

Mayan Glyphs Demo

Formative Evaluation

COSI Labs in Life Language Pod

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Background

The Language Pod is part of the Labs in Life in COSI's Life exhibit. It serves as a research space for professors and students at The Ohio State University working in the field of linguistics, and allows COSI visitors to participate in and observe real scientific research. The Language Pod also develops and operates program carts on linguistic concepts for COSI visitors in the main hall outside the Life exhibit. The cart demos are run by Ohio State students as part of a course at the university and explore a wide range of linguistic concepts.

Program carts consist of short, educator-facilitated activities on mobile carts and are conducted outside of the main exhibit spaces. They are regularly operated throughout the halls of COSI by the Labs in Life, as well as COSI staff and volunteers. They can be conducted anywhere in the museum and they are operated for typically 30 minutes to two hours at a time, as they require a demonstrator to facilitate the activity and explain concepts to visitors. Visitors choose whether to engage in the experience or not as they walk through the museum. In some cases they stop at the cart with the intention of engaging in the specific program cart experience, in others something about the demo catches their attention and they come over to explore it.

Mayan Glyphs Demo

Mayan Glyphs is a new cart demo developed for the Language Pod that uses the ancient Mayan logossyllabic language to discuss different types of writing systems.

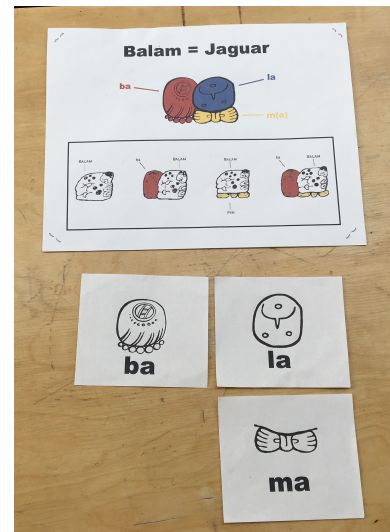
The ancient Mayan writing system consists of symbols, or glyphs, stylized in square blocks. These glyphs can be pictographic, representing whole words, or syllabic, standing for syllables that together make up the phonetic spelling of a word. This system works much like our alphabet, using phonetic units and their corresponding symbols to build words; however, rather than individual letters, it utilizes whole syllables.

This type of writing system can be found in modern Japanese, Cherokee, and other languages, and represents one of many types of different writing systems. This demo allows visitors to explore and use a different writing system than their own and teaches them how syllabary languages work. It shows that there are different ways to write words other than the system they use and that other writing systems can be both different from and similar to their own.

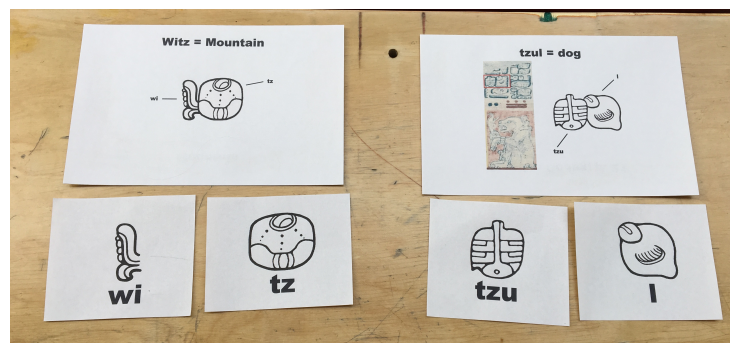
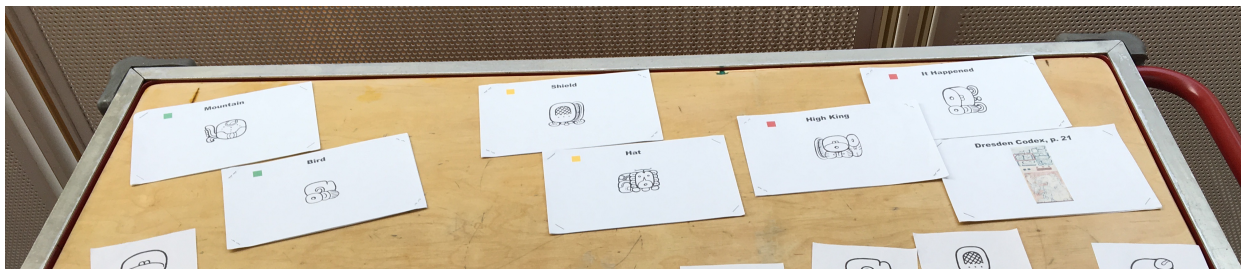
The learning objectives of the demo include:

- **Main objective:** there are ways to write language other than alphabets
- Words are composed of smaller elements and these elements can be different
- Alphabets are made up of letters that stand for the most basic sounds of speech
- Syllabaries are made up of syllables, a more complex unit of speech

The demo is conducted using a program cart. Visitors are given a card with the Mayan glyph for jaguar on it and asked to use a bank of Mayan glyphs to determine the Mayan word for jaguar. They locate each of the three glyphs and determine that they stand for the syllables “ba,” “la,” and “ma.” The glyphs/syllables are then put together into the Mayan word for jaguar, *balam*. The variable pictographic and phonetic nature of Mayan glyphs is discussed with a chart on the back of the “jaguar” card showing how the word can also be written using a singular pictogram or some combination of the pictogram and syllable glyphs.



