

Mutant Maize in the Metaverse

Sarah J. Downing^{*1}, Sohaila E. Askar^{*2}, Bianca KM Sheridan², and Hank W. Bass²

^{*}Contributed Equally. Affiliations: 1. School of Dance, Fine Arts; 2. Biological Science, Arts & Sciences

Abstract:

The Maize-10-Maze project is a public education outreach event at FSU in Tallahassee, FL, as part of our outreach educational project for more than 20 years. The goal of the outreach is to produce a fun and educational self-guided public field tour of the maize genome. The goal of this project is to produce a virtual version of the Maize-10 maze for distribution online. We started by exploring different online platforms that would be compatible with posting images and movies from past events. We selected 3 platforms to enhance visibility and for user-guided exploration, such as Instagram (@maize10maze) and GlideApp. Our criteria for platforms were based on user accessibility, cost, and ease of administration. The online resources (images, placards, links to more info) are intended for free use in any educational setting from middle school through college level. The final product, which we call the maize10maze online museum, is fascinating and beautiful on its own, while also illustrating the historic importance of maize mutants for advancing plant biology research.



Intro/Background:

Maize is a fundamental model organism for genetic research due to its well-characterized genome and extensive mutant collection. The Maize10Maze project was originally designed as an interactive, field-based experience, allowing participants to explore maize genetics by walking through 10 rows, each representing a chromosome. Each row featured single-gene mutants illustrating key biological concepts, including plant development, gene regulation, and evolutionary adaptations.

To expand access to this resource, we aim to develop a user-friendly digital platform that translates the Maize10Maze experience into an interactive, online format. This transition will allow students and educators to explore maize genetics remotely, removing logistical barriers while enhancing engagement.

Research Question: This project is not a traditional research study but is derived from research with an educational goal rather than a discovery-based one. The guiding question is: Which user-accessible platform can effectively educate students on Maize10Maze content?

Methods/Process:

Overall Goal: *To create a virtual educational museum featuring the genetics of maize mutants using the maize-10-maze project.*

Approaches:

1. **Create a social media outlet** to share content about maize mutants.
 - Instagram and TikTok. (IG:maize10maze, TT:scienceforall)
 - a. Objectives:
 - i. to generate interest in the project
 - ii. to announce the future museum.
 - iii. to share field activities: corn shelling and plant breeding (crossing)
 - iv. to highlight FSU-FAMU summer FACE program students
1. **Research platforms** for the future interactive online Maize10Maze museum.
 - a. Established criteria
 - i. easily accessible to the public
 - ii. easy to create, administer, and organize content
 - iii. inclusive and accessible to learners of all educational levels
1. **Compare and test** three candidate platforms.
 - a. Possible platforms and status
 - i. Glide app (in progress)
 - ii. Thinglink (under consideration, pricing limitations)
 - iii. FrameVR (rejected, difficult to admin/use)



R1-marbled mutant of maize.
The marbled color is from the color gene (R) turning on and off during seed development



Instagram



Linktree/Glide App

Chr 1

- sr1, striate leaves1**
Phenotype: Many white striations or stripes on the leaves. (Photo from: J. Doster, H. Bass, BIO FSU 333)
- lls1, lethal leaf spot1**
Phenotype: Chlorotic-necrotic lesions resembling Helminthosporium carbonum infection. (Photo from: J. Doster, H. Bass, BIO FSU 333)
- ts2, tassel seed2**
Phenotype: Tassel mostly pistillate with occasional staminate or perfect florets; pendant branches. (Photo from: J. Doster, H. Bass, BIO FSU 333)
- zb4, zebra crossbands4**
Phenotype: Regularly spaced lighter green crossbands on earlier leaves, enhanced by cool temperature. (Photo from: J. Doster, H. Bass, BIO FSU 333)
- rs2, rough sheath2**
Phenotype: Leaves curled; liguled protuberances and other growth anomalies on sheath and auricle. (Photo from: J. Doster, H. Bass, BIO FSU 333)

Glide App Chromosome 1
This is a screenshot of chromosome 1 on our app.

- Resources & References:**
- Neuffer, M. G., Coe, E. H., & Wessler, S. R. (1997). *Mutants of maize*. CSHL Press.
 - MaizeGDB database: MaizeGDB.org
 - Crazy Lazy Maze: www.crazylazycorn.org
 - Photography by: J.DosterPhoto.com

Findings:

GLIDE app

PROS: Easy accessibility for creators and viewers. Cost Efficient (basic plan is free). Simple & clear formatting for viewing and comprehension

CONS: Global editing access once published with the basic/free plan (anyone can change our content). High cost for upgraded plan (\$600-\$2,000 per project).

THINGLINK app

PROS: Good for content addition in the future. It has a "virtual reality" feel (360° media view). Interactive engagement through a multimedia scheme.

CONS: Complex design process. Expensive (\$2,500 for the minimum plan).

Instagram made by this UROP project with Dr. Bass: [@maize10maze](https://www.instagram.com/maize10maze)

Analytics from @maize10maze Instagram:

Post	Date	Likes	Comments	Shares	Views (for videos)	Saves	Type of Post
1	10/09/24	15	0	0	-	1	Graphic
2	11/1/24	20	0	1	174	3	Video
3	11/6/24	13	0	0	-	3	Picture
4	11/6/24	7	0	0	108	1	Video
5	11/13/24	18	1	0	-	1	Picture
6	11/15/24	16	1	1	156	3	Video
7	11/20/24	14	0	1	267	3	Video
8	11/27/24	17	2	0	-	0	Picture
9	12/4/24	8	0	1	152	0	Video
10	1/15/25	7	0	0	84	0	Video
11	1/28/25	9	1	0	-	2	Photo
12	2/18/25	11	0	2	-	0	Photo



The Mutants of maize in "chromological" order

Conclusions:

- The search for a platform has yielded two good candidates
- Ongoing research and funding may be required to access their full potential

Future Directions:

- Identify funding sources and write grants for these platforms
- Alternatively, we develop our custom platform, requiring coding expertise.
 - Collaborate with computer science experts in the design process
 - Identify server hosting resources (e.g., Biological Science Dept.).