PNAP

Proceedings of the National Academy of Plushies

January 16, 2023 vol. 103 no. 87 huck.psu.edu/PNAP

Assessing the impact of life experiences on game-changing and risk-taking Penn State scientists in the Life Sciences and their correlation to plushie predispositions

Daniel R. Lesher, Jodie L. LeMaster, Keith J. Irwin-Hickey, Brianna E. Lumpkin, Christopher "Cole" M. Hons

The Pennsylvania State University

Abstract

The study of the textile facsimiles of selected fauna, also known as "plushies" or on occasion stuffed animals, has emerged as a popular and important topic. In this study, 6 risk-taking and game-changing scientists were interviewed about both their science and their plushie preferences. Certain traits emerged as being in common. It is possible that many of their current and childhood experiences and traits have impacted their preferences of these textile facsimiles and could be used to further plushie research and change the usage of plushies in our everyday lives. Implications of our findings and potential research are discussed.

Introduction

Plushie preference research is a new and rather controversial topic of interest in science. It is an important field of scientific study due to the well-established, deep and lasting impact that plushies are known to exhibit in the lives of individuals. However, there has been little to no research on their relationship to risk-taking and game-changing scientists and their preferences.

Plushies can be defined as toys that are covered in plush fabric – fabric with an even pile that is longer and less dense than velvet pile – and filled with soft material (Merriam-Webster, n.d.). The origin of stuffed animals dates back to the 19th century but its ancestors are the wood toys of 21st century BC Egypt (Razenberg, 2020). The research surrounding plushies covers a range of topics such as the innovative techniques being developed to create customized plushies professionally and nonprofessionally (Mori & Igarashi, 2007). Many theories and concepts about human development and psychology relating to the ways people approach life and situations in the future have emerged from experiments that require interaction with not just people but objects as well. These toys can often include plushies. Such studies focus on attachment security, such as the strange situation experiment developed by Mary Ainsworth (1970). Other studies focus on emotion and psycho-physiological measurement such as temperament (Goldsmith et al., 1987), emotion regulation (Cole et al., 2004), anger (bandura et al., 1961 and Stifter & Braungart 1995), speech perception (hay & Drager, 2010) and more. There is even research on the creation of stuffed animals that help children learn respiration control to combat Post Traumatic Stress Disorder (Uratani, H. & Ohsuga, M., 2013).

Additionally, plushies have become a part of today's pop culture. There are stores centered entirely on plushies. An example is Build-a-Bear which as of January 2022 boasts over 400 store locations all over the world whose mission is "to add a little more heart to life" (Build-A-Bear, 2022). The company allows for each child to customize their own stuffed animal which adds sentimentality "the most distinctive aesthetic feature of Build-A-Bear Workshop" (Lee, 2008). Adding customization, variation, accessibility and play has made plushie companies and toy lines such as Beanie Baby, Webkinz, and Squishmallows into household names.

According to Mustafa ÖNDER (2018), "Playing games and playing with specific toys is an activity that makes a great contribution to learning, creativity, problem solving, personality development, mental health, cultural development and moral development of children." He suggests that time for play should even be integrated into education not only to encourage these skills but also to solve problems such as digital addiction and facilitate the increase of worth of values and strengthen social ties.

With the 2020 COVID-19 outbreak, scientists found ways to help solve and ease problems that the arose with the necessary pandemic restrictions. A student-design competition saw many programmers using plushies as their way to make the technology subject-appropriate or more user-accessible, including AI COVID-19 symptom monitors (Bragg et al., 2021) and emotional support connectors to promote connectedness to improve/maintain mental health during this time of isolation (Agrawal et al., 2021). Both projects used textile facsimiles of different forms like the microscopic SARS-CoV-2 image that has become well known as the illustration of COVID-19.

supported by PennState Huck Institutes of the Life Sciences

We hypothesize that ground-breaking and risk-taking scientists likely have certain traits in common and find plushies to be enjoyable. By performing this study we sought to further plushie research as a whole and find out what people who are changing the world see within the plushie world, in order to help us to find new and innovative ways to encourage current and future youth. The Huck Institutes of the Life Sciences at Penn State is full of risk-takers and game-changers studying and researching a wide range of topics, while working to generate novel solutions to global challenges. We were lucky enough to be able to interview them.