If visitors chose, they can continue to decode glyphs with extra glyph cards. These cards are broken down into three levels, easy, medium, and hard. The easy glyphs are “mountain” and “bird” and they include only two syllables. The medium glyphs, containing three syllables, are “shield” and “hat.” The hard glyphs are more varied but contain unique features such as the vowel-only glyph in “it happened” or more syllables such as the four-syllable “high king.” Also in this group is a handwritten “dog” glyph from the Dresden codex, an ancient Mayan book.



Four different versions of the activity were tested throughout the process:

Version 1

In the first iteration of the activity visitors were given the complete Mayan syllabary on 5 pages spread across the cart and asked to use them to translate the “jaguar” glyph. The syllabary worked by locating the glyph from “jaguar” and determining the syllable it stood for by matching consonants by rows with vowels by columns. Once all glyphs were located, the visitor pronounced the three syllables together as *balam*.



Version 2

In the second version of the activity, visitors went through the same process of locating the glyphs and determining their syllable meaning; however, the syllabary was abbreviated to less than half the original size. A color-coded version was also created to make searching easier for younger visitors. This version color coded the three glyphs in “jaguar” with the consonant row the glyph could be found in so that visitors had an even smaller area they needed to search.



Version 3

The third version of Mayan Glyphs began with a comparison of the English and Mayan alphabets. Visitors were shown the English alphabet and asked what it was. After giving the obvious answer, “the alphabet,” they were asked what the Mayan syllabary was. This comparison showed both the fundamental differences between English and Mayan – letters vs. syllables – and their similarities – they both use a system of phonetically corresponding symbols. For the decoding activity flashcards were used as the bank of glyphs. The set contained the nineteen glyphs essential for decoding and seventeen optional extra glyphs to make searching more challenging. The flashcards contained a large image of a glyph with the syllable it stood for underneath. Visitors moved the flashcards around and, upon selecting the glyphs in “jaguar,” assembled them into the shape of the complete glyph. With the glyphs in order, they could read the corresponding syllables as *balam*.



Version 4

The fourth and final iteration of the demo began by looking at the basic difference between syllables and letters. The word “COSI” was written on a whiteboard and visitors were asked how many letters and how many syllables were in the word. It was then explained that while English breaks words into letter units, Mayan breaks words down into syllable units. Visitors were asked how many glyphs would be in the Mayan word for COSI, the answer to which, based on the number of syllables in the word, is two. The main decoding activity used the flashcard bank.



Evaluation

Objectives

The objective of this evaluation was to understand visitors' reactions and learning outcomes regarding Mayan Glyphs and to utilize that information in the further development of the demo.

This evaluation aimed to observe and understand:

- Whether visitors understood how to complete the activity
- How visitors physically interacted with the activity
- Whether the activity difficulty and length were appropriate for COSI visitors
- Whether visitors found the activity enjoyable
- What visitors took away from the demo
- Whether visitors attained some or all of the learning objectives

Methodology

This evaluation consisted of a brief verbal questionnaire conducted with visitors after completing the demo, as well as the taking of observational notes on visitor demographics and activity experiences by the demonstrator after each trial. The questionnaire was given to the group as a whole, thus each response reflects the experience of the collective group, regardless of size or makeup. All demos and questionnaires were conducted by the author.

The demo was done on a program cart, and the evaluation questionnaire was conducted at the cart immediately after the completion of the activity. The cart was located in the hallway outside of the Life exhibit and operated during regular COSI hours on various days throughout the week. The evaluations were conducted on average three days every-other week, two weekdays and one weekend day, over a three month period from September 2017-November 2017.

Participants were recruited when they came over to try out the demo. Before the demonstrator began, they told the visitors that the demo was currently in development and asked if they would be willing to answer a few brief questions when they had completed it to help further improve the experience. They were told that if they did not want to answer any questions, or wanted to stop answering questions at any point, they were allowed to do so. If visitors agreed to be surveyed they were asked the questions verbally and the demonstrator recorded their answers. The demonstrator also made observational notes on the experience. If visitors declined to be surveyed, the demo was still conducted but no questions were asked, though the demonstrator made notes reflecting on the experience. The demonstrator never referred to herself as the creator of the activity and described the demo as though she was testing it for the Language pod to avoid influencing visitor's responses.

The questionnaire gathered demographic information including number of visitors doing the demo (the demo was almost always done by a single group of visitors who had come to the museum together, e.g. a family, a couple), the ages of the visitors in the group, and the group's

relationship to one another. This information was gathered/estimated observationally by the demonstrator and was not specifically asked of the visitors. It was collected to determine whether the activity was effective for different ages and group makeups. Activity related information was also recorded, including whether visitors were successful at the activity, what glyphs they decoded, and they level of difficulty of those glyphs, in order to determine visitors' ability to do the activity and interest in continuing with it. The post-activity visitor questionnaire consisted of five open-ended questions. They were meant to assess visitor's enjoyment of the activity and whether it was too difficult or too simple, as well as visitor's learning outcomes and whether what they learned was in line with the learning objectives of the demo. After completing the demo and, if conducted, the questionnaire, the demonstrator answered a series of eight questions reflecting on the experience. They recorded how they setup and conducted the demo and the benefits or issues that resulted from that particular configuration, as well as what assistance, if any, they had to provide to visitors in order for them to complete the activity. Also noted were the demonstrator's perceptions of the visitor's experience, including engagement level, perceived learning, and interest in continuing with the activity.

