Examining Curriculum Designers' Processes for Place-Based Curriculum Development for Urban Learners

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Abstract of Dissertation

Examining Curriculum Designers' Processes for Place-Based Curriculum Development for Urban Learners

Despite the widely recognized effectiveness of place-based education (PBE) by researchers in the science education community, there is a lack of resources and curriculum appropriate for the environment of urban schools. Unequal access to quality science curriculum materials is an ongoing issue facing urban schools in the United States. This basic interpretive qualitative study explores curriculum developers' processes for creating place-based science materials for learners in urban schools, which is a potentially significant and under-researched aspect of curriculum access. Drawing on the concepts of personal frames of reference (York & Ertmer, 2016) and representation of children in urban schools (Quinlan, 2021), the study aims to understand curriculum developers' design processes and places they design for, and the prior experiences that inform their design processes. Realist thematic analysis of semi-structured interviews with place-based and science curriculum developers resulted provided valuable insight on the strategies, considerations, and methodologies used by curriculum developers when creating PBE lessons for urban learners. In the results, I determined that the curriculum developers in the DMV area were intentional about designing for the city. They studied the local history in the neighborhoods and museums to ensure they planned lessons that would connect to the learners. Personal frames of reference did contribute to the curriculum designers' passion for place-based curriculum, but they felt the reason for lack of access to place-based curriculum in urban schools was due to funding, time, and administrators' assessment concerns. By understanding their approaches, the dissertation identifies areas of improvement and makes recommendations such as considerations for

developing curriculum for urban learners, incorporating meaningful diversity onto the lessons, and providing equity and accessibility to enhance access to and inclusivity of PBE curricula for diverse urban populations.

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Description of the Chapters

Chapter 1: Introduction

This chapter begins with a personal motivation for the study and then summarizes its purpose, research questions, and design.

Chapter 2: Practitioner Literature Review

The practitioner review analyzes a variety of texts from leading practitioner-focused journals to identify common trends and gaps in the existing place-based curricula that are currently used in different school districts and communities around the world.

Chapter 3: Research Literature Review

This research literature review chapter discusses the existing articles, theories, and methodologies related to the topic of place-based education and motivates the need for additional research on PBE curriculum developers' design processes.

Chapter 4: Methodology

The objective of this study is to understand how curriculum developers' approach PBE lesson development as part of a broader effort to understand the relative scarcity of PBE science materials for learners in urban settings. Chapter 4 describes the research design used to answer the research questions and strengths and limitations of the study.

Chapter 5: Analysis and Findings

This section will discuss the findings of the research interviews conducted along with a chart that helps to break down the coding system used to analyze and understand the collected data.

Chapter 6: Discussion and Implications

The concluding chapter presents a summary and discussion of the findings along with implications for curriculum developers and suggested directions for future research to follow.

Chapter 1: Introduction

The Importance of Science Curriculum Materials

As an educator over the past twelve years, I have worked in various DC charter schools in a range of grades from pre-kindergarten, kindergarten and first grade, all the way to high school. In my experience, most DC charter schools either do not have a science curriculum at all, or they have one that is not used to fidelity on a day-to-day basis. I have spoken to elementary and middle school teachers over the years that have all shared how they have a certain level of discomfort when it comes to teaching science in their classroom. Some of my colleagues had concerns about a lack of support with the science curricula supplied by the school, while others shared their hesitation of teaching science stemmed from not having an actual curriculum in place at all and being expected to create lessons on their own — with no guiding structure to follow.

Unfortunately, me and my colleagues' experiences with lack of access to science materials and support are not unique. For many years, our urban communities have been forgotten when it comes to equality in educational resources (Sharkey, 2013). One of the main factors that may contribute to this negligence is that most curriculum is not written and or created with urban city students in mind. Place-based science curriculum for example, engages students in their local communities and is popular among environmental science instructors (Sharkey, 2013). Students being able to learn from their surroundings is a powerful concept; however mainstream or popularized conceptions of place-based curriculum are primarily envisioned within natural, open settings (Sharkey, 2013). Because place-based science teaching materials do not keep all learning environments in mind, it makes it difficult for teachers in urban schools to incorporate these materials in their science lessons.