Methods/Materials/Methodology

Sample/Participants

Our participant pool consisted of 6 researchers studying disparate topics, all of whom employed distinctly multidisciplinary approaches to their areas of expertise. This study focuses on data surrounding risk-taking and game-changing scientists working at Penn State University. **Table 1** breaks down the demographics of our participants. Participants were interviewed on *The Symbiotic Podcast* (Hons et al, 2019-present) about their work and possible factors from their early childhood development that may have contributed to their risk-taking approaches. Participants agreed for us to divulge their names and research information to aid in illustrating the influence that current day factors appear to have. Participants in order of appearance of *The Symbiotic Podcast*:

David Hughes
Huck Chair in Global Food Security; Professor of Entomology and Biology
Research Summary: Parasite manipulation of host behavior

Nita Bharti
Huck Early Career Professor; Assistant Professor of Biology
Research Summary: The Bharti lab investigates the underlying links between humans, pathogens, and the environment. We work to identify the mechanisms that give rise to heterogeneities in host disease burden and risk across scales, across spatial and temporal scales. We study the dynamics of host-environment interactions that drive movement and contact patterns as they relate to pathogen transmission and access to health care.

Dr. Steven Schiff
Former Director of the Center for Neural Engineering; Former Brush Chair Professor of Engineering; Former Professor of Neurosurgery; Former Professor of Engineering Science and Mechanics
Research Summary: Neural engineering, neurosurgery, epilepsy, Parkinsons Disease, wave mechanics, brain machine interfaces, EEG, electrical fields, and control theory.

Laura Weyrich
Associate Professor of Anthropology
Research Summary: Microbiome adaptation and evolution; medical microbiology; anthropological genetics; ancient DNA; paleomicrobiology; paleoecology; bioethics; dentistry; and Indigenous health

Sally Mackenzie
Director of the Plant Institute; Huck Chair of Functional Genomics; Professor of Biology and Plant Science
Research Summary: Organelle biology and cellular specializations. Plant epigenetics, memory and phenotypic plasticity. Crop epigenetic breeding.

Xiaojun (Lance) Lian
Associate Professor of Biomedical Engineering
Research Summary: Human Stem Cell Engineering; Genome Editing via CRISPR-Cas9; Epigenome Editing and Epigenetics.

Design/Procedure

Participants took part in live-streamed interviews to talk about game-changing research they are doing and were asked some control questions. While being interviewed they sat on our Symbiotic Podcast set, which was decorated with various items, including the plushies they would later choose from (**Fig. 1**).

supported by PennState Huck Institutes of the Life Sciences

Scientists were asked about their behavioral patterns in their childhood and adolescent years that could be considered risk-taking, in order to explore the possible roots of the risk-taking and game-changing attitudes they took towards their research.

At the end of each interview, participants were asked which "alternative Penn State plushie" they preferred, while the live online podcast audience simultaneously voted on their own favorites. The results of audience voting were displayed on screen at the end of each livestream. All of the plushies chosen were branded with official Penn State logos and were laid out on the podcast set. Plushies available to choose from included a llama, a gnome, a bear, and a unicorn. A Penn State Nittany Lion plushie was also present, but not offered as a choice. Midway through the podcast season a Porphyromonas gingivalis microbe plushie (gifted by guest Laura Weyrich) was also present, but not part of our study.

