Where the Wild Things Learn:

Creating a Junior Ranger Book for Mammoth Cave National Park using Informal and Environmental Education Best Practices

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Abstract

For over 100 years, the National Park Service (NPS) has brought inspiration and education to the millions of people who visit. Within the NPS, the Junior Ranger program has emerged as a fun and informal way for children aged 5-13 to learn about a park site. Part of the Junior Ranger program is the completion of an activity booklet that one must complete to earn a badge, patch, or a certificate. Often, NPS resources for this program can vary, and the creation of Junior Ranger booklets can become low-priority, side projects for interpretation or education rangers. Furthermore, these rangers differ significantly in their understanding of education theory and as such, the curricula and quality of these booklets are inconsistent across parks. The purpose of this project was to create a new Junior Ranger booklet for Mammoth Cave National Park (MACA) in central Kentucky, using informal and environmental education best practices. This project involved collecting and researching Junior Ranger booklets from across the country, visiting the host site, drafting the booklet, and designing the final digital product. The new Junior Ranger booklet incorporated staff input, native perspectives, and visually appealing art design, with the result being a more holistic and useful educational tool. This project was crafted with the next generation of park visitors in mind, and each page was deliberately tailored to help learners create a significant and personal connection with the park and its unique resources. This

project has the potential to be an example for the field and specifically the park service, showing what a Junior Ranger program can inspire to be.

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Chapter One: Introduction

Looking back at my professional and educational career, one event in my young life shifted everything toward the understanding and teaching of the natural world…the Junior Ranger program. I still remember visiting Acadia National Park in Maine when I was about five years old; it was the first time I had ever tried the Junior Ranger program. I completed the booklet, went to a ranger talk, and explored the tide pools of coastal Maine.

The ranger who checked my booklet made such a big deal out of it, and when he swore me in as a Junior Ranger, he let me wear his iconic flat hat. My father captured this moment with a photo, and as I stood straight, booklet in hand, and focused on the oath I had to recite, you can see me smiling from ear-to-ear. I still remember thinking, as I stared at the ranger, he had the greatest job in the world; he got to hike outside all day, talk to people about animals and wear an awesome hat. Even at the age of five, I knew that was the job I wanted when I grew up. I wanted to be just like that ranger at Acadia.

Ever since that day, I read, explored, and learned everything I could about the historical and natural world. Along the way, I also learned I loved to teach people what I knew and realized I had to combine these passions. I geared my higher education and career toward being an NPS Park Ranger, which I achieved in 2014. Knowing that my dream and passion stemmed from one visit to a National Park, that a ranger and a booklet made all the difference; the Junior Ranger program has become my obsession and led me to this thesis project.

The National Parks Service (NPS) was established in 1916, and each year has brought inspiration and education to over 330 million visitors (NPS, 2019). Within the NPS, the Junior Ranger program has emerged as a fun and informal way for children aged 5-13 to learn about a

park site. Last year more than 800,000 children took part in the Junior Ranger Program at over 400 park sites around the country (NPS, 2019).

The program's history, like its lasting effects on the public, is hard to pin down. Sources place its beginnings as the Yosemite Junior Nature School, which was founded in the 1930s and allowed a child to complete different tasks, consisting "…mostly of field instruction, observations and nature games" (Heil, 1937). The Junior Ranger Program reached its "modern" form in the 1980s and created national standards in 2005. Since 2005 the program has worked on two levels, one is the National Junior Ranger office in Washington D.C., which at the time of this paper is going through a significant reorganization. The national office has not done much in the way of research or studies for the program and throughout the years have created several National Junior Ranger booklets like "Junior Ranger Eclipse Explorer" or "Let's Go Fishing Activity Book". The new restructuring of the national office will hope to create a more central resource for the Junior Ranger program and hopefully conduct studies on the program so they can realize changes that need to be made across the board (Goodman & Moyer, 2019). The second tier is the individual parks themselves, which have relatively free rein to create their Junior Ranger book.

The Junior Ranger Program within the National Park Service is directed at children to help them learn and make personal connections within the different park sites. Each Junior Ranger program follows the same basic structure, having the participant fill out an activity booklet unique to the park. These booklets usually consist of crosswords, word-searches, matching games, fill-in-the-blank questions, drawing, and reflections on the child's overall visit. In most cases, a child would also need to attend a ranger program and go on a self-guided walk or hike of the grounds/trails. With all these requirements complete, the child or even adult

receives a Junior Ranger badge, patch, or certificate confirming them as Junior Ranger of that site. These programs are found today in almost every site and are still the flagship for childhood education within the parks. The structure of the curricula was created to reach the general public, bring in families to the park, and allow children/adults to understand the park site through many different facets, whether that is activity pages or reflective hikes through the park's environment.

Although this is the basic structure for the Junior Ranger Program, it can differ in terms of composition, content, and quality. Depending on the park, resources for this program can vary considerably. Furthermore, the Junior Ranger booklet is often created as a side project for interpretation or education rangers who also have other duties to attend to and can differ significantly in their understanding of education theory. While these parks have the national Junior Ranger standards created in 2005, it is unsure how many park sites use these standards when creating their booklets. Even though these books can be informative and fun, they can also be outdated and rely on the same basic activity pages and programs that have been used for decades. There also seems to be a lack of research on the effects of the Junior Ranger Program on youth, and this has led to a potential for stagnation on what is the next step for the program (Bourque, Houseal, Welsh & Wenger, 2014). As more and more visitors/families come to the National Parks each year, it becomes paramount that the NPS stays as a leader in education and conservation. If the Junior Ranger program is to continue serving as a valued source of inspiration and education for the next generation of park supporters, its foundational core—the Junior Ranger booklet—needs to be revisited and tailored toward new ways of learning.

The purpose of this project is to create a new Junior Ranger booklet for Mammoth Cave National Park (MACA) located in central Kentucky, which needs a new version of their current publication. Mammoth Cave National Park, which sees over half a million visitors a year and is

one of the most visited park sites in the United States (NPS, 2019). With such a high volume of visitors, a new Junior Ranger booklet is vital for helping families and children learn about the park in a fun and effective way. The project will use in-depth research and studies on informal education to create a booklet that genuinely reflects best practices and inspires the next generation of park enthusiasts. The booklet will also examine the effectiveness of art direction, page layout, wording, and activities, which, when effectively combined, can hopefully encourage continued fascination with the natural world and its preservation.

The Junior Ranger program is one steeped in informal learning and environmental education (EE), the ideals of learner-driven activities, self-interest, and exploration is something the park service has used as a cornerstone for years (NPS, 2019). Yet, it is hard to pinpoint what best practices are being deliberately used in the creation of these programs. That is why this project is so important. This booklet will be purposely crafted with informal and EE best practices, and when used with this manuscript will include a detailed understanding of the topics at hand and how they can be implemented in a program such as this.

The significance of this project is twofold. One is that Mammoth Cave National Park, who handed out around 30,000 Junior Ranger booklets in 2019 (Wyrick, 2019) will get a new resource that is co-created and geared toward the next generation of park visitors. This continued influence on children after they leave the park is one the Junior Ranger Program struggles with (Vezeau, Stern. 2010), and although it worked for me many years ago, I hope to create a booklet that increases this retention for the next generation of children. This book will look to significantly improve the park's educational potential and increase the enjoyment children and families have at the park. The other outcome for this project is to become an example for other parks and Junior Ranger programs throughout the nation. The hope is that eventually, this book

and others in the NPS become part of new standards for the National Junior Ranger program and that the sharing of best practices in Junior Ranger programming becomes a keystone for further booklet creation.

Chapter Two: Literature Review

In order to create an improved Junior Ranger book for the Mammoth Cave National Park (MACA), we must first understand the reasoning behind such an endeavor and how these improvements can be made. The literature collected in this review will look at several critical areas regarding the project topic. One field of study is the wide-ranging subject of informal learning, which makes up a great deal of the education process regarding the world and how one learns from it. This area of research will be divided further into understanding what informal learning is and why it is essential for childhood development, as well as examining the topic of environmental education (EE) and how it pertains to the NPS. Another section of the paper will also examine what is considered best practices regarding both informal and EE, as well as the importance of worksheets/booklets in educational situations. Finally, this chapter will examine the significance of artwork and page design as it pertains to more effective learning; since this will be one of the key factors along with informal best practices in developing a new Junior Ranger booklet. Together, this literature will help with a greater understanding of what is known and not known about this area of study and how it will be used when crafting a new activity booklet.

Limitations of Available NPS Research

Since the main objective of this project is to create a new Junior Ranger booklet using informal education best practices, it is best to state that at its heart, the NPS is an environment of informal learning, which will be discussed more in detail later. Unfortunately, little has been written about informal education and the NPS, and even less on the Junior Ranger program (Bourque, Houseal, Welsh & Wenger, 2014). Very few statistics and tools exist about the program, and even the history of the Junior Ranger program is hard to find (Goodman & Moyer,

2019). A tool kit was created back in the mid-2000's for parks and their staff to use for the creation of a new Junior Ranger Program, but the program as a whole remains segmented and individualistic as each park is in charge of their booklet and programming with little regulation or guidelines (Goodman & Moyer, 2019). Although a research thesis on the Junior Ranger program was considered, its scale and seasonal timing seemed too much of a hurdle to clear. Also, the lack of cohesion between the National Junior Ranger office and individual parks seemed like a relationship that needs to be bolstered before a practical evaluation among several different park sites could be conducted.

The small amount of focused study on the Junior Ranger Program that does exist has been completed by Marc Stern, Susan Vezeau, and their colleagues. Even these studies were mostly focused on one park, Great Smokey Mountains National Park. For this chapter, the studies by Stern and Vezeau will not be aggregated into one section about the NPS but synthesized within the other major topics. To achieve a better understanding of learning for this project. Case studies on field trips, worksheets, outdoor educational programs, and different informal settings will be used to support our comprehension of learning and hopefully lead to its application at MACA. Which shares common conditions and subjects with the above-mentioned case studies.

Understanding of What Informal Learning is

Within literature, informal learning is often used interchangeably with nonformal or free-choice learning. These words are comparable, although not completely synonymous (Bourque, Houseal, Welsh & Wenger, 2014; Falk, 2001). For the sake of regularity, this literature review will use the word *informal* when talking about the form of out-of-classroom learning. Informal learning is a large and somewhat amorphous area of education; in some cases, it is hard to define

where informal and formal learning begins and ends (Falk, 2001). Informal learning can be anything from a child watching the water move down a creek bed to an adult trying to hang new cabinets in their kitchen (Bell, Lewenstein, Shouse & Feder, 2008). Informal learning happens throughout a person's childhood, but even adults continue to learn about the world around them in this way. For this project and review, literature will focus on elementary age K-12, informal learning research.

Compared to formal learning, which is regarded as a more structured, educator-driven, and curriculum-based (Bell, Lewenstein, Shouse & Feder, 2008; Jeffs & Ord, 2018; Mills & Kraftl, 2014), informal learning seems to be more fluid and overarching in its definition. Yet, researchers have created four main pillars that envelop all forms of informal learning:

1.) Guided by the learner and requires a somewhat voluntary act in order to take part in it. (Bell, Lewenstein, Shouse & Feder, 2008; Bourque, Houseal, Welsh & Wenger, 2014; Falk, 2001; Jeffs & Ord, 2018; Mills & Kraftl, 2014)

2.) Nonlinear, in that it does not have to follow a set of instructions or timelines to be successful. (Bell, Lewenstein, Shouse & Feder, 2008; Falk 2001; Jeffs & Ord, 2018)

3.) Open-ended or ongoing, so that further inquiry can continue and allow for future educational progression within a topic or idea. This ideal also implies that there may not be one right answer or an answer at all, which in the formal education world is not seen very often. (Bourque, Houseal, Welsh & Wenger, 2014; Falk, 2001)

4.) Personal, the learner must have some individual want or need to pursue what they are interested in. This sentiment, in turn, can lead to greater self-interest and help create a lasting eagerness to continue what they find personally compelling. (Bell, Lewenstein, Shouse & Feder, 2008; Falk, 2001; Jeffs & Ord)

Although these four characteristics of informal learning are regarded as the accepted groundwork, they are by no means the only pillars for which professionals build the understanding of informal education.

Settings of informal education

It would be easy to state that formal learning takes place in a classroom, while informal learning takes place anywhere else. Although this would be a cut and dried distinction to make, it is debated where the line is drawn. For some, like John Falk, where the physical location of informal learning is not as important as how the learning is being done. Falk states that "What makes learning different is partially the physical setting but equally important-perhaps more so-are the social context and the underlying motivation of the learner" (2001, p.7). Mills and Kraftl would also agree with Falk, noting that throughout history, informal education has found itself in a "traditional" classroom setting. Using an example of Robert Owen's school in New Lanark, whose curriculum focused on encouraging students to develop their own style of learning, and even within lecture-based classes gave students the ability to guide a discussion or debate with the instructor. (2014, p. 86-95).

It is predominantly accepted that although the location is not a leading factor when explaining informal or formal education spaces, some places, help stimulate informal learning more than others. Areas like zoos, aquariums, science centers, parks, and museums (Bell,

Lewenstein, Shouse & Feder, 2008; Kisiel, 2003) have been agreed upon by researchers as areas where learners have an easier time falling into informal education characteristics. Most of these areas are, in turn, visited by schools in the form of field trips. Field trips are a quintessential example of how formal education indulges in informal practices. Although teachers might give-out worksheets or have a museum educator accompany them, the students in some cases are given more freedom and self-guidance to explore and learn from these settings (Kisiel, 2003). Again, these settings of formal and informal are always in flux, both can reside within each other, and although some spaces might stimulate one over the other, it is not so much about a location that distinguishes formal and informal learning, but more about what contexts and freedoms are given to the learner.

Other ideals of informal learning.

The connection between educator and learner is also existent within informal learning. Although this type of education centers around the learner and it may seem like educators are not needed, in most cases, the literature shows that dialogue and minor guidance by an educator can be necessary for the development of a learner who is new to the subject area. The role of "educator" within informal learning can take many functions, and like informal education itself does not fit into one category but changes and fluctuates depending on the situation. In the context of childhood learning, an educator or facilitator is almost always around and can be a multitude of people like a counselor, parent/guardian, docent, chaperone, or even another child. This educator's role can vary significantly depending on the situation and can be anything from helping a child read their activity booklet, too showing them how to paddle a boat. Again, the importance of the educator is not so much to teach the individual but guide them toward self-

exploration; to do this effectively, one must give them a framework to start from (Falk 2001; Jeffs & Ord, 2018; Mils & Kraftl, 2014).

Sarah Mills and Peter Kraftl, in their book *Informal Education. Childhood and Youth,* as well as Tony Jeffs and Jon Orb's book *Rethinking Outdoor, Experiential And Informal Education*, discuss in detail the importance of dialogue between educators and learners, and that to effectively have children learn, one must create a relationship with them (Jeffs & Ord, 2018, p.65-66; Mills & Kraftl, 2014, p. 4). Additionally, this relationship which is less teacher-student and more learner-chaperone based, becomes increasingly important when it deals with informal learning and topics not yet encountered or unfamiliar, like rock-climbing or hiking (Jeffs & Orb, 2018). It should also be noted that depending on the age, sociocultural understanding, and mental/physical ability, the level of guidance needed will vary. As much as informal educators want learners in informal learning to have completely free choice of an area or topic, a framework or set of instructions must be laid out in front of the learner (Bell, Lewenstein, Shouse & Feder; Falk, 2001; Jeffs & Orb, 2018). This necessity becomes increasingly important when a topic or environment is either hazardous or restricted by laws or guidelines (Jeffs & Orb, 2018).

A less recognized but still viable aspect of informal education is the idea that informal learning has positioned itself to become a more considerable aspect within the realm of education. For some, this notion has been used for centuries and still plays a pivotal role within certain dispossessed groups that use informal education to counteract the effects of formal education, which has historically dehumanized and marginalized them. (Mills & Kraftl, 2014). Although not found in most of the education research, Mills and Kraftl's notion does strive to illuminate an area of instruction that does not center around white-western ways of

implementation. Informal learning stresses the idea that there is no one way of knowing, and as the understanding of informal education grows, so will its sphere of influence. Anyone can be an educator within informal learning, and it is essential going forward that all of society hold on to this notion as not continue the marginalization of people and their knowledge.

Why is informal education important?

According to researchers, the importance of informal learning is like the topic itself: immense. Research shows that humans only spend 9% of their lives learning from formal education, which means that around 91% of their life is spent out in a world filled with informal educational opportunities (Bell, Lewenstein, Shouse & Feder, 2008). Taking advantage of these opportunities can be highly significant to childhood development and has many benefits. Although informal education rarely makes someone an expert in the traditional or formal sense, it does have the ability to leave a learner with a greater motivation to continue future learning (Falk & Dierking, 2012). It is also stated that informal learning of any subject allows one to build off their formal education and create a better understanding of the topic. The National Science Board even cites informal education as one of the three integral pieces of the U.S. education system, the others being K-12 and higher education (Bell, Lewenstein, Shouse & Feder, 2008). Informal learning has also shown to help growth in social and cultural contexts, allowing kids to learn skills such as teamwork, socialization, understanding, and compassion as well as a semblance of self-worth to society (Jeffs & Ord, 2018). Bell, Lewenstein, Shouse & Feder state that experiences in informal learning environments such zoos or museums are not so much about knowledge gained, but about broadening the notion of learning for children, this might not increase content knowledge but produce "…experiences, environments and social interactions that provide strong connections to pull people of all ages and backgrounds toward greater

scientific understanding, fluency, and expertise" (2008, p.42). This concept, in turn, could lead to interests turning into passions, which could continue into the higher education and professional world development (2008, p. 12). Falk and Dierking have also stated that informal education opportunities have the potential to significantly influence children's future career choices within the sciences (2010, p.490). Knowing that the literature shows informal education as necessary to the overall development of children, one must now look at another form of learning, called environmental education, which helps put into context the wants and needs of learners regarding the Junior Ranger booklet and NPS.

Environmental Education

Informal environmental education (EE) is "…used in parks and other natural areas to communicate information, spark interest and provoke reflection…intended to persuade visitors to engage in resource protection behaviors" (Powell, Vezeau, Stern, Moore and Wright, 2018). EE uses many of the same ideals and considerations as informal learning (Bourque, Houseal, Welsh & Wenger, 2014), and as such, will touch on many of the factors already discussed previously. Although EE does not cover all the topics of education within the NPS, it is a keystone for the NPS mission and the goals of the Junior Ranger program.

Best Practices of Environmental Education

Like Informal learning, EE is a widely varying aspect of the educational world, and its primary goal is to inspire learners toward environmental stewardship. To complete this goal effectively and enjoyably, the North American Association for Environmental Education (NAAEE, 2017) created guidelines for best practices within the field. Produced by hundreds of

researchers, theorists, and practitioners within the EE community (Stern, Powell & Hill, 2014), the result was a set of consensus-based guidelines for field-wide best practices:

1. **Fairness and accuracy**: EE materials should be fair and accurate in describing environmental problems, issues, and conditions, and in reflecting the diversity of perspectives on them.
2. **Depth**: EE materials should foster awareness of the natural and built environment, an understanding of environmental concepts, conditions, and issues, and an awareness of the feelings, values, attitudes, and perceptions at the heart of environmental issues, as appropriate for different developmental levels.
3. **Emphasis on skills building**: EE materials should build lifelong skills that enable learners to address ecological issues.
4. **Action orientation**: EE materials should promote civic responsibility, encouraging learners to use their knowledge, personal skills, and assessments of environmental problems and issues as a basis for environmental problem solving and action.
5. **Instructional soundness**: EE materials should rely on instructional techniques that create a productive learning environment.
6. **Usability**: EE materials should be well designed and easy to use.

All these principles, when applied correctly, should be able to reach all ages with minor tweaks to the content being presented (NAAEE, 2017).

In order to achieve these ideals within EE programming, the NAAEE also identified key features to be included. These characteristics are active participation, hands-on observation, and discovery, place-based learning, group learning, play-based learning, investigation, guided inquiry, personal inquiry, data collection, reflection, issue-based learning, learner-centered

instruction, multimodal delivery of content and multiple points of view. These features will not only help with practical knowledge of EE, but also evoke an emotional response as well, which studies have shown to be a critical factor for effective EE programming (Stern, Powell & Hill, 2014).

It is also vital for EE programs to create a holistic experience when teaching, as this creates a complete and straightforward story between the complexities of EE. This comprehensive experience can also carry a higher potential when understanding the relevance of activities completed, which in turn can lead to future reflection and further pursuit of the topics at hand (Stern, Powell & Hill, 2014). This aspect of future pursuit is one the NPS struggles with and will be discussed in more detail in the next section.

Although in practice, these characteristics and ideals can create impactful EE programs, studies have shown that there is a disconnect between these EE elements and educator follow-through. The resources for best practices have been created, but because of a multitude of constraints, including but not limited to, a lack of theoretical understanding, free time for research, and formal training with experts on the topics at hand (NAAEE, 2016). These limitations are magnified by the fact that both museums and the NPS rely heavily on volunteers and seasonal employees. While permanent employees have the time to overcome these constraints, volunteers and seasonal employees are hampered by a lack of time and the intensity of work when they are active; because of this, some educators lack the full understanding of how or why these elements work within their programming. It is also of note that most EE programming looks to either focus on knowledge gain or behavioral change; it is of great importance and future research that educators try and fuse the two areas of interpretation as this

will help further the goal of EE and improve the environmental problems at hand (Stern, Powell & Hill, 2014; NAAEE, 2016).

Gaps within research and literature regarding environmental education

The connection between the NPS and Environmental Education, is of course, paramount regarding interpretative plans (Powell, Vazeau, Stern, Moore & Wright, 2017). Even within historic sites and parks, the ideals of preservation and protection still connect the NPS's mission, EE, and educational goals (Bourque, Houseal, Welsh & Wenger, 2014). Although these principles and plans have been around for over a hundred years within the NPS and other small environmental organizations, still very little is known about their continued impact on youth and families.

In a review of three of the top academic journals related to EE from 1994-2008, only 30 articles within the past 15 years have analyzed EE practices and programs. Three of these articles were research papers that discussed pilot programs, six of them were considered "how-to" pieces on EE evaluation, and the remaining 22 reported on program evaluation. Even within these 22 articles, many were missing program objectives, evaluation design, recommendations, and impacts (Carleton-Hug, Hug, 2010). This lack of evaluation creates a gap between educators, learners, and the environment. Without knowing what works and does not, most of these programs will miss opportunities for improvement and modification, which in turn can prevent a meaningful connection between learners and the resource (Bourque, Houseal, Welsh & Wenger, 2014; Carleton-Hug, Hug; 2010; Jeffs & Ord, 2018).

The National Education Council was created by the NPS as a non-governmental entity to examine education and interpretation within the parks. This organization found that many sites

suffer from inaccurate, inaccessible and outdated programming; this issue was stated as detrimental to not only informal childhood learning but family learning as well (Bourque, Houseal, Welsh & Wenger, 2014).

Fortunately, the NPS knows that educational practices and understandings must shift to continue the NPS mission and successful EE programming (NPS, 2012). In *A Call to Action: Preparing for a Second Century of Stewardship and Engagement* the park service outlined 39 areas for improvement. One of the common themes found throughout the report was education and the need for the NPS to improve and become a leader in EE education (Bourque, Houseal, Welsh & Wenger, 2014; NPS, 2012). Although little has been done in the last few decades for examining EE, the self-evaluation of the NPS and want to change shows a promising first step toward following through with EE best practices and evaluation of programming.

Implemented Best Practices of Informal Learning, EE and Visual Design

In order to see how these educational theories work in the modern world, this section will focus on the implementation of these best practices in varying situations; specifically, worksheet/booklet modeling and visual design.

Worksheets and activity booklets as forms of effective informal learning

One area of learning that blends both informal and formal learning objectives but can be useful in a multitude of situations is a worksheet or activity booklet. Since almost no study of the Junior Ranger booklet has been done, this literature will focus on field trips and their use of worksheets. This comparison is being used since it shares a multitude of factors, including an informal setting such as a museum or park, the use of a worksheet or booklet as the primary form of learning, and the relationship of a chaperon/guardian being involved.

When visiting a park or museum, parents bring their kids to these destinations so that they can have a meaningful experience, one filled with learning opportunities (Bourque, Houseal, Welsh & Wenger, 2014). Studies have also shown that a teacher's reasoning behind a field trip and the connected worksheet is for the kids to have a learning experience outside of the classroom, but one that feels less like a formal experience. Teachers also saw the worksheet as crucial to the overall learning experience, and most teachers felt without it, their students would learn very little (Kisiel, 2003). The use of worksheets in an informal setting can be used for a multitude of reasons; one of these is to help guide learning in an unfamiliar or confusing learning environment. If a child feels over-stimulated or lost, a worksheet or booklet can help direct and guide their visit and potential learning (Kisiel, 2003). A chaperon or parent might also use these worksheets to help build upon a child's interest in a subject they know little about or have never heard of (Krombass & Harms, 2008). Directing children in this way is not as forced or demanding as reading a textbook or doing a project on the same subject, which hopes to follow the mantra of "learning without knowing it."

Other studies have also shown that field trips and partnered materials cannot only guide learners through new subjects but also reinforce pre-existing knowledge. If done correctly, prior interest or understanding can be quantified by a successful field trip experience and lead to positive attitudes or increased motivation toward the topic of study. This increased inspiration causes the creation of strong, lasting memories that not only create a positive correlation between learning and the visited location; but the potential for lasting support either as a return visitor or continued enjoyment in the area of study (Storksdieck, 2011). One of the primary goals of EE is to increase continued stewardship of the earth and its resources. If done correctly, field trips can spark this ideal in participating learners (Powell, Vezeau, Stern, Moore and Wright, 2018).

It should be noted that worksheets if done incorrectly, can have a "textbook" like feel to them and can turn children off to learning in these situations (Kisiel, 2003; Krombass & Harms, 2008). Worksheets that ask a lot of close-ended questions rely on information being found via labels, and involve less social interaction, and require minimal personal exploration are considered "Survey agenda worksheets" (Kisiel, 2003). This type of worksheet has been found to help with testing and curriculum-based assessment but has a negative effect on a child's overall experience and can shut them off from further learning (Kisiel, 2003; Krombass & Harms, 2008).

If a worksheet or booklet is to be a useful learning tool, then one must use a structure that encourages free exploration of a space, gives children choices in either their answers or activities, provides guidance to children unfamiliar with the environment, encourage social interaction with peers or adults and focuses on important key concepts which can lead to post-visit self-exploration (Krombass & Harms, 2008). This form of worksheet is known as a "Concept agenda worksheet" and is generally considered more effective at conveying a meaningful learning experience; one that leads to further interest in a topic later after their visit to the park or museum (Kisiel, 2003). This ideal of further learning is one the NPS has struggled to convey, and although kids taking part in the Junior Ranger program have shown immediate interest and understanding, the ability to continue this interest after leaving the park seems to be lacking (Vezeau & Stern, 2010). Concept agenda worksheets although more effective in certain situations, still have their drawbacks. Most notably, if the worksheet is too vague and has less site-specificity, the child can become confused or lost, ultimately making the worksheet an obstacle to learning (Kisiel, 2003).

In order to combat this confusion and further enhance the learning experience, the teacher/chaperon or parent should be a focal point of any visit. It is important to note that in both the worksheet literature and NPS focused literature; the parent/chaperon is key to helping enrich a child's experience with a worksheet or booklet. The reasoning behind this is that chaperones and parents can further direct learning, help when needed, and create a closer relationship between families or workgroups (Kisiel, 2003; Bourque, Houseal, Welsh & Wenger, 2014). Teachers and parents also come to a museum or park with their own agenda, and because of this can be the key factor in deciding how learning is dictated before it even starts (Kisiel, 2003).

Researchers for both case-studies showed that the use of worksheets had positive effects on helping children learn in an informal environment. Whether this was more quantitative results like in Krombass and Harms Austrian study, which showed that worksheets helped with later testing in school; or in the case of Kisiel, showed the more qualitative effects of worksheets in that they can inspire children and hopefully lead to further interest. If all these factors are considered, worksheets and booklets can become another tool of informal learning, one that bridges a gap with formal learning but does so in a less structured and curriculum-based way.

Importance of Visuals for Learning

One area of education that can be overlooked because it is not initially considered pertinent to learning, is visual arts. Learning about certain subjects like science or history, when combined with illustrations and color page design can help with interest and understanding for the learner. Each Junior Ranger booklet has its own visuals and art direction, some are simpler and use clip art, while others like Kenai Fjords used a scientific illustrator to create a booklet that looks more like an old naturalist journal with sketched drawings and full-page illustrations. This vast array of drawings, pictures, and photographs again stems from the individualistic nature of

the Junior Ranger program. Each park has a different budget and artistic talent to pull from; some can create the book completely in-house or use their budget/grants for other educational professionals to develop. If a park has the ability or budget, it could be in their best interest to invest in a more skilled artistic layout for their book.

The use of colorful and engaging illustrations has shown to help with learning in not only children but adults as well (Roche, 2015; Tyler & Likova, 2012). From a purely aesthetic and artistic standpoint, illustrations like those found in children's books can help inspire children in their artistic work. This also lets them visualize topics of learning, such as the water cycle or envisioning what an elephant looks like (Roche, 2015; Libresco, Balantic & Kipling, 2011). As children, our first understanding of certain topics does not come from the words on a page, but of the illustrations connected with them. To use the water cycle again, even some adults still visualize the water process as a cycle with arrows surrounding pictures of clouds, groundwater, and rain, some illustrations become so ingrained in our understanding that it becomes easier to use pictures for learning, then words (Roche, 2015; Dhanapal, Kanapathy & Mastan, 2014).

Visual arts and illustrations can also help children tackle new or difficult content, whether this is politics or molecular biology (Libresco, Balantic & Kipling, 2011). Concepts that are hard to discuss or even ones with varying answers depending on your perspective can be made easier for children to digest through picture books or illustrations. This way of learning takes the pressure off the guardian or teacher in regard to explaining the complexity of these issues and allows children to make their own connections through words, art, and activities (Libresco, Balantic & Kipling, 2011).

Art and illustrations can also draw children in initially, a colorful or eye-catching display can start the learning process. A book with attractive visuals can grab a child's attention, the

aesthetic value of the book creates a sense of importance within the learner's mind and makes them more willing to start and continue a learning experience (Roche, 2015). It is important to note that because of the wide variety of child interests and aesthetic styles, some children might find the chosen art direction not as appealing, which could be a mental roadblock with learning. Still, if this aesthetic difference is not too jarring, the obstacle is seen as minor (Roche, 2015).