High quality curriculum materials often include lesson plans, teaching strategies, manipulatives, technology, and assessment tools that can be a valuable resource for teachers. These materials can offer guidance on how to effectively teach the content and reach diverse groups of students. Curriculum materials ensure that the content and instructional methods are aligned with the educational objectives, standards, and learning outcomes. They help guide what students should learn and achieve, they can also help promote educational equity by ensuring that all students, regardless of their location or background, have access to the same quality of educational content and resources. If our goal as educators is to teach all learners and to meet students where they are, why don't our curriculums do that? Science is everything that surrounds us, it is everything we see daily, everything in life. Place-based curriculum materials need to reflect urban communities so that our students can also experience the world of science around them and build problem-solving and critical thinking skills to address challenges in their communities. For example, students can create projects to clean the community and volunteer at the local recreation centers to help with beatification activities like gardening.

In addition to needing curriculum that reflects the urban environment, it is also important to create culturally relevant education that can help reduce achievement gaps among different racial and ethnic groups. If all students could have equal access to culturally responsive teaching, it could help lead to more equitable educational outcomes. When students see themselves and their cultures reflected in the curriculum, they tend to perform better academically, and it boosts their self-esteem and confidence (Sharkey 2013). Culturally relevant PBE can look like projects that reflect the cultural backgrounds of the students. This might include using local history, traditions, or current issues relevant to the students' communities. Or even collaboration with

local organizations, businesses, or community leaders, so the students can work on real-world problems that affect their communities.

Having a proper curriculum in place also means having access to appropriate materials needed to implement the curriculum. For example, if students are conducting a study on animals' behavior, they may need a camera to observe and capture the events taking place overnight. However, if they do not have access to a camera, they may not be able to effectively conduct this study or gather the proper data. If teachers can create educational resources to help bring the curriculum to life and connect it to real life experiences, that will be the key to making learning both fun and engaging. I like to call it "the hook." The moment when you can truly hook a child into a lesson is truly one of the best moments a teacher can experience. There are many learners who experience this joy of learning, many students who are exposed to content and experiences that will hook them into an interest for the rest of their lives. Unfortunately, there are also students who are not privileged to experience "the hook" due to lack of proper resources, lack of materials, and lack of localized curriculum that can make learning personally and culturally relevant.

During my student life I was exposed to three different learning environments and experiences. I was privileged to attend a private elementary school from pre-k through the sixth grade, for middle school I attended a DC public school, and for high school I attended a public charter school. Although each of these schools were different, all were centered in an urban community. While the walls and buildings all seem quite different, the students I met from school to school were usually the same race, the number of resources we had were the same, and the exposure was limited but also the same. As an elementary school student, I wanted to grow up to be a princess, as a ninth-grade student I wanted to be a forensic pathologist—that is a big

shift from a princess. One important thing to note is the reason I had so many shifts in what I wanted to be. As I grew up and watched movie after movie, I realized there were no Disney princesses that looked like me, which was why that dream for me quickly ended. Fast forward to my dream of wanting to be a forensic pathologist, that was also short lived because although it interests me, I had no exposure to this level of science, so it was hard to remain invested in the idea. By the time I graduated high school, I wanted to be an actor, all quite different dreams at various stages of life yet somehow, I ended up in education which was something I never imagined at all. However, it made a lot of since because teaching was the one career I had plenty of exposure to as a student. As an adult, I learned early exposure to science and place-based education can spark an interest in science and show students the possibility that they could be scientists in the future (Waters, Schroeder, and D'Augustino, & 2018).

Growing up watching the Disney Channel is what made me want to be a princess. Princess Jasmine from Aladdin was my favorite princess of all because she was the only princess I had ever seen with a tint of brown skin like my own. However, the older I got I realized there were not any African American princesses at all so that dream quickly died for me. Now if we fast forward to when I was in the ninth grade my grandfather died from a brain aneurysm. As a ninth grader I had no clue what that was. However, I developed a new fascination with now wanting to be a forensic pathologist. I know it sounds strange and random, but I wanted answers to why my granddad died, so I figured maybe when I grew up, I could help people get closure for their lost loved ones by being the person to give those answers. After losing my grandad and not understanding exactly why I felt confused, and I wondered how many other people had lost someone and not been sure how or why they died. When I got this idea, it was not only due to my experience of losing my grandad, but it was also because of what I watched on TV.

I grew up watching classic shows like *Saved by the Bell, Family Matters,* and *Boy Meets World*. On these shows the kids who were in school had science classes. On some episodes they would dissect frogs in class, have competitive science fairs and even create time machines. Watching these shows had me excited to go to school daily, hoping that one day I would dissect an animal, create a volcano, or even make a time traveling machine—but these days never came for me. I never dissected animals in my classes, but I really wanted to, and I could not understand why the kids on TV opportunities I had had did not. As a child I soon got over it and in doing so I gave up my dream or idea of being a forensic pathologist. However, I truly feel like if I had been exposed to more biology and or science that I may have gone on to pursue a future as a coroner. Much like if I had seen a Black princess on the Disney Channel, I would have held onto that dream. Yet due to the lack of exposure I lost the desire for those dreams, which is how my own personal life experience has been affected by lack of exposure and this has helped to motivate this work. Seeing the lack of PBE for urban students reminds me of my own childhood

Understanding my own experience opened my eyes to how exposure and representation is essential to not only create different career avenues for students but also to help mold and grow their individual ideas and interests. As Chimamanda Ngozi Adichie says in her famous TED talk, single stories are damaging to our learners, to cultures, and to education. Closed doors are damaging to our learners, not having exposure and opportunity damages the futures of our learners.

This is why curriculum materials are important and why place-based learning is so important. There is growing consensus among researchers that promoting equity requires teachers to adapt the existing curriculum, tailoring it to the needs of their students in a local context, instead of simply using a generic curriculum “as is” (Kang et al. 2016; Penuel et al.

2007). In my work I want to create and explore the process of adapting existing curricular resources to promote equitable learning experiences for diverse learners. Place-based learning should immerse students in local heritage, opportunities, cultures, and experiences.

I constantly think of whether urban learners are left behind intentionally. While I hate to assume the worst, it is hard to ignore the obvious trends in my own educational experiences. In my master's program I was taught that the best way to teach and introduce reading is with books or text that are relatable to the learners, yet in each curriculum I have taught from I have almost never seen books in the curriculum that includes African American faces or stories. Place-based education is widely regarded as an effective and engaging way to teach science, yet as Chapter 2 shows, very few place-based materials have been designed specifically for city environments. I need to understand, not only for my own knowledge as an educator in urban schools, but also as a science education scholar, if, how and why urban schools are overlooked in the science curriculum design process. Curriculum design is influenced by many factors, such as limited funding for educational materials and constant focus on core subjects like math and literacy, which often overshadows other areas such as science. These constraints can play a huge role in the scarcity of culturally relevant content and diverse perspectives in curriculum. Curriculum developers have a crucial role in addressing these gaps and shifting the direction towards more inclusive and representative education. To effectively make this shift, we first need to understand how curriculum developers approach their work, including their personal frames of reference, values, and decision-making processes. By gaining understanding of their perspectives and practices, we can support and advocate for the integration of culturally relevant and diverse materials to enhance PBE experience for all students.

Study Overview

In this basic interpretive qualitative study, I interview science curriculum developers to understand their process of designing place-based science curriculum materials. The interviews are semi-structured, addressing specific questions about the places and learners they design for. One goal of these interviews is to understand whether curriculum developers' personal frames of reference, such as their experience or knowledge of learners in urban environments, might account for why there is a scarcity of PBE materials for urban settings. Secondly, the interviews invite curriculum developers to discuss additional factors that they think influence who materials are designed for, to understand where personal frames of reference fall short in explaining PBE materials. To my knowledge this will be the first study to examine how PBE curriculum design decisions affect urban learners.

Research Questions

The research questions guiding the data collection and analysis are:

1. How do curriculum developers' approach PBE science lesson development?
    1. Which learners are they designing for?
    2. What place(s) are they designing for, and why?
2. To what extent do personal frames of reference account for curriculum developers' approach to PBE science lesson development?

Significance

As discussed in Chapters 2 and 3, the literature points to a lack of quality place-based education (PBE) science curriculum material designed specifically for urban settings. Given the research suggesting that PBE is an especially effective way to learn science, it is important to understand why the scarcity of materials for urban learners exists, so that access can be

improved. By speaking with curriculum developers and understanding their approach to curriculum development, this study will start to get to the root of how and why PBE curricula are not being developed with a direct focus for urban learners in mind. The information from these interviews will contribute to the broader science education community's effort to increase the access of science curriculum in more of our urban communities. For example, if curriculum designers tell us they lack direct experience working or living in urban areas (which results in them not having the needed background knowledge to effectively plan in a way that can connect students to their learning experience) we would know we then need to either recruit science curriculum designers with experience in urban areas, or have more intentional planning where the curriculum developers study these areas before creating their materials.

Chapter 2: Practitioner Literature Review

Introduction

For many years, science education researchers have tried to find answers to how to create equitable learning for students, particularly for students of color. Studies show that students who come from socioeconomically disadvantaged communities are more likely to engage in science activities meaningfully when they feel like the work matters to either themselves or the people they care about (Tsai, Kang, Chang, & Cassese, 2022). Place-based education is one pathway to create science learning experiences that are personally meaningful and relevant to students of color in socioeconomically disadvantaged communities (Tsai, Kang, Chang, & Cassese, