

# Evaluating Museum in a Box for the London Postal Museum



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# Abstract

The Postal Museum asked the authors of this report to evaluate a new outreach program, called Museum in a Box. To determine its effectiveness as an educational tool outside the museum, the team determined design criteria, developed a functional prototype, and observed its use in a classroom. The team collated key takeaways from interviews, surveys, and observations to produce actionable recommendations. The team ultimately advised The Postal Museum to pursue further development of content for deployment on the Museum in a Box platform.

# Acknowledgements

Our team would like to thank those who made this project possible. First and foremost, thank you to our project liaison at The Postal Museum, Martin Devereux, for his constant support. He and all of the other staff at The Postal Museum made us feel very welcome in our seven weeks and provided us with the guidance and resources necessary to complete this project.

We would also like to thank Eric Cota and Valentina Evangelou who not only took time out of their busy schedule to be interviewed, but also opened up their school and freed up time in their classrooms to allow us to test our lesson prototype. We also want to personally thank Sally Sculthorpe, Dr. Helen Chatterjee, George Oates, and Charles Cattel-Killik for taking the time to speak with us and providing important guidance for our project.

Lastly, we would like to thank our advisors, Professor Fabio Carrera and Professor Esther Boucher-Yip, for their constant guidance and advice. We appreciate their dedication and support throughout the duration of the project. We would also like to acknowledge Professor Creighton Peet for preparing us for our project before we arrived in London.

## Executive Summary

Our team explored a new outreach technology for The Postal Museum that combines powerful learning techniques with the internet of things. This technology, called Museum in a Box, lets students access museum content they otherwise could not by sending them replicas of museum items, each of which are supplemented by informative audio. This project investigates if the museum could use this tool to share their content with a wider and more diverse audience. In fourteen weeks, we evaluated MiaB for The Postal Museum to determine if it could fill their need for an outreach program that would enable them to share their collections with students and educators who lack the resources to visit the museum.

The goal of our investigation was to explore MiaB's possible applications and determine the program's efficacy as an educational tool for The Postal Museum. Our major objectives to accomplish this goal were to:

1. Determine design criteria for MiaB, and identify The Postal Museum's goals for MiaB
2. Develop a prototype lesson and bundle for MiaB
3. Evaluate the lesson and bundle to form a recommendation for The Postal Museum

To identify our design criteria, we gathered background information to clarify the needs of The Postal Museum in relation to MiaB. This required understanding how The Postal Museum presents its content to children and identifying the overall goals of our project from both our sponsor and the learning team manager. We found that the museum was looking to create a sustainable, wide-reaching outreach program that would share key aspects of its collection with audiences that could not attend on-site exhibitions.

An effective outreach program needs to properly select elements of a collection and engage students in a diverse and meaningful way. To understand how The Postal Museum's content can best be presented to children, we observed its current field trip programs, studied behaviours of children in its gallery, and discussed student engagement strategies with primary school and university level educators. These educators helped us determine what schools needed from museums to meet their own objectives. Combining these needs with our initial design criteria we developed a functional prototype that met all of the requirements for a successful outreach program (Figure E-1).

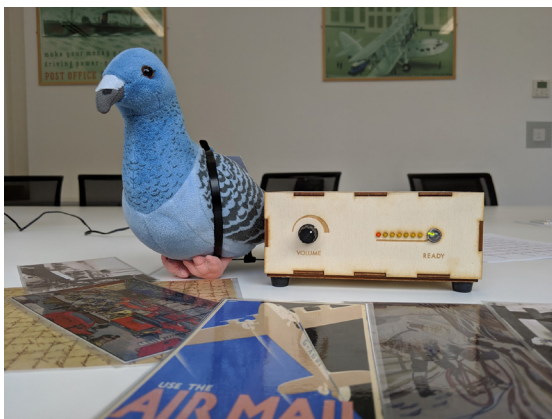


Figure E-1: Some of our MiaB item bundle

To support our findings and recommendations, we brought our prototype into classrooms, tested it, and collected feedback on its

use from both students and teachers. The prototype was accompanied by a supplemental activity that could be used to occupy half of a class while the other half was using the box, maximizing the hands-on experience. The activity, which tasked students with interpreting telegrams and cross-written letters, proved highly successful and unexpectedly engaging. The data we gathered provided us with the evidence we needed to present The Postal Museum with actionable recommendations that will help them develop their own content in the future.

- ❖ Use engaging and tactile items
- ❖ Capture student's attention with scripts and audio
- ❖ Engage students throughout the lesson

After careful research, we are comfortable advising The Postal Museum to develop content with the MiaB platform and to evaluate any new content they make to corroborate our findings on MiaB's effectiveness. The type of lesson that the MiaB platform encourages shows promise for getting students excited about The Postal Museum's collection. Even if the MiaB platform does not gain traction among educators, the content developed for it will still prove valuable if used with other mediums. Our classroom testing indicates that MiaB-based lessons have a promising future in the repertoire of The Postal Museum's programs and could allow the museum to share its content with schools all across London, the UK, or even the world.

# Authorship

The process behind writing this paper was highly collaborative and involved each team member at every step. We believe crediting only one or two people for each section would not do justice in recognizing the efforts of each team member in every section.

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2.1.1 The Postal Museum's Outreach	Owen Smith	Benjamin Schade, Tabitha Gibbs
2.2 Museum in a Box	Tabitha Gibbs	Owen Smith
2.2.1 Museum in a Box: Strengths	Tabitha Gibbs	Connor Dietz
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2.3.2 Interactivity and its Benefits	Connor Dietz	Owen Smith
2.3.3 Creating and Effective Educational Activity	Connor Dietz	Owen Smith
2.4 Evaluating Outreach Programs	Connor Dietz	Benjamin Schade
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5.3 Students should be constantly engaged	Connor Dietz	All
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# 1. Introduction

Society is continuously evolving, and museums must develop new outreach programs to keep up. Traditionally, outreach programs are made up of activities that present content to students in a watch-and-listen style. This method does not transfer a lasting understanding of the material to the audience and does not take advantage of the museum's rich and extensive collections (Willingham, 2009). Research surrounding children's learning is constantly progressing, and educators are constantly developing new tools for learning activities. However, it can be difficult for museums to select the best program for their collection from the wide variety of available tools. Museums have the difficult task of gauging the efficacy of many programs at once, potentially straining institutional resources. Each museum has items that are unique to its collection, so there is no ideal solution for every museum worldwide.

One possible solution is Museum in a Box (MiaB) (2019). MiaB is a new technology that presents users with an internet connected box and a bundle of museum artifacts. These artifacts each have an NFC sticker on them and are either a card with an image of the item, or are a 3D-printed replica of the item. These replicas allow children to control their learning experience and give the public access to the hidden pieces of museums' collections. The Postal Museum in London is exploring the MiaB platform to decide if it is the best format for incorporating physical interaction into its school outreach (M. Devereux, personal communication, January 31, 2019).

Currently, there have been some publications on MiaB accompanied by a multitude of research on other options for museum outreach (Buckley, Fraser, Garbely, & Naras, 2018; Burek, Kenoian, Marrion, & Szewczyk, 2008; DesPlaines, Ferro, & Kurtz, 2008; Espiritu, 2018). Sara Cordello, an education specialist at the Smithsonian believes that MiaB could "become a useful classroom tool that can take learning off the screen" (Espiritu, 2018, para 5). More broadly, museums and institutions have repeatedly examined educational outreach programs by researching topics including child involvement and content knowledge (DeKorver, Choi, & Towns, 2017; Melber, 2003).

While all of this information is valuable to The Postal Museum, it still needed to investigate how MiaB could benefit its outreach programs. Since MiaB was such a new technology, there was very little information on the educational success of the system; therefore, The Postal Museum lacked the information necessary to determine how the MiaB could suit its programs.

This project explored the efficacy of MiaB as an educational tool for The Postal Museum. Our objectives to achieve this goal were to determine design criteria for MiaB and identify The Postal Museum's goals for MiaB, develop a prototype lesson and bundle for MiaB, and evaluate the lesson and bundle to form a recommendation for The Postal Museum. First,

we compiled ideas from The Postal Museum staff and employees of MiaB Ltd. to establish design criteria for The Postal Museum's MiaB. Then, we performed interviews to record museum staff and teacher opinions regarding potential lessons with MiaB to prototype a lesson bundle. Finally, we tested the lesson and formed a final recommendation for The Postal Museum's use of MiaB. That recommendation will help guide The Postal Museum to use MiaB as an effective outreach tool that will expand its network.

## 2. Background

The primary focus of this project was to evaluate the use of Museum in a Box for The Postal Museum by testing educational content on the platform. To contextualize the use of museum outreach concepts we present an overview of The Postal Museum's history, exhibitions, and outreach. It is followed by a description of Museum in a Box and how lesson content can be presented through the product. The chapter concludes with a description of factors that constitute successful museum outreach programs and how to evaluate such programs.

### 2.1. The Postal Museum

The Postal Museum (2019) is part of a charity called the Postal Heritage Trust. This group has worked to maintain the history of the Royal Mail since 2004, but it traces its roots back to the establishment of the Record Room in the General Post Office HQ in Central London in the 1890s. In 1969, Her Majesty Queen Elizabeth II officially opened the National Postal Museum in London. However, funding ran thin and the museum's extensive collection was unfortunately closed to the public in 1998 following the sale of the building. In the years leading up to the formation of the Postal Heritage Trust, the museum's objects and staff were moved to the Freeling House at Mount Pleasant. After the Postal Heritage Trust was given control of the postal archives, it turned its focus to establishing a public venue for its collections. This decision led to the acquisition of a 999 year lease at the current location of The Postal Museum on July 28, 2017 (Figure 2-1).



**Figure 2-1:** *The Postal Museum on Phoenix Place in London*

The Postal Museum's exhibits are divided into two categories, the Mail Rail Exhibition and The Postal Museum Exhibition (The Postal Museum, 2019). The **Mail Rail Exhibition's** main attraction is a ride on an electric underground train that used to carry mail around the city of London, where visitors can experience a 15-minute ride to see original station platforms and engage with its history. The train cars and tunnels can be seen below in Figure 2-2.



**Figure 2-2:** *The Mail Rail on the tracks*

The **Postal Museum Exhibition** contains activities and objects devoted to the history of the British postal system such as a pneumatic message delivery system and a sheet of the world's first adhesive postage stamp. The most notable exhibit here is the temporary exhibit, the *Voices from the Deep*. It hosts recently recovered letters and objects from the S.S. Gairsoppa which was sunk by a German U boat during the Second World War. In addition to the artifacts themselves, the exhibit details the recovery mission and the steps taken to restore and preserve the ship's cargo.

### 2.1.1. The Postal Museum's Outreach Programs

Though the physical aspects of a museum may be confined to a specific location, outreach programs allow the museum's content to reach beyond its walls (Moreno, Izumoto, Kim, & Yonemoto, 2016). Museums benefit communities educationally, culturally, and socially through programs that engage a wide range of audiences outside of the museum (Hein, 2005). These programs include public activities, after school programs, and classroom visits that address a wide range of topics and learning styles. The Postal Museum (2019) offers two categories of outreach. Organizations can hire **traveling exhibits** or visit the museum

and participate in a range of **programs at The Postal Museum**. If an organization wishes to participate in a traveling exhibit, it can choose between *Mail Rail: How Technology Solved a Problem* and *Pop it in the Post* (The Postal Museum, 2019). The Mail Rail program details the construction of the driverless railway under London using an interactive, inflatable tunnel. *Pop it in the Post* describes the unique ideas that revolutionized communication in the mid-19th century. Both of these programs take advantage of unique aspects of the postal system's history to share the country's history with its people.

Teachers also have a few options when considering a visit to The Postal Museum (2019). They can either opt for a completely self-led visit and take it upon themselves to present the exhibition's content to their students, or they can participate in a visit led by a Postal Museum staff member. The Postal Museum's guided outreach programs are separated into three age categories:

- ❖ Key Stage 1: Engineering of the Mail Rail, Mail Delivery, the Penny Black stamp standardization of the Postal System
- ❖ Key Stage 2: Engineering of the Mail Rail, the Penny Black stamp standardization of the Postal System, code breaking, computing, The Postal Service in the First World War, The Postal Service in the Second World War, *Voices from the Deep*
- ❖ Key Stage 3: Engineering of the Mail Rail, The Postal Service in the First World War

These educational programs keep students engaged and promote the museum's content. However, these programs are either hosted in specific areas, held in the museum, or present in classrooms which require a Postal Museum employee visiting these schools. These current outreach approaches can be improved with a platform like the Museum in a Box.

## 2.2. Museum in a Box

Museum in a Box (MiaB) is a platform that allows people to interact with replicated collections of a museum to learn about their history. It can be used as part of an exhibit to supplement a museum visit or as a loan box for museum outreach.

The MiaB kit comes with an internet-connected wooden box and a set of artifact replicas that are related to a general lesson theme (Museum in a Box, 2019). The box contains a processor that controls a near-field communication (NFC) reader and speakers. When items are placed, or "booped," on the box's NFC reader, it plays a corresponding audio file. An example of this process can be seen in the image below.



**Figure 2-3:** "Booping" an artifact.  
(Museum in a Box, 2019)

The program's core advantage is that it allows audiences to interact with artifacts that normally would otherwise be too valuable, fragile, or inaccessible in the museum's archives. It is particularly marketed to engage audiences and reach people who cannot make the trip to see a museum's exhibits. Currently, the MiaB kit itself is priced at GBP 200, though this may change in the future (G. Oates, personal communication, March 28, 2019).

Each program is unique to a museum and allows lessons to be created around the physical items so that users can move at their own pace. It should be noted that the items do not fit into the box, but the box is a self-contained unit that complements the other pieces. The various replicas in the kit can be 2D pictures, cards or documents and/or 3D representations of items in the museum's collection. MiaB gives museums the option to incorporate the kit into their outreach programs which offers adaptability without breaking the budgets of schools or museums.

MiaB Ltd. has created an instruction manual for creating content packages for its product that it supplies to museums enrolled in its program. The document details the steps and thought processes necessary to select items in the museum's collection, create a story, digitize the content, and set up the physical system (M. Devereux, personal communication, February 5, 2019). This general structure is summarized in Figure 2-4.

### 2.2.1. Museum in a Box: Strengths

The most common forms of museum outreach work closely with schools and other education advancement programs (Burns, 2015). Museums provide unique opportunities for schools by teaching specialized content in ways that cannot be used in traditional school environments. These specialized lessons from museums are designed to connect with students in ways that will adapt to student learning styles and foster a deeper understanding of the content through the use of subject experts and replicas of primary source materials.

These specialized lessons have also been shown to elicit better behavior and attentiveness from students (Andre, Volman, & Durksen, 2017; Willingham,

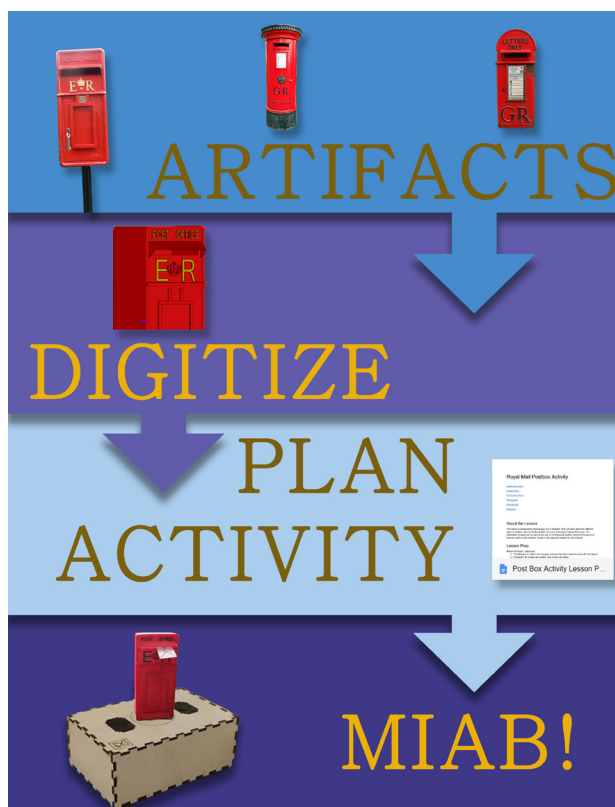


Figure 2-4: Steps in Creating Museum in a Box



2009). Studies have repeatedly demonstrated the connection of engagement and immersion with stronger educational impacts. The high level of interactivity also keeps students focused on the task at hand by employing critical thinking skills that integrate social, emotional, and academic development (Steward, 2017). When content creates an emotional or social connection, students are more willing to openly share thoughts, reactions, and ideas concerning the material presented to them, leading to better classroom discussions and information retention.

The MiaB platform has a unique collection of potential benefits that make it adaptable to schools around the globe including its low cost, content availability anywhere internet services are accessible, and flexible curriculum applications. (Museum in a Box, 2019). MiaB promises to rekindle schools' lost relationships with museums by cutting costs for schools and creating materials that can be applied to a wide range of age groups. The company seeks to combine the benefits of online and outpost learning by providing schools with online content and physical objects. This combination can give students a wide range of online activities, yet does not sacrifice the tangible side of the museum experience that is crucial for information retention.

### 2.2.2. Museum in a Box: Shortcomings

Though MiaB offers several potential advantages over traditional outreach programs, it also faces issues related to the very concept it benefits from: uniformity. Confined to content adaptable to the box, museums are limited in terms of the kind of resources and activities they can include with the box (Museum in a Box, 2019). This puts a significant limit on the types of museums that would be inclined to participate in the program, hindering MiaB's mission of becoming a universal outreach program. The key to creating a successful pilot for The Postal Museum was finding a topic with a high level of applicability and adaptability to the British national curriculum that also lent itself to the types of museum content that complement MiaB.

### 2.3. Key Elements of Successful Outreach Programs

Outreach programs come in many different forms but all successful activities share important elements that drive their popularity. In this section we present a brief overview of some of the most prominent elements—engaging activities that cater to many learning styles and interacting with the lesson in a meaningful manner. For additional information on our research on the development of museum outreach programs see our informational essay in Appendix B.

### 2.3.1. Engagement and Learning Styles

One of the most important aspects of any educational lesson or activity is the students' engagement (Chatterjee, 2007; Denig, 2004; Newmann, 1992). Students learn in a variety of ways; it depends on how they process and internalize information and how they later recall that material. What is consistent across all different learning styles, however, is the need for each student to be engaged. Engagement is a student's investment in not only completing the work, but also understanding it. This goes beyond simply completing an assignment because it is required, but rather because the student wants to.

The target audience for our project was young children in Key Stage 2, which added additional considerations for engagement (Denig, 2004; Newmann, 1992; Slavin, 1996). A mistake often made with young students is treating them too much like children. Not listening to concerns or feedback from young students can disengage them from an activity. Young children are also easily distracted, and often value socializing or playing higher than learning in class. This concept of cooperative learning directly describes one of the core principles of MiaB; students should not feel as though they are learning and should engage in teacher-guided, peer-to-peer discussions during the activity.

Cooperative learning takes advantage of the common social nature of young students and can potentially solve many of the difficulties associated with educating adolescents (Chatterjee, 2007; Newmann, 1992; Slavin, 1996). The core tenet of cooperative learning methods is that students are responsible for each other's education. They are not tasked with just doing something together, but rather learning it together. Success in a cooperative learning environment is when all members of the team learn the material, not just when the assigned work is completed.

Students must engage with one another to solve problems, using each other's unique perspectives to reach an understanding of complex topics.

### 2.3.2. Interactivity and its Benefits

Interactive tasks are highly effective at engaging students. Compared to traditional material presentation methods, when students can actively explore material they can retain and recall it more effectively (Allen & Gutwill, 2004; Newmann, 1992). Furthermore, interactive engagement can be fun for the student, which has been shown to increase not only retention, but also foster deeper critical thinking (Chatterjee, 2007). Entertaining activities get students thinking about the task at hand in more detail which, according to Willingham (2009), improves retention.

Teachers often undervalue the importance of emotions in their lessons (Chatterjee, 2007; Willingham, 2009). Students commonly associate stress with learning. Object-based learning focuses on the use of physical objects in the classroom and can lead to a reduction in the

stressful aspects of the learning process. Furthermore, handling objects often triggers other subtle emotional responses which help the brain to retain memories of the event.

### 2.3.3. Creating an Effective Educational Activity

With so many different learning styles and levels of interest, it is important to understand what goes into formulating quality activities (Chatterjee, 2007; Lee, 2014). There is value in placing emphasis on designing with intent and ensuring that each part of the activity has a purpose, especially when considering the increased integration of technology in education.

When new education tools are being tested as an activity, some experimentation is needed to get a clear picture of the activity's success (Black, 2005; Lansdown & O'Kane, 2014; Lee, 2014). There are many ways a researcher can vary the presentation of an activity. Two particularly useful examples are changing the amount of instruction given to the students and giving the students freedom to explore by not describing every step of the activity. Both options provide sufficient differences to illuminate potential pitfalls or discrepancies and, therefore, improve future iterations of the program.

The activity should be intuitive enough that students can operate any tools they might use, and the goals should be obvious (Allen & Gutwill, 2004; Black, 2005). In general, superfluity is the bane of any good interactive activity. Controls should be natural and follow commonly accepted conventions while limiting their function to a single purpose. A good example is turning a volume knob clockwise to increase volume and counterclockwise to decrease volume. Further consideration should be made to ensure the design of the activity does not permit the student should do something that may break or destroy the tools. The correct usage decision should be clearly evident in the design. Additionally, functions in the activity should avoid pursuing other learning objectives that may detract from the actual goal. Content clutter may potentially be seen as benign, but in reality it can greatly obfuscate the desired message. This means an important part of the design process will be testing and revising the activity based on feedback from students or other participants.

## 2.4. Evaluating Outreach Programs

To understand how to evaluate and revise developed activities, we had to develop methods for both assessing an activity and its participants. Unlike an activity presented as part of a school's curriculum, the academic performance of the students is not crucial. Instead, the important data is the relative improvement of the students' understanding of the related content over the course of the activity. This means conventional student performance assessment techniques will still be useful, but data collected through observation will be used differently.

Beginning the assessment process involves identifying a few key aspects of the activity, namely the primary sources of feedback and the goals of the activity (Lansdown & O'Kane,

2014). There are many stakeholders in a given educational program, such as the students, the teachers, and the educational institution. Feedback from each of these groups provides differing, yet valuable information that influences the content and presentation style of the activity. Depending on the situation, feedback from these varying groups may be more effectively retrieved in different ways. Notably, teachers or educational institutions sometimes collect feedback from their students or observe classes and report their findings and analysis.

Regardless of the activity, students' engagement in the activity is an important metric (Lansdown & O'Kane, 2014; Newmann, 1992). Unfortunately, evaluating that level of engagement is a difficult task. Many traditional indicators serve as estimations at best. Some of these are student participation, enthusiasm, and apparent concentration. While these indicators could point to a student's level of engagement, they may just indicate a student's cooperation. It is for this reason that having the class's teacher(s) make observations is so useful. These teachers have often spent lots of time with their students, and are familiar with each individual's personality.

Data collection materials and methods should be created to match the assessment needs of the activity (DeKorver, Choi, & Towns, 2017; Diamon, Luke, & Uttal, 2009; Lansdown & O'Kane, 2014; Lee, 2014; Whittaker, Salend, & Duhaney, 2001). This way the assessment of students' performance in the activity can be customized to monitor the desired concepts. Rubrics are well suited to accomplish this task because they can be constructed to record student's qualitative strengths and weaknesses within the activity as well as student's quantitative responses within the activity. Because the activity is the focus of evaluation, it is helpful to give both pre and post activity quizzes to the students. These quizzes could be more the traditional, written response type, or they could be performed orally by the teacher for the class as a whole. The rubrics should then accompany general observations on the performance of the students during the activity by the teacher.

When possible, interviews with the teachers should be given in addition to the written feedback (Castillo-Montoya, 2016; Diamon, Luke, & Uttal, 2009; Lansdown & O'Kane, 2014). The interviews should address the activity objectives and discuss if each was met. If certain objectives were difficult or not met, a discussion should be had that seeks to answer why. The teacher should pass this question on to the students, asking them what was difficult or confusing. These comments can then be used to inform further revisions of the activity. Careful evaluation allows for constant improvement and will lead to high quality educational designs.

## 3. Methodology

The goal of this project was to determine the potential effectiveness of the Museum in a Box (MiaB) platform as an educational tool for The Postal Museum in London. MiaB presents new technology with great potential, but little experimentation has been done to bring it into classrooms as a formal lesson. After careful consideration, we developed the following project objectives:

1. Determine design criteria for MiaB, and identify The Postal Museum's goals for MiaB
2. Develop a prototype lesson and bundle for MiaB
3. Evaluate the lesson and bundle to form a recommendation for The Postal Museum

This chapter discusses the methods we used to create our prototype lesson using MiaB as a platform, and how that lesson helped us evaluate it as an outreach tool. We collated key takeaways from interviews, surveys, and observations, both inside and outside the classroom, that helped us supply actionable recommendations to The Postal Museum.

### 3.1. Determining design criteria for a MiaB prototype for The Postal Museum

The scope of our project required us to determine The Postal Museum's expectations for their outreach and what MiaB was capable of. Two interviews with employees at MiaB Ltd. (Appendix C, D) and discussions with staff at The Postal Museum (Appendix E, F) helped us form an outline for the design criteria of the prototype we created. In addition to providing useful feedback, the staff members at The Postal Museum, Martin Devereux and Sally Sculthorpe, became useful resources for making contact with other professionals who would become crucial to our project.

Based on a recommendation from Sculthorpe, we observed student workshops in The Postal Museum to see what content and activities from the museum engaged the students (Appendix L, P). Our observations of the activities focused on recording the age group of the students participating, the subjects presented, the involvement of students, and the excitement of students. We selected these facets to benchmark the activities because they represented student engagement and educational content while keeping it relative to a specific age group. These observations provided guidelines and standards for our future program development and stressed the importance of student involvement.

With MiaB being such a new technology there were not many people familiar with its use. For this reason, we went directly to the source and interviewed the creators of MiaB to determine specific design criteria that utilized the platform's strengths. One of our interviews was with its lead designer, Charles Cattel-Killik and the other was with the founder and CEO,

George Oates. They both provided insightful commentary on MiaB's applications and how museums like The Postal Museum can benefit from its use.

### 3.2. Developing a MiaB prototype lesson for The Postal Museum

To provide an adequate recommendation to The Postal Museum, we developed our own MiaB content and tested its effectiveness with students and museum patrons. This content creation was only possible through an internal iterative process that helped us create the best possible lesson in the given timeframe. Some of our most effective research for developing successful MiaB content was based on contact with local teachers and The Postal Museum's educational staff. These teachers gave us feedback on items and topics to include with our box lesson.

We conducted three semi-structured interviews with educators and consulted with a member of The Postal Museum's educational staff to help us determine guidelines for a prototype box and lesson plan (Appendix G-J). We chose to use semi-structured interviews because we wanted to have an open conversation about our question areas, while still ensuring we touched on everything we wanted to. We interviewed teachers at two local primary schools, Eric Cota and Valentina Evangelou. Additionally, we interviewed Dr. Helen Charterjee, a professor at University College London and an expert in object-based learning. We performed these interviews to learn how students interact with the MiaB materials and the appropriate uses of these items in a classroom setting. The semi-structured interviews also gave use a chance to brainstorm with the interviewee about how they thought MiaB could be used. Their diverse feedback was a powerful tool in designing items and programs that met teacher and museum staff expectations, particularly when carefully analyzed and combined with our own research.

We visited the galleries to learn about The Postal Museum's exhibitions and to gauge how patrons interacted with the physical exhibits. This information served as inspiration during our searches through The Postal Museum's digital image archives and public records library. These resources did not limit our freedom in selecting images of infographics, brochures, pictures, and other replicas of paper-based artifacts for our prototype lesson. Making informed decisions from this design phase allowed us to create meaningful items that were effective educational tools.

We outlined a modular lesson system that we used to guide our lesson design (see Section 4.2, Figure 4-1). From this framework, we compiled our chosen materials into prototype lesson plans to test in classrooms (Appendix P). Our interviews and discussions resulted in us selecting the *Delivery Operations* module and naming our lesson *Delivery Methods*. This lesson served as the focus for our testing, the results of which formed the foundation of our recommendation to The Postal Museum. The lesson contained cards and one physical object

that interacted with MiaB and was accompanied by supplementary worksheets and activities which are discussed in the Findings chapter.