Results

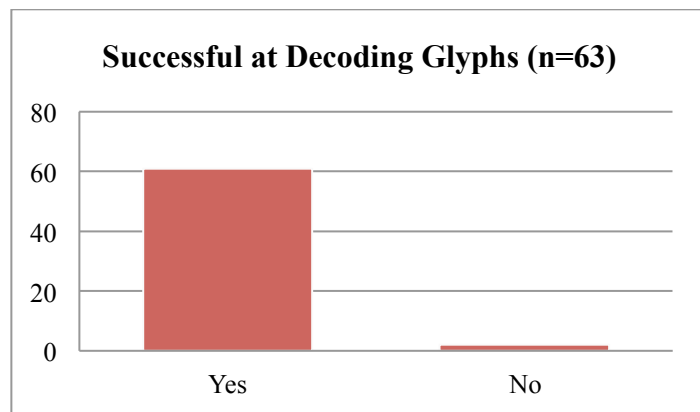
The following results come from 63 trials of the Mayan Glyphs demo. Demonstrator notes were taken for each trial. Visitors agreed to and questionnaires were conducted for 32 of the trials.

Due to the limited sample size overall and especially for some of the earlier versions data trends may not be entirely reliable, particularly in cases where the ages of visitors evaluated were skewed higher or lower than average. However, many clear trends did emerge throughout the demonstration and evaluation process that indicated what was and was not effective in the demo.

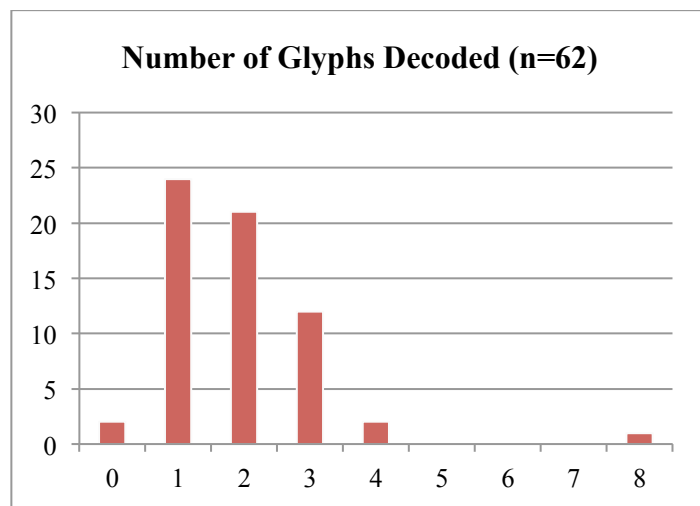
Results are grouped by the version of the demo they came from to allow for comparison of the effectiveness of each particular demo's approach. For each trial the "visitor" describes the group that completed the activity in that trial (ranging in size from an individual to a family group) as each group responded to the questionnaire collectively.

General

Overall, visitors were very successful at completing the glyph decoding activity. With the exception of two instances in which visitors lost interest and stopped doing the activity part way through, visitors were able to complete the activity by themselves or with some assistance.

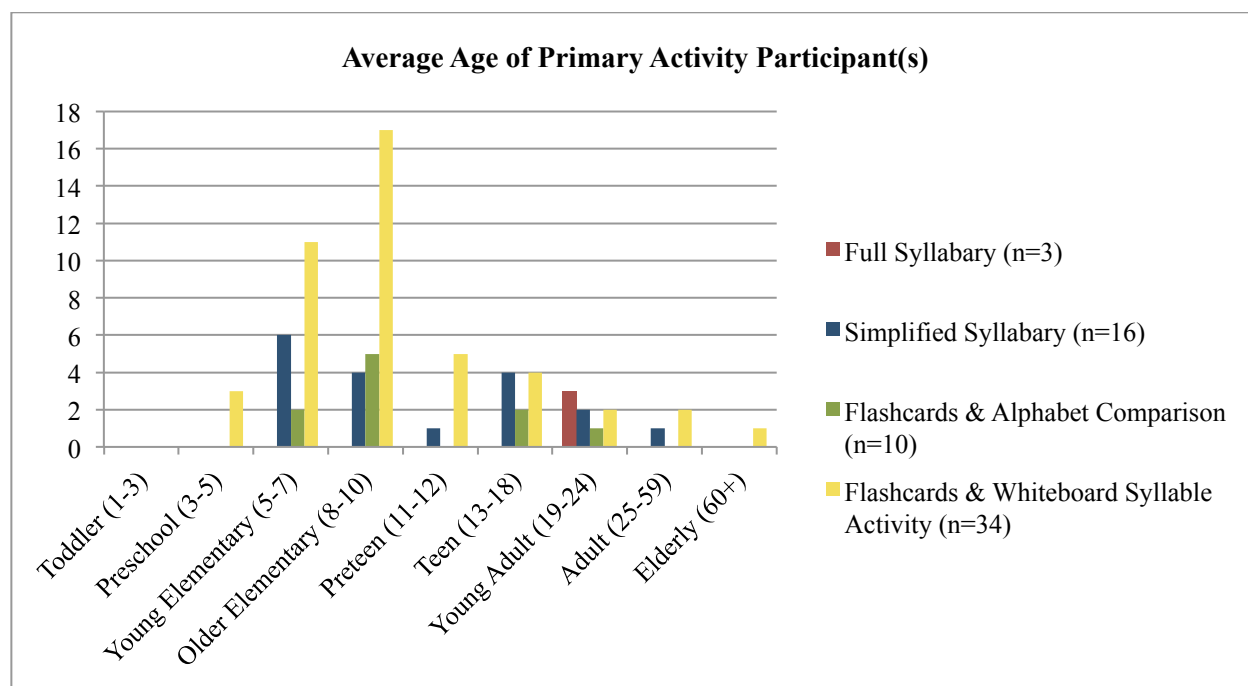


All visitors who completed the activity decoded one glyph. This was the most common number and represents visitors who did the activity, but did not chose to continue with the extra glyphs. The zero column represents visitors who did not complete the activity. For visitors who did chose to continue and decode more than the basic glyph most chose to do just one more for a total of two. A smaller number chose to do two, three, or, in an extreme case, all seven of the additional glyphs. Many visitors did chose to continue with the activity, as the number of visitors who decoded two or more glyphs is larger than the number of visitors who decoded one or fewer.



A range of different groups, from individuals to families, did the Mayan Glyphs demo. Primary activity participant(s) refers to the visitors in the group who participated in the activity and, if surveyed, answered questions about it. This distinction was made because, while many groups were families, it was often the children that did the majority of the activity and answered the questions about their experience. The full syllabary version of the activity was only tested with young adults, as it was the preliminary test conducted with students in the Language pod course.

Data was gathered thoroughly, but the visitors were not as dispersed among age groups as the later tests with the wider COSI audience. The simplified syllabary iteration was tested with a group that was, on average, older than the groups for the other versions. The flashcards and alphabet comparison was tested with a fairly standard makeup of visitors averaging within the older elementary group. For the flashcards and whiteboard syllable activity version a larger sample size offered a clearer trend. As expected, visitor ages concentrated around younger and older elementary, though data was collected on the activity from a full range of ages. Overall, younger and older elementary visitors (roughly ages 5-10) were shown to be the primary audience for the cart, did most of the activity (though many had adults with them at the cart), and provided the bulk of the feedback for the questionnaire.



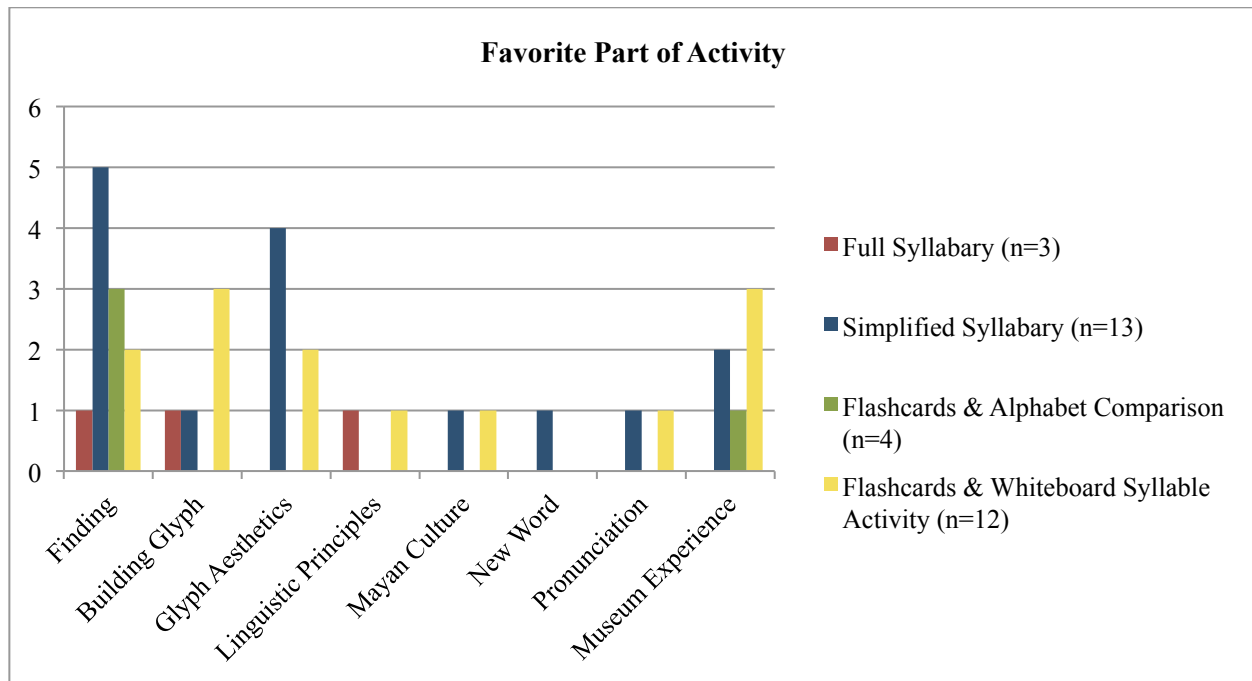
Visitors were also asked what could be done to improve the activity. Several trends appeared in their answers and some good suggestions were made.

The “jaguar” card was initially black and white; however, early visitors expressed a preference for the colored “jaguar” card initially made to go with the easier colored version of the syllabary. Visitors also repeatedly suggested adding color-coding to make searching for the glyphs easier.

Working with the syllabary pages proved difficult for many visitors, and several suggested ways to make it more useable. Early suggestions included creating a poster that included everything on one large sheet. Other visitors expressed a desire for a more hands-on, tactile activity using flashcards of glyphs that allowed them to move and assemble the glyphs themselves.

Visitor Post-Activity Questions

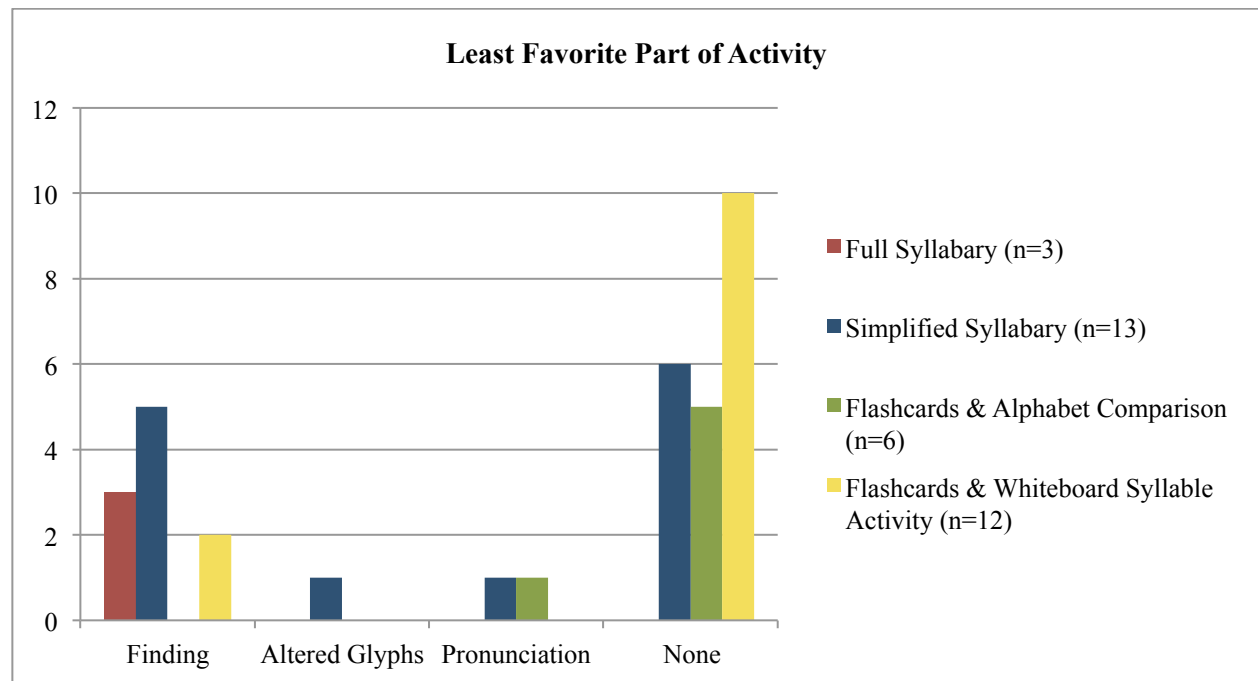
Visitor's favorite parts of the activity tended to vary by personal interest, but the information was collected to see what aspects of the activity were enjoyable and which if any, should be expanded upon to promote greater enjoyability and engagement. Searching for the glyphs proved to be enjoyable to visitors across all different versions of the activity. Other highlights included the process of building a glyph, particularly for the later flashcard version where visitors could physically piece together the glyph, and the glyph aesthetics. Visitors also expressed that they felt that they activity was good learning experience or worked well for the COSI audience, responses that were grouped under museum experience.



The following terms were used to group and code open-ended responses:

- **Finding** – searching through the bank of glyphs to locate the ones needed
- **Building Glyph** – putting together the glyph pieces to figure out what the word was
- **Glyph Aesthetics** – admired the glyphs in an artistic/graphic sense
- **Linguistic Principles** – learning some linguistic principle (e.g. SOMETHING)
- **Mayan Culture** – learning something about Mayan culture
- **New Word** – learning a new word/a word in a foreign language
- **Pronunciation** – pronouncing the Mayan word once the syllables were assembled
- **Museum Experience** – varied comments about the enjoyableness or effectiveness of the demo

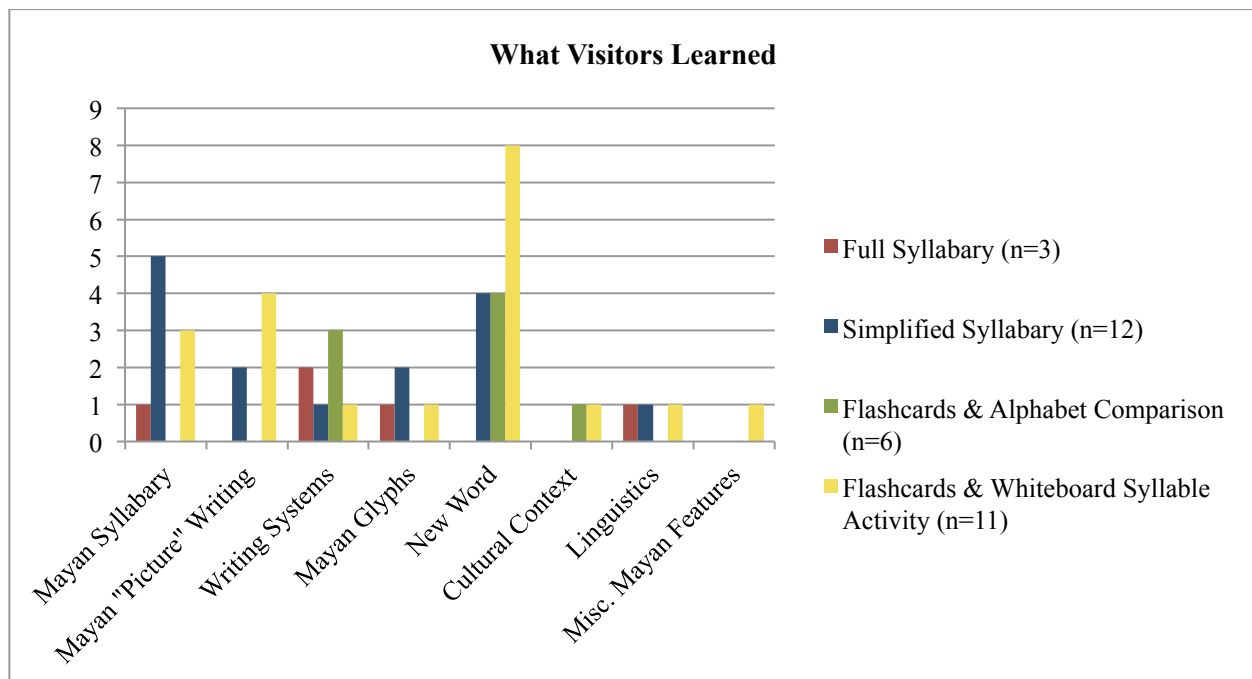
Visitor's least favorite parts of the activity were recorded to determine whether some parts of the activity were not enjoyable or difficult to the point of becoming an obstacle to engagement. Finding was the most common least favorite part of the activity, and signified that visitors found the bank of glyphs too large or the process of searching through it not enjoyable. Pronunciation also arose as an issue, but the final iteration made adjustments that corrected for it. In the majority of questionnaires, visitors did not cite a least favorite aspect of the activity or simply said that they enjoyed it in its entirety. This may have been a result of them enjoying the activity, or it may have been an unwillingness to criticize it.