Visual arts can also create motivation to learn on a cognitive level, in a study done by the Smith-Kettlewell Brain Imaging Center, art when combined with other subjects such as science, form "…a multidisciplinary communicative system, the arts provide an ideal platform for learning about the pleasure of knowing, which in turn provides the motivational inspiration to explore further, to ask questions, analyze and synthesize, and engage in convergent and divergent thinking" (Tyler & Likova, 2012, p.3). It is also important to note that on the cognitive level, connections between science, art, and goal-directed behaviors greatly increase inspiration within children. This inspiration helps lead to greater emotional reward and a sense of pride in their work or accomplishments (Tyler & Likova, 2012). Another study in Malaysia showed that visual art is not only important for promoting higher thinking skills and cognitive development, but helping with self-expression and self-esteem. The study goes on to explain that these proficiencies are crucial later life skills and when consistently encouraged, could lead to students with a higher understanding of art and science (Dhanapal, Kanapathy & Mastan, 2014).

The relationship between visual art and subjects like science is becoming increasingly important not only for factual understanding, but inspiration and cognitive development. These studies strengthen the idea that visuals should be used not only in the Junior Ranger program but also in other aspects of formal and informal learning. Eye-catching visuals on a page can help reinforce the eye-catching scenes that can be found in the National Parks.

Implications of the Literature

This literature summarizes some key aspects of informal education and examines strategies for designing learning materials for children. Informal learning represents the majority of our learning encounters in life and relies on the learner guiding the experience. Unlike formal education, informal learning is very personal, considers multiple perspectives, and can continue even after the initial involvement. EE learning follows along the same vein but also emphasizes skill-building, action, and environmental awareness and empathy. Both areas of education want learners to reflect and continue their interests in a topic. Worksheets and activity booklets, shown to be effective tools in environmental education programs and field trips, highlight ways to offer guided inquiry that help build a personal understanding of a topic. It was also shown that appealing and catching visual designs also help learners express themselves and help children learn with greater interest and retention.

All these factors contribute to the design of an education booklet that helps foster a learners personal interest in environmental topics. The Junior Ranger program, when using these best practices effectively; creates not just a booklet, but a tool for children to use at a park site like Mammoth Cave. Instead of objective questions and tests of knowledge, the booklet has the potential to create a personal journal where the children not only learn but express themselves and the things they enjoyed. This ideal, in turn, creates a more significant potential for continued learning and inquiry, which are the ideals of successful informal learning and EE.

Chapter Three: Process and Deliverables

Host Site Background

In order to effectively create a Junior Ranger booklet using informal learning and EE best practices, it was crucial to find a host site that would implement the deliverable. Although more general knowledge Junior Ranger booklets had been published by the National Junior Ranger office, I wanted to work on a smaller scale and create a book for a specific park site. These parameters would allow me to work closely with park staff, community members, and pursue topics with a greater sense of detail. To narrow down which park sites would be contacted, I examined the Junior Ranger materials of over one-hundred and thirty-six park sites. From this initial review, I chose park sites that either lacked a Junior Ranger booklet or surmised that the current booklet was over ten years old and used certain repetitive activity pages such as word searches or crosswords.

A total of six park sites were chosen as potential host sites and were sent a detailed email about the project. Those six park sites included Golden Spike National Historical Park (Utah), Hawaii Volcanos National Park (Hawai'i), Mammoth Cave National Park (Kentucky), Mesa Verde National Park (Colorado), Wind Cave National Park (South Dakota), and Charles Young Buffalo Soldier National Monument (Ohio). Out of those six sites, Mammoth Cave National Park was selected for its responsiveness to the project and my understanding and background with the area and cave environment.

Mammoth Cave National Park protects not only the world's longest recorded cave system with over 400 miles of mapped passageways, but also 53,000 acres of pristine forest. This limestone cavern rests in the Kart and Sinkhole Plains of Eastern-Central Kentucky and is a

natural wonder above and below ground. The cave was designated a National Park in 1941 and a World Heritage Site in 1981. The geological history of the park is well known, and the mammoth-sized passageways found hundreds of feet underground is why it became so famous. Although the geological features are well known, the human history and biological diversity of the park are sometimes forgotten about. Human interaction with the cave stretches back thousands of years, with the first peoples entering the cave, and has continued up into the present day. People have used the cave for gypsum, saltpeter, medical experiments, and even tours. The biological diversity in the park also includes dozens of endangered or threatened plants and animals, along with some species only found at Mammoth Cave, like the Kentucky Cave Shrimp. The park receives over half-a-million visitors a year and runs hundreds of tours to accommodate the ever-growing demand (MACA, 2019). These factors, as well as the park employees' desire for a new Junior Ranger booklet, made Mammoth Cave a perfect fit for this project.

Process

The purpose of this thesis project was to create a new Junior Ranger (JR) booklet for Mammoth Cave National Park, one that uses informal education best practices and community input. This new book was created to better utilize the park holistically, create new engaging activities, and produce a meaningful product geared toward the next generation of park visitors. The completion of this thesis project took place in four phases, as outlined in *Table 1*.

Timeline of Activities

Timeline		
Phases	**Activities**	**Dates**
Phase One: Junior Ranger Booklet Collection & Research	• Contacting and Receiving of JR booklets from park sites • Analyzing of JR booklets • Research of Literature	Summer 2019-Fall 2019
Phase Two: Host Site Visit	• Contacting of the host site • Site visit of MACA and contact of community partners. • Research of park resources	Fall 2019-Winter 2020
Phase Three: Theme of Book and Activity Drafts	• Hand drawn draft of pages and themes • List of Illustrations • Drafts sent to MACA for content edits • Contact of illustrator	Winter 2020
Phase Four: Digital Booklet Creation	• Transfer of drawn drafts/illustrations to Adobe Illustrator© and InDesign	Winter 2020-Spring 2020

Table 1

Phase 1: Junior Ranger Booklet Collection & Research

The first phase of my thesis project was to obtain an extensive collection of Junior Ranger booklets, from numerous park sites spanning across the entire country. This collection of the source material was significant for two reasons. One was to review and analyze the JR booklet from a broad spectrum of park sites, to gain a clear understanding of book quality, activities provided, and topics covered. The second was to create a starting point for finding a park that needed a new booklet, whether this was because the booklet was outdated, lacked the comprehension of park resources, or had never had a JR booklet before. In order to quickly and effectively collect these booklets and stay within the realm of understanding regarding the NPS, booklets were only collected from NPS sites. Educational material was not obtained from local, state, or even other federal agencies to stay within an agreeable workload. The massive undertaking of collecting and analyzing these booklets also limited the number of park sites I

contacted as I felt obtaining and examining all 419 sites educational materials would be too much of an enterprise for this thesis alone.

Instead, 145 park sites were contacted via email; almost all park sites got back to me within a month and either sent me their Junior Ranger booklet or directed me to an online version. In total, 136 booklets were collected. I then spent several months going through each booklet and noting activities, wording, or themes based on the research I had completed for my literature review.

The critical observations made about the 136 booklets revolved mostly around repetitive activities, and design/layout of books. Out of the 136 booklets reviewed, 108 (79%) had a crossword, word search, maze, connect-the-dots, or a combination of the four (see Appendix A). Without a substantial evaluation as to why these activities are put into the work booklets, it is hard to accurately conclude why they are so prevalent. What we do know is that there is no substantial evidence proving these activities are beneficial in helping reach meaningful learning goals, especially those affiliated with informal learning. Younger children might use connect-the-dots for learning numbers, but we wanted to make the activities in this book different then what they might see in a formal classroom. Therefore, most closed-ended activities such as multiple-choice questions, word searches, or crosswords were left out of the creative process. The new booklet for MACA was not to include a crossword, word search, maze, or connect-the-dots activity and instead focus on new or more engaging activities backed by informal learning practices.

As stated before, the Junior Ranger program is organized mainly from park to park, and it is up to the administration to create and run the program. This individuality leads to a wide variety of booklets being produced. Some are more simplistic and use Microsoft Word and

clipart, while others contract out the creation of the booklet or use a photoshop program for visual aspects. As the research has shown, visual design and their impact on learning are especially important when peaking children's interests; for this reason, I recommended that MACA fund an independent illustrator.

This phase of my project was not only academically crucial for understanding the themes and activities of certain booklets, but also helped contribute to my overall understanding of the NPS and JR program. Without this collection of data, I would not have had the detailed insight to choose a deserving host site effectively and might have spent many wasted hours contacting dozens of park sites who did not require such a resource. This collection of booklets also become crucial later in my thesis project, as it coalesced into a resource for both myself and community members to use when searching for creative inspiration regarding page layout and activities.

Phase 2: Site Visit

A conference call was set-up in November 2019 with both Dave Wyrick Chief of Interpretation and Kathy Profitt Head of Program Services at MACA. During this meeting, key features about the booklet design were outlined. The park would request a grant to fund the printing and artwork for the book. Although the page layout in Adobe Illustrator would be completed by myself, the hand-drawn illustrations throughout the book would be contracted out to a scientific illustrator to fully achieve the goal of a booklet with visually engaging artwork.

It was also made clear that the booklet pages should have participants venture out into the park or exhibits of the visitor center. The old booklet, which was created in the late '90s or early 2000s, allowed kids to complete the activities without physically discovering the park or getting outside. The new booklet focused on the kids exploring the park for answers and inspiration. It

was also important that any activity asking learners to venture out into the park could be completed on fully accessible trails (paved and lower inclines). I also emphasized the idea of co-creation throughout the book; this included both park service employees and affiliated tribes. Since I do not work at the park, it was important for me to use the knowledge and experience of people who worked and had a personal connection with the park resources.

Since I had not visited the park since the early 2000s, a park visit was scheduled from January 18-25. During this visit, I meet with park staff, including members of their Junior Ranger committee and outreach team. I also went on all available cave tours, examined and walked all visitor center displays/paved trails, and researched topics of interest using the park's library. As part of my visit, I also brought along the Junior Ranger booklets I had collected over the past months and allowed for employees to read them at their leisure if they found something they enjoyed or didn't like in one of the books, I asked that they make a note of it and place it on the page. Although this activity did not yield substantial results, I had many in-person conversations with park employees who told me what they would like to see in a new booklet and what did not work in their old one. Park staff were still encouraged to send suggestions for page design via Dave Wyrick and take part in the editing of later draft pages.

Figure 1 Park Entrance Signage MACA

In keeping with the central theme of co-creation, I was also put in contact with members of the Chickasaw Nation, which historically has a connection with the Mammoth Cave area, but is now based in Oklahoma. Through email, I communicated with both Adam Drannon, Senior Manager of Research and Cultural Interpretation, and LaDonna Brown, Director of Research and

Cultural Interpretation for the Chickasaw Nation. I asked what they as a community would like to see represented in the new booklet. It was important that a holistic view of Mammoth Cave was shared with the public and emphasized that the native voice is not in the past, but still present and important within the realm of informal learning. Although the Chickasaw Nation played a critical role in the creation of a specific page within the booklet, it is also important to note that many different cultures and peoples were thought of when creating these activities. Stressing the idea of multiple ways of knowing is an important ideal of informal learning. Since I cannot experience the lives and history of the many different people who visit this park, it was important to ask them for their help and acknowledge them within the creation of this booklet; as their experiences and understanding helps create a more holistic booklet (See Appendix E).

This week-long exploration into the park was invaluable to the creation of this new booklet, the ability to meet with so many park staff, hear their opinions, comments, and concerns helped create a starting point for what they wanted to see in their new booklet. The resources and tours I had at my disposal also made it effective when sketching out pages and including information specific to the park. After all major research had been completed, draft page designs and illustrations took form.

Phase Three: Booklet and Activity Draft

The next phase of the project started during my visit to MACA in January of 2020 and was completed by early March of 2020. This phase centered around creating hand-drawn draft pages for the booklet, using research from the literature, other Junior Ranger booklets, and a visit to MACA. Scientific illustrator Luke Schutzman was also contacted at this time and offered a contract to draw the 38 illustrations needed for the activity pages, as well as the front cover of the book. A total of thirteen activity pages were created, as well as a Junior Ranger certificate for

the back of the book (see Appendix B and C). The front cover of the book was completed by the Luke Schutzman and then finished up in Adobe Illustrator, the guidelines and rules page were also left out and created later in Adobe Illustrator as well.

It was decided that thirteen activity pages allowed for a modicum of choice for even the older participants, as not all pages had to be finished in order to receive a Junior Ranger badge and signed certificate. Thirteen activities also allowed for a large variety of topics to be covered without feeling over or underwhelming and made sure to cover subjects pertaining to many aspects of the park, not just the cave. It was crucial that the pages created followed informal and environmental education best practices and so each page made sure to focus on several different elements regarding these essential forms of learning (see Appendix D). The key of this booklet was to create a tool that felt like a personal journal, with the activity pages acting as a subjective experience to the wide range of topics covered. For this reason, almost all pages have activities that rely on the children's personal thoughts, feelings, and experiences to complete. This theme makes each booklet unique and gives children a sense of ownership to the booklet and, hopefully, the park.

Several park sites had created two different booklets depending on their age range, with each age range having different or simplified versions of the activity pages. It was decided that MACA would only have one booklet made for all age ranges and, depending on their age, would have to complete so many activities. The pages themselves were crafted with a 4th-grade reading level in mind. More advanced definitions were underlined and explained to help with an understanding of the topics at hand for younger children or those whose first language is not English. The pages were also designed so that either younger kids would complete the book with

the help of their guardian, creating a family learning opportunity or older kids could complete them and still obtain a sufficient amount of challenge, enjoyment, and knowledge.

The overall artistic theme of the booklet was that of a naturalist journal, one with hand-drawn pictures and pages with a worn, notebook appearance. A major inspiration for this thematic direction was the Explorer Journal, which was created by Amy Ireland and Liza McElroy for Kenai Fjords National Park. The booklet was made for participants 13 & Up, but the artistic style taken is that of a naturalist journal, full of faux taped pictures and notes; it gives the appearance of a journal created by hand and over time (See Figure 2). It was decided to base the new booklet for MACA off this artistic theme since it was unique from other books found in the NPS, matched the style of the illustrator contracted out, and received positive reviews by many of the employees at MACA. We also wanted the book to limit text and covey the instructions or small facts effectively. A large amount of text can be off-putting and create a loss of interest in the activity; the booklet wanted to emphasize the activity itself, visuals, and the child's input.

Figure 1 Page from Kenai Fjords "Explorer Journal"

After the initial pages were drafted, they were sent back to MACA in a digital scan for their review and edits in February. Along with Dave Wyrick, the pages were reviewed by several park staff from different departments, including cultural resources and outreach education. Their edits mostly consisted of grammatical corrections and rewording of certain informational content (see Appendix B).

This portion of the project was crucial to the overall creation of the deliverable as it provided a tangible prototype for both MACA and myself to collaborate on productively. These pages allowed for ideas, artistic themes, and content to be sketched out before a final digital copy was created. Like a rough draft of a paper, these pages were meant to be peer-reviewed and helped further visualize the activities and information being presented. Without these original sketches, it would have been difficult to create the pages directly on Adobe Illustrator as only a vague understanding of the themes and activities was known at the time. These sketches became the crucial foundation and scaffolding for the booklet and would become a guiding force during the digital design process. After the edits and feedback were sent back, a final illustration list was sent to Luke Schutzman and the process of taking the drawn drafts and transferring them into Adobe Illustrator began.