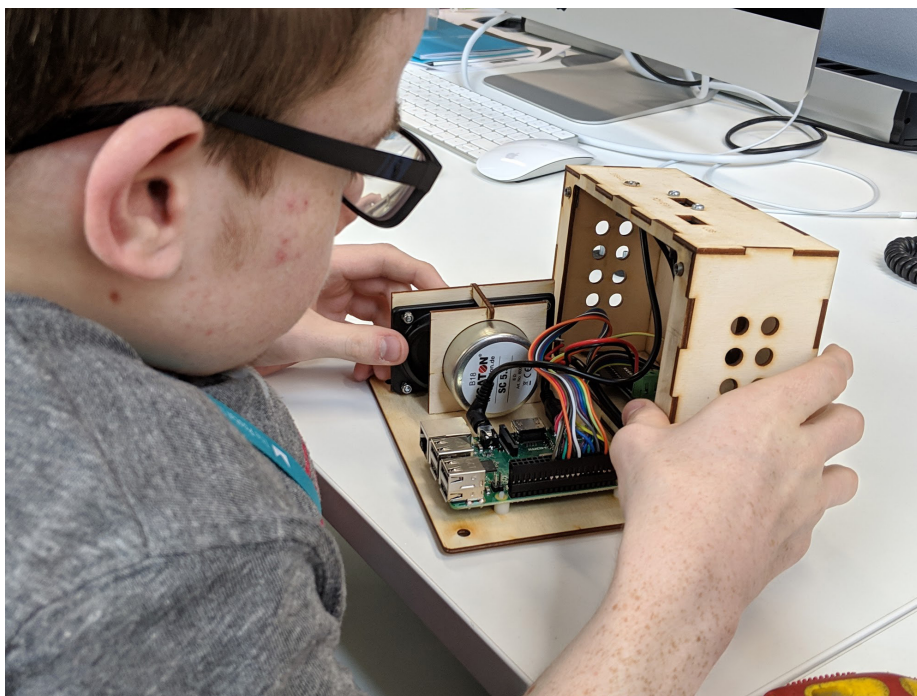
### 3.3. Evaluating the effectiveness of the MiaB prototype

To establish the educational value of MiaB, we piloted our prototype lesson. We visited two schools and interacted with 44 students in the classrooms. The first round of testing was at St. Mary's Primary School and the second was at Lancasterian Primary School; both classes were Year 4. Our observations and analysis focused on metrics for educational value and student engagement. We developed observation sheets (Appendix M) and a simplified feedback form (Appendix N) to determine student feedback on the activity and performance of our created items and lesson plan. Two of us led the activity while the other two observed and gathered feedback from the students. We collected evidence regarding the activity's effectiveness through an interview with the teacher and our own research observations. While a teacher may be able to comment on how much their students learned from the activity, pre-tests and post-tests are considered much more rigorous (Lansdown & O'Kane, 2014). To do this we gave the students worksheets to complete during the activity. One group completed the worksheets before doing the MiaB lesson, and a second group completed the worksheets afterwards. To minimize a potential skew in the data, the teacher was asked to include students of all ability levels in each of the groups. We followed up each testing session with a post-activity discussion with the teacher about what they thought went well, what they thought could be improved, and addressed any additional notes.

We used our testing results to develop clearly stated actionable advice on how to use MiaB going forward. This advice included a description of how to make quality items and lesson plans for MiaB outreach and a recommendation of the contexts in which it will be most effective and can be found in the Recommendations chapter.

### 3.4. Project Limitations

While we did our best to use the resources at our disposal, we experienced some limitations along the way. One of the major problems that we encountered was that we were not supported by a curator when we designed our lesson. Curators were unavailable at the time of our project development. An available curator might have given us more flexibility in selecting prototype content and improved the historical accuracy of the items. Instead, we communicated with Sally Sculthorpe and two teachers for guidance on creating lesson plans in a very limited timeframe. Ideally, we would have been able to formally iterate on complete prototypes to improve the plan until it was well-developed instead of iterating on incomplete prototypes.



**Figure 3-1:** Team member Connor Dietz dismantles MiaB to understand how it works.

MiaB, arguably the most important element of the project, provided its own set of limitations and challenges. The MiaB platform was still in its infancy, and the hardware is still very much in beta. Typically, content is loaded onto the box using a web interface. However, our unit had issues connecting to The Postal Museum’s network, and due to a tight deadline we had to take the box apart to manually load the content on. This was a complicated process that involved unpacking the custom communication protocol used by the NFC tags and the MiaB and then loading the files onto the internal SD card in the correct directory.

A notable challenge during our project was unexpected time constraints that resulted in inadequate time for testing our lessons in UK classrooms. Students’ two week Easter break coincided with our project development, so we were unable to test our lesson in as many classrooms as we originally desired. As a result, we limited the number of classroom testing sessions. Additional testing could have revealed more informative trends and improved the statistical significance of our results from our classroom demonstrations. In turn, this would have better supported our finding that MiaB-centered lessons were engaging and educational for students.



## 4. Results and Conclusions

This chapter is organized on a per-objective basis. Findings relating to each objective are prefaced by briefly reintroducing the specific methods we used. Next, we outline key findings from the information we gathered. Finally, we analyze the significance of the findings and note any specific limitation.

### 4.1. Design Criteria for MiaB

We held two discussions with staff at The Postal Museum (Appendix E, F) and two interviews with employees at Museum in a Box (Appendix C, D) to outline The Postal Museum's goals for the MiaB program and identify the design criteria necessary to create content. Our findings from these discussions and interviews are organized into two main categories, **lesson design criteria** and **content criteria**. We identified the lesson design criteria from our first two discussions with The Postal Museum employees. The content criteria was compiled from the interviews from MiaB Ltd. employees. The lists in this section summarize these findings and our sources for specific information.

#### 4.1.1. Lesson Design Criteria:

The following are criteria that we used to ensure that we met the standards of The Postal Museum when creating our prototype lesson.

- ❖ Target age group is **Key Stage 2**, with a potential for Key Stage 1 as well.<sup>1</sup>
- ❖ Incorporate the idea that the postal system was the first **social network**.<sup>2</sup>
- ❖ It is fine to **replace a museum visit**, as The Postal Museum wants to share content with new audiences first and foremost.<sup>2</sup>
- ❖ Explore **cross-curriculum** activities (e.g. combining history and literacy).<sup>1</sup>
- ❖ Consider using **MiaB as a museum activity**.<sup>2</sup>

The above determinations were summarized from advice from our interviews and some were phrased as advice for our specific project. While each represent different elements that The Postal Museum finds important to include their content this may not always be true. Outreach needs change, and any evaluation of what The Postal Museum expects out of a lesson would need to be changed with it to reach different people in different classrooms.

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1. (Personal Communication, Sally Sculthorpe, March 2019)

2. (Personal Communication, Martin Devereux, March 2019)

### 4.1.2. Content Criteria:

Several pieces of advice were vital for directing our early development; using these findings to create items for MiaB will ensure The Postal Museum utilizes the platform effectively.

- ❖ Content should be **sourced from collections**.<sup>1</sup>
- ❖ Audio should transform boring into **engaging**.<sup>3</sup>
- ❖ Audio should include a **range of voices and characters**.<sup>3</sup>
- ❖ Audio should be **fast**; do not exceed a minute.<sup>3</sup>
- ❖ Consider using **postal history** at key turning points in history.<sup>1</sup>
- ❖ Students should still have the **hands on** aspect that solidifies the intersensory experience.<sup>4</sup>

These content criteria are specific and actionable, but were collected as findings from two interviews of people who were both highly experienced with MiaB—yet not trained educators. These findings were identified early in the project, and are very useful as specific criteria during content development, but these are guidelines, not rules, so The Postal Museum should be prepared to deviate from them—especially as feedback on prototypes come in.

### 4.2. Prototype MiaB Lesson



Figure 4-1: Lesson Framework

3. (Personal Communication, Charlie Cattel-Killik, March 20, 2019)

4. (Personal Communication, Helen Chatterjee, March 27, 2019)

In order to support our concept for a MiaB lesson based on The Postal Museum's content, we analyzed background information on creating and evaluating an effective outreach activity. Since we did not have any professional lesson building experience for educational purposes, we interviewed teachers and other education experts to guide our process and provide suggestions. Through these interviews (Appendix G-J) we iterated on our lesson designs and arrived at the following modular lesson system (Figure 4-1).

This framework summarized our lesson iterations and helped guide us to our final lesson theme. We summarize additional notable findings from our interviews below and end this section with an overview of our final lesson content.

#### 4.2.1. Lesson Creation Takeaways

These criteria will aid The Postal Museum when building the lesson such that it caters to the needs of schools.

- ❖ MiaB complements modular lesson design.<sup>5</sup>
- ❖ Students should interact with MiaB in small groups.<sup>5</sup>
- ❖ Students should produce something during the activity to challenge their creativity.<sup>6</sup>
- ❖ Setting a learning goal is the simplest way to build a lesson.<sup>6</sup>
- ❖ Schools are more interested in lessons that tie into the national curriculum.<sup>1</sup>
- ❖ Reading levels may vary within a class so reading exercises should be easy.<sup>6</sup>
- ❖ Technology needs to be intuitive and not impede the content delivery to be successful in a lesson.<sup>7</sup>
- ❖ If the technology gets too complicated, then students will lose interest.<sup>7</sup>
- ❖ Items capture attention because kids rarely get the chance to handle interesting objects.<sup>4</sup>
- ❖ Use simple items with unambiguous interpretations that have an obvious connection to the lesson.<sup>4</sup>

From our interviews and observations, we found several ways to engage student learning. While it is representative of our research, this list is not complete and The Postal Museum should pursue further lesson creation advice.

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5. (Personal Communication, George Oates, March 28, 2019)

6. (Personal Communication, Eric Cota, March 22, 2019)

7. (Personal Communication, Valentina Evangelou, March 26, 2019)

## 4.2.2. Lesson Analysis Takeaways

In addition to quality, it will be to The Postal Museum to continue evaluating what they create for this platform.

- ❖ Student's facial expressions and the general vibe of the room reveal a lot about how much students are engaged with the activity.<sup>6</sup>
- ❖ Students asking questions and participating in the discussion are clear indicators of their engagement with the lesson.<sup>6</sup>
- ❖ If you ask students to give you feedback and tell them what you want them to learn from the activity, then they will give you meaningful responses and tell you if they think you hit your mark.<sup>7</sup>

Evaluating the effectiveness of a lesson is a difficult task, especially given little time to learn how to do so (personal communication, Eric Cota, March 3, 2019). We were only able to draw on a few sources for this information, so these points are not necessarily representative of how other teachers evaluate the lessons they create. They are, however, still useful expert opinions given the experience of both Cota and Evangelou. These criteria for lesson analysis were true and useful, but The Postal Museum should not limit themselves to only these methods as there are other evaluation techniques to do so that our interviews did not uncover.

## 4.2.3. The Final Lesson Design: Delivery Methods

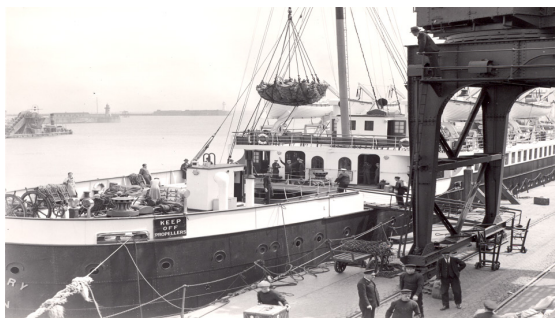
Based on the combined feedback from our interviews and The Postal Museum's expectations for MiaB's implementation, we curated content from the digital archive to make an educational collection. We selected the topic *Delivery Operations* from the modules we initially presented, as it was information we could gather in our limited research time and it had some of the most child-friendly concepts. When writing scripts we gave each method a unique character, provided facts that would be of interest to Key Stage 2, and made sure there was information to connect cards to each other. We were also able to connect the *Delivery Methods* items to some of the curriculum outlined by Cota in his interview. The lesson flow we developed for the items combined history and literacy by prompting students to consider how and why delivery methods have changed over time and how their usefulness compared to each other.



**Figure 4-2:** Scan this QR code to view the complete lesson and listen to the audio components.

#### 4.2.4. Lesson Bundle

The bundle of nine items we brought into classrooms were developed complete with audio, laminated card, and a single 3D objects (Appendix T).



**Air Mail** - The postcard we created used the image of an old poster that was circulated to promote air mail in the 1930s and was very eye-catching. This may explain why the students in our classroom testing gravitated towards investigating it early in the lesson. The script discussed the adoption of air mail and some of its pros and cons. (Figure 4-3)

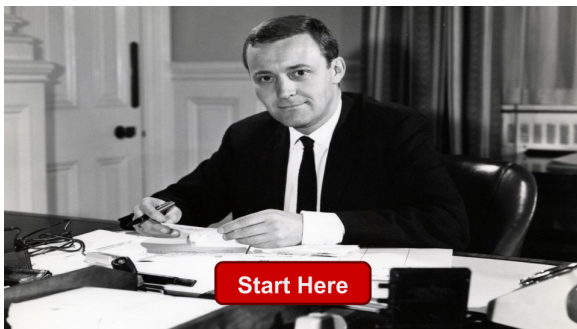
**Bicycle** - The bicycle card featured artwork of a postie walking with a delivery bike on a snowy lane. The script talked about using bicycles to deliver post and used crashes to indicate how parcels prove very challenging for bicycling posties. This highlighted the difficulties of using a bicycle in the current era of online shopping which drastically increased the number of large parcel in the post. (Figure 4-4)

**Maritime** - The maritime card had a picture of an old steamboat used to deliver mail in the mid 1930s. The character was a captain with a pirate accent, which added an element of fun for the students. The script had crashing waves and presented both the positive and negative aspects of maritime post. (Figure 4-5)

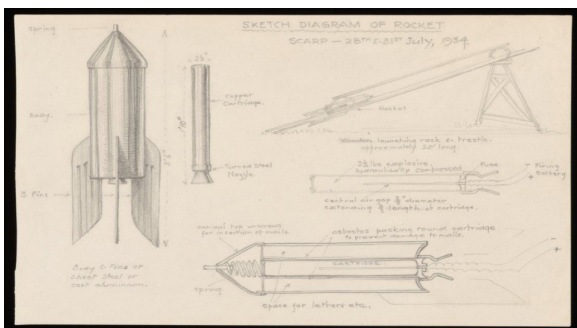
**Pigeon** - Pigeon post is no longer used today, but it offered a delivery method that was historically practical and entertaining for children. The character in the audio was the representation of the stuffed bird. This fun voice, paired with a fun script that had a few jokes, aimed to get the students talking about why it was previously practical and why it may have lost popularity. (Figure 4-6)



**Postie** - The postie card had the simplest imagery; it was a black-and-white photograph of a postwoman on her daily route in 1942. We tried to balance the simplicity with a surprising characterization and used an American southern accent that we expected would keep the students attention. Since the card's content had limited complexity, there were not any sound-effects that fit naturally with the script so we relied heavily on the accent for engagement. The script itself talked about the role a postie played in delivering mail and how the job had changed over the years. (Figure 4-7)



**Postmaster General (Start Card)** - The start card was vital for introducing the lesson to the students, and set up the pretenses for exploring the collection. This card asked the students to consider each of the delivery methods and sort them by the usefulness to the postal system. It also suggested that, once they have seen all the delivery methods, the students try to come up with their own to use in the future. This framing was designed to inspire conversation about the material and, as it was most effective when booped first, the card was clearly labeled with a red square containing the text 'Start Here'. (Figure 4-8)



**Rocket** - The most extreme and outlandish of the delivery methods presented in the collection. The card depicted an engineering drawing of a rocket used to test the rocket mail delivery method in the 1930s. The hand drawn image provided an interesting contrast to the paintings and photographs in the other cards. The audio itself was exciting and captured attention with the sound of a rocket blasting off. The script talked about the impracticality of using rockets to deliver mail which is reinforced by the sound of a distant rocket crash. However, it also suggested that a delivery method faster than airplanes could be very useful. (Figure 4-9)



**Train** - This card exhibited an interesting voice, like a radio announcer, and numerous train sound effects. It showcased a black-and-white photograph of a train being loaded with post at a depot. The audio was silly and full of energy which combined well with the dense amount of information presented in the script. It discussed how trains have changed over the 200 years the Royal Mail has used them to deliver mail and some of the pros and cons of using the rail. (Figure 4-10)



**Truck** - The image on the truck card was a painting of a truck loading station. It featured many trucks in various stages of preparing for mail delivery. The voice actor spoke clearly, and the audio included recognizable truck sounds that helped paint a scene in the listeners mind. Mail trucks were the item that would be most familiar to the students so it was used to ground what they were learning with what they already knew. The script talked about the size of the Royal Mail's ground fleet and how horse-drawn carriages predated gas vehicles. (Figure 4-11)

#### 4.2.5 Supplemental Activity

In addition to a complete item bundle, we created supplementary worksheets that provided the students with additional activities to interact with The Postal Museum's Collection.

