciar los puntos? ¿Lo más difícil?
6. Algunas partes de su cuerpo detectan mejor los puntos debido a la **cantidad** de receptores sensoriales y al **tamaño** de las áreas que detectan. Su brazo tiene menos receptores que cubren áreas más grandes, por lo que si ambos puntos están cerca de uno solo, ¡el cerebro no puede notar la diferencia!



Piénselo: para una parte del cuerpo con muchos receptores sensoriales, ¿cree que el cerebro necesita más o menos espacio para procesar sus señales? ¿Para uno con pocos receptores?

Más diversión: ¡prueba a un amigo o familiar! Pídeles que cierren los ojos y adivinen si están sintiendo uno o dos puntos en diferentes partes del cuerpo. ¡Solo tenga cuidado al usar la pinza!





Actividad 2: Lanzamiento de sinapsis

Pon a prueba tu puntería en un divertido juego de mesa y aprende cómo las células cerebrales se comunican entre ellas.

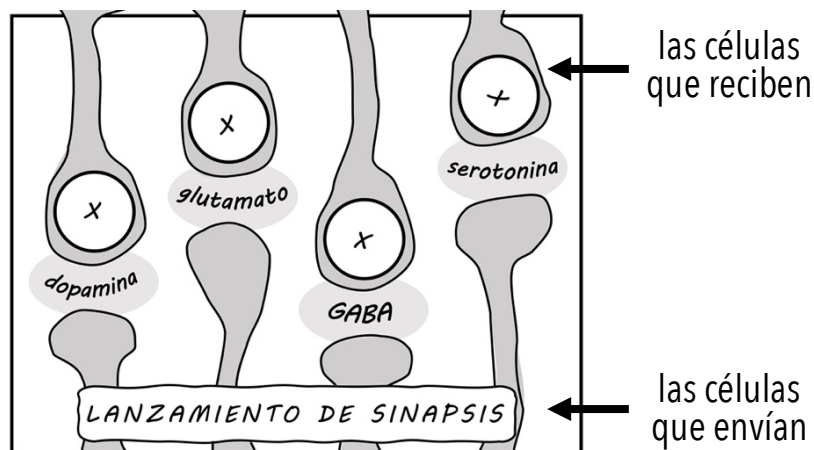


Materiales:

- Juego de mesa
- Tazas
- Bolitas de puff / pompones
- Puntos de Velcro

¡Únase a nosotros el **20 de marzo** a las **2 pm** para hacer esta actividad juntos! bit.ly/satsci21

1. En tu sistema nervioso, las células cerebrales envían sus señales a través de *sinapsis*, o pequeños espacios entre los extremos de las células. Las células cerebrales usan sustancias químicas llamadas *neurotransmisores* para enviar todo tipo de mensajes. Algunos le dicen a la siguiente célula que transmita una señal, ¡y otros le dicen que no lo haga!
2. Saca tu tablero de juego. Usando tus pares de puntos adhesivos de Velcro (algunos ásperos y otros suaves), pega un punto suave en el medio de cada círculo, en el **X**.
3. Luego, pegue un punto rugoso en la parte inferior de cada una de sus cuatro tazas y colóquelas en los círculos. Empuje un poco desde la parte posterior de su tablero para unirlos.

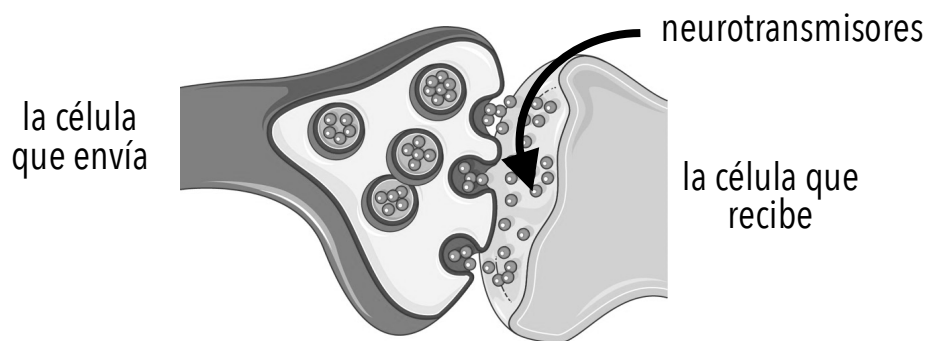


4. ¡Tu juego ya está hecho! Pero antes de comenzar, ¡aprendamos qué tiene que ver esto con tu cerebro!