Phase Four: Digital Booklet Creation

The final phase of this project started in March of 2020, ending in April of 2020 and consisted of taking all edits in addition to drawn page layouts and converting them into a digital medium on Adobe Illustrator. The main purpose behind this phase was three-fold and was done primarily so that Mammoth Cave had a digital copy of the booklet for easy printing and distribution. The creation of a digital copy using Adobe Illustrator also allowed for dynamic artboards using a multitude of resources such as pictures, digitized illustrations, vector images, and a variety of fonts. Finally, the digital version of the book allowed for easy alterations and edits to be made without having to redesign or start over completely with a new artboard.

Since I had minimal experience using Adobe Illustrator, I used online video tutorials and small informal class sessions with Brooke McCulloch, a peer with considerable experience in digital design and Adobe programs. Thanks to these learning sessions, I was able to create the

booklet pages in the themes and detail I had envisioned through phase three. Key changes made between the physical sketches and digital design centered around minor page elements such as faux sticky notes and taped scrap paper. These elements usually had secondary information regarding the subject being explored and were considered "fun facts" for learners to read but were not immediately crucial to the understanding of the activity page. During the digital creation of these pages, it was realized these secondary elements crowded the page and took away from the critical information being interpreted. For this reason, some but not all secondary information was either removed or moved to another activity page. Part of this phase was also the creation of the front cover, instructions page, and Junior Ranger certificate on the back of the book. These three pages did not receive draft sketches as they were considered either non-crucial or needed major illustration elements to complete and so were produced directly in Adobe Illustrator. The only aspect of the digital booklet that was not completed were the hand-drawn illustrations contracted out to Luke Schutzman. At the time of the booklet's digitization, only a handful of illustrations by Mr. Schutzman were finished and added to the layout.

The skills learned within this phase about Adobe Illustrator, and more so digital design will be invaluable as a professional going forward. The phase of the project was considered one of the most important tasks throughout this thesis project. Without it, MACA would not have been able to print the booklet, and the overarching theme would not have been shown effectively without the tools available in Illustrator. When this project began back in early 2019, this was the end goal in mind, and except for a few delays, the project itself came out as envisioned.

The Final Product

Although, the booklet itself was not in its final state when this manuscript was written, the overall theme and illustration work completed to this point was precisely what was proposed

back in the winter of 2019 and in the coming months will be sent back to MACA as a complete booklet. The digital version of the booklet can be found in Appendix C, and although not all illustrations are present, much of the project can be understood and evaluated. The final product given to MACA was a completely new Junior Ranger booklet, one backed by informal and EE best practices and co-created by employees and members of the Mammoth Cave community. Each activity strived to educate learners on a particular topic specific to the Mammoth Cave area; it encouraged individuals and families to venture out into the park and learn together through their personal experiences. The deliberate crafting of each activity and theme was crucial to set a new precedent within the Junior Ranger program. Hopefully, this project will push the boundaries of educational materials at the park and eventually the NPS.

Since this project was not fully ready for print at the time of this writing, it is of the utmost precedent that a final copy of this digital booklet is sent to MACA with all illustrations and in an easy and ready to print format. I hope that one more round of peer-reviewed edits can be made before the final version of the booklet goes out and that everything is checked off and approved by Dave Wyrick and his team. I would also like to print-up a guideline for the book not only showing the appropriate answers for activities that are objective, but also tips and prompts that might help spur a conversation between the learner and the ranger checking the booklet. As the research has shown, it is essential to have not only an effective learning resource, but also a guide or educator that is passionate and willing to encourage the interests of the learner.

Although it is difficult to know when the National Park Service will again be fully operational, my project and deliverable have already been set-up for success in the coming years. MACA has already received a grant from their gift store partner Eastern National, that will pay not only for the illustration work done by Luke Schutzman but also to pay for the printing cost of

their new Junior Ranger booklet. In order to keep the Junior Ranger program sustainable at MACA, the book will also be sold for a small monetary sum in their gift shops and will hopefully allow for further printing and publication for the foreseeable future. I hope that this booklet not only becomes published but also has a continuing impact on the thousands of children who come to Mammoth Cave National Park each year.

Chapter Four: Reflections and Implications

The purpose of this project was to create a new Junior Ranger booklet for Mammoth Cave National Park, one grounded in informal and environmental education best practices, co-creation, and commanding art direction. This booklet was created to replace MACA's older Junior Ranger booklet and create an educational resource tailored toward the next generation of park visitors. The booklet looked to replace ineffective and overused activities like crosswords and word searches, with those centered around the learner, relying on their personal experience with the park resources. The artistic direction of the booklet also was designed around visually captivating the learner, helping them pique their interest in the covered topics and stimulating their thought processes and imagination. The use of employee feedback and Chickasaw Nation perspectives also allowed for a holistic approach to the park resources and activity pages created. These themes will help build relationships with displaced peoples and bring up topics or ways of learning not touched on frequently by a traditionally white learning curriculum. It also creates a sense of proposed ownership with park employees who might feel that since the booklet was not designed at MACA, it lacks the depth of resource knowledge or a personal connection to the park site. All these factors helped create a booklet that hopefully raises the bar for what the Junior Ranger program can accomplish not only at Mammoth Cave but within the National Park Service.

Reflection

This project has done more for my insight into informal educational theory then over ten years of working in the field. The in-depth and detailed research allowed me to gain a hold of a subject I had spent years working in, but did not fully understand. This newfound knowledge has not only helped me hone my skills as an informal educator, but better understand the choices I

make when crafting educational material. This project helped reinforce my passion for informal and environmental education, as well as pushed me toward the goal of becoming an expert in this field of study. My hope is to continue educating children and adults alike on a variety of topics, creating the spark for future exploration and passion.

I also gained an appreciation for the logistical and administrative side of the NPS. I had worked in the frontline interpretation side of the park service. I never had to deal with the back of house areas of the NPS, including the acquisition of grants, project funding, inter-department communication, and park site partnerships. Through this project, I was also able to continue my networking and relationship building within the park service, meeting several new people, and building connections I hope to last for future projects.

Finally, the acquisition of new skill sets, involving Adobe Illustrator and digital design, only increased my desire to learn more and use these programs in future educational projects. The tools available in Adobe Illustrator open a new avenue of crafted educational materials, ones that are more dynamic and visually appealing. I hope to continue learning about these programs and eventually use them as a major part of my professional career.

Implications for Host Institution

MACA, from the very beginning of this project, wanted learners to get out and explore the park, even if they were not able to go on a cave tour. They also wanted to highlight the other resources this park has to offer and make sure everyone, no matter their capabilities, can learn and have fun within its boundaries. Out of the 13 activity pages, over half of them require exploring the park in search of answers, although not all the pages needed to be completed, it makes it very difficult to finish this book without exploring something other than the cave.

Through this process, a multitude of future implications could be made for Mammoth Cave. Mammoth Cave could re-evaluate some of their learning materials using this project and paired thesis manuscript, allowing them to update or upgrade other portions of the Junior Ranger program with a centralized idea of informal and EE best practices. Mammoth Cave could also use this opportunity to grow and expand their relationship with affiliated native tribes. The co-created page found in this new Junior Ranger booklet shows the potential for more learning resources based on native perspectives and ideas. This process would help MACA interpret the park resources using a more holistic approach and connect a greater audience to this unique environment. Furthermore, Mammoth Cave could evaluate the new Junior Ranger booklet to understand if the goals of the program are being reached more effectively and in a lasting, meaningful way. This evaluation would provide insight for changes or edits to the booklet, thus helping to achieve the goal of lasting ties between learners and park resources. The far-reaching implications of this book are hard to comprehend, and only time will tell if learners, traverse more trails, ask more questions and gain lasting memories from their own experiences. Thousands of children will complete this booklet every year until hopefully, a new version takes its place, only time will tell if this resource helps create the next generation of park supporters like it did for me so many years ago.

Implications for the Field

For both informal and environmental education, the success and implementation of this Junior Ranger booklet can help solidify best practices within the field. If an evaluation of the booklet can be completed, it also might help future practitioners modify what works and what does not when these techniques are implemented into the field. Not only can the National Park Service and the National Junior Ranger office use this resource as a framework for new

educational materials, but hopefully point to it as an example for other parks looking to rebuild their Junior Ranger booklet or program. This project was lucky enough to receive the funding it needed to reach all its planned goals/themes. Other parks with fewer resources allocated toward the Junior Ranger program can hopefully look to this project and change their perceptions of what a Junior Ranger booklet can be and the impact it can have on its visitors. This ideal in turn, could lead to larger budgets and more allocated time for this substantial NPS program. A final goal for this project is that it becomes a reference for future endeavors and helps the Junior Ranger program as a whole grow and adapt. Hopefully, projects like this change the mentality of the Junior Ranger program, and instead of keeping the program in divided self-sustaining sites, creates a merging of information and ideas that are easily shared across the country. This project has shown what the Junior Ranger booklet can be when designed meticulously, and with a clear goal in mind. This program inspired me to love nature and become a park ranger; it is now time to do the same for the next generation.

References

Bell, P., Lawenstein, B., Shouse, A., & Feder, M. (2008). Part 1: Learning Science in Informal Envionments. In *Learning Science in Informal Environments: People, Places, and Pursuits* (pp. 11–53). Retrieved from file:///C:/Users/Logan%20Wegmeyer/Downloads/Bell,%20Lewenstein,%20Shouse%20&%20Feder%20(2008).pdf

Bourque, C. M., Houseal, A. K., & Welsh, K. M. (2014). Free-choice family learning: A literature review for the National Park Service. *Journal of Interpretation Research*, *19*(1), 7.

Carleton-Hug, A., & Hug, J. W. (2010). Challenges and opportunities for evaluating environmental education programs. *Evaluation and Program Planning*, *33*(2), 159–164. https://doi.org/10.1016/j.evalprogplan.2009.07.005

Dadvand, P., Nieuwenhuijsen, M. J., Esnaola, M., Forns, J., Basagaña, X., Alvarez-Pedrerol, M., … Sunyer, J. (2015). Green spaces and cognitive development in primary schoolchildren. *Proceedings of the National Academy of Sciences of the United States of America*, *112*(26), 7937–7942.

Dhanapal, S., Kanapathy, R., & Mastan, J. (2014). A study to understand the role of visual arts in the teaching and learning of science. *Asia-Pacific Forum on Science Learning and Teaching*, *15*(2), 25.

Falk, J. (2001). Free-Choice science learning: Framing the discussion. In *Theoretical Framework* (pp. 3–20). Retrieved from file:///C:/Users/Logan%20Wegmeyer/Downloads/Falk%20(2001).pdf

Falk, J. H. (2012). *The Museum Experience Revisited* (1st edition). Walnut Creek, Calif: Routledge.

Falk, J. H., & Dierking, L. D. (2010). The 95 Percent Solution. *American Scientist; Research Triangle Park*, *98*(6), 486–493.

Federal/Provincial/Territorial Early Childhood Development Agreement Canada. (2002). *Early childhood development activities and expenditures, Government of Canada report*. Human Resources Development Canada.

Goodman, O., & Moyer, T. (2019, November 25). *Junior Ranger Central Office Meeting and Interview (WASA)* [Phone Interview].

Ireland, A., & McElroy, L. (n.d.). *Explorer Journal* (1st ed.). Kenai Fjords National Park.

Jeffs, T., & Ord, J. (2018). *Rethinking outdoor, experiential and informal education: Beyond the confines*. Abingdon, Oxon ; New York, NY: Routledge.

Kisiel, J. F. (2003). Teachers, Museums and Worksheets: A Closer Look at a Learning Experience. *Journal of Science Teacher Education*, *14*(1), 3–21. https://doi.org/10.1023/A:1022991222494

Krombaβ, A., & Harms, U. (2008). Acquiring knowledge about biodiversity in a museum—Are worksheets effective? *Journal of Biological Education*, *42*(4), 157–163. https://doi.org/10.1080/00219266.2008.9656134

Libresco, A., Balantic, J., & Kipling, J. (2011). *Every Book Is a Social Studies Book: How to Meet Standards with Picture Books, K-6*. Santa Barbara, California: Libraries Unlimited.

Mills, S., & Kraftl, P. (2014). *Informal education, childhood and youth: Geographies, histories, practices*. Houndmills, Basingstoke: Palgrave Macmillan.

NAAEE. (2016). *Early childhood environmental education programs: Guidelines for excellence.*

NAAEE. (2017). Guidelines for Excellence: Community Engagement. In *Guidelines for Excellence* (p. 172). Retrieved from https://cdn.naaee.org/sites/default/files/eepro/resource/files/community_engagement_-_guidelines_for_excellence_0.pdf

National Park Service. (2012). *A Call to Action: Preparing for a Second Century of Stewardship and Engagement* (p. 23). Retrieved from NPS website: https://www.nps.gov/calltoaction/PDF/C2A_2015.pdf

National Park Service. (n.d.-a). Junior Rangers | National Park Service. Retrieved June 5, 2019, from https://www.nps.gov/kids/jrrangers.cfm

National Park Service. (n.d.-b). What We Do (U.S. National Park Service). Retrieved June 7, 2019, from https://www.nps.gov/aboutus/index.htm

Nespeca, S., & Reeve, J. (2003). *Picture Books Plus: 100 Extension Activities in Art, Drama, Music, Math and Science*. Chicago, Illinois: American Library Association.

Powell, R. B., Vezeau, S. L., Stern, M. J., Moore, D. D., & Wright, B. A. (2018). Does Interpretation Influence Elaboration and Environmental Behaviors? *Environmental Education Research*, *24*(6), 875–888. https://doi.org/10.1080/13504622.2017.1339302

Ranger-Naturalist, (1937). W. G. H. (n.d.). *Yosemite Junior Nature School Notes*. 10.

Roche, M. (2015). *Developing Children's Critical Thinking through Picturebooks: A Guide for Primary and Early Years Students and Teachers*. New York, New York: Routledge.

Stern, M. J., Powell, R. B., & Hill, D. (2014). Environmental education program evaluation in the new millennium: What do we measure and what have we learned? *Environmental Education Research*, *20*(5), 581–611. https://doi.org/10.1080/13504622.2013.838749

Storksdieck, M. (2011). *Field Trips in Environmental Education*. BWV Verlag.

Tyler, C., & Likova, L. (2012). The role of the visual arts in enhancing the learning process. *Frontiers in Human Neuroscience*, *6*, 7. https://doi.org/10.3389/fnhum.2012.00008

Vezeau, Susan L, Powell, R. B., & Stern, M. J. (n.d.). *Stewardship 101: An Evaluation of the Great Smoky Mountains National Park Junior Ranger Program*. 16.

Vezeau, Susan Lynn, Powell, R. B., Stern, M. J., Moore, D. D., & Wright, B. A. (2017). Development and validation of two scales to measure elaboration and behaviors associated with stewardship in children. *Environmental Education Research*, *23*(2), 192–213. https://doi.org/10.1080/13504622.2015.1121377

Wyrick, D., & Profitt, K. (2019, November 21). *Mammoth Cave Thesis Expectations and General Information* [Phone Interview].