The following terms were used to group and code open-ended responses:

- **Finding** – searching through the bank of glyphs to locate the ones needed (typically indicated that they found the bank too large)
- **Altered Glyphs** – glyphs that were altered in shape or direction from their original form in the bank
- **Pronunciation** – pronouncing the Mayan word once the syllables were assembled
- **None** – had no least favorite part of the activity

Visitors were asked in the questionnaire to recount two things that they had learned from the activity. The most common answer across versions was that visitors learned a new word or a word in a foreign language, the immediate takeaway of completing the decoding activity. The full syllabary version showed the highest levels of deeper engagement – understanding what the Mayan syllabary was and that writing systems can vary – though this may have been confounded by the older ages of the participants in those trials. The simplified syllabary approached proved very effective at teaching the targeted learning outcomes, particularly the Mayan syllabary; however, other factors lead to a transition to the flashcard-based system. The alphabet activity in conjunction with the flashcards proved the most effective at teaching visitors that there are different forms of writing systems, while the whiteboard syllable activity proved fairly effective at showing how Mayan and other syllabary-based languages work.

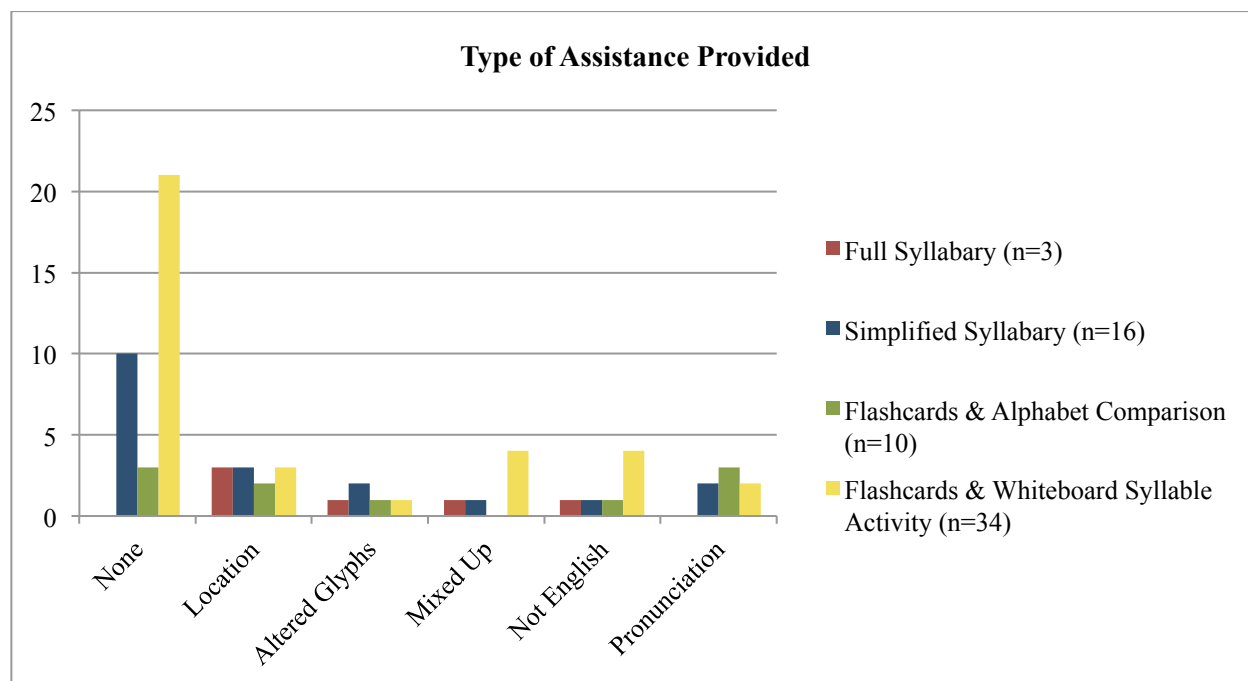


The following terms were used to group and code open-ended responses:

- **Mayan Syllabary** – the Mayans wrote in syllables
- **Mayan "Picture" Writing** – the Mayans wrote in "pictures" (showed a misunderstanding of the largely phonetic nature of their writing system)
- **Writing Systems** – there are other ways to write besides letter-based alphabets
- **Mayan Glyphs** – ancient Mayans had writing and that writing, once largely lost to time, was decoded by scholars
- **New Word** – a "new word" or a word in a foreign language (immediate takeaway of completing the decoding, showed a lower level of learning engagement than other outcomes)
- **Cultural Context** – any aspect of how writing fit into Mayan culture (e.g., writing on temples, the ability to write being limited to scribes, etc.)
- **Linguistics** – how letters/syllables work linguistically
- **Miscellaneous Mayan Features** – other features of Mayan writing (e.g., the order in which glyphs were read, etc.)

Demonstrator Reflection

Throughout the activity the demonstrator provided assistance to visitors if they required it. For all visitors who did the full syllabary version of the activity assistance was needed in locating the glyphs on the syllabary. This number went down considerably for the simplified syllabary and even more so with the flashcard versions, as the bank of glyphs was reduced in size further and further. However, other struggles emerged with altered glyph forms and pronunciation. The flashcard versions, which also reshaped the glyph forms in the bank to be more similar to those in the complete glyphs to be decoded, showed a decrease in assistance needed with altered glyphs. For the most part assistance was needed in low numbers and did not significantly impact visitor's ability to complete or learn from the activity.



The following terms were used to group and code open-ended responses:

- **None** – the visitor required no assistance to complete the activity
- **Location** – demonstrator pointed out or hinted to visitor where glyphs were located on the syllabary chart or among the flashcards
- **Altered Glyphs** – demonstrator told visitor that the glyphs could be altered in shape or direction from their original form in the syllabary or on the flashcards
- **Mixed Up** – visitor mistook one glyph for another and the demonstrator corrected them
- **Not English** – visitor attempted to spell the English “jaguar” using the Mayan syllables rather than the Mayan word *balam* (i.e., started looking for the “ja” glyph) and the demonstrator corrected them
- **Pronunciation** – the demonstrator corrected or assisted with the pronunciation of the Mayan words

Interpretation and Application of Results

The results of the evaluation were used throughout the development process to improve Mayan Glyphs. Over the three-month evaluation process, qualitative data was continually analyzed for patterns and trends that indicated the successes and shortcomings of different aspect of the demo. Findings from each iteration resulted in alterations and improvements for the following iteration.

The demo initially utilized the complete Mayan syllabary, a five page chart of more than 100 unique symbols that almost immediately proved to be difficult for visitors. All visitors surveyed needed assistance locating glyphs and expressed that finding the glyphs in the large table was their least favorite aspect of the demo. Based on these findings, the syllabary was simplified by removing over half of the glyphs to make locating the ones needed for the activity easier. This adjustment proved beneficial and a lesser proportion of visitors needed location assistance; however visitors surveyed continued to express that finding the glyphs was still the least enjoyable part of the demo. While testing these versions of Mayan Glyphs, two different visitors suggested that the activity could be improved by making the syllabary into individual flashcards so that the words could be assembled physically. This approach was appealing for two reasons. Firstly, it allowed visitors to build the glyph themselves, a more interactive and theoretically enjoyable activity than looking through the chart. Second, it did away with the complicated system of matching up the consonants and vowels and the abstractness of having to remember the located syllable while searching for the rest. With this in mind, a set of flashcards were created that had images of glyphs on them along with their corresponding syllables. This approach proved more effective, as smaller numbers of visitors required assistance locating the glyphs from the abbreviated selection and expressed that locating the glyphs was their least favorite part of the demo.

Another aspect of Mayan Glyphs that came about through the testing process was the addition of color. Initially the “jaguar” glyph card was presented in black and white. However, early on in the evaluation visitors expressed an interest in color-coding the glyphs to make searching easier. Additionally, visitors who were given the chance to use the colored “jaguar” card initially created for the simpler version of the activity expressed a preference for it. The colors helped to distinguish the three different syllables within the “jaguar” glyph block and made it easier for visitors to identify the specific appearance of each glyph. With these benefits in mind, the colored jaguar card was adopted as part of the activity.

An issue that continually arose was the pronunciation of the Mayan words once the syllables had been assembled, and steps were taken to address it. With the syllabary system this part of the activity was difficult as visitors had to remember the syllables they had found and put them together in their head without a visual reminder. This proved to be a problem, and was another of the primary reasons for switching to the flashcard system. With the glyphs and their syllable meaning on individual cards, visitors could assemble them in the shape of the word and simply read the syllables off of the cards. This eliminated the abstractness of remembering the multiple syllables, and visitors could quickly and easily sound out the word from the syllables they saw in front of them. Another pronunciation issue that came up was the incorrect pronunciation of the silent vowels at the end of many of the words. For example, the three syllables in jaguar, “ba,” “la,” and “ma,” were read as balama, rather than the correct *balam* without the vowel at the end, and the demonstrator had to correct visitors almost every time. To solve this problem, the syllables on the flashcards were abbreviated to only consonants for the last glyphs in the words, so visitors instead could read “ba,” “la,” and “m” as *balam*. This approach was dramatically more effective and visitors were consistently able to pronounce the Mayan words correctly without assistance.