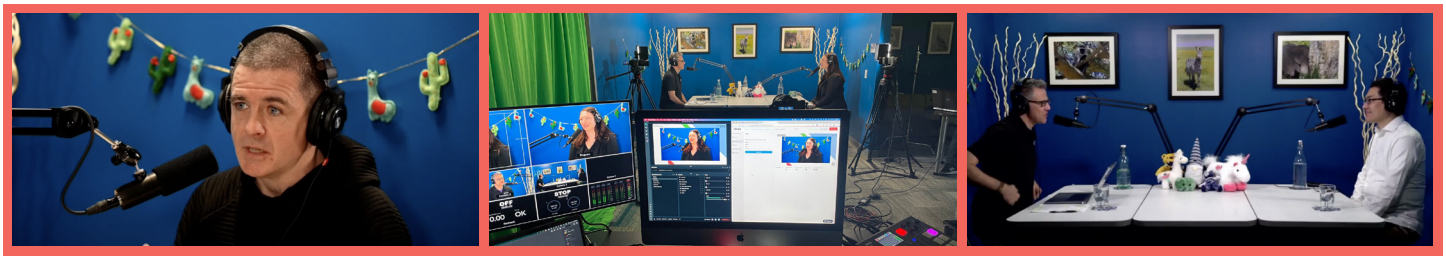

Figure 1 Studio decorations. Stills from S3:E1, S3:E4, and S3:E6

Data Analysis

All information collected was organized and the qualitative data was then analyzed by researchers.

Results/Findings

Using data collected from interviews and dedicated Huck websites, the quantitative data showed similarities between participants and their preferences with the plushies.

Table 1 *Demographics of Participants*

Name	Title	Gender	Birthplace	Plushie Preference
David Hughes	Huck chair, Professor	Male	Ireland	Unicorn
Nita Bharti	Assistant Professor	Female	USA	Llama
Steven Schiff	Former: Director, Brush chair, Professor	Male	USA	Gnome
Laura Weyrich	Associate Professor	Female	USA	Llama
Sally Mackenzie	Director, Huck chair, Professor	Female	USA	Llama
Xiaojun (Lance) Lian	Associate Professor	Male	China	Unicorn

Plushie Patterns

Of the 6 participants 50% chose Llama, 33.33% chose Unicorn, and 16.66% chose Gnome as their favorites (**Table 1**). Bear was least popular across podcast audience and the scientists. None of the scientists chose the bear and the only audience that chose bear at all was Weyrich's audience. 20% of her audience chose the bear (**Appendix, Table 1**).

Reasoning behind preferences

Participants had many different thoughts on why each plushie was their favorite that ranged from life experiences to aesthetic reasons. Nita mentioned that during the podcast her decision changed from unicorn to llama because of the decorations surrounding her (**Fig. 1**) saying "I've been sitting here and there's these really

supported by PennState Huck Institutes of the Life Sciences

adorable llamas behind you. So, I feel like I'm a little primed for the llama right now." Laura is working on llamas in South America as a part of her research. Sally liked how the llama is different (the only alternative plushie with a name - "Lisa"); it attracted her attention.

Steven offered 2 reasons that he chose the gnome, stating "It's kind of a homely looking creature and he always wears a hat in the sun." Steven has a similar hat (though much flatter and wider) that he wears to protect his bald head from burning. Lance explained that in China, unicorns are associated with dreams and he wants to be a person who dreams big and does risky things.

Behavioral patterns across child and adolescent development

During our participants' childhood and adolescent development, different behavioral patterns appeared that may have contributed to their current risk-taking ways, and therefore plushie preferences. When participants were asked about whether they were risk-takers during their childhood they all had examples that made them consider themselves to be risk-takers. One common theme was their attitude towards school. This varied from not liking school to being troublemakers to getting kicked out. David Hughes is the 5th of 6 children in a family where nobody stayed in school past 11 years old. Laura couldn't follow the path that was laid out for being a doctor because she wouldn't be able to help improve health in as big of a way that she felt she needed to do. Nita and Sally didn't love school, Sally mentioning how she often got into trouble. During her interview, Sally suggested that there is a trend of people who become passionate about what they do. She stated that in their background you'll likely see a history of impatience and "You'll see it in their school life as being, not particularly good students or maybe students that got themselves into trouble. Kids who got themselves kicked out of school a time or two." She said that this turbulent energy turns into passion in adulthood.

All participants indicated risk-taking in their youth, especially when it came to their studies. David stated that he had often been described as "an angry Irishman" and was expelled from Catholic school at age 15 for questioning things such as the doctrines. His anti-establishment personality traits are still present in his adulthood. David was included on Newsweek's list of "America's Greatest Disruptors" in 2021.