**Telegram** (Appendix O, U, V) - The telegram activity presented students with a set of telegrams that were written with common abbreviations and an accompanying key to decipher them. The associated worksheet added a deeper literacy and interpretation aspect to our lesson bundle and was designed to improve our evaluation of what students learned. After deciphering the message, students used what they learned to write their own telegram to a friend.

**Cross-written Letter** (Appendix X) - The cross-written letter activity had students look at a real example of a cross-written letter (Figure 4-12) and then read a custom, colored message (Figure 4-13). After reading it, the students wrote a short cross-written note inside a box on the worksheet.

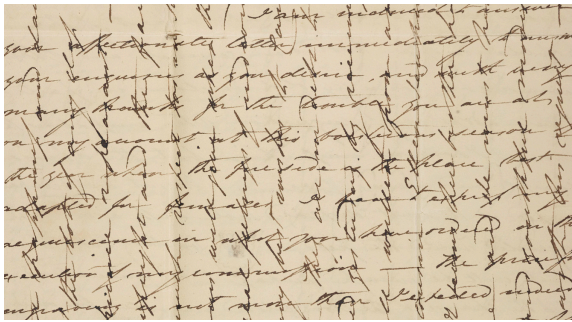


Figure 4-12: A cross-written letter

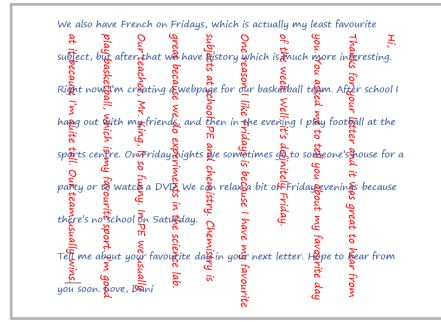


Figure 4-13: Our simplified cross-written letter

Delivery Method Worksheet (Appendix Y) - This worksheet (Figure 4-14) was the main focus of the supplemental activity. The questions referenced topics from the MiaB activity and were designed so students could complete the worksheet whether they participated in the MiaB portion of the lesson before or after doing this worksheet. The difference in responses from the pre- and post-MiaB groups suggested if students learned anything from the MiaB activity.

Group No. \_\_\_\_\_

### ***Delivery Collection***

**As you participate in the activity, answer the following questions:**

Name as many mail delivery methods as you can from the 20th century:

What is the biggest modern problem with having posties on bikes?

A) Long distance                      B) Too many parcels                      C) Easy to get lost

What explosive delivery method from the 1900s is not used today?

The Mail Rail was a very special train that ran under London. Because it was underground, it needed a special way to power it through its rails. What was it?

Figure 4-14: Delivery Methods worksheet

### 4.3. Evaluating the Bundle: Results and Conclusions

Our evaluation phase was primarily performing and analyzing our classroom testing. We tested with two schools and held a post interview and survey with one of the teachers. While

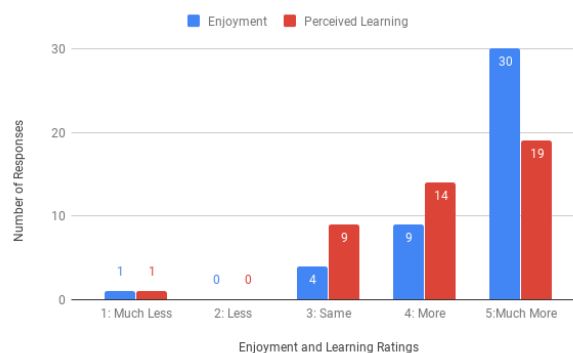


these sources of data are still a relatively small sample size for broad-stroke analysis, they helped us form several points that we believe will be useful to The Postal Museum going forward.

- ❖ MiaB is effective at engaging students in the classroom.
- ❖ Students feel they have more fun while learning with MiaB than in a normal lesson.
- ❖ Lessons can and should include non-MiaB content.
- ❖ MiaB helps students retain information about postal history.
- ❖ Build content around activities for students to complete, ideally relating to history or literacy elements of the curriculum.
- ❖ Supply teachers with engaging and comprehensive questions for students.
- ❖ Advise teachers to have small groups so every student can interact with MiaB.
- ❖ When continuing MiaB development, also continue testing and evaluation.
- ❖ MiaB engages schools because teachers think it captures student interest.
- ❖ An online lesson plan resource would help teachers run MiaB activities themselves.
- ❖ MiaB is better suited for an outreach program than a museum exhibit.

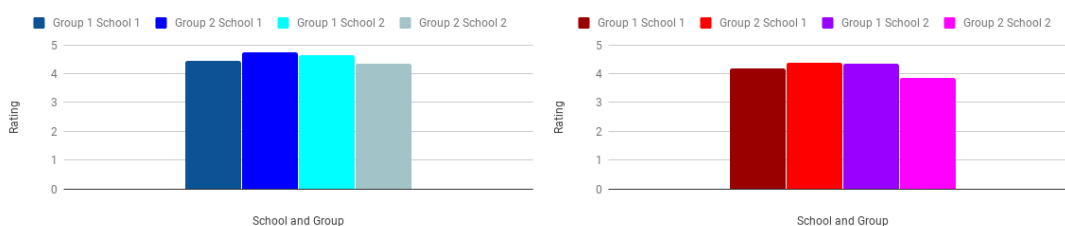
The results of our prototype testing suggests that MiaB was effective at engaging students in the classroom. The overwhelmingly positive response from the students and teachers at both St. Mary's Primary School and Lancasterian Primary School supports continued investigation of MiaB by The Postal Museum. We were further encouraged by the interest and enthusiasm that MiaB Ltd. showed for our work. Originally, they had no plans to create lessons with supplemental worksheets and activities, but our results have given them reason to consider incorporating these materials into future lessons.

The bar graph in Figure 4-15 summarizes the student responses from our short survey at the end of the MiaB activity.



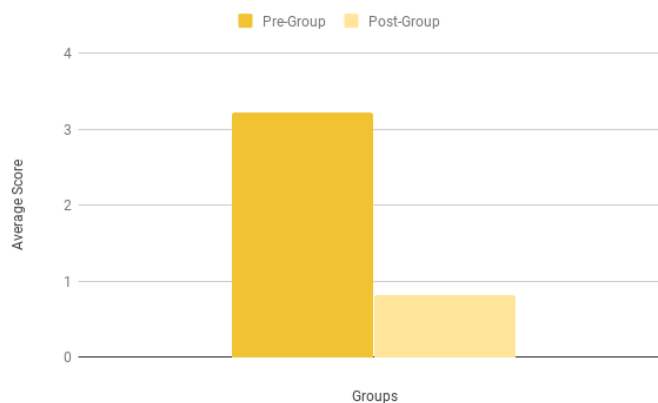
**Figure 4-15:** *Enjoyment and Perceived Learning (44 Students from Year 4)*

Nearly 89% of students reported enjoying the MiaB lesson more than normal lessons and 75% of students reported learning more from the MiaB lesson than from normal lessons (n=44). This shows students felt like they learned a lot while also having fun.



**Figure 4-16:** Average Group Enjoyment (n=44) **Figure 4-17:** Average Group Perceived Learning (n=44)

A summary of each individual group's engagement survey responses can be found in Figure 4-16 and Figure 4-17. These charts show very consistent averages across the board which indicate that the performance of the activity was not severely impacted by variations in discussions and presentation across the testing groups. The small variation in the perceived learning for Group 2 from School 2 can be accounted for by the single child who responded to our survey with the lowest rating.



**Figure 4-18:** Mean Correct Worksheet Responses (n=44)

Figure 4-18 shows the scoring difference between students that completed the worksheets before interacting with MiaB (Pre-Group) and those that completed the worksheets after interacting with MiaB (Post-Group). The worksheet contained four questions about the content from the box. Three of the questions referenced facts presented in the audio, and the fourth asked students to recall as many postal delivery methods from 1900 to 1950 as possible. The answer for the fourth question was counted as correct if they could name at least one method.

The analysis of our pre-post worksheets, observations, and feedback from the teacher made it apparent the lesson was a huge success. Most of the students, even those who normally are not engaged in the classroom, were actively participating in the box discussions and literacy activities (Personal communication, Eric Cota April 8, 2019). Surprisingly, we found students were more engaged with the literacy activity than expected and were very excited to show us the letters and telegrams they created. This makes the team hopeful that The Postal Museum's content can easily adapt to MiaB Ltd.'s goal to have students create and share their own content.

## 5. Recommendations

In this final chapter, we present our recommendations to The Postal Museum for future use and investigation of MiaB. Our data suggests that it is in the best interest of The Postal Museum to continue to pursue using MiaB to complement their outreach. Our results from testing our prototyped MiaB lesson indicate positive effects on children's learning and engagement with the presented material. Along with this general recommendation, we have identified key concepts to keep in mind when selecting items in the collection, creating scripts, and developing a lesson.

### 5.1 Use engaging and tactile items

The primary role of items in a MiaB-oriented lesson is to draw students into the lesson and get them thinking before they even listen to the corresponding audio clip. We found that highly tactile and unique items provide the best level of engagement. We recommend whoever continues this project should consider including **both 2D and 3D** specimens with the box because 3D objects grab attention and 2D items help hold it. When selecting 2D artifacts, they should prioritize **colorful and interesting images** that are directly related to, or representative of, the main theme of the lesson. While this remains true for 3D replications of artifacts, the color is limited by the capabilities and budget for 3D printing services. Additionally, MiaB supports schools creating the replicas of the collection themselves so the 3D objects may not be reproduced in full color. For this reason, 3D objects should be selected with the presupposition that they will be recreated in a single color.

The physical position of the NFC tag is an important, yet easily overlooked detail for both 2D and 3D objects. If the tag is positioned unintuitively and it is not immediately obvious, then students may have a more difficult time engaging with the content. Thus, we suggest **centering the communication chip on the bottom of the items** to reduce the opportunity for potential confusion.

However, we do not recommend inundating students with items or using complex objects. George Oates explained that their commission with the Smithsonian Libraries produced over 40 items and that it was too overwhelming and time intensive for children to explore all of the content in one session. Additionally, the program should **avoid overly complex and ambiguous items**, particularly when dealing with younger children. If a child were to become confused over the identity of an item, it can inhibit his/her learning and cause him/her to lose interest in the activity. The appearance and form of items may set the stage for a child's experience during a MiaB program, but the scripts associated with said items hold the potential to draw children into the lesson and shape their understanding of the material.

## 5.2 Capture student's attention with the scripts and audio

Object's scripts are, without a doubt, the most essential piece of a MiaB program. Without them, students are left handling lifeless figures and limp postcards and would lose interest quickly. It is the audio's job to bring the content to life and present children with the chance to delve into history with suspended disbelief. In our development process we identified three aspects of scripts that are essential for maintaining children's attention and engaging them in the material. Together length, sound effects, and voice make or break the quality of an object's associated audio.

The scripts should introduce the content for the object but ensure that students do not zone out and stop paying attention. Our findings suggest that audio **clips** be kept as **short as possible**. A good rule of thumb is to limit the audio to approximately one minute. This is not a hard limit but anything past it risks exceeding children's attention span and detracting from the main focus of MiaB lessons, the discussion. Sound effects are another crucial part of audio clips. These brief snippets add a sense of reality to the audio and help to create an immersive atmosphere that **captures the attention of students**. However, use too many and you may find children too distracted to follow along with the important content of the script. The best scripts toe this line and create small worlds that enthrall the listener to the very end. The last and most important aspect of the script is the voice reading the script. It is beneficial to the program if **each item has its own character** with their own voice actor. Each recording should be **high energy and engaging** while remaining **relevant and easy to understand**. Overall, the recorded scripts and associated sound effects should clearly relay the desired information while **stimulating the listener's imagination**.

## 5.3 Engage students throughout the activity

Our prototype testing in classrooms was not nearly extensive enough to draw wide-ranging claims, but we gained an understanding of how our activity and its logistics complemented MiaB. We identified three main takeaways directly related to the MiaB section of the lesson and gauged the importance of including a secondary activity in the program. The MiaB lesson benefited the most from optimizing group size, keeping students standing, and checking listening comprehension.

In the trials of our prototype we identified that MiaB appears to work best when the **students are approximately equal to the number of items included with the lesson**. The Museum in a Box company identifies nine as an ideal collection size but welcomes smaller and larger collections. With this in mind, we suggest that it is best to **split classrooms into two or three groups of students** to ensure that every student has the opportunity to engage with MiaB. Across our two test sessions students both sat and stood. We observed that **students who stood were much more engaged** with and energetic about the items during the lesson.

This may be because they were free to move around and examine the content and did not feel confined to a seat. After students have been split into groups, organized themselves around the box, and begun listening to content, we found that it was beneficial to the discussions to **briefly summarize the clip by asking the students a few comprehension questions**. These questions capture the key takeaways of the scripts and focus the student's discussion to be more relevant to the question at hand. The activity itself should avoid linearity and prioritize maximizing the each students interactivity.

With the students being separated into multiple groups, we found it important to **provide a meaningful secondary activity** with the lesson. This activity focused on complementing the content presented by the box while not relying on it. Student reception to these activities was overwhelmingly, and unexpectedly, positive. What we initially considered filler content became a meaningful and engaging activity for students to complete when they were not working with MiaB. If secondary content is not presented alongside MiaB, then it will be important to find a different way to take advantage of the individual interactivity that works best with MiaB. It is imperative that students have time to work with MiaB in a personalized environment; **limiting exploration should be avoided at all costs**.

We also examined the possibility of including Museum in a Box in an exhibit at The Postal Museum. In our short span of testing we found that the box had to compete with other more attention-grabbing exhibitions. The box is a bit unassuming in the face of large and colorful artifacts and is not loud enough to compete with some of the other exhibits in the museum. If it were to have a portion of the exhibition designed around its implementation, then the MiaB may have the chance to shine as a unique and interactive activity. However, MiaB, as it stands, is **no more well-suited for museum exhibits than the activities and programs already employed** by The Postal Museum and is **better fitted for a classroom environment**.

## 5.4 Closing Remarks

Overall, MiaB appears to provide The Postal Museum with exciting, new outreach capabilities that, through further testing, could become a successful and integral piece of their school programs. In pursuing MiaB, we recommend that The Postal Museum should keep in mind the importance of engaging students with the items, scripts, discussion, and lesson to ensure the activity is appealing and educational for children. Even if the MiaB platform does not gain traction among educators, the content developed for it will still prove valuable if used in other mediums. If our classroom testing is a good indicator of the potential of MiaB-oriented lessons, the platform has a promising future in the repertoire of The Postal Museum and could provide them with the opportunity to share its content with schools all across London, the UK, or even the world.

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## Appendix A: What is an IQP?

The WPI faculty has defined nine major educational objectives for a student Interactive Qualifying Projects (IQP) (Worcester Polytechnic Institute, 2019).

- ❖ Demonstrate an understanding of the project's technical, social and humanistic context.
- ❖ Define clear, achievable goals and objectives for the project.
- ❖ Critically identify, utilize, and properly cite information sources, and integrate information from multiple sources to identify appropriate approaches to addressing the project goals.
- ❖ Select and implement a sound approach to solving an interdisciplinary problem.
- ❖ Analyze and synthesize results from social, ethical, humanistic, technical or other perspectives, as appropriate.
- ❖ Maintain effective working relationships within the project team and with the project advisor(s), recognizing and resolving problems that may arise.
- ❖ Demonstrate the ability to write clearly, critically and persuasively.
- ❖ Demonstrate strong oral communication skills, using appropriate, effective visual aids.
- ❖ Demonstrate an awareness of the ethical dimensions of their project work.

Our project allows us, as students, to rigorously meet each of these objectives. Evaluating MiaB provides an opportunity to perform research and develop strategies for a technological program that must interact with a diverse social and cultural community. The evaluation process benefits from establishing a sound understanding of previous research in the field and identifying a reasonable approach using common social research techniques such as interviews and focus groups. We must be particularly careful in constructing the protocol for these research methods to be mindful of the ethical dilemmas presented by the project, especially when interacting with children. This is critical for our project because we are evaluating an educational tool that is purposefully designed to engage a child audience. Towards the end of the project, we will be able to analyze our, mostly qualitative, results to draw reasonable conclusions and present the content in a clear and effective manner. This will be crucial as we plan our final presentation to our sponsor that will test the strength of our oral presentation and visual aid creation skills. Overall, this project satisfies the IQP because we must determine the best ways to fit MiaB into the social, cultural, and economic needs of The Postal Museum and its neighboring communities.

## Appendix B: An Investigative Essay on the Development of Outreach Programs

Designing an outreach program is similar to designing a standalone interactive activity, but it introduces some additional considerations and steps (Henry & Pfeifer, 1996). Generally speaking, the design process starts with identifying the program goal, target audience and any collaborating organizations. Next, researchers need to work on the content included in the activity. They can design the activity by including any logistical planning that may accompany the program. Once the design is complete, they can test it with the target audience and collaborators, who will give feedback to incorporate into revisions. Finally, after the design is complete and satisfies the program goal, the program is ready for public release.

To start the development process, the designer needs to identify the target audience, including any collaborating organizations, and describe the goal of the outreach program (Chatterjee, 2007; Denig, 2004; Henry & Pfeifer, 1996; The University of Delaware, 2019). Identifying the target audience is a crucial part of the first step as it not only influences the content and activity design, but it is also a central element of the program goal. The goal of most outreach programs is to educate and share the content a museum has to offer, often purpose of interesting people to visit the museum. This means the target audience may encompass multiple groups of people at once, such as students and teachers. The program will need to be fun and engaging to the students, and also demonstrate to the teachers that students are learning meaningful and applicable things. Schools are often involved in vetting the use of potential programs, so their needs, particularly in logistics, should be kept in mind. Sometimes other organizations, such as community centers or other museums, may be involved and so their considerations need to be included as well.

After the target audience is defined, the content research phase can begin (Henry & Pfeifer, 1996). This step involves determining the focus of the content and then formatting the information needed to provide a complete understanding to future participants. The research should include anything relevant to the focus of the program, while keeping in mind the target of the program. For young children, concepts and big ideas are more memorable than specific facts and figures, and having a key takeaway, or “moral of the story,” can make the program more relatable (Henry & Pfeifer, 1996; Black, 2005; Lansdown & O’Kane, 2014). Older students and young adults can contextualize more detailed information, so information about historical background and personal recounts can be great for starting discussions. It is also possible that, when working with older students, the program needs to relate to their curriculum or provide a foundation for an assignment. In this case, the school will most likely have input about the kinds of content they would like to see.

The program design phase also involves addressing some logistical concerns (Henry &

Pfeifer, 1996). For most programs, this involves creating a budget for the project and deciding on the preliminary pricing of the program. If the program is physical, especially if it will be brought to or deployed at many locations, things like transportation and even food may need to be arranged. The program may also involve assigning a museum representative, reserving a workspace externally or at the museum, and other managerial tasks.

After establishing a clear plan for the program, it is time to start testing (Henry & Pfeifer, 1996). Any collaborators in the program should be involved in this phase, and their feedback should be the primary director of program revisions. If the program is not tied to a particular organization, then focus groups and interviews can be held with groups that are representative of the target audience. Some of these groups, such as teachers, will be more verbose and give more specific feedback, while others, namely young students, may give more experiential and anecdotal feedback. While it may seem children's feedback lacks the percipience of teachers, both kinds of data offer unique insights into problems and therefore should be considered when making revisions to the program (Newman, 1992). It is important to note that the testing and feedback step is an iterative process that shapes the outreach program to provide excellent interactive and educational experiences.

Once the program has passed the rigorous testing phase and has met its design goals, the program is ready to be deployed for use by the general public. Sometimes despite meticulous testing, things may not perform as intended. For this reason it is important to continue to collect feedback to make additional improvements and to best engage the audience.

As outreach programs are variable by nature, this process is not meant to be an excellent fit for every one of them. However, the general concepts still apply, and each step will need to be addressed to create a lasting and successful outreach program.

## Appendix C: Charles Cattel-Killik Interview Summary

Charles Cattel-Killik is the designer at Museum in a Box. The interview was structured to gather his insights on what content best synergizes with the MiaB program. The major focus of his suggestions was the audio for the box items, but he also touched on the company's own processes for developing bundles for museums.

The key point from our discussion about audio was to transform potentially boring information into a creative and appealing experience. In accordance with this idea, Cattel-Killik mentioned that each script should have audio snippets that grab people's attention and not last longer than a minute to prevent people from losing interest. Additionally, he stressed the importance of including a range of voices in the audio to prevent the content from becoming too much like a long monologue. To concretize his suggestions, Cattel-Killik gave first hand examples of audio and items that he had seen perform well. The quintessence of these was a compass which played a brief audio clip that ended with a jaunty sea shanty. A child became enraptured with the item and listened to the audio for over 15 minutes while saluting and marching around the box. Not only did this story prove the importance of the audio of an item, but it also exemplified the extent to which students could engage with the program's content and wholesomely summarized his points from the discussion.

When introducing the workflow of the box, Cattel-Killik discussed the current modus operandi of the MiaB company. In their current stage of development, the company is primarily commissioned by museums to produce a bundle. They work closely with the museum's curators and educational staff to identify themes and objects to include in the bundle and then contract professional writers and voice actors to create and perform the scripts. The primary aspects that drive curator's decisions for objects are the items available in their museum's collection and the desired theme of the lesson. Cattel-Killik also pointed us to the manual that MiaB makes available to museums who enroll in their program. It guided our process with relevant questions that instigated brainstorming and discussion throughout the group. This interview provided us valuable guidance, especially for audio-related content, which was integral in writing, recording, and editing the scripts for our prototyped items.

## Appendix D: George Oates Interview Summary

George Oates is the CEO of the Museum in a Box company and holds a seat on the advisory board for The Postal Museum. With a background in software engineering, George built her company with the goal of bringing content from museums to audiences everywhere by making interesting artifacts and information available to people who are unable to visit museums. The goal of our interview was to find out more about the capabilities of MiaB, how she envisions it could be used in classroom settings, and how to design our content most effectively to complement MiaB.

She told us about the design of the box and showed us how “the device is adaptable from the general to the specific,” allowing it to be simple at the surface level while still potentially handling much more extensive features in the future. Some of these features include the capability for people to design and make their own content to share with others and running interactive activities, which tend to hold the attention of students better than strictly listening to information.

She also told us how she imagines MiaB could fit into schools. Teachers may lead the lessons, but students should still have the hands on aspect that solidifies the intersensory experience. Another possibility is having students in small groups using the box to complete an assignment, or even having one box per student to offer a more intimate hands on experience.

In addition, she gave us tips on how to design our content to be effective when working with kids. She, like Cattel-Killik, affirmed that including humor was a good way of holding kids’ attention while presenting the educational material. When writing for both humor and educational content, it’s also important to keep it at a level appropriate for our age group, as kids easily get bored with content below them or at levels they don’t understand. Amusing storytelling was also recommended by her to accompany the humor because children enjoy the surprising and immersive elements of a story character presenting information to them.

## Appendix E: Martin Devereux Guidelines Discussion Write-up

Martin Devereux works at The Postal Museum as their Digital Content Development Manager. As our sponsor liaison, he helped us make contacts, set up meetings, directed us to tools we needed, and served as our primary resource for any questions we had during the project.

Our early discussions with him primarily focused on determining concrete project goals and identifying the resources we would need to complete the project. In addition to basic office tools such as printers and laminators, he told us we would have access to some digitization equipment. This included standard cameras as well as ones designed for photographing old letters and books, and the Adobe Creative Cloud suite of digital image manipulation tools to process the images. The museum also has some photogrammetry equipment, which is a setup for converting a series of images of an object into a 3D object. Finally, we would have access to their digital archives, which contains all of the artifacts in the museum that have been digitized.

Currently, The Postal Museum is defining the postal system to be the world's first social network. Devereux indicated that we should incorporate this concept into our lesson as one of the primary takeaways. His suggestion was to draw parallels between how the post connected populations of the past and how the internet and social media connects people now. We took his recommendation to heart and its influence can be found in our final activity.

One of the primary goals and inspirations for the MiaB company is extending museum's content to people who may never get the chance to visit the building. Prior to arriving, we thought we should try to avoid repeating content present in museum exhibits to prevent eliminating the need for a museum visit. Devereux views the MiaB program as a great way to share The Postal Museum's vast collections and engage new audiences. For this reason, he told us to not be concerned about replacing a visit to the museum's exhibits with the content of the outreach program.

In fact, he told us they were considering using the box as an activity within the museum. Depending on how our testing went and what the reception to the prototype would be, the museum may want to integrate the box with the hands on exhibits they currently have. To test if this could work, he said we could set up testing session in a table inside the exhibition and observe visitor interactions.

## Appendix F: Sally Sculthorpe Guideline Discussion Write-up

Sally Sculthorpe is the Schools Learning Manager at The Postal Museum. She has an extensive background in working with children and educational programs, and served as our gateway contact to schools and teachers in London. She helped guide us through the lesson creation process, providing feedback on our drafts and helping us find resources along the way.

In the first stage of the project, Sculthorpe gave us an overview of the education specific goals The Postal Museum had for the project. She told us that the target age groups would be Key Stage 1 and Key Stage 2, but we should focus our efforts on Key Stage 2 as it would be easier to get feedback from the older students. She also said we should guide our lesson creation efforts on looking at key turning points or periods in history, and finding postal history during those times. Some examples she gave were World War 1 and 2, and Victorian Era Britain. She said The Postal Museum would like to see cross-curriculum content explored, such as combining history and literacy. During our first meetings, Sculthorpe said that she hoped to arrange a meeting with curators and archivists in the museum for us, however we ultimately were unable to find a time that worked for them to meet with us.

## Appendix G: Eric Cota Interview Write-up

Eric Cota is a Year 4 teacher at St Mary's Islington C of E Primary School. Recently, his class had been studying Ancient Egypt, and was finishing the module the week we would be doing classroom testing. Though our lesson content would not be related to what they had been studying, he was still eager to have his class participate in our lesson testing due to the strong literary aspect. One of the things he wanted to see in that regard in the lesson was having the students write or produce something during or shortly after the lesson. We incorporated this into our lesson design and used this recommendation to further develop our worksheets and letter writing activity.

We then talked about some lessons that he had created, and how he went about designing them. The first piece of advice we got from him was set a learning goal for the students and then work backwards from there. Some other advice we got was to keep in mind how the lesson ties into the curriculum as a whole. This was useful as it got us thinking further about how content from The Postal Museum could fit into a curriculum. Another thing that he wanted us to note was that reading levels may be different within a class, particularly in our target age group of Key Stage 2. Reading exercises in the lessons should be easy, or students should be able to help each other. Continuing with that, he said that having students work together can be great for engagement, though sometimes some students may be distracted by this.

At this stage of the project, we were getting ready to devise an evaluation scheme for our own content. Cota said, in his experience, some of the best ways to gauge the engagement of students with a lesson is to watch for facial expressions and note how often students are asking questions. In general, he said it can be hard to quantify the engagement of students, so often you will need to just note general 'feelings' or 'vibes' you get from the class. We kept this in mind when determining our observation criteria we would use during our lesson testing.



## Appendix H: Valentina Evangelou Interview Write-up

Valentina Evangelou is the Computing and Online Safety Lead at Lancasterian Primary School. Previously, she taught as a teacher for the younger students, however she eventually moved on to teaching technology and computer science for the school. As a technology teacher, she was very enthusiastic about the idea of MiaB, even though she had never heard of it. Our discussion centered around how we would use it in a classroom, and we got her opinions on how she would like to see it used.

We first talked about what elements a good educational activity that uses technology needs to have. Evangelou noted that, most importantly, the technology needs to be intuitive and not impede the content delivery. It should be easy to get up and running and require little explanation. Depending on the device, the first use of the technology the students see should be impressive, and there should be minimal time from introduction to putting it in their hands. Additionally, students should be able to reproduce the demonstration, or produce something similar on their own. This gratification keeps the students engaged for longer periods of time. If it becomes complicated to do something, students will lose interest. We kept this in mind when designing our lesson plans, ensuring the box was presented in an easy to use way such that students did not need to spend a large amount of time figuring out how to use it.