With the basic mechanics of the activity figured out, attention was turned to the meeting of

learning objectives. The targeted learning objects focused on the idea that there are different ways to write language and that syllabaries specifically differ from alphabets in that they utilize syllables, rather than letters, as the basic units of words. This idea was woven into the syllabary versions of the demo fairly well as it was clear that the syllabary was the Mayan equivalent of the alphabet; however, with the transition to flashcards the system of the glyphs was less clear. To deal with this, an introductory alphabet comparison was introduced that demonstrated what the Mayan syllabary was and allowed visitors to see it in its entirety even though it was not used in the actual decoding. This activity proved successful at promoting the writing systems learning outcome, but it was brief and was not always well understood by visitors. An alternative introductory activity was developed that broke a word down into letters and syllables in order to illustrate the difference between the two to visitors, as well as show how they could be used as units of words. This activity led to an increase in the Mayan syllabary learning outcome as it helped visitors to understand on a more foundational level how writing with syllables works. Overall it was better understood and visitors engaged in it more than the alphabet comparison, so it was selected as the introductory activity.

One aspect of the activity that arose through testing was how it connected to what visitors were learning in school. A component of the activity introduction was typically inquiring if visitors knew about the ancient Mayans. For many younger visitors the answer was no, and so the demonstrator explained to them that they were a civilization that lived in South America many centuries ago or compared them to a more familiar civilization such as ancient Egypt. For older visitors who did know about the Maya though, there was a stronger connection to the context of the writing they were decoding and they often asked more questions about the role of writing within Mayan culture. According to the Ohio Department of Education Social Studies Standards, students learn about the Maya in fifth grade. With this in mind, it was important to make sure that the material was accessible to visitors younger than fifth grade without background knowledge, but also to find ways to tie it in to what visitors in fifth grade and beyond knew or were learning.

At the conclusion of this evaluation the following recommendations leave room for further development and improvement of Mayan Glyphs. A physical representation of Mayan culture such as an image of Mayan pyramids or a map of where the Mayan civilization was located would help visitors to put what they are learning in context, as many were unfamiliar with the culture and verbal explanations didn't seem to be entirely effective. Visitors also suggested in questionnaires that such an addition would improve the demo. The learning outcomes of the demo were most commonly that visitors learned a new word, rather than the targeted outcomes of understanding syllabaries or the diversity of writing systems. While efforts were made to improve visitor's attainment of targeted learning objectives, there is still room for improvement in this area.

Conclusion

The evaluation process proved to be an extremely valuable tool for the development of Mayan Glyphs, revealing the successes and failures of the activity in the real museum environment so that it could be shaped into the best possible experience. The demo began with an initial linguistic principle, the diversity of writing systems, and sought to teach that principle through

the Mayan logosyllabic writing system that utilized both syllable-based phonetic writing and pictograms. An activity was developed that tasked visitors with decoding Mayan glyphs by assembling different syllables to form a Mayan word. Through several rounds of trials, different versions of the demo were developed based on visitor feedback and the success and failures of the demo in practice. The final iteration of the demo was a flashcard decoding challenge prefaced by an activity that compared letter-based writing and syllable-based writing. It was the result of three months of visitor research and activity development, and proved to be a successful demo that would not have been possible without the feedback provided through the evaluation process.

To other museum content developers looking to create similar program carts or exhibits on writing systems such as ancient Mayan the following recommendations are offered. Take the visitor's advice! Some of the most effective changes such as adding color and switching to the flashcard system were ideas initially given by visitors. Advice like they gave typically comes from a desire for some aspect of the experience that they had wished had been possible, and, odds are, other visitors will wish for as well. Something that is easy to overlook but was found to be an important part of conducting evaluations was when trials were conducted. Mayan Glyphs was geared toward an older audience, and conducting trials on weekdays proved to be difficult as the majority of visitors were younger than school age. Weekends provided a more diverse age range among visitors, as well as greater numbers of visitors. For any demo testing it is important to look at what age range is targeted and to ensure that trials are being conducted at an appropriate time for that audience. A lesson that can be learned regarding Mayan or other specific cultural exhibits is to find a way to introduce the visitor to the topic succinctly but effectively so that they do not immediately feel out of their depth with the information. For visitors unfamiliar with the Mayans giving them a reference to a similar, more familiar culture such as ancient Egypt or a place they knew such as South America allowed them to better contextualize the activity. I would recommend building these associations or an introduction to the culture into the activity so that unfamiliar visitors have a way to put what they are learning into context.

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Appendix: Questionnaire

The following form was utilized to evaluate visitor's experiences with Mayan Glyphs.

COSI Labs in Life Language Pod Demo Formative Evaluation

Visitor Information

Number of visitors: _____

Age(s): _____

Relationship to each other: ☐ family ☐ friends ☐ other: _____

Successful at decoding the glyph(s)? ☐ yes ☐ no ☐ partially

Glyphs decoded: ☐ jaguar ☐ mountain ☐ bird ☐ shield ☐ hat ☐ it happened
☐ high king ☐ Dresden codex

Level of glyphs completed (check all that apply): ☐ easy ☐ medium ☐ hard

Visitor Post-Activity Questions

1. What was your favorite thing about this activity? What was your least favorite thing?
2. Did you find this activity difficult or confusing? If so, why?
3. What are two things you learned from this activity?
4. What could we do to make this activity better?
5. Any further comments?

Demonstrator Reflection Questions

1. How was the demonstration physically set up? What were the pros and cons of this?
2. Were visitors able to understand the instructions?
3. If applicable, what kind of assistance did you need to provide to visitors so that they could complete the task?
4. Were visitors able to complete the task? If not, why?
5. Were visitors engaged with/excited about the activity?
6. Did visitors appear to learn something from the activity?
7. Did visitors want to continue with the activity and decode more glyphs? Why or why not? What level did they chose?
8. Any good quotes from visitors?