Nita Bharti talked about how her experiences as being a child of an immigrant family gave her a unique perspective because of how she would notice details about what made her different so she could assimilate and fit in. Nita talked about how this alternative point of view that she gained as a child has impacted her ability to push boundaries and take risks, noting"there's really, really massive improvements to be made if you don't assume that everything is, always has been, and should be the way that everyone's doing it."

When Dr. Steven Schiff was younger, he did a lot of ski racing, which can be dangerous if you take risks without knowing what you're doing. But once Schiff felt confident in his sport, he took many risks and that led him to become a competitive finalist for New York in high school.

Laura Weyrich never liked doing things the way they've always been done and has always looked for new approaches to challenges. She originally wanted to be a doctor, but when her grandfather developed Alzheimer's she realized that she wanted to be the person who helps to create a cure for disease rather than the person using a cure to treat others. This led to Laura steering her academic path from medical school to a PhD program, so that she could pursue her goal of improving health through research.

During Sally Mackenzie's childhood, she constantly moved around and therefore never really established deep roots, knowing she wouldn't be in any one place for long. That is how she learned to take what she got and make the most out of it. When she was younger, Sally considered herself to be an experimentalist. She was the troublemaker who felt too impatient to sit in the classroom and just listen. This led Sally to find her own way of learning.

When Lance Lian was younger, he also liked to take risks. When hiking, he did not want to travel on the established, well laid-out paths that others took. Instead, Lance wanted to wander into unknown areas with no pathways to seek out the beautiful and unique things that no one else was seeing. Lance has continued to take risks as an adult in his research with stem cells which is itself a risky field with a controversial history.

supported by PennState Huck Institutes of the Life Sciences

World Experience

Many of our participants have experiences related to movement around the world. Some traveled internationally as children; many travel globally for their work. Some were born abroad or have immigrant parents. These are just a few examples of participants' experiences outside of their work here in State College: David Hughes is originally from Ireland and has traveled a lot for his work especially to Africa for PlantVillage. Nita Bharti grew up in an immigrant family. As a child Steven Schiff traveled to Africa with his parents for 6 weeks when he was 11 years old, which influenced his urge to return as an adult to do work there and other places around the world. Laura Weyrich goes back and forth to Australia and South America regularly. While growing up, Sally Mackenzie moved around a lot because of her father's business. Lance Lian is from a town in the Jiangsu province of China.

Discussion

We have looked at 6 risk-taking and game-changing scientists and their plushie preferences and the role that plushies play in our lives. Analyzing our findings, we noticed a distinct gender-based trend among our participants that shows that the females tended to pick the llama while the males tended to pick the unicorn.

To our knowledge we are the first to do a study focused primarily on plushie preferences when it comes to risk-taking and game-changing scientists, so it is hard to compare our results outside of overall preferences of people all over the world.

Conclusion

We see that ground-breaking and risk-taking scientists likely have certain traits in common and find plushies to be enjoyable. We were very lucky to recruit such a diverse sample of participants for this study. To further our results and understanding, we have considered doing a follow-up with our current or future participants after we've narrowed down the favorite plushies. Replicating this study would be a perfect way to further research of our interest so that we can find out the difference between plushie preferences already researched and with these risk-taking and game-changing scientists. The future ramifications of the results could benefit the world in so many ways. Factors such as country of birth and type of childhood risk-taking is something that we are interested in looking into more if we can find a trend with future guests and categorize risk-taking.

We invite our fellow plushie researchers and stuffed animal lovers to think about and explore how we can incorporate other cutting-edge plushie research into our studies or collaborate with other plushie scientists. Once more information is collected. a longitudinal study could be conducted to find out whether our hypothesis is correct and could be further developed.

Acknowledgements

We would like to extend a major thanks to David Hughes, Nita Bharti, Steven Schiff, Laura Weyrich, Sally Mackenzie and Xiaojun Lian for appearing on The Symbiotic Podcast and taking the time to share their groundbreaking research. This paper would not have been possible without the support of these scientists. We would also like to thank Penn State's Huck Institutes of the Life Sciences for supporting this research so we could begin this preliminary textile facsimile of selected fauna study. Lastly, we'd like to recognize Lisa Llama and the Penn State Lion plushie, along with the gnome, unicorn and bear plushies for their contributions to our research.