The other main thing we discussed with Evangelou was how to assess educational activities that use technology. She said one approach is to just tell the students what you are looking for them to get out of the lesson and have them give feedback on if it was successful. Written assessments can also be helpful, as are short feedback forms. In general, she said to just ask the students what they thought of it both during and after. We used this recommendation to help build our survey system and also our lesson protocols, which included asking the students for feedback along the way.

## Appendix I: Sally Sculthorpe - Lesson Designs

Once we had developed some lesson ideas, we met with Sculthorpe for review. The initial drafts we presented can be found in Appendix \_\_\_. Of the ideas we presented, we received positive feedback on the Preservation Restoration activity and the Inside Letters - Through the Ages activity. Briefly, the Preservation Restoration activity would guide students through The Postal Museum's Voices from the Deep collection and learn about preservation methods for paper artifacts. The Inside Letters - Through the Ages activity would have students examine how the postal system and its influence has evolved throughout time by looking at postal technology and historical letters. The biggest draw for Sculthorpe of the Preservation Restoration activity was its possibility for interactivity. She also explained that the curriculum in Key Stage 2 focuses heavily on comparing and contrasting history with modernity, so she also liked the Inside Letters - Through the Ages activity. Ultimately, she decided she would like us to pursue both a bit further until we could decide which one would deserve our full efforts. Eventually, we decided on a combination of the work we did for the two activities and presented the new lesson outline to her. The summary of this lesson can be found in Appendix \_\_\_. Sculthorpe was receptive to the lesson, and had some comments on how it could be implemented. She thought it best to keep the number of letters to six, or maybe seven, and that the letters should have a similar focus to keep the lesson coherent. The focus should also stay on London history to give the students relatable history to learn about.

Ultimately, we pivoted away from this lesson to focusing on Delivery Methods, but we did retain many of the core concepts. This lesson framework could still be developed further into a full MiaB lesson if a curator or archivist would be able to guide the content makers on what letters from the collection should be used.

## Appendix J: Dr. Helen Chatterjee Interview

Dr. Helen Chatterjee is an expert in object-based learning and acts as both a professor and the Head of Research and Teaching at University College London. This interview was valuable for determining the characteristics of effective objects from an education perspective. Dr. Chatterjee reinforced the importance of sensory diversity between objects by telling us that unique objects inspire students to explore them. An object's shape, texture, color, and design are all ways to engage student senses. She told us that young kids rarely get permission to handle interesting items, so the item itself can capture their attention. Dr. Chatterjee complimented MiaB as a neat way to turn object engagement into learning.

We also asked for specific recommendations about item development for educational purposes. She said the most important thing about creating a collection was being aware of what information is available for use and that thoughtful content selection was vital. Beyond that, Dr. Chatterjee suggested identifying and using simple items with unambiguous interpretations that have an obvious connection to the lesson objective. She also suggested that exploring the objects should be a tactile experience where students can learn from all aspects of their exploration. Dr. Chatterjee's insights led us to make several decisions that improved our prototype. While we did not have the freedom to develop truly tactile objects, we did focus on making cards distinct and having elements to explore. Lamination, an interesting cardback, and the art for each item having unique styles all helped improve the sensory experience for students.

## Appendix K: Second Interview with MiaB Staff

In our post-interview with Oates and Cattel-Killick, we went over our experience in our school testing sessions and how we believe it went. We described our observations and showed them copies of the materials we created and the feedback we collected. They were pleased with what we had to show them and were excited with how we tied together the core of MiaB's functions while also opening doors for more interactive experiences and content sharing in the future.

They were especially interested the feedback we received on the interactive parts of our lesson plan, because one of the features they are going to implement in the future is the ability for users to design and create content with other users. Our lesson plan had sections for students to create their own telegrams, cross-written letters, and design future delivery methods for the post. The students were extremely excited to share what they had created with us, their classmates, and their teacher. We believe this is a good sign that activities like this for The Postal Museum will lend themselves well to the MiaB platform. An interesting conclusion to this interview was afterwards, team member Connor Dietz was extended a request to work on MiaB in a paid consulting capacity.

Their confidence in our work ensures that we have truly taken advantage of MiaB's capabilities. This reaffirmation leads us to believe that our observations and data are representative of the gauging the potential for The Postal Museum to add bundles similar to the one we have developed to their outreach program offerings and to MiaB's collection of museum sets.

# Appendix L: School Workshop Observation Template

Program Name: \_\_\_\_\_

Date: \_\_\_\_\_

Observer: \_\_\_\_\_

Presenter: \_\_\_\_\_

**During the workshop, comment on each of the areas below. Additional comments can go at the bottom.**

Describe the activity:

What do the students seem excited about?

What kinds of questions are the students asking?

What appears to draw the attention of the students?

Is there anything that appears to 'bore' the students?

How are the history and items used with the students?

General comments on student engagement.

# Appendix M: School Testing Observation Template

## MiaB Group Observations

How many students are in the group?

Students' Initial reactions:

Do the students have any questions about the box/activity?

Note items or discussion points where children appear confused:

How engaged are the students (Record any interesting questions if possible)?

### *Pigeon Post:*

**Engagement(1-10)**

**Questions (#):**

**Comments (#):**

**Notes:**

### *Maritime:*

**Engagement(1-10)**

**Questions (#):**

**Comments (#):**

**Notes:**

### *Air:*

**Engagement(1-10)**

**Questions (#):**

**Comments (#):**

**Notes:**

### *Bicycle:*

**Engagement(1-10)**

**Questions (#):**

**Comments (#):**

**Notes:**

***Postie:***

**Engagement(1-10)**

**Questions (#):**

**Comments (#):**

**Notes:**

***Rocket:***

**Engagement(1-10)**

**Questions (#):**

**Comments (#):**

**Notes:**

***Truck:***

**Engagement(1-10)**

**Questions (#):**

**Comments (#):**

**Notes:**

***Train:***

**Engagement(1-10)**

**Questions (#):**

**Comments (#):**

**Notes:**

**Questions to ask?**

Which items were your favorite?

Which items were your least favorite?

**Worksheet, Telegram, Cross-Written Letters Observations:**

How many students are in the group?

Students' Initial reactions:

Do the students have any questions about the box/activity?

Note items or discussion points where children appear confused:

How engaged are the students (Record any interesting questions if possible)?



## Appendix N: Short Feedback Forms

Group number: \_\_\_\_\_

How much did you **enjoy using** Museum in a Box compared to normal school activities?

Please circle your answer



Much less

Somewhat less

Same

Somewhat more

Much more

How much did you **learn from** Museum in a Box compared to normal school activities?

Please circle your answer



Much less


Somewhat less

Same

Somewhat more

Much more

# Appendix O: Telegram Template

<b>Charges to pay</b> _____s. _____d. <b>RECEIVED</b>	 <b>POST OFFICE</b> <b>TELEGRAM</b>	No. 10xx0 _____ <b>OFFICE STAMP</b>
At.....m From..... By.....	Prefix, Time handed in, Office of Origin and Service Instructions, Words.	At.....m To..... By.....
[Text Here]		
For free repetition of doubtful words telephone "TELEGRAMS INQUIRY" or call with this form <b>B or C</b> at office of delivery. Other enquiries should be accompanied by this form and, if possible, the envelope		

## Appendix P: Lesson Concepts

### Preservation Restoration Activity

An activity primarily centered around the artifacts from Voices from the Deep and the methods and philosophy behind conserving them

#### Target Audience:

Key Stage II

#### Curriculum Covered:

History (Relating mostly to WWII)

Basics of Chemical Reactions

Kinds of Light

Math

#### Objects to Include:

3D Prints from Gairsoppa (candidates: teapot, dye, rubber stamp, obliterating fluid)

Parts of Letters to Piece Together

Letters

Interactive Paper - Invisible Ink, Hydrochromic ink

UV Lamp

Paint Brushes for Water

#### Lesson Activities:

Put separated letters together

Find hidden messages or information on the paper

this should be in addition to some VftD content. maybe do a little bit of VftD letters, then talk about how they were preserved, and then go into more VftD content (depends heavily on time)

General Outline:

**Artistic Stamp Design**

This bundle focuses on the artistic elements and mediums involved in stamp-making, while also describing the artistic limitations of stamps.

Target Audience:

Key Stage I

Curriculum Covered:

General Curriculum of Art

Some Postage Related History

Brief descriptions of historical events and people depicted on stamps

Objects to Include:

Early Stamps, including Penny Black

3D Print of original elizabeth sculpture

Stamps through history

Current stamps

Well known stamp artist (I can't remember his name)

Examples of stamps designs using different mediums

Sketches

Watercolors

Additional stamp examples students will identify easily

Star Wars

Marvel

etc.

Felt/Felt-Board stamp backgrounds

Velcro attachable stamp elements (some useful some extraneous)

Large stamp shaped paper

Crayons?

Lesson Activities:

Build a stamp as a class, considering implications of what goes on the stamp

Let students draw their own and take it home

good for getting whole class involved, something MiaB is often lacking

follows mail history from the 'perspective' of stamps.

hard to test with KS1 aged students, maybe adapt to KS2, focus more on history instead of art?

**Inside Letters — Through the Ages**

With the aim to compare and contrast how the mail service has been used since its inception, we will explore letters from throughout time.

Target Audience:

Key Stage II

Curriculum Covered:

History

Math

Writing

“Hook” for Teachers:Objects to Include:

Letters from Various Stages of History

Letters Today

Envelope Templates

Items Historically Sent Through the Postal Service

What Can Be Shipped Today

Cool Postcards from Around the World

IMAGE: How Letters Travel (Rail, Plane, Ship, Truck), how they used to travel

Envelope and Letter Blanks

Lesson Activities:

Hear the kinds stories people sent over mail, and their importance

Learn the steps of a sending and receiving letters from a postal perspective

Consider the importance of addresses, and use of a return address on a letter

Write a letter, calculate cost to send

## Appendix Q: Workshop Observations

Program Name: The Jolly Postman

Date: 3/18/19

Observer(s): Owen and Tabitha

Presenter: Rosie (Postie)

**During and after the workshop, comment on each of the areas below. Additional comments can go at the bottom.**

Describe the activity:

Students go on an adventure with Rosie the Postie to deliver mail to characters from children's tales.

What age group are the students?

Key Stage 1 (Year 2)

What do the students seem excited about?

Participating

Being chosen as one of the three Bears

Singing songs with motions

What kinds of questions are the students asking?

Didn't really have much question asking; more like question answering

Spelling

Spelled "S P E L L" in the air with wooden spoons

Counting

We have two stamps and need three for a large parcel... how many more do we need?

Reading

Read along with Rosie in the large book

What appears to draw the attention of the students?

Costumes

Songs

Is there anything that appears to ‘bore’ the students?

Very engaged for the majority of the show

How are the history and items used with the students?

Interactive

Objects, videos, songs

General comments on student engagement:

Program Name: Mail Rail Science Show

Date: March 19, 2019

Observers: Connor Dietz, Tabitha Gibbs

**During the workshop, comment on each of the areas below. Additional comments can go at the bottom.**

**Workshop description:**

Mail Rail Science Show went through the history of the Mail Rail, why it was needed, and the things it did for the postal system in the UK. The primary focus was on the engineering aspect, asking questions about why the rail was underground, and how engineers designed the tunnels. At most steps along the way, the students were able to participate in some way, usually through question prompts from the activity leader.

**What age group are the students?**

Key Stage 2 (year 4)

**What do the students seem excited about?**

Any time where the students are able to participate, they would get super excited, even at the tiniest things. For example, each time they finished talking about an item on a list, a volunteer would go up and tick it off. The students counted down “Three! Two! One! Tick!” excitedly. Even though it was such a small detail, they were still so excited to do it. Generally, any time the

**What kinds of questions are the students asking?**

The workshop did not have many opportunities for the students to ask questions. However, the workshop leader did ask the students lots of questions. A lot of the questions were easy to answer. Some were more difficult, such as asking what kinds of materials were conductive, or even identifying famous people from a description.

**What appears to draw the attention of the students?**

The things that drew the attention of the students best were the ones where they could touch something. In the case of this activity, there was a little light that two students grabbed, and then everyone else linked hands to complete the circuit. The students also had construction hard hats under each of their seats, and any time they had to use it they would get really excited, and very few students did not participate.

**Is there anything that appears to 'bore' the students?**

None of the content itself appeared to bore the students, but it was clear that whenever something was repetitive, or there was lag time for setup, the students' attention would wane.

**How are the history and items used with the students?**

As mentioned, the students each had a hard hat under their seats, which were incorporated into many parts of the lesson. The light bulb was also mentioned above. Part of the light bulb activity included different materials that two students would grab instead of each others' hands to test the conductivity of, such as a large wooden board, an aluminum sheet, a plate of steel, and some paper. There was also another bit where a student volunteer was chosen to get inside a burlap sack to demonstrate roughly the weight of a full sack of mail back then.

**General comments on student engagement.**

The students were pretty highly engaged the whole time. As expected, there were many students talking with each other throughout the workshop, and a few times their teacher needed to poke them on the shoulder. Aside from that, everyone was excited to participate. One of the teachers mentioned afterwards that the students don't often get to do stuff like this, which is why they were so excited.



Program Name: Engineers: GOOD IDEAS!

Date: 3/19/2019

Observer(s): Owen and Tabitha

Presenter: George

**During the workshop, comment on each of the areas below. Additional comments can go at the bottom.**

Describe the activity:

What age group are the students?

Preschool 4 years old

What do the students seem excited about?

Participating and answering questions.

The song

Goofy things (skeletons in the “under the city” model)

George shooting an Air Rocket

What kinds of questions are the students asking?

Not many. They mostly responded to questions

If they can't go on the land and can't go above it, then where can they go? (Underground)

Have you been on the London Underground?

(Most yes)

What appears to draw the attention of the students?

Models

Demonstrations

Participating

Is there anything that appears to ‘bore’ the students?

Sitting still

How are the history and items used with the students?

Use hands to show strength of different structures that went into how the mail rail was made.

Flat & fingertips touching =>

Flat & interlocked fingers =>

Circular & interlocked fingers

Crowded streets of London called for different transportation

General comments on student engagement.

# Appendix R: St. Mary's Primary School Observations

## MiaB Activity Observations

### MiaB Group 1 Observations

How many students are in the group?

11

Students' Initial reactions:

Amazed, all smiles, paying attention, "That's cool!"

Do the students have any questions about the box/activity?

"How does it work?"

Note items or discussion points where children appear confused:

The group didn't know what the Train Mail card was from the picture before it was booped.

How engaged are the students (Record any interesting questions if possible)?

### *Pigeon Post:*

**Engagement Rating(1-10):** 10

**Questions (#):** 0

**Comments (#):** 4 (participating in discussion around usefulness)

\*came back to this briefly and a girl mentioned that they were used in WWII!