Appendix A: Collected Junior Ranger Booklet Analysis

Parks highlighted in yellow mean they did not have any of four common activities in their booklet. Parks highlighted in green did not have a booklet but a short quiz

Parks Contacted	Media Type	Crossword	Word Search	Maze	Connect the Dots
4th of July Celebration Junior Ranger Book (National Mall and Memorial Parks)	Print	Yes	Yes	No	No
Acadia National Park	Online	No	Yes	Yes	No
Adams National Historic Park (Age 9 & Up)	Print	No	Yes	No	No
Adams National Historic Park (Ages 6-8)	Print	No	Yes	No	No
Agate Fossil Beds National Monument	Print	No	Yes	No	Yes
Alaska Public Lands Information Center	Print	No	No	Yes	No
Alibates Flint Quarries National Monument	Print	No	Yes	No	No
Antietam National Battlefield (6 & Under)	Print	No	No	Yes	No
Antietam National Battlefield (6 & Up)	Print	No	No	Yes	No
Apostle Islands National Lakeshore	Print	No	Yes	Yes	No
Arches National Park	Print	No	No	Yes	No
Belmont-Paul Women's Equality National Monument	Print	No	Yes	No	No
Big Bend National Park	Online	No	Yes	No	No
Big Cypress National Preserve	Print	No	Yes	No	No
Big Hole National Battlefield	Print	No	No	No	Yes
Biscayne National Park	Print	No	Yes	No	No
Black Canyon of the Gunnison National Park	Print	No	No	No	Yes
Boston National Historical Park	Print	No	No	No	No
Bryce Canyon National Park	Print	Yes	No	Yes	No
Canyonlands National Park	Print	No	No	No	No
Cape Cod National Seashore	Print	Yes	Yes	Yes	Yes
Capitol Reef National Park	Print	No	Yes	No	Yes
Carlsbad Caverns National Park (6 and under)	Print	Yes	Yes	Yes	Yes

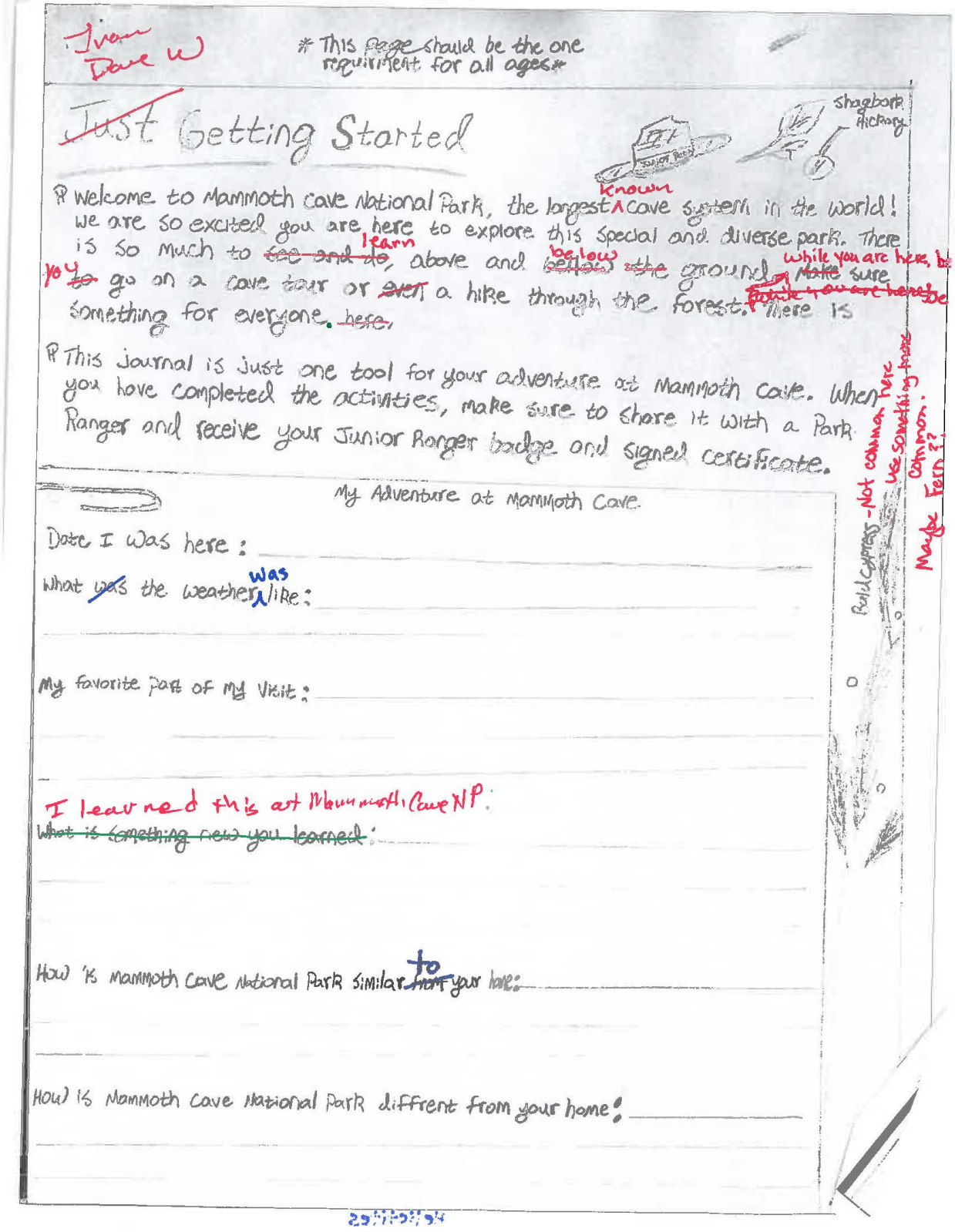
Carlsbad Caverns National Park (Age 13 & Up)	Print	Yes	No	No	No
Carlsbad Caverns National Park (Ages 7-12)	Print	Yes	Yes	No	No
Charles Young Buffalo Soldiers National Monument (Four Page Quiz)	Print	No	No	No	No
Corinth Civil War Interpretive Center	Print	No	Yes	No	No
Cowpens National Battlefield	Print	No	No	No	No
Crater Lake National Park	Print	No	Yes	Yes	No
Curecanti National Recreation Area	Print	No	Yes	Yes	No
Cuyahoga Valley National Park	Print	Yes	No	No	No
Death Valley National Park	Print	No	Yes	Yes	No
Delaware River Scenic and Recreation Area	Print	Yes	No	Yes	No
Denali National Park & Preserve	Print	No	Yes	Yes	Yes
De Soto National Memorial	Online	No	No	Yes	No
Dinosaur National Monument	Online	Yes	Yes	Yes	Yes
El Malpais National Monument and National Conservation Area	Print	No	No	No	No
El Malpais National Monument	Print	No	Yes	Yes	Yes
El Morro National Monument	Print	No	No	No	No
Eleanor Roosevelt National Historic Site	Print	No	Yes	No	No
Everglades National Park	Print	No	Yes	No	No
Ford's Theatre National Historic Site	Print	No	No	No	No
Fort Laramie National Historic Site	Print	No	No	Yes	No
Fort Necessity National Battlefield	Print	No	Yes	Yes	No
Fort Raleigh National Historic Site	Print	No	No	No	Yes
Fredrick Law Olmsted National Historic Site	Online	No	Yes	No	No
Friendship Hill National Historic Site	Print	Yes	Yes	Yes	No
Gates of the Artic National Park	Print	No	No	Yes	No
George Rogers Clark National Historical Park (One Page Worksheet)	Print	No	No	No	No
Glacier National Park	Print	Yes	Yes	Yes	Yes
Golden Spike National Historic Site	Print	No	No	Yes	Yes
Grand Canyon National Park (Phantom Ranch)	Print	Yes	No	No	No
Grand Canyon National Park (North Rim)	Print	Yes	No	Yes	No

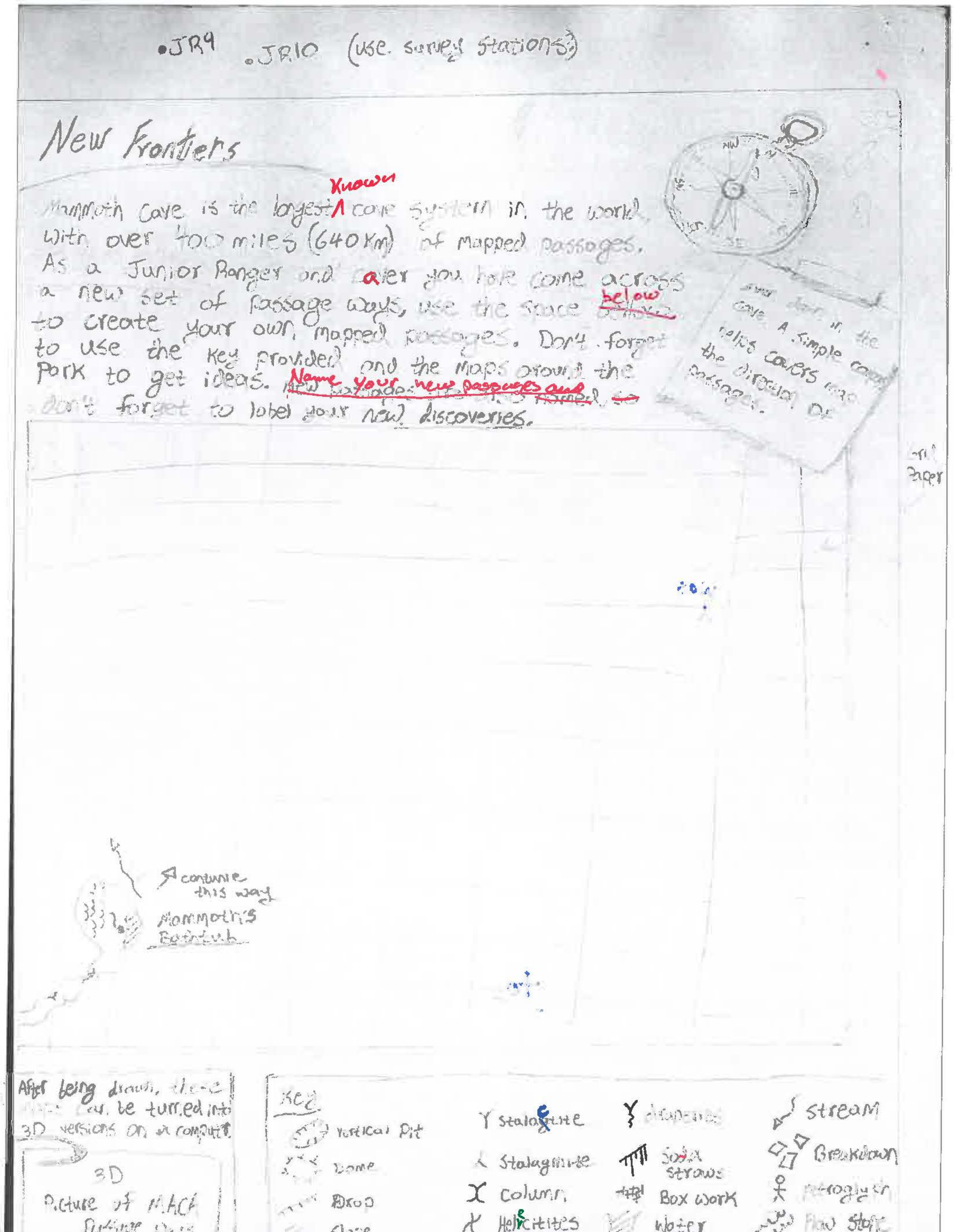
Grand Canyon National Park (South Rim)	Print	No	No	No	No
Grand Teton National Park	Online	No	No	Yes	Yes
Harpers Ferry National Historic Park	Print	Yes	Yes	Yes	Yes
Hawai'i Island National Parks	Print	Yes	Yes	No	No
Hawai'i Volcanoes National Park	Print	No	No	No	No
Historic Preservation Junior Ranger	Print	Yes	Yes	Yes	No
Home of Franklin D. Roosevelt National Historic Site	Print	No	Yes	Yes	No
Hopewell Culture National Historic Park	Print	No	Yes	Yes	No
Hopewell Furnace National Historic Site	Print	No	Yes	Yes	No
Hot Springs National Park	Print	No	No	No	No
Hot Springs National Park (All About Bats)	Print	No	Yes	Yes	No
Hovenweep National Monument	Print	Yes	Yes	Yes	Yes
Independence National Historical Park	Online	No	No	Yes	Yes
Isle Royal National Park	Print	No	No	Yes	No
Jewel Cave National Monument (Ages 3-4)	Print	No	No	Yes	No
Jewel Cave National Monument (Ages 5 & Up)	Print	Yes	Yes	Yes	No
Joshua Tree National Park	Print	No	No	No	No
Junior Paleontologist	Print	No	Yes	Yes	Yes
Junior Ranger Archeology Program	Print	No	Yes	No	No
Junior Ranger Arizona Explorer	Print	Yes	No	No	No
Junior Ranger Eclipse Explorer	Print	No	No	No	No
Junior Ranger Garden Explorer	Print	Yes	No	Yes	No
Junior Ranger: Night Explorer	Print	No	Yes	Yes	Yes
Kaloko-Honokohau National Historical Park	Print	No	No	No	No
Kenai Fjords National Park	Print	No	No	Yes	No
Kenai Fjords National Park (Explorer Journal)	Print	No	No	No	No
Klondike Gold Rush National Historic Park (Ages 4-8)	Print	No	Yes	Yes	Yes
Klondike Gold Rush National Historic Park (Ages 9-16)	Print	Yes	Yes	No	No
Knife River Indian Village National Historic Site (6-12)	Print	No	No	No	Yes

Knife River Indian Village National Historic Site (Age 5 & Under)	Print	No	No	No	No
Lava Beds National Monument	Print	Yes	Yes	Yes	No
Let's Go Fishing Activity Book	Print	Yes	No	No	No
Lewis & Clark National Historical Park	Online	Yes	No	Yes	No
Lowell National Historic Park (Book A)	Print	No	No	No	No
Lowell National Historic Park (Book B)	Print	No	No	No	No
Lowell National Historic Park (Community Ranger)	Print	No	No	No	No
Mammoth Cave National Park	Print	Yes	Yes	Yes	No
Mesa Verde National Park	Print	Yes	Yes	Yes	No
Minidoka National Historic Site	Print	No	Yes	Yes	No
Mount Rushmore National Memorial (Ages 13 & Up)	Print	Yes	Yes	No	No
Mount Rushmore National Memorial (Ages 5-12)	Print	Yes	No	No	No
Natchez National Historic Park	Print	No	Yes	Yes	No
National Mall & Memorial Park	Print	Yes	Yes	Yes	Yes
National Mall & Memorial Park (Cherry Blossom Festival)	Print	No	Yes	Yes	No
Natural Bridges National Monument	Print	Yes	Yes	No	Yes
Niobrara National Scenic River	Print	No	Yes	Yes	No
North Cascades National Park	Print	No	No	No	No
Olympic National Park	Print	No	No	No	Yes
Olympic National Park (Ocean Stewards)	Print	No	Yes	Yes	No
Organ Pipe Cactus	Print	No	Yes	Yes	Yes
Organ Pipe Cactus (Desert Ranger Guide)	Print	Yes	No	No	No
Overmountain Victory National Historic Trail	Print	No	No	Yes	No
Petrified Forest National Park	Print	Yes	No	Yes	No
Pictured Rocks National Lakeshore	Print	No	No	Yes	No
Pu'uhonua o Honaunau National Historic Park (Age 13 & Up)	Print	Yes	Yes	Yes	No
Pu'uhonua o Honaunau National Historic Park (Age 6-12)	Print	No	No	No	No
Redwood National and State Park	Online	No	Yes	No	No

Rocky Mountain National Park (Ages 5 & Under)	Print	No	No	No	No
Rocky Mountain National Park (Ages 6-8)	Print	No	No	No	No
Rosie the Riveter / WWII Home Front National Historic Park	Print	No	Yes	Yes	Yes
Roosevelt-Vanderbilt National Historic Site (Age 16 & Older)	Print	Yes	No	No	No
San Francisco Maritime National Historical Park	Online	Yes	No	No	No
San Antonio Missions National Historical Park	Print	No	No	No	No
San Juan Island National Historic Park	Print	No	No	Yes	No
Shenandoah National Park	Print	Yes	No	No	No
Shiloh National Military Park	Print	No	No	No	No
Sleeping Bear Dunes National Lakeshore	Online	Yes	Yes	Yes	No
Tallgrass Prairie National Preserve	Print	No	Yes	Yes	Yes
Thaddeus Kosciuszko National Memorial	Online	No	No	No	Yes
Theodore Roosevelt National Park	Print	No	No	No	Yes
Tumacacori National Historic Park	Print	No	Yes	Yes	Yes
Tuzigoot National Monument	Print	No	No	No	No
Underwater Explorer Junior Ranger	Print	No	Yes	Yes	No
Upper Delaware Scenic and Recreational River	Print	Yes	No	No	Yes
Valley Forge National Historical Park	Print	No	No	No	No
Valor in the Pacific National Monument	Print	No	No	No	No
Vanderbilt Mansion National Historic Site	Print	Yes	No	No	No
Voyageurs National Park	Print	Yes	Yes	No	No
Whiskeytown National Recreation Area	Print	No	No	Yes	No
White Sands National Monument	Print	No	No	No	No
Wind Cave National Park	Print	No	No	Yes	No
Yellowstone National Park	Print	No	Yes	No	No
Zion National Park	Print	No	Yes	No	No

Appendix B: Rough Draft Sketches and Proposed Edits




•JR9 •JR10 (use survey stations)
New Frontiers
Mammoth Cave is the longest known cave system in the world with over 400 miles (640 Km) of mapped passages. As a Junior Ranger and after you have come across a new set of passage ways, use the space below to create your own mapped passages. Don't forget to use the key provided and the maps around the park to get ideas. Name your new passages and don't forget to label your new discoveries.
continue this way
Mammoth's Bathtub
After being drawn, these maps can be turned into 3D versions on a computer.
3D Picture of MACA
Key
Vertical Pit
Dome
Drop
Stalactite
Stalagmite
Column
Helictites
Helectites
Soda Straws
Box work
Water
Stream
Breakdown
Petroglyph
Flow Stone

Why did you take this Photo?

camera here

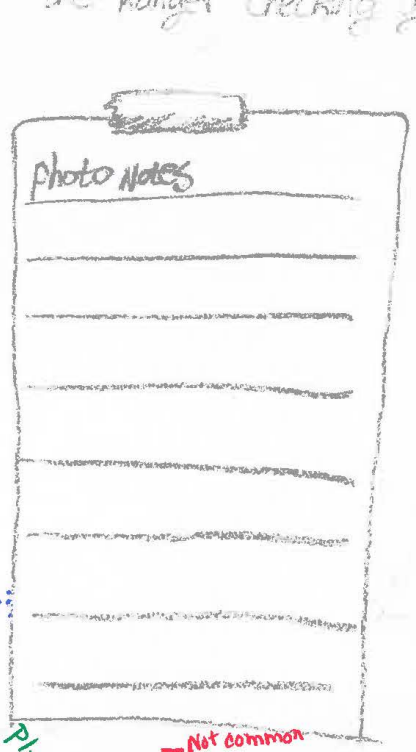
Do not put Brand of Camera

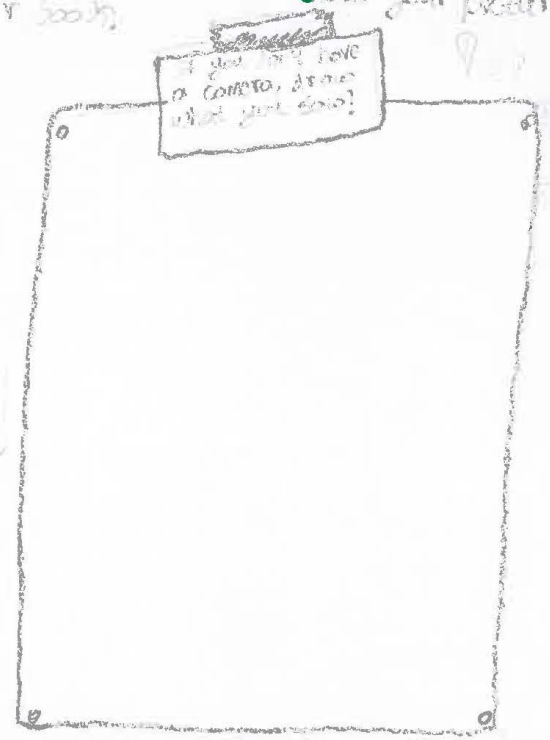
Canon AE-1

Rolleiflex 2.8F

Snapshot

Since the invention of the camera, people have been taking photos of the world around them. Using a camera can be useful for making observations without taking something out of the park. Take ~~a~~ some photos of your visit. They can be of animals, plants, people, buildings or anything else. Make sure to note where you took the photo, or any other observations. Show your pictures to the Ranger checking your book.





Please do → Tulip Poplar Tree

Not common

Kentucky coffeetree

Ky state tree.

Maple Tuplip Popular Tree

used for pipes in Mining operation.

"A good photograph is knowing where to stand"

-Ansel Adams

For Generations to Come

Part of being a Junior Ranger is helping protect these beautiful and special places. ~~Remember~~ When exploring, remember to leave everything the way you found it. This helps Preserve the Cave and forests for generations to come. Mammoth Cave has over 500,000 visitors a year and even ~~little~~ small changes made by each person can add up to a big impact.

Read the statements below, and write or draw the impacts these changes would make on the Park.

What would happen...

...if each park visitor collected a few rocks or took some cave formations?

...if each Park visitor scratched their names on the cave walls?

...if each park visitor picked a plant or flower?

Junior Ranger Tasks!

Remember to...leave only footprints!

take only pictures!

make only memories!

Leave No Trace (Logo)

cream? narcissus

Trillium - more common in spring

or Daffodils

There ~~is~~ are some historic signatures on the cave walls but this was done before it was against the law.

Is/are?

Shorten this?

Adapt to your World

PART 1

All creatures have special body parts or behaviors that help them survive in certain environments, these are called adaptations. ~~All animals have~~ Some adaptations, ~~this~~ could be skin or fur ~~that~~ helps them blend in, claws to pick-up and catch food or ~~even~~ wings to help them ~~soor~~ soar high and see far.

Caves are a special kind of home where creatures can live with little to no sunlight, food, or water. Animals living in this world ~~have to~~ must have super special adaptations.

* ~~Can you~~ Match the picture and names with the correct cave critter adaptations. Draw a line to connect the three sections.

Animals	Name	Adaptations
	Woodrat	I send out high-pitched sounds that bounce off objects and come back to me.
	Eyeless Fish	I have very long antenna (antennae plural?) that I use to feel around in the dark.
	Cave cricket	I use a special scent to mark were (where) I have been, this helps me smell my way back.
	Cave crayfish	I have special cells in my tail that can detect light
	Brown Bat	I have no eyes, but can save my energy, I can go without food for up to two years

Adapt to your World

PART 2

The animals living in caves have to be perfectly evolved & adapted evolved to live there. in order to survive. Scientists ~~are always making~~ continue to make new discoveries of animals that live in the cave. Imagine you are a scientist who just discovered a new cave creature. What does it look like? Where in the cave was it found? What adaptations does it have to help it survive? What does it eat?

Use the space below to draw your new discovery. You can use the page before to help give you ideas.

* Make sure to draw the cave ~~environment~~ environment around your animal *

cave salamander

Cave animals that need to leave the cave to find food are called ~~troglobites~~ troglophites. Animals that live their whole life in the cave and never leave are troglobites.

~~What about troglobites?~~

* Rule about leaving everything where it is *

Scavenge For Answers

As a Junior Ranger, you ~~have~~ need to have good eyes and a sense of adventure. Mammoth Cave National Park has lots to see and do. Can you find the answers ~~bellow~~ below? Don't worry if you can't find everything, being a Junior Ranger is all about trying your best. Draw or write down your answers ~~to~~ in the diffrent boxes.

Litter (Throw it away)	Find something that is your favorite colors	The offical length of Mammoth Cave. (Check the exhibits in the VC) ____ miles	Find something bigger than you.
See something with wings	Find a source of water	Something that is rough	Hear a bird sound 
A leaf from a tree 	Find something smaller than you.	A wild animal (Give it plenty of room) 	Find something that smells good.
Find the National Park Arrowhead	~~A tool~~ equipment a caver would use	The Historic Entrance to Mammoth Cave	Find something that is Smooth

* Facts on different species at MACA *

* Font will be smaller *

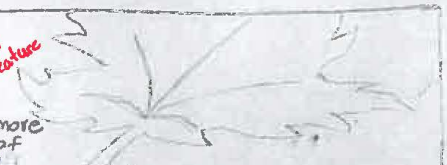
* Maybe make two pages? *

* Fit in word diverse *

Citizen Science

* poisonivy picture + warning

* Almond Centepede cool creature



Anyone can be a scientist ~~and even~~ you can help Mammoth Cave learn more about the diversity of park. One experiment that scientists do to find out if the park has ~~a lot~~ a lot of diffrent living things in it is called a grid test. This is when scientist make a small square on the ground and count how many diffrent plants and animals they see. They also measure these living creatures with a ruler or tape measure. this helps them learn how big or small plants and animals ~~get~~ can grow.

~~Can you~~ Make an imagenary square on the ground of the forest and do a grid test.? Draw, Count and measure what you see in the square and answer the question about your expirement.

* graph paper?

Number of...

Plants____

Animals____

Size of largest...

Plant____cm

Animal____cm

centimeter

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Was your grid test in a diverse area? ☐ Yes ☐ No

A lot of different kinds of plants & animals means the area ~~is diverse~~ has high diversity.

→ To much text... * Rubbing of fossil in VC * - Leave back page blank 6 possible rubbings

Try doing a rubbing with ~~the~~ paper in a Jr Book to make sure it works

Fossil Hunters


Crinoids


Gastropod


Shark Tooth

The rock that makes up Mammoth Cave is called Limestone. This rock is made ~~up~~ of skeletons from ancient sea creatures like coral, fish and sharks. The remains of these animals build on top of eachother, ~~and over things~~ millions of years became rock ~~while mud fills in the gaps~~. ~~This kind of rock~~ Limestone is not very strong. ~~and~~ Water ~~mixed with other chemicals~~ over thousands of years, can dissolve limestone which creates caves. ~~creates caves.~~ *Hole sentence

Some ~~of these~~ animal skeletons can be found in the cave and are called fossils. One way to copy the texture of things is to take a rubbing. Fossils, rocks and tree bark have alot of texture, using your Junior Ranger book and pencil, make two rubbings one of a fossil and one of anything outside.

*Hint - There are 6 possible fossils to do a rubbing of in the Visitor Center displays.

Check out Echo River Springs Trail and the displays for items to do rubbings on.

Fossil Rubbing

Don't take rubbings of anything in the cave.

Outside Rubbing

Name of Fossil: ______

Name of outside item: ______


Horn Coral

Lay the blank page over the ~~texture~~ object & rub with a pencil over →

* Need a better third question *

'Grand, Gloomy and Peculiar'

Picture of David Bransford?

Picture of Bob Lively

Black history at Mammoth Cave is both long and fascinating. Many visitors don't know that some of the first people to give cave tours were enslaved Africans. The most famous of these guides was Stephen Bishop. Stephen guided, explored and mapped the cave. He was the first person to cross the Bottomless Pit, discover eyeless-fish and draw a map of the cave.

Even after slavery ended, black African American cave guides continued to work at Mammoth Cave. Men like Mat Bransford, Ed Bishop, Bob Lively and David Bransford also left their mark on the cave.

? → Who is David? Do you mean Nick?

Walk the Heritage Trail and answer the questions bellow. You will find Stephen Bishop's grave in the middle.

1. Being enslaved meant you were forced to work & live a certain way and were owned by another person. Men like Stephen were allowed to explore the cave when they were not working. Why do you think Stephen spent so much time exploring?

2. What is ~~strange~~ unique, ~~different~~ about Stephen's headstone?

Picture of Stephen Bishop?

Picture of Ed Bishop

Picture of Mat Bransford

? 3. How do you think Stephen felt being a slave? Why?

3. What do you think Stephen's greatest discovery was? Why?

*Could also use [illegible] or soda/sinkholes — * Smaller font — *Bring up Beneath Your Feet* — *Names hidden in description — * Does this activity actually work?

Drip... Drop... Drip... Drop

As water leaks into the cave from cracks (or sinkholes) above us, it picks up acid (carbonic, ~~that gives the fizz~~ in soda pop) and calcium (in your bones + teeth) (~~a mineral found in lots of dairy products~~). When the water reaches the cave it lets go of the calcium, this is now called calcite. Calcite adds up over a long time, drip by drop making cave formations. The shape of the formation can change depending on how the water enters the cave.

Misleading — not sure if relevant

Can you help finish the names of the diffrent cave formations below, and ~~also~~ come up with your own name for these unique looking creations.

Hint: The names of these formations can be found on a tour or in the exhibits.

This cave formation is made when water flows down the sides of walls or floors making a sheetlike cover — Answer: ________ stone — New Name: ________ (frozen Niagara picture)

Formed when water drips from the ceiling and calcite builds up on the floor, watch out you might trip on them. — Answer: Stalag ________ — New Name: ________ (stalagmite & stalactite picture)

(switch)

Hanging like an icicle, tight to the ceiling, this formation is made from dripping water and has a pointed end. — Answer: Stala(c) ________ — New Name: ________

Beautiful white crystal pedals that form on cave walls when sulfur is added to the water. Collected by prehistoric people who explored the cave. — Answer: ________ flower — New Name: ________

When water pops & splatters on the wall, these cave formations form bumpy balls. — Answer: ________ corn — New Name: ________

Take an above ground virtual tour of the cave. Ask a Ranger about the "Beneath Your Feet" Tour

→

* Gypsum *
-pic?

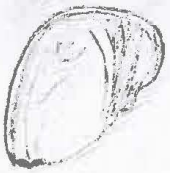
The Very First Explorers

The first known people to explore Mammoth Cave were Native American's from 5,000 years ago. They went into the cave finding minerals and crystals. They left behind artifacts or hand-made tools during their adventures, which helped them in the dark and rocky world. Look at the tools bellow and write down what you think they were used for. Would you go into a cave with just these items?

Gourd Bowl

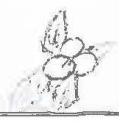
River Cane Torches

Plant fiber slippers

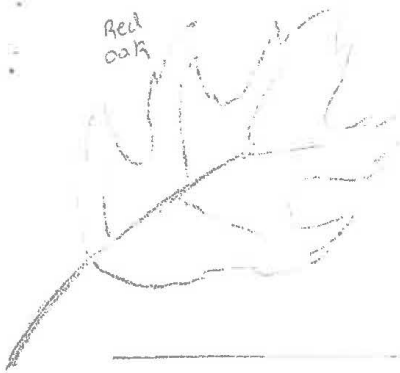


Mussel Shell Scoop

Modern cavers now use things like helmets, ropes, compass and flashlights to help them explore, map, and stay safe in the cave.



Gypsum



Mammoth Cave National Park
Certifies that

* Back of book certificate

* JR Oath?

has completed all of the requirements
for becoming an official

Maybe a Bit picture?