Literature Cited

Agrawal et al. (2021). Cara: A smart Plush Toy for Support During COVID-19. *Association for Computing Machinery,* 636-638. https://dl.acm.org/doi/10.1145/3434074.3446951

Ainsworth, M. D. S., & Bell, S. M. (1970). Attachment, exploration, and separation: Illustrated by the behavior of one-year-olds in a strange situation. *Child Development, 41*, 49-67.

Bandura, A., Ross, D. & Ross, S.A. (1961) Transmission of Aggression Through Imitation of Aggressive Models. *Journal of Abnormal and Social Psychology, 63,* 575-582.

The Bite-Sized Backpacker. (July, 20, 2020). Where do stuffed animals come from? [blog post]. Retrieved from https://www.thebitesizedbackpacker.com/stuffed-animals/where-do-stuffed-animals-come-from

Bragg et al. (2021). Covid-19 Symptom Checker: The Plushie Solution. *Association for Computing Machinery,* 624-625 https://dl.acm.org/doi/10.1145/3434074.3446941

Build-A-Bear Workshop, Inc. (n.d.) Company Profile. Retrieved December 2022 from https://ir.buildabear.com/corporate-profile

Build-A-Bear Workshop, Inc. (n.d.) Find A Workshop. Retrieved December 2022 from https://www.buildabear.com/storefinder

Cole, P. M., Martin, S. E. & Dennis, T. A. (2004) Emotion Regulation as a Scientific Construct: Methodological Challenges and Directions for Child Development Research. *Society for Research in Child Development, 75(*2), 317-333. https://srcd.onlinelibrary.wiley.com/doi/epdf/10.1111/j.1467-8624.2004.00673.x

Goldsmith, H. H. et al. (1987). What is temperament? Four approaches. *Child Development*, 58(2), 505 – 529. https://www.jstor.org/stable/1130527

Hons, C. M. (Host). (2019-present). In *The Symbiotic Podcast*. Marketing and Communications for The Huck Institutes of the Life Sciences. https://www.thesymbioticpodcast.com

Hons, C. M. (Host). (2022, January 27). Changing the Game in Food Security (S3:E1) [Video podcast]. In *The Symbiotic Podcast*. Marketing and Communications for The Huck Institutes of the Life Sciences. https://www.thesymbioticpodcast.com/season3/episode1

Hons, C. M. (Host). (2022, February 24). Changing the Game in Epidemiology (S3:E2) [Video podcast]. In *The Symbiotic Podcast*. Marketing and Communications for The Huck Institutes of the Life Sciences. https://www.thesymbioticpodcast.com/season3/episode2

Hons, C. M. (Host). (2022, March 31). Changing the Game in Global Pediatrics (S3:E3) [Video podcast]. In *The Symbiotic Podcast*. Marketing and Communications for The Huck Institutes of the Life Sciences. https://www.thesymbioticpodcast.com/season3/episode3

Hons, C. M. (Host). (2022, April 28). Changing the Game in Ancient DNA Research (S3:E4) [Video podcast]. In *The Symbiotic Podcast*. Marketing and Communications for The Huck Institutes of the Life Sciences. https://www.thesymbioticpodcast.com/season3/episode4

Hons, C. M. (Host). (2022, June 30). Changing the Game in Epigenetics (S3:E5) [Video podcast]. In *The Symbiotic Podcast*. Marketing and Communications for The Huck Institutes of the Life Sciences. https://www.thesymbioticpodcast.com/season3/episode5

Hons, C. M. (Host). (2022, September 18). Changing the Game in Epigenetics (S3:E6) [Video podcast]. In *The Symbiotic Podcast*. Marketing and Communications for The Huck Institutes of the Life Sciences. https://www.thesymbioticpodcast.com/season3/episode6

The Huck Institutes of the Life Sciences. (n.d.). Directory, Pennsylvania State University. Retrieved December 2022 from https://www.huck.psu.edu/people

Lee, Y. (2008) Build-A-Bear Workshop: Its Aesthetic and Ideology. *Art Education, 61*(6), 20-24, DOI: 10.1080/00043125.2008.11652073

Merriam-Webster. (n.d.) Plushie. In *MerriamWebster.com dictionary.* Retrieved December 2022 from https://www.merriam-webster.com/dictionary/plushie

Merriam-Webster. (n.d.) Plush. In *MerriamWebster.com dictionary.* Retrieved December 2022 from https://www.merriam-webster.com/dictionary/plush

Mori, Y. & Igarashi, T. (2007). Plushie: An Interactive Design System for Plush Toys. *ACM Transactions on Graphics, 26(*3) 8 pages. https://dl-acm-org.ezaccess.libraries.psu.edu/doi/pdf/10.1145/1276377.1276433

Newsweek. (n.d.). America's Greatest Disruptors: Planet Protectors. Retrieved December 2022 from https://www.newsweek.com/2021/12/24/americas-greatest-disruptors-planet-protectors-1659074.html

ÖNDER, M. (2018). Contribution of Plays and Toys to Children's Value Education. *Asian Journal of Education and Training, 4*(2), 146-149. https://files.eric.ed.gov/fulltext/EJ1176006.pdf

Stifter, C. A., & Braungart, J. M. (1995). The regulation of negative reactivity in infancy: Function and development. *Developmental Psychology, 31*(3), 448-455. https://doi.org/10.1037/0012-1649.31.3.448

Uratani, H. & Ohsuga, M. (2013) Development and Evaluation of Respiration-Leading Stuffed Toy to Learn Respiration Control Method for Children, *Transactions of Japanese Society for Medical and Biological Engineering,* 51, R-47. https://doi.org/10.11239/jsmbe.51.R-47

Appendix

Figure 1 Plushies involved (from left to right): Beanie Baby Bear, Gnome, Lisa the Llama, Unicorn, and traditional Nittany Lion (for reference only, not included in polls).

Figure 2 Participants organized by appearance on podcast (from left to right) David Hughes, Nita Bharti, Steven Schiff, Laura Weyrich, Sally Mackenzie, Xiaojun (Lance) Lian.

Table 1 *Podcast Audience votes*

Guest	Llama	Gnome	Bear	Unicorn
David Hughes	25	**41** ✓	0	33
Nita Bharti	**40** (tie) ✓	**40** (tie) ✓	0	20
Steven Schiff	20	20	0	**60** ✓
Laura Weyrich	20	**40** ✓	20	20
Sally Mackenzie	0	**100** ✓	0	0
Xiaojun (Lance) Lian	**60** ✓	20	0	20

Note: Percentage of audience preference calculated live during each podcast episode

supported by PennState Huck Institutes of the Life Sciences

Appendix (con't.)

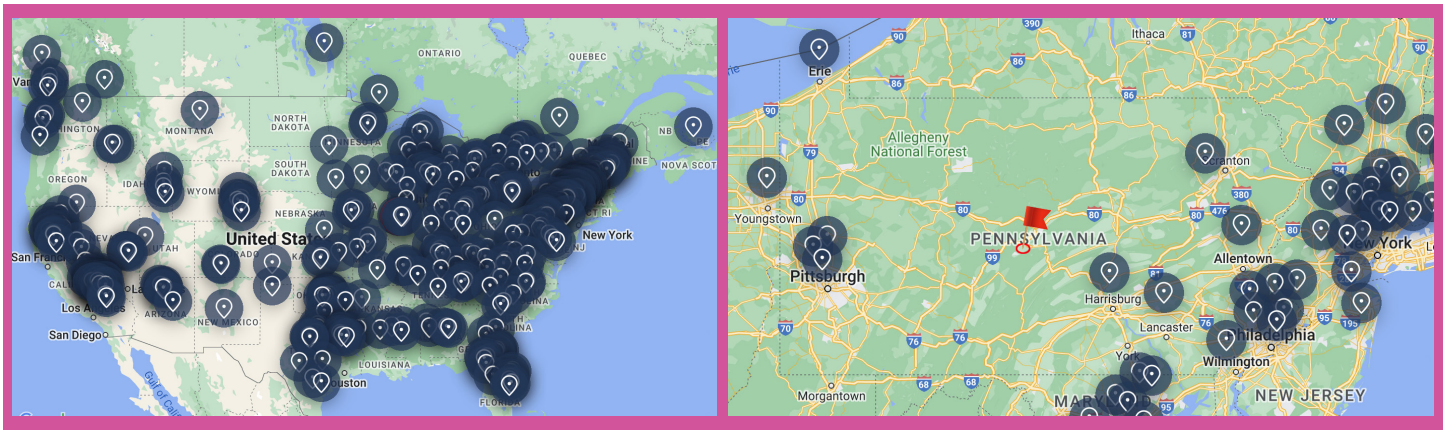

Figure 3 Build-A-Bear locations in the United States (left) and Pennsylvania (right). State College, PA is marked on the right map by a red flag. *Note:* Images from buildabear.com.

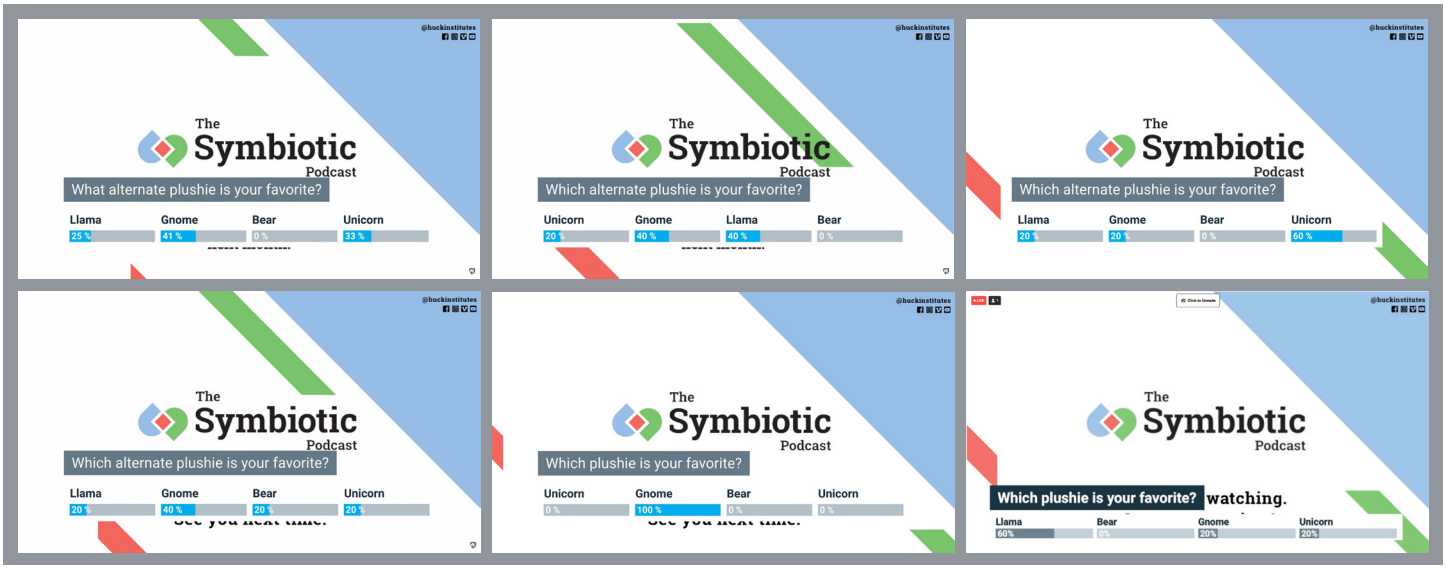

Figure 4 Audience votes organized by appearance on podcast (from left to right, top row) David Hughes, Nita Bharti, and Steven Schiff; (from left to right, bottom row) Laura Weyrich, Sally Mackenzie, and Xiaojun (Lance) Lian.

supported by PennState Huck Institutes of the Life Sciences