Actúas como un conjunto de células cerebrales y tu tablero de juego es otro, conectado por una sinapsis. ¿Ves los nombres cerca de los círculos en la pizarra? Cada uno es un neurotransmisor que le dice a la célula qué hacer. Tus pompones son estos químicos, y cada taza del mismo color los detecta. ¡Tíralos en las tazas que combinen o no se escucharán sus señales!

5. Ahora aleja la tabla unos metros y empieza a lanzar. ¡Ve cuántos puedes lanzar correctamente antes de que se acaben!

¡Así es como se ve una sinapsis de cerca! Recuerda, está arrojando pequeños paquetes de sustancias químicas y las tazas son sus detectores.



Piénsalo: si hubieran más tazas de un color, ¿sería más fácil o más difícil tirar las bolitas? ¿Y si hubieran más bolitas de ese color? Al cambiar la cantidad de receptores y neurotransmisores, las sinapsis pueden volverse más fuertes o más débiles, lo que hace que sea más fácil o más difícil enviar una señal.

Más diversión: ¡desafíate a ti mismo alejándote del tablero, o pide a tu familia y amigos que jueguen lanzamiento de sinapsis también!





Actividad 3: Sentidos Escurridizos



¡Vea cómo un sentido puede cambiar otros comiendo un dulce, un olfato y mucho más!

Materiales:

- un paquete de gominolas

¡Únase a nosotros el **20 de marzo** a las **2 pm** para hacer esta actividad juntos! bit.ly/satsci21

1. Abre tu paquete de gominolas y ponlas en una superficie limpia. ¿Qué colores ves? ¿Puedes adivinar qué sabores podrían tener?



2. Mantén la nariz cerrada y mastica una gominola. ¡No te lo tragues todavía! ¿Cuánto gusto tiene? ¿Puedes decir de qué sabor es?
3. Abre la nariz, sigue masticando, y ya traga. ¿Qué tan sabroso es ahora? ¿Ahora sabes de qué sabor es?
4. Esta vez, coloca una gominola en tu boca sin masticar. Aplasta una gominola de otro color entre los dedos, y huele la gominola aplastada mientras comienzas a masticar la gominola que llevas en la boca. ¿Cual sabor es más fuerte? ¿Puedes distinguir entre los dos? ¡Trata esto con el resto de tus gominolas!
5. Estos son ejemplos de cómo las partes de tu cuerpo trabajan juntas para sentir cómo el mundo es. Tu sentido del olor constituye una gran parte de tu sentido del sabor. ¿Cómo podría tu sentido de la vista ayudar a tu sentido del gusto? (¿Crees que un tomate marrón parece tan sabroso como un tomate rojo?)

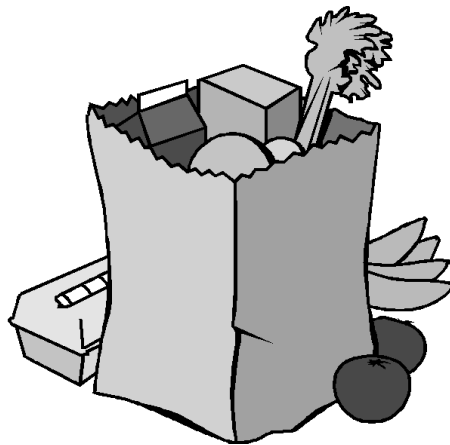
6. Mira otro ejemplo viendo el video en este enlace, o escaneando este código con la cámara de tu teléfono. ¡Escuchas el mismo ruido, pero tu cerebro escucha un ruido diferente cuando ves que la boca se mueve de una manera diferente!