**Notes:** Chosen 2nd, was an object and not a postcard so they were more intrigued

### *Maritime:*

**Engagement Rating(1-10):** 9

**Questions (#):** 0

**Comments (#):** 5

**Notes:** Chosen 6th

### *Air:*

**Engagement Rating(1-10):** 8

**Questions (#):** 0

**Comments (#):** 4

**Notes:** Chosen first! Children's first thoughts were it could deliver country to country.

***Bicycle:***

**Engagement Rating(1-10):** 9

**Questions (#):** 0

**Comments (#):** 6

**Notes:** Chosen 7th

***Postie:***

**Engagement Rating(1-10):** 7

**Questions (#):** 0

**Comments (#):** 4

**Notes:** Chosen last (8th), a few giggles at the southern United States accent

***Rocket:***

**Engagement Rating(1-10):** 10

**Questions (#):** 0

**Comments (#):** 5

**Notes:** Chosen 3rd

***Truck:***

**Engagement Rating(1-10):** 10

**Questions (#):** 0

**Comments (#):** 3

**Notes:** Chosen 5th

***Train:***

**Engagement Rating(1-10):** 9

**Questions (#):** 2 (Q-"What is this?" A-The image is a train)(Q-"How do they use magnets?" A-The train levitates about magnetic rails and kinda flies down the track)

**Comments (#):** 6

**Notes:** Chosen 4th

**Questions to ask:**

Which items were your favorite?

Airplane - 1

Rocket - 2

Bicycle - 1

Boat - 1

Which items were your least favorite?

Pigeon - 4            Postie - 2

General Notes:

Really good discussions about usefulness

The students had a hard time “booping” the cards because the RFID chip was not centered on the back.

Their reasoning for usefulness focused on if the delivery method was capable of losing the mail and how much mail it could carry

**MiaB Group 2 Observations**

How many students are in the group?

16 but after only 1 item was played a large number of students had to leave to take advantage of a recess period award for having perfect attendance. 7 students were left and one additional joined a minute later. Therefore **8** students were present for most of the activity.

Students' Initial reactions:

Wow! A few questions were asked about the items in excitement.

Do the students have any questions about the box/activity?

“How does it (the box) work?”

Note items or discussion points where children appear confused:

N/a

How engaged are the students (Record any interesting questions if possible)?

***Pigeon Post:***

**Engagement Rating(1-10): 9**

**Questions (#): 0**

**Comments (#): 3**

**Notes:** Chosen 2nd. This is the item during which the students left.

***Maritime:***

**Engagement Rating(1-10): 9**

**Questions (#): 0**

**Comments (#): 3**

**Notes:** Chosen 6th

***Air:***

**Engagement Rating(1-10): 8**

**Questions (#): 0**

**Comments (#): 3**

**Notes:** Chosen 3rd

***Bicycle:***

**Engagement Rating(1-10): 9****Questions (#): 0****Comments (#): 3****Notes:** Chosen 1st***Postie:*****Engagement Rating(1-10): 8****Questions (#): 0****Comments (#): 1****Notes:** Chosen 5th, children were amused/surprised by the southern accent***Rocket:*****Engagement Rating(1-10): 10****Questions (#): 2****Comments (#): 9****Notes:** Chosen 7th, talked about space, how the rocket started even though there was no pilot, the children rated it last in usefulness right away (deemed it too dangerous and destructive)***Truck:*****Engagement Rating(1-10): 8****Questions (#): 0****Comments (#): 2****Notes:** Chosen 4th***Train:*****Engagement Rating(1-10): 9****Questions (#): 1** ('What accent is that, Scottish?')**Comments (#): 3****Notes:** Chosen last (8th)**Questions to ask?**

Which items were your favorite?

Rocket - 2

Boat - 3

Truck - 1

Postie - 1

Pigeon - 1

Which items were your least favorite?

Bike - 1

Rocket - 1

**General Notes:**

The discussion was awesome! It appealed to the age range and everyone was very involved. Talked about stamps and sending post - how it used to work and how it works now

Children did seem to want to just speed through the items so leading them with discussion and facts really helped to properly pace the lesson.

Rating by usefulness was a good way to get a conversation going

Students in this group picked on the Postmaster General because he just “sits on his bum” and doesn’t go around delivering mail.

Kids directed the discussion and when items were booped but did not physically boop them because the tag needed to be in the correct place on the box for the audio clip to play.

**Worksheet, Telegram, Cross-Written Letters Observations:**

*NOTE: a large portion of the second group of students doing the telegrams and cross-written letters activity had to leave just after they started, and only two remained.*

How many students are in the group? (?)

The telegram / cross-written letters activity ended up getting broken up into two groups

Students’ Initial reactions:

The students are very excited when handing out the papers.

Students handed out the papers very methodically

we didn’t ask them to pair up, but that seems to be what the kids prefer, so we let them work together.

After explaining the lesson, there were many questions on what they should do

Delivery Collection Worksheet:

*due to the hectic setup at the beginning, part of group two (did worksheets first) did not get to the delivery worksheet*

a good portion of the kids had to leave early, so the ones that did start the worksheet didn’t have time to finish it

two kids in this group stayed after, so we did a one on one

one kid’s idea for futuristic delivery was drones

he also wanted to talk about spiders

they did a good job at remembering the things they saw, though there were some that were hard to remember for them.

Telegrams sheet

after passing telegrams out, kids were very excited.

there were varying levels of ability of kids to decode  
 some kids were able to figure out the telegrams without the abbreviations key  
 some kids could figure them out with the abbreviations key  
 two kids needed help using the abbreviations key  
 note: kids did not know the word abbreviation  
 they had lots of questions about why they used the abbreviations  
 after the kids finished the messages, some would ask if there was more for them to try  
 the kids were excited when they got to try writing their own messages  
 we asked them to share what they had written and they were all very eager and all of their hands shot up  
 when writing their own, there was a question from a kid “can we use words not on this list?”

#### Cross-Written letters sheet

first passed around the actual cross-written letter. we need to print more for next time  
 kids were initially confused at what was going on on the page  
 it took prompting to get them to talk amongst themselves about what the letter was  
 some students were able to figure out that it was a written letter  
 some students needed it pointed out, but then went aha  
 then passed out the easier to read one.  
 kids were excited to be able to read it, and thought it was cool  
 one kid asked “why did they do this?” which we turned into a discussion  
 one student suggested it was another language (it was not)  
 finally a student came up with the idea that it saved cost, after prompting them by saying how expensive it was to send letters back then, but it took a moment.  
 after that, a student asked “how did they write like this?” which we used to segue into having them try to write their own  
 the kids were surprisingly very excited to get to write their own  
 some kids clearly enjoy writing quite a lot  
 they were even more excited to try and have each other read what they wrote.  
 though the kids’ handwriting was not the best, and it was harder to read due to the cross writing, they were still able to read some of what the others wrote, though mainly for the kids with nicer handwriting  
 one kid asked if he could use the abbreviations in his letter, which was an interesting point of creativity

#### How engaged are the students (Record any interesting questions if possible)?



## Appendix S: Lancasterian Primary School Observations

MiaB Activity Observations

### **MiaB Group 1 Observations**

How many students are in the group?

12 but lost one after the Boat clip was played

Students' Initial reactions:

Laughs, smiles, captured attention

Do the students have any questions about the box/activity?

No

Note items or discussion points where children appear confused:

No one voiced their confusion and we did not see any confused faces.

How engaged are the students (Record any interesting questions if possible)?

### ***Pigeon Post:***

**Engagement Rating(1-10): 10**

**Questions (#): 0**

**Comments (#): 5**

**Notes:** Chosen 7th, was an object and not a postcard so they were more intrigued, it may not have been clear that it was something to boop

### ***Maritime:***

**Engagement Rating(1-10): 9**

**Questions (#): 0**

**Comments (#): 12**

**Notes:** Chosen 5th

### ***Air:***

**Engagement Rating(1-10): 8**

**Questions (#): 0**

**Comments (#): 8**

**Notes:** Chosen 3rd

### ***Bicycle:***

**Engagement Rating(1-10): 10**

**Questions (#): 0**

**Comments (#): 5**

**Notes:** Chosen 2nd

**Postie:**

**Engagement Rating(1-10): 10**

**Questions (#): 0**

**Comments (#): 5**

**Notes:** Chosen last (8th)

**Rocket:**

**Engagement Rating(1-10): 10**

**Questions (#): 0**

**Comments (#): 15**

**Notes:** Chosen 4th, mentioning space in the script might make them focus too much on space travel rockets, it might help to liken rocket mail to launching a model rocket, also might want to parallel it traveling to an open space like airplanes because they focus on the rocket damaging houses.

**Truck:**

**Engagement Rating(1-10): 9**

**Questions (#): 0**

**Comments (#): 5**

**Notes:** Chosen 1st! Teacher checked listening comprehension when the audio clip finished which I think helped recap and guide the discussion in the appropriate direction

**Train:**

**Engagement Rating(1-10): 9**

**Questions (#): 0**

**Comments (#): 9**

**Notes:** Chosen 6th

**Questions to ask:**

Which items were your favorite?

Which items were your least favorite?

General Notes:

Did not get to ask favorite/least favorite.

Students were better at booping items this time - still should move the chip to be centered

The students must have just discussed pollution recently in class because they mentioned the pollution aspects of the delivery methods

**MiaB Group 2 Observations**

How many students are in the group?

10 at the start, 11 after pigeon, 14 after boat

Students' Initial reactions:

Laughs, that's confusing(how the box works)

Do the students have any questions about the box/activity?

“How does it (the box) work?”

Note items or discussion points where children appear confused:

No

How engaged are the students (Record any interesting questions if possible)?

***Pigeon Post:***

**Engagement Rating(1-10): 9**

**Questions (#): 0**

**Comments (#): 7**

**Notes:** Chosen 1st! This is the item during which the students left.

***Maritime:***

**Engagement Rating(1-10): 9**

**Questions (#): 0**

**Comments (#): 8**

**Notes:** Chosen 4th

***Air:***

**Engagement Rating(1-10): 9**

**Questions (#): 0**

**Comments (#): 7**

**Notes:** Chosen 5th

***Bicycle:***

**Engagement Rating(1-10): 8**

**Questions (#): 0**

**Comments (#): 9**

**Notes:** Chosen 3rd

***Postie:***

**Engagement Rating(1-10): 8**

**Questions (#): 0**

**Comments (#): 8**

**Notes:** Chosen 8th, laughs at the accent, someone noted that she is part of every delivery method

***Rocket:*****Engagement Rating(1-10):** 10**Questions (#):** 2**Comments (#):** 9**Notes:** Chosen 6th***Truck:*****Engagement Rating(1-10):** 9**Questions (#):** 0**Comments (#):** 7**Notes:** Chosen 7th***Train:*****Engagement Rating(1-10):** 8**Questions (#):** 0**Comments (#):** 7**Notes:** Chosen 2nd**Questions to ask?**

Which items were your favorite?

Which items were your least favorite?

**General Notes:**

A few kids are not participating

It might be best to recap what the audio says and then do the useful/not useful discussion

**Worksheet, Telegram, Cross-Written Letters Observations:****Group 2 (did this activity first, before MiaB):**How many students are in the group?

10

Students' Initial reactions:Delivery Collection Worksheet:Telegrams sheetCross-Written letters sheetHow engaged are the students (Record any interesting questions if possible)?**Group 1 (did this activity second, after MiaB):**How many students are in the group?

11 -&gt; 12 -&gt; 11

Students' Initial reactions:

- ❖ students were organized when sitting down
- ❖ excited to get up and move to a separate room

- ❖ The first thing kids wanted to know is if they would be graded
- ❖ one student said they were worried they might get the answers wrong

#### **Delivery Collection Worksheet:**

- ❖ kids that got more confused lost focus and became disengaged fairly quickly
- ❖ they were excited at the idea that mail was the first social network
- ❖ all wanted to volunteer their ideas for the social networks they know of
- ❖ kids had a lot of questions about what they were allowed to write
- ❖ they were really excited to get to the drawing activity
- ❖ when we went to collect worksheets, they did not want to stop drawing

#### **Telegrams sheet**

- ❖ lots of kids volunteered answers to q of what a telegram was
- ❖ students lost focus if they did not get to share their answer
- ❖ teacher liked to interject with own instructions, kids seemed to volunteer more answers when teacher did not give instruction
- ❖ kids liked solving telegram puzzles
- ❖ some kids had a hard time using the key, most kids were able to work through them
- ❖ this group of kids were slightly less excited to do the puzzles than the group that did MiaB first
- ❖ most seemed excited to share own coded telegrams
- ❖ many kids called tabby (running lesson) over to try and read theirs
- ❖ some kids didn't get the point that they were supposed to use abbreviations and just wrote full sentences

#### **Cross-Written letters sheet**

- ❖ everyone raised their hands to volunteer to read the background prompt
- ❖ took them a few guesses to understand what cross-written letters are
- ❖ once they figured it out, there were lots of oohs and ahahs
- ❖ this group seemed more tired and less excited to write their own cross written messages
- ❖ this group was still excited to share what they had written and to try and read what their friends had written

#### How engaged are the students (Record any interesting questions if possible)?

overall they were reasonably engaged, save for a few times when some of them spaced out

the lower ability kids had a harder time staying focused, especially if they didn't get con-

stant attention

kids were more excited than we expected to do telegrams/cross written letters

I was a silent observer, but after the activity a group came up and wanted to share their letters and telegrams with me and have me try to decode them

## Appendix T: Prototyped Items

The following items are formatted in alphabetical order and contain the name, image, and script. You can use the QR code to be directed to our team website to listen to the audio files we used.

### Air Mail



*\*jet engine firing up, switches flipping\* \*coms blip\** “Heathrow Ground, this is Golf 2 4 6 1 Foxtrot. Ready to taxi, East departure.” *\*coms blip\** The first plane to carry mail flew in 1919, just 16 years after the Wright Brothers’ first powered flight. Now, the Royal Mail owns a fleet of 737s which are massive aircraft that can carry almost 40 tonnes of cargo. I can fly mine wherever it needs go. Over mountains, across rivers, and to any country in the world! But I can only land on runways, so the mail will still need to get from the airport terminal to your house. That means it might have to go on a train or truck when I’m done with it.

**Bicycle**

*\*Ding-ding\** “Mails here!” *\*bike crash\** Ooof, that’s the third time this route. All these packages people are ordering nowadays are making it harder and harder to make my deliveries. But don’t get me wrong, bicycles are still great for delivering mail! They’re efficient, use no gas, and biking is great exercise. But they’re still a little slow when trying to carry a lot of mail, especially parcels. *\*Crash\** Ahh- not again...