JUNIOR RANGER

and Pledges to preserve, protect and respect the forest and cave ~~bellow~~ below. I will also learn ~~all that~~ about I can and enjoy as many National Parks as I can!

Park Stamp

Park Ranger Signature

Date

Appendix C: Digital Rendering of JR Booklet

Pages may not appear exactly as they do on Adobe Illustrator

FRONT COVER

Become A Mammoth Cave Junior Ranger

In order to become a Mammoth Cave Junior Ranger there are three tasks you must complete.

1. Complete the number of activity pages for your age range. Every Junior Ranger must complete the activity page "**Getting Started**"

AGES 4-7	Must complete **6** activty pages
AGES 8-12	Must complete **8** activty pages
AGES 13+	Must complete **10** activty pages

2. Go on at least one cave tour, attend a ranger led program or hike through the woods. **Hint** - The activties "**Snapshot**", "**Scavenge For Answers**", "**Citizen Science**", and "**Follow Me!**" are made for hikes through the woods.

3. Once you have finished your first two tasks, get your book checked by a ranger in the vistor center and receive your Junior Ranger badge and signed certificate.

Special thanks to...

Eastern National
Serving the Visitors to America's National Parks and Other Public Trusts

Show us how your adventure here at the park went on social media and use the hashtag

#MammothCaveJR

National Park Service
U.S. Department of the Interior
Mammoth Cave National Park

@mammothcavenps

@MammothCaveNPS

More information at: www.nps.gov/maca

Getting Started

Welcome to Mammoth Cave National Park, the longest known cave system in the world! We are so excited you are here to explore this special and diverse park. There is so much to learn, above and below ground. While you are here, be sure you go on a cave tour or hike through the forest. There is something for everyone.

This journal is just one tool for your adventure at Mammoth Cave. Write down how your visit went at the National Park and explain the similarities and diffrences between this place and where you live.

My Adventure at Mammoth Cave

Date I was here: _____

What the weather was like: _____

_____

Favorite part of my visit: _____

_____

I learned this at Mammoth Cave NP: _____

_____

How is Mammoth Cave NP similar to where you live? _____

_____

How is Mammoth Cave NP diffrent from where you live? _____

_____

1

Snapshot

Since the invention of the camera, people have been taking photos of the world around them. Using a camera can be a useful for making observations without taking something out of the park. Using a phone or digital camera take some photo's of your visit. They can be of animals, plants, people, buildings or anything else you see.

Make sure to note where you took the photo, or any other observations.
Show your picrures to the ranger checking your book.

Photo Notes

If you don't have a camera, draw what you saw!

2

For Generations To Come

Part of being a Junior Ranger is helping protect these beautiful and special places. When exploring leave everything the way you found it, this helps preserve the cave and forests for generations to come. Mammoth Cave has over 500,000 visitors a year and even small changes made by each person can add up to a big impact.

Read the sentence below and write or draw the affect these changes would make on the park and enivorment.

What would happen...

...if each park visitor collected a few rocks or took some cave formations?

...if each park visitor scratched their names on a tree or the cave walls?

...if each park visitor picked a plant or flower and took it home?

There are some historic writings on the cave walls, but this was done before it was not allowed.

Junior Ranger Tasks:

Remember...leave only footprints!

...take only pictures!

...make only memories!

Leave No Trace

Adapt To Your World

Part 1

All creatures have special body parts or behaviors that help them survive in certain environments, these are called adaptations. Some adaptations could be skin or fur that helps them blend in, claws to pick-up and catch food, or wings to help them soar high and see far.

Caves are a special kind of home where creatures can live with little to no sunlight, food, or water. Animals living in this world must have super special adaptations.

Match the picture and names with the correct cave critter adaptation.
Draw a line to connect the three sections.

Animal	Name	Adaptation
	Woodrat	I send out high-pitched sounds that bounce off objects and come back to me.
	Eyeless Fish	I have very long antennae that I use to feel around in the dark.
	Cave Cricket	I use a special scent to mark where I have been, this helps me smell my way back.
	Cave Crayfish	I have special cells in my tail that can feel light.
	Little Brown Bat	I have no eyes, but can save my energy. I can go without food for up to two years.

4

Adapt To Your World

Part 2

The animals living in caves have evolved and adapted to live there. Scientists contuine to make new discoveries of animals that live in the cave. Imagine you are a scientist who just discovered a new cave creature. What does it look like? Where in the cave was it found? Near the entrance? In the water? What adaptations does it have to help it survive? What does it eat? It is your discovery, so make it your own.

Use the space below to draw your new discovery. You can use the page before to help give you ideas.

Cave animals that need to leave the cave to find food are called Troglophiles. Animals that live their whole life in the cave and never leave are Troglobites

5

Scavenge For Answers

As a Junior Ranger, you need to have good eyes and a sense of adventure! Mammoth Cave National Park has lots to see and do. Can you find the answers below? Don't worry if you cannot find everything, being a Junior Ranger is all about trying your best. Draw or write down your answer in the diffrent boxes and check them off as you go.

Take an above ground, virtual tour of the cave. Ask a Ranger about the "Beneath Your Feet" Tour.

☐ Litter (Throw it away)	☐ Find Something that is your favorite color	☐ _____ Miles The offical length of Mammoth Cave. (Check the exhibits in the visitor center)	☐ Find something bigger than you
☐ See something with wings	☐ Find a source of water	☐ Something that is rough	☐ Hear a bird song
☐ A leaf from a tree	☐ Find the National Park Arrowhead	☐ A wild animal (Give it plenty of room)	☐ Find something that smells.
☐ Find something smaller than you.	☐ Equipment a caver would use.	☐ The Historic Entrance to Mammoth Cave	☐ Find something that is smooth

6

The Very First Explorers

The first known people to explore Mammoth Cave were Native American's from 5,000 years ago. They went into the cave finding minerals and crystals. They left behind artifacts or hand-made tools during their adventures, which helped them in the dark and rocky world. Look at the tools below and write down what you think they were used for. Would you go into a cave with just these items?

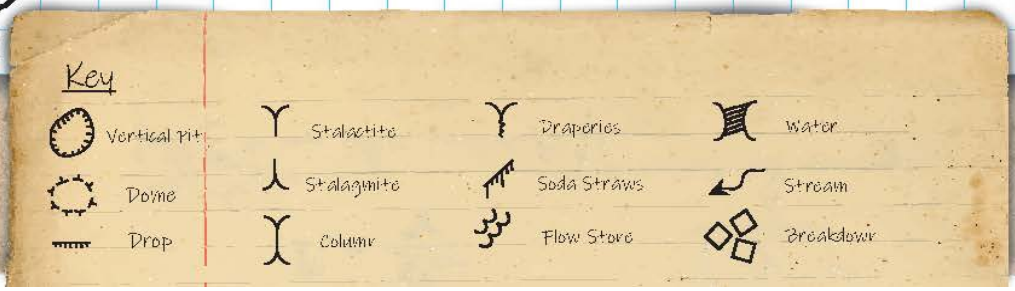
Modern cavers now use items like helmets, ropes, compass, and flashlights to help them explore, map and stay safe in the cave

7

New Frontiers

Mammoth Cave is the longest known cave system in the world. With over 400 miles (640 km) of mapped passages, put end-to-end thats longer than the state of Kentucky! Today cavers are still finding new passageways and rooms at Mammoth Cave, getting to see parts of the world never seen before by humans. As a Junior Ranger and caver you have come across a new set of passage ways, use the space below to create your ownmapped passages.

Don't forget to use the key provided to help you draw certain formations found in the cave. Maps and rangers around the vistor center could also give you tips too. Finally, name your new passages and don't forget to label your created discoveries.



8

Drip...Drop...Drip...Drop

Mammoth Cave's massive passageways and beautiful formations are created by water and the slow passage of time. Water from rainfall or rivers seeps into cracks and sinkholes in the ground. The water picks-up a small bit of acid as it runs through the soil, and over millions of years this water erodes the cracks into hallow passageways or rooms.

Cave formations are also created over a long peirod of time. Sometimes the water also picks up minerals as it makes its way down to the cave. The water then lets go of the minerals and drip by drop the formations start to appear. The shape of these formations can change depending on how the water enters the cave.

Can you help finish the names of the diffrent cave formations below and come up with your own name for these unique looking creations?

This cave fromation is made when water flows down the sides of walls and floors making a sheet like cover.

Offical Name: stone

New Name:_____

Hanging like an icicle tight to the ceiling this formation is made from dripping water and has a pointed end.

Offical Name: Stalac_____

New Name:_____

Formed when water drips from the ceiling and minerals build up on the floor, watch out you might trip on them.

Offical Name: Stalag_____

New Name:_____

White crystal pedals that form on cave walls when sulfur is added to the water. Collected by Prehistoric people who explored the cave.

Offical Name: flower

New Name:_____

When water pops and splatters on the wall, these cave formations form bumpy balls.

Offical Name: corn

New Name:_____

Frozer Niagara

Hint: check the exhibits in the visitor center or go on a Frozen Niagara tour.

Citizen Science

Anyone can be a scientist. You too can help Mammoth Cave learn more about the diversity of this park. One experiment that scientists do to find out if the park has a lot of diffrent living plants or animals, is called a grid test. This is when scientists make a small square on the ground and count how many diffrent plants and animals they see. They also measure these plants and animals with a ruler or tape measure, this helps them learn how big or small these living creatures can grow.

Make an imagenary square on the ground outside on the forest floor and do a grid test. Draw, count, and measure what you see in the sqyare and answer the questions about your experiment.

Number of...

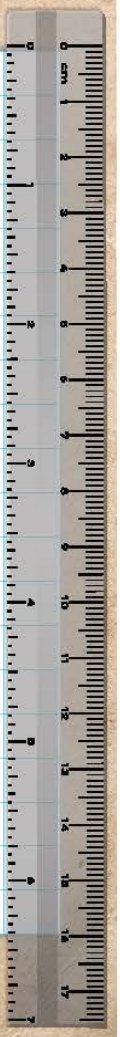
Plants_____

Animals_____

Size of the largest....

Plant_____

Animal_____



A lot of diffrent kinds of plants and animals means the area has high diversity. Was your grid test in a diverse area?

☐ YES ☐ NO

Watchout for Poison Ivy when doing this activty

10

Follow Me!


Bob Lively

Black history at Mammoth Cave is both long and fascinating. Many visitors don't know that some of the first people to give cave tours were enslaved African Americans. The most famous of these guides was Stephen Bishop. Stephen guided, explored and mapped the cave. He was the first person to cross the Bottomless Pit, discover eyeless fish and draw a detailed map of the cave. Stephen also named alot of the passages we know today on the scenic tour and even his signature can be found drawn on the cave walls.


William Garvin

After slavery ended, African Americans cave guides continued to work at Mammoth Cave. Men like Mat Bransford, Ed Bishop, Bob Lively and William Garvin also left their mark on the cave.

Walk the Heritage Trail and answer the questions below. You will find Stephen Bishops grave in the middle.

Being enslaved meant you were forced to work and live a certain way and were owned by another person. Men like Stephen were allowed to explore the cave when they were not working. Why do you think Stephen spent so much time exploring?


Stephen Bishop


Ed Bishop

What is unque about Stephen's headstone?

What do you think Stephen's greatest discovery was? Why?


Mat Bransford

11

Keepers Of The Flame

12

Fossil Hunters

The rock that makes up Mammoth Cave is called Limestone. This rock is made of skeletons from ancient sea creatures like coral, or mollusces. The remains of these animals build on top of eachother, and over time, pressure turns them into rock. Some animal skeletons don't become Limestone and instead are called fossils. These fossils teach us about the plants, animals and the enviorment of Earth from millions of years ago.

One way to copy the texture of things is to take a rubbing. Fossils, rocks, and tree bark have alot of texture or feeling to them. Rubbings help copy the look of something without removing it from nature. Using your Junior Ranger book and pencil, make two rubbings one of a fossil and one of anything else with texture. Use the back on this page to line up the circles and make your rubbing.

Hint - There are 6 possible fossils to do a rubbing of in the visitor center displays. Use the side of your pencil and softly move back and forth for your art to show up

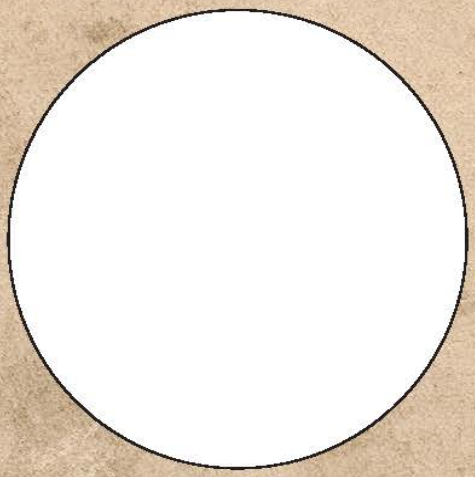
Fossil Rubbing

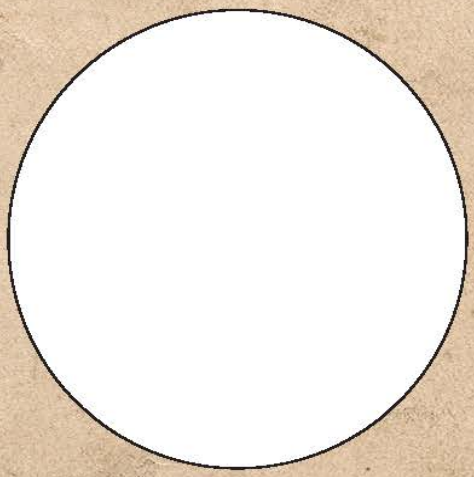
Other Rubbing

Check out the Echo River Spring Trail and the displays along the trail for items to do rubbings on.

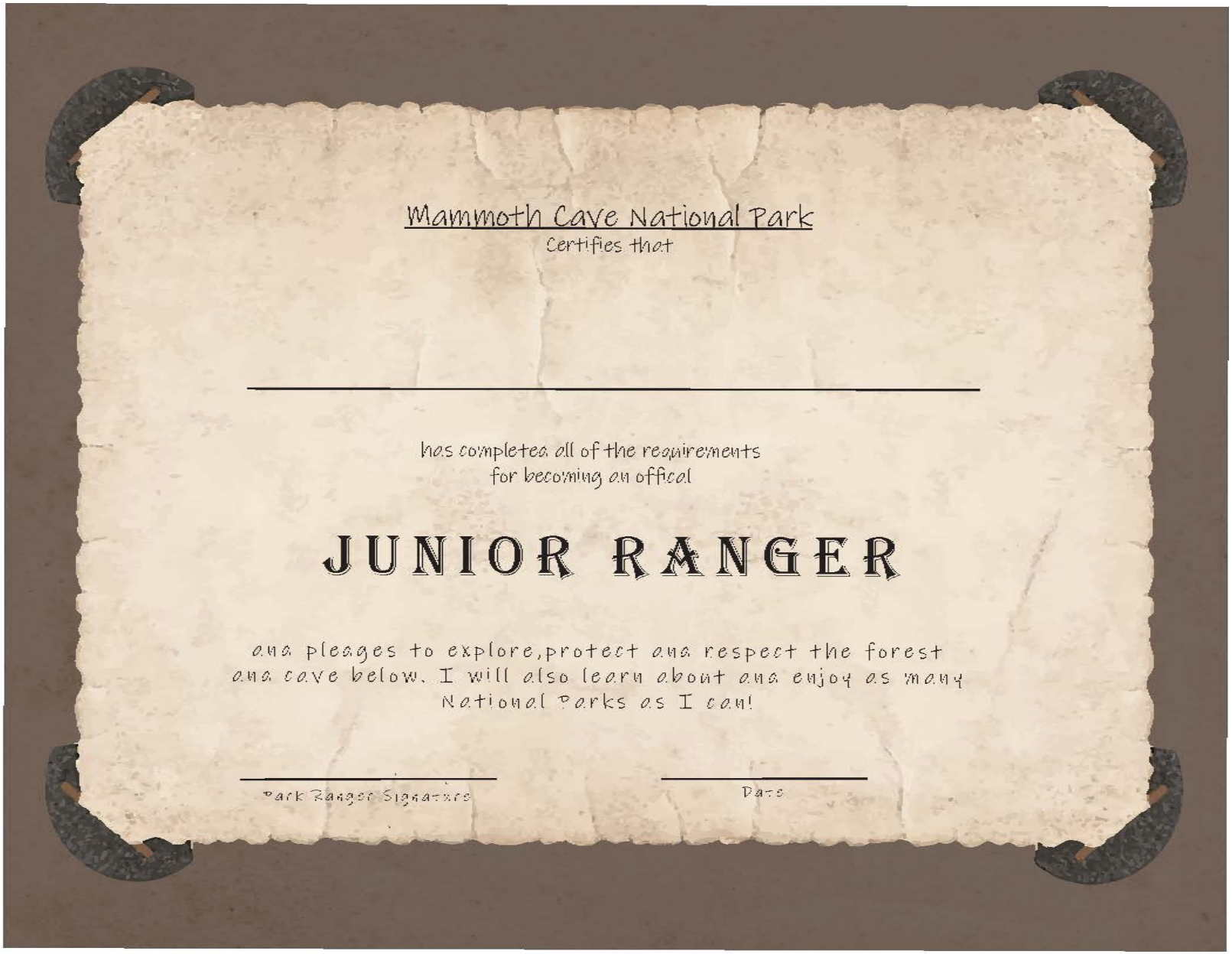
13

Use this area to line up your rubbing for "Fossil Hunters"





14



Mammoth Cave National Park

Certifies that

_____

has completed all of the requirements
for becoming an offical

JUNIOR RANGER

and pleages to explore, protect and respect the forest
and cave below. I will also learn about and enjoy as many
National Parks as I can!

_____ _____

Park Ranger Signature Date

Appendix D: Page Creation Rationale

This Junior Ranger booklet looked to use best practices in both informal and environmental education. The key of this booklet was to create a holistic view of Mammoth Cave and get learners active and exploring the park and exhibits. This section of the appendix helps rationalize and explain each activity page as well as note the best practices used. Key words will be used in the best practices section, if more information is needed then the reader should reference Chapter two, specifically the sections on informal and EE for a more detailed understanding of the keywords used

Activity Page Name	Overview of Page	Informal Best Practices	EE Key Features
Getting Started	This page is the only mandatory page found in the booklet and asks the learner both subjective and objective questions about their time at MACA. This is the first page in the booklet as it allows both the ranger and learner to start their conversation with simple answers, which can lead to questioning them about their visit to the park. Hopefully, this opens the learner and ranger to deeper conversations when checking the booklet.	-Guided by learner -Personal	-Personal inquiry -Reflection -Active participation
Snapshot	Old versions of the Junior Ranger booklet could not rely on technology as the use of it was not as universal or as widespread as it is today. Cameras are found on almost every phone; this allows people to take pictures almost anywhere. This page allows learners to take pictures of things found during their visit and make observations. This activity is subjective in nature and allows the learner to make open observations about anything in the park that interests them. It also stresses the idea of not taking anything from the park physically, but still	-Guided by learner -Nonlinear -Personal	-Skill building -Usability -Instructional soundness -Hands-on observation -Discovery -Place-based learning -Investigation

	making memories. Even if a camera is not available the page can still be finished by drawing what the learner saw and still making observations. These photos can be saved and allow the learner to look back through their experience later.		
For Generations to Come	This page stresses the National Park Services goal of preserving and protecting the natural, cultural, and historical world. The activity gives three hypothetical questions to the learner asking how the park would be affected by overuse or not following the park rules. These questions do have a somewhat objective answer, as they want to stress the negative effects of these events. Still, the learner has the freedom to write or draw their answer in a variety of fashions. The activity will make the learner critically think about their actions while visiting the park and beyond and hopefully have them create a relationship between resources and the importance of protecting them.	-Open-ended -Personal	-Action orientation -Usability -Guided inquiry -Reflection -Issue based learning
Adapt To Your World part.1	This page works as a connected activity with a page of the same name but does not require both to be completed. The point of doing both activities is that it could give the learner suggestions or ideas when completing part 2. Part 1 is more objective and is one of the few pages with right/wrong answers. This activity is set up as a matching game, having learners connect the appearance, name, and adaptation of a cave creature. Learners doing this activity might already know what adaptations are, but	-Nonlinear	-Accuracy -Place-based learning -Investigation -Guided inquiry -Active participation

	we wanted to highlight the unique and special traits for creatures living in a cave environment. The matching is relatively simple and helps learners think about what adaptations are needed to live in a cave.		
Adapt To Your World part.2	Going off part 1 of this activity, part 2 is completely subjective and allows learners to create their own cave creature by drawing it on the page. Using part 1 of this activity can give learners an idea of what they want their creature to look like and what it might need to live down in the cave. This activity allows a wide range of answers with rangers being able to have conversations about the learner's creature and why they chose certain aspects.	-Learner centered -Nonlinear -Personal	-Instructional Soundness -Personal inquiry
Scavenge For Answers	This activity built off the more traditional version of a scavenger hunt where a set of items or objects must be found. In order to make it more learner centered the scavenger hunt has objective and subjective answers for the learner to find. This still uses the observation skills of a traditional scavenger hunt but adds a personal aspect as they must fill in some of the squares with what they saw on their specific visit. MACA employees believed the scavenger hunt page in their old book to be one they thought worked well and was popular. Considering their opinion, the scavenger hunt page was kept but with more creativity involved.	-Learner centered -Nonlinear -Personal	-Action orientation -Active participation -Place-based learning -Discovery -Guided inquiry -Personal inquiry -
The First Explorers	This page looks at a part of MACA history that not many people know or think about. This is the use of the cave by prehistoric native peoples.	-Open-ended or ongoing	-Depth -Discovery

	The main purpose for this activity was for learners to understand how ancient people explored the cave and compare it to modern tools. Again, this activity is somewhat objective in that each tool used by the ancient people had a job, but research on these items only tells us so much and there is still aspects of these artifacts that we have to make inferences about. This same idea is what learners will do and must make educated conclusions on what each artifact could have been used for.	-Multiple perspectives	-Place-based learning -Personal inquiry
New Frontiers	This activity talks about mapping cave systems and how cavers draw what they see when exploring new passageways. This introduces learners to caving and gives them the freedom to draw their own cave system with a key to help them. There is no wrong way to drawing their cave system and allows learners of all ages to be as simple or as detailed as they want. Rangers can question the learner on why they named a certain room/passage or why certain formations are found in this room.	-Guided by learner -Open-ended -Personal	-Skills building -Usability -Place-based learning -data collection
Drip…Drop…Drip…Drop	This page goes over popular wet cave formations found at Mammoth Cave, with a fill in the blank activity. Although fill in the blank activities are one activity that is found often in other Junior Ranger booklets, the added subjective activity of creating your own name for the formation adds a different aspect to the page. It was also felt that some pages with more objective answers were needed as certain learners might feel	-Personal	-Accuracy -Investigation

	fatigued by the constant personal creative processes found throughout the book.		
Citizen Science	This activity allows learners to complete an actual scientific experiment conducted by wildlife ecologists called a grid test. This activity looks for diversity in an area and allows learners to observe, measure, count and draw a specific area of the forest floor looking for different plants and animals. This activity not only plays off the idea of real-world examples but also allows learners to grow an interest in ecology and the skill set one might need. This also allows for further investigation by the learner, who could try to identify the plants and animals that they find in their grid test. Hopefully, this allows rangers checking the book to start a conversation on what the learner saw and if they wanted to find out what the plant or animal could have been.	-Guided by the learner -Nonlinear -Ongoing -Personal	-Depth -Skills building -Action orientation -Instructional soundness -Usability -Active participation -Hands-on observation -Discovery -Place-based learning -Data collection -Personal inquiry -Investigation
Follow Me!	This activity explores the role of African American slaves and later freed African Americans as early cave guides at Mammoth Cave. Specifically, it has learners find the grave of Stephen Bishop, a particularly famous and important person of the cave's history. The activity has learners answer both subjective and objective questions about his life and try and put themselves in the shoes of an enslaved cave guide. Although, this is considered a difficult topic to cover, it was felt to be important not only for a more holistic interpretation of Mammoth Cave but allowing learners to	-Multiple perspectives -Personal	-Accuracy -Depth -Active participation -Discovery -Place-based learning -Guided inquiry -Reflection -Issue based learning

	understand all aspects of American history, good and bad.		
Keepers Of The Flame	This page was co-created with the Chickasaw Nation who once inhabited Kentucky and the surrounding area. They are one of the tribes affiliated with MACA and it felt that their input was important for a holistic creation of the booklet. Although a specific story regarding Mammoth Cave did not exist, the importance of storytelling in Chickasaw culture was decided to be the key theme for this page. It was decided that the Chickasaw creation story would be read by learners and then they would craft their own story about either the cave or a park resource. This activity allows for creative freedom in crafting your own story or poem and an emphasis on creative writing.	-Multiple perspectives -Nonlinear -Open-ended -Personal	-Fairness & Accuracy -Skills building -Usability -Personal inquiry -Native perspective
Fossil Hunters	Although fossil topics have been covered in several books, doing a rubbing of one or any object is not one seen in a Junior Ranger booklet. This activity was created so that learners would need to explore the exhibits in the visitor center and the trails outside, having them complete a physical activity with variation in the rubbings made. This page was also created to offer a subjective activity with not as much critical thinking, as the booklet looked to push the boundaries of learning in the park without mentally and physically fatiguing the learner.	-Nonlinear	-Usability -Active participation -Discovery -Place-based learning -Guided inquiry

Appendix E: Ways of Knowing Page Implementation

One of the key ideals of informal learning is the concept that there are multiple ways of exploring a topic or subject. Different cultures, societies or peoples might understand and interpret the world around them differently. It is important to take these ideas and include them in our holistic understanding of the world. This crucial concept was important to note when creating these booklet activities. In order to create a more holistic way of learning within this booklet, many different cultures, and peoples were contacted and considered in its creation. It was also important to include these different ways of thinking as it fit into best practices within informal learning. Below are the pages that were created using these ideals, their purpose and how they were crafted

Activity Page Name	Purpose of Activity	How they were crafted using different ways of knowing.
Junior Ranger Booklet (Overview)	Almost ever page in this booklet was created to allow for more subjective answering. This in turn allows for people of all cultures, societies, and backgrounds to share their thoughts, feeling and insights regarding the park and its resources. It is important to note that these subjective pages do not have "right" answers and instead should be used to allow all peoples regardless of how they learn to make a connection with some aspect of the National Park. In other Junior Ranger booklets, we see a lot of objective activities and this hinders the program considerably since informal learning is about knowing through many different ways. The below pages were specifically crafted to include other ways of learning in a more particular way, but that does not mean the other pages lack this incentive. *Note: The booklet will be formatted to be 503 compliant*	The subjective nature of these activities allows for an unfathomable amount of input from people of every walk of life. Still being able to learn about the park, but making your own connections allowed people to distill their own way of knowing on an activity. To often do we believe that information should be expressed or learned one-way, informal learning proves that this is wrong and hinders the learning process. This was the mentality used when crafting almost every page. Since everyone's experiences are meaningful to the holistic way of learning.

Scavenge For Answers	The old version of this activity was considered very popular by park employees and guests, it was kept in but was crafted to not rely on only a sense of sight. Instead the activity has learners complete a scavenger hunt using all their senses and personal interests, expect for taste which was considered dangerous considering the environment. This allows learners with varying degrees of disabilities to complete the page, especially those with vision impairment. Scavenger hunts of the past relied mostly on one's eyes to complete, to include more people and make it a more holistic learning experience other senses were included.	Knowing that scavenger hunts were a popular activity, I decided to keep the activity in, but wanted it to consider all of one's senses. I also crafted the page to consider those who might not have been able to complete a scavenger hunt before, depending on a multitude of factors. Having children use all their senses or at least the ones they have access to allowed for a holistic learning experience were everyone can be included.
The First Explorers	This activity talks about exploration of the cave by pre-historic people and although a lot is known about the artifacts, archeologist still don't know everything about why and with what they ventured into the cave with. Learners describe what they think each artifact was used for. This page was subjective in that people from all walks of life could make educated conclusions to what the artifacts were used for. This includes the idea that other cultures or people might think differently on how these artifacts were utilized, leading to a more dynamic story, as archaeology can only tell us so much.	A conversation with park archaeologists shed light on the topic of these prehistoric explorers. Although, a lot can be dated and understood about the artifacts, most of the information created is by using scientific inferences. The idea that a lot is unknown and only so much can be understood from materials was crucial to what the park archeologist expressed. This idea of the unknown allows for a wide range of interpretation to be made by the learner no matter their background.
Follow Me!	This activity was created to expose learners to the topic of slavery and African American history regarding Mammoth Cave. This topic was important not only because it covered a section of history not well known by most people, but also helps learners	The use of primary sources from the park library and preexisting signage pertaining to African American history along with the book *Making Their Mark: The Signature Of Slavery At*

	of color see their own history in the park. This is especially important since National Parks have struggled to have minorities visit park sites for a variety of reasons.	*Mammoth Cave"* by Joy Medley Lyons created the core of this page creation.
Keepers Of The Flame	This booklet page was co-created directly with the Chickasaw Nation, an affiliated tribe of Mammoth Cave National Park. The page has learners read a creation story adopted from the original and approved by the Chickasaw Nation council. Learners receive an understanding of native culture, through the dynamic of storytelling which is crucial within native society. They also spend time writing their own story about the creation of Mammoth Cave using their own experiences and the ones learned by the original story.	The importance of this page was to shed light on native culture, especially those affiliated with the area. I worked with the Chickasaw Nation directly, mostly with LaDonna Brown, Director of Research and Cultural Interpretation for the Chickasaw Nation. She acted as a point of contact, advisor, and liaison for the tribe to create this booklet page. She proved readings, history and insight into the Chickasaw people which led to the design of a creation myth for children based on the original story. This activity page was then passed throughout the tribal hierarchy and approved by all members. Sharing the Chickasaw Nation mindset and story was crucial to creating a holistic park story, making sure people understood that native society is not just in the past but still her today. The rest of the activity also allows stories to be created by people coming from all walks of life, since all of humanity has a story to tell, but in their own unique way.

Fossil Hunters	This activity was different than other fossil page activities because it relied on a tactical activity, using touch as the main force of learning. It also exposes children to the idea of rubbings which might not be a skill they had learned in their past.	To allow the participation of more learners during this booklet creation other activities using other senses was important. Just like the page "Scavenge For Answers" this booklet page relied on other senses to complete and allowed for learners who might be vision impaired to take part. The use of tactical exhibits in the visitor center along with their own curiosity allows learners to feel and understand the shape of fossils, along with learning about textures regarding nature. This activity also allows them to keep a rubbing of what they found interesting and because of the texture left behind can still be felt on the paper.