[bit.ly/
sneakysenses](https://bit.ly/sneakysenses)



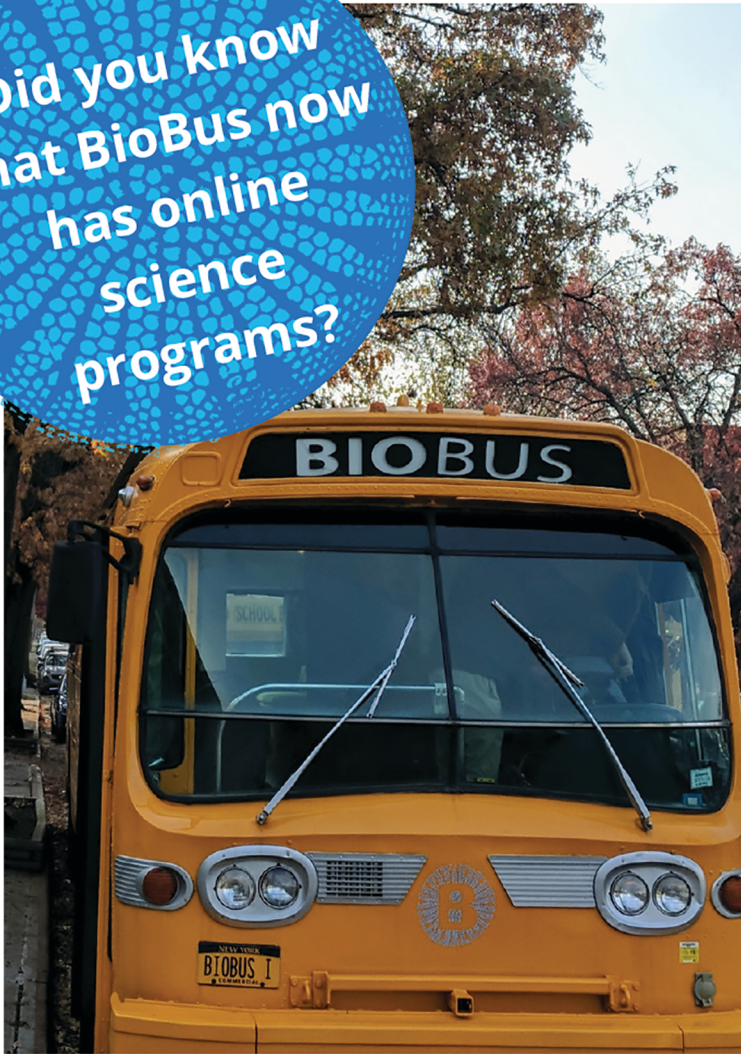
Piénsalo: cuando tienes los ojos cerrados, los oídos cubiertos por auriculares, o la nariz tapada por una gripe, ¿cómo cambia el mundo? ¿Hay otros sentidos que se fortalecen cuando no puedes ver ni oír?

Más diversión: con permiso y ayuda, configure una prueba de sabor de los alimentos en tu casa. Cierra los ojos, tapa la nariz, y pide a un familiar o amigo que te dé algo de comer. ¿Puedes adivinar qué es? Destapa tu nariz y vuelve a intentarlo. ¿Te ayuda el olor? Siente la textura de la comida – ¡eso es un sentido también!



BioBus at Home

Did you know
that BioBus now
has online
science
programs?



Discover at Home: live, interactive, online microscope classes for schools and individuals!

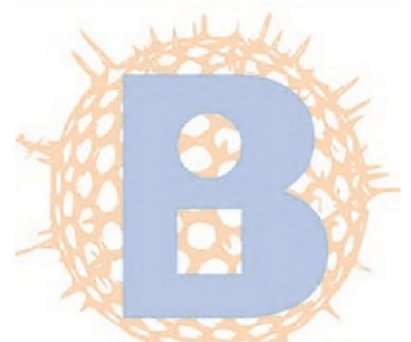
biobus.org/discover

Explore at Home: weekly science challenges, free and open to all!

biobus.org/explore

Student Town Hall: virtual forum where scientists answer your questions, Thursdays at 4pm!

biobus.org/townhall



Applications are open!



Are you a high school teacher in New York City?

**Do you teach science or math, or have an interest in brain science?
If so, this fellowship is for you!**

Based at Columbia University's Zuckerman Institute, the Stavros Niarchos Foundation Teacher-Scholar Program offers an opportunity to learn about cutting-edge neuroscience research and be part of a team creating educational materials to bring neuroscience into your classroom.

This is a paid 1-year fellowship at Columbia University for the 2021-2022 school year.

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