## Maritime



*\*big wave crash, waves in background\** Arrgh. I'm Captain Hook of the RMS Theseus! Don't worry, the names Freddie Hook, I'm not here to plunder your mail. I'm here to carry it across the ocean. While it can be slow, bringing post by ship is a lot cheaper and uses a lot less fuel than planes. We've been carrying cargo this way for thousands of years, but the first Royal Mail Ships were enlisted in 1841. Sometimes, the Royal Mail would contract large passenger ships to carry mail along their routes, such as the infamous RMS Titanic. *\*under breath\** We all know how that ended up... The barges used for shipping these days can pack more mail and cargo onboard than the steam and sailing ships from 100 years ago... and they tend not to sink anymore. *\*big wave crash\**

### Pigeon



P1- “Look! It’s a bird!” P2- “It’s a plane!” P1- “No, I’m pretty sure it’s a bird.”

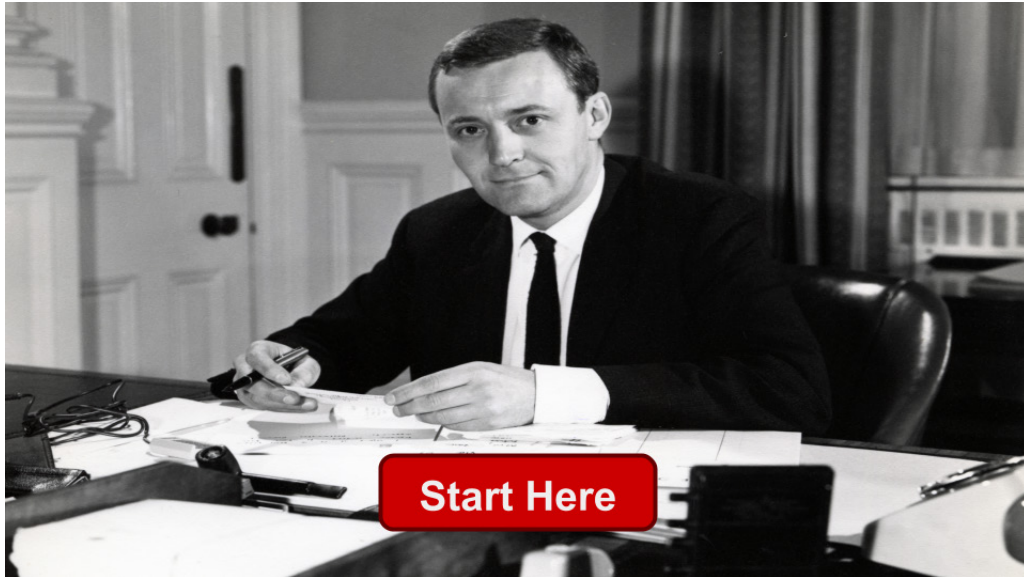
“CAW” I’m a homing pigeon to be precise. Travelers would bring many of us with them and strap messages to either our legs or backs. My instincts help me return to the place I was born, so when someone releases me, I just go home. So called Pigeon post was first used over 2000 years ago to deliver messages during wartime, and was frequently used in some parts of Britain until 1910! I wonder why nobody uses us much today? Maybe cause people don’t want a postie that can poop on your head... What do you think?

## Postie



I'm a postwoman! Or postie for short. You can find me driving a mail truck, loading up a train, collecting from post boxes, and bringing letters right to your doorstep. People like me have been taking care of your mail since the 16th century! Before planes and trains and cars, we posties were responsible for getting your mail where it needed to go. Back in those days, mail delivery was a dangerous task. Sometimes people wanted to take mail that wasn't theirs, so we had to carry guns to defend our precious cargo and important messages. We don't need to do that anymore, but back then a letter could mean the difference between life and death, so we made sure it got to its recipient safely.

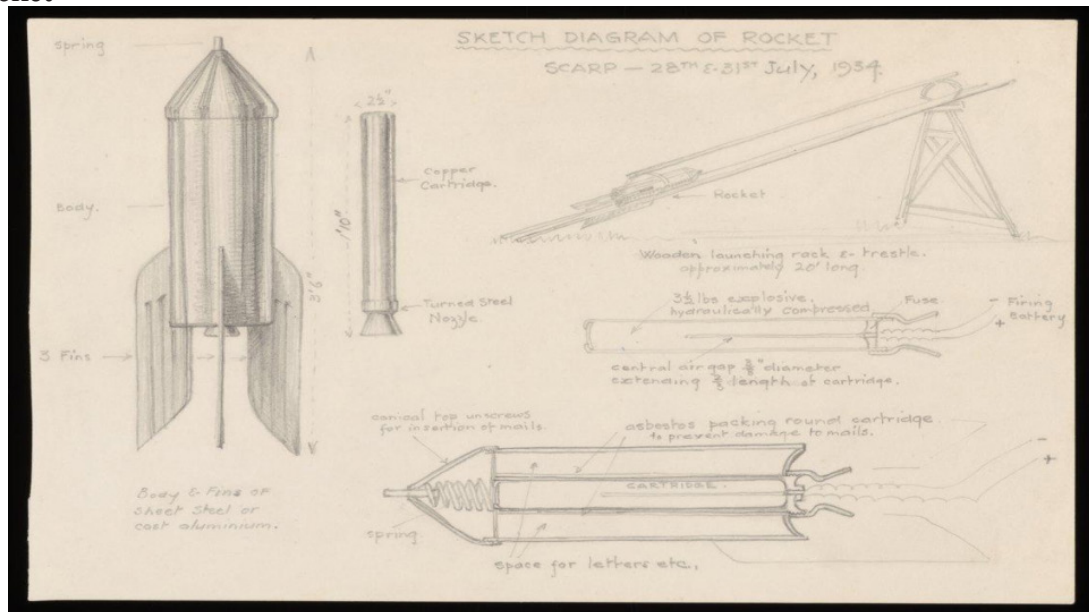
## Postmaster General



*\*Regal Trumpeting\** *\*Announcer voice\** “Attention! The Postmaster General approaches!”

*\*Sound of Steps\** *\*Clears Throat\** “Good day. First, I would like to thank all of you for volunteering your services. You’re all here today because I need your help in creating a new delivery method for the post. In this day and age people want their letters and parcels sent faster than ever before. I need you to sort these services in order of their usefulness. When you’re done, your task is to invent a brand new delivery method for us to invest in. Are you up for the challenge? Take a look at some of the items in the collection to get started. I wish you luck.” *\*Regal Trumpeting\**

## Rocket



“Fwoooosh! Did you hear that?! I just sent a letter to my mom on a rocket! It’s expensive, sure, *\*crash/explosion\** and doesn’t always go to plan. Most of the rockets didn’t even go to space, they were really just high speed missiles carrying mail. But with a bit rocket fuel I can send a letter from London to Scotland in a matter of minutes. Over 200 attempts of rocket mail have been made in the worlds history. There is no denying that high speed delivery, even faster than planes, would be very useful. But maybe rockets weren’t the way to do it, since sometimes the letters got a little singed.

## Train



*\*Chug-a-chug-a-chug-a. Choo! Choo!\**

This bad boy can fit so much mail in it. When sorted correctly, putting mail on trains gets it where it's going and gets it there on time. The Royal Mail has used trains like this to carry mail across the country for almost 200 years! Some of the first trains got their power by burning coal to make steam. *\*Steam engine noise\** In the early 1900s, trains started to use internal combustion engines, just like your car. Then in 1927 we got the Mail Rail, one of the first electric trains. By sending a large current *\*zap\** through the tracks the train's motors would drive the train. Nowadays some trains use engines, some use electricity, and some are even powered by magnets! Almost like magic, isn't it? At one point in time, it all seemed like magic, but technology moves forward and one day they seem ancient. Only the heavens know what we'll come up with next!

*\*choo choo\**

## Truck



*\*engine pulls up, continues idling\** Name's Jamie. Everyday my truck and I are out here with the nearly 48 thousand vehicles that make up The Royal Mail ground fleet, and we work together to bring mail to the far reaches of the UK. While we may be fast, it takes a lot of gas and a lot of drivers to get the job done. All these costs add up fast so going long distance gets expensive. Before our trucks, the Royal Mail used horse drawn carriages to get mail from place to place. While it still beat walking, this was way slower than today's vehicles, and, once the day was done, you had to worry about taking care of the horses. Alright, let's get this show on the road. We're off to deliver some more mail today. *\*engine pulls away\**

## Appendix U: Our Telegram Messages

For format, see Appendix O.

**Message: It tuk us three das to mk ts potato salad! Three das!**

**Decoded Message:** It took us three days to make this potato salad! Three days!

**Message: To b, or nt to b, tt is t question.**

**Decoded Message:** To be, or not to be, that is the question.

**Message: Wi am I doing ts? I want to tk t trn instead.**

**Decoded Message:** Why am I doing this? I want to take the train instead.

**Message: I rode t trn estrda and md t condr ha ha.**

**Decoded Message:** I rode the train yesterday and made the conductor laugh.

**Message: Move t troops fwd into t 4th dist, immy.**

**Decoded Message:** Move the troops forward into the 4th district, immediately.

**Message: Chg t bldg, bt b careful o t 3rd dist.**

**Decoded Message:** Charge the building, but be careful of the 3rd district.

**Message: Cn u do me a fvr tomw, pls?**

**Decoded Message:** Can you do me a favor tomorrow, please?

**Message: I recd a pkg estrda. It was fm the trn condr.**

**Decoded Message:** I received a package yesterday. It was from the train conductor.

**Message: Wi is ts pkg open? I do nt want to pa r it.**

**Decoded Message:** Why is this package open? I do not want to pay for it.

**Message: Hw mch do u chg r bread? I heard u gtd hf price in t evening.**

**Decoded Message:** How much do you charge for bread? I heard you guaranteed half price in the evening.

**Message: G M, I gt ur pkg estrda and wanted to sa tnx. Tlk to u sun. Love, Annie**

**Decoded Message:** Good morning, I got your package yesterday and wanted to say thanks.  
Talk to you soon. Love, Annie



## Appendix V: Telegram Worksheet

### Telegrams

Communication has changed a lot in the last 100 years. Just as people find new ways to use technology today, people would come up with inventive uses of different communication methods. Telegram operators would charge by the letter to send a message, which would get quite expensive. Senders came up with abbreviations to shorten their messages, just like texting. Not ready to lose out on profits, enterprising telegram operators began selling books with abbreviations and their meanings.

Do you want to learn more about cross-written letters, or telegrams? Choose one and try to decode it.

Below are some abbreviations. Can you use them to decipher the telegrams on the table?

b	be	fvr	favour	mk	make	tk	take
bc	because	fwd	forward	nt	not	tlk	talk
bldg	building	G M	Good morning	o	of	<u>tomw</u>	tomorrow
bt	but	gt	got	pa	pay	tnx	thanks
chg	charge	gtd	guaranteed	pkg	package	trn	train
cn	can	ha ha	laugh	pls	please	ts	this
condr	conductor	hf	half	r	for	tt	that
das	days	hw	how	recd	receive	tuk	took
dist	district	immy	immediately	sa	say	u	you
<u>estrda</u>	yesterday	md	made	sun	soon	ur	your
fm	from	mch	much	t	the	wi	why

What does your telegram say?

When you are done, try writing a message to a friend using the abbreviations on one of the blank telegrams.

## Appendix W: Our Simplified Cross-Written Letter

We also have French on Fridays, which is actually my least favourite subject, but after that we have history which is much more interesting. Right now I'm creating a webpage for our basketball team. After school I hang out with my friends, and then in the evening I play football at the sports centre. On Friday nights we sometimes go to someone's house for a party or to watch a DVD. We can relax a bit on Friday evenings because there's no school on Saturday.

Hi,  
 Thanks for your letter and it was great to hear from you. You asked me to tell you about my favourite day of the week. Well, it's definitely Friday. One reason I like Friday is because I have my favourite subjects at school: PE and chemistry. Chemistry is great because we do experiments in the science lab. Our teacher, Mr. King, is so funny. In PE we usually play basketball, which is my favourite sport. I'm good at it because I'm quite tall. Our team usually wins. Tell me about your favourite day in your next letter. Hope to hear from you soon.  
 Love,  
 Dani

**Transcription of the Letter:**

Hi,

Thanks for your letter and it was great to hear from you. You asked me to tell you about my favourite day of the week. Well, it's definitely Friday.

One reason I like Friday is because I have my favourite subjects at school: PE and chemistry. Chemistry is great because we do experiments in the science lab. Our teacher, Mr. King, is so funny. In PE we usually play basketball, which is my favourite sport. I'm good at it because I'm quite tall. Our team usually wins. We also have French on Fridays, which is actually my least favourite subject, but after that we have history which is much more interesting. Right now I'm creating a webpage for our basketball team. After school I hang out with my friends, and then in the evening I play football at the sports centre. On Friday nights we sometimes go to someone's house for a party or to watch a DVD. We can relax a bit on Friday evening because there's no school on Saturday.

Tell me about your favourite day in your next letter. Hope to hear from you soon.

Love,

Dani

## Appendix X: Cross-Written Letter Worksheet

The answers are given in red.

### Cross-Written Letters

Communication has changed a lot in the last 100 years. Just as people find new ways to use technology today, people would come up with inventive uses ways to send messages. Back when it was expensive to send letters because the cost was dependent on the number of pages, people would do something called cross-writing.

**What is cross-writing? Well, take a look at the letter you got. What do you think is going on? Can you read the letter? Describe what you see:**

Cross-writing is writing across the page in multiple, overlapping directions.

**Why do you think people wrote letters this way?**

People wrote letters this way to save paper and money.

**You probably haven't seen cross written letters before. Why do you think people no longer need to write like this?**

The cost to send a letter is not dependent on the number of pages you are sending.

Now you can try to write your own cross-written letter. In the box below, write your cross-written message. You should come up with a message that is too long to fit in just one direction. Then, pass it to someone next to you to see if they can read it.

## Appendix Y: Delivery Methods Worksheet

The answers are given in red.

### Delivery Collection

As you participate in the activity, answer the following questions:

**Name as many mail delivery methods as you can from the 20th century:**

**Airplane, Bicycle, Boat, Pigeon, Postie, Rocket, Train, Truck**

**What is the biggest modern problem with having posties on bikes?**

A) Long distance                      B) **Too many parcels**                      C) Easy to get  
lost

**What explosive delivery method from the 1900s is not used today?**

**Rockets**

**The Mail Rail was a very special train that ran under London. Because it was underground, it needed a special way to power it through its rails. What was it?**

**Electricity**

**The post was the first social network and connected people all over. Nowadays, communication is mostly digital. What do you use to talk to your friends and family?**

*This question was open-ended and not included in evaluation of the lesson. It was used to get children to connect old delivery methods to today. Correct answers were: Texting, Email, Letters, Social Media, etc.*

**Draw or describe your idea for how mail could be delivered in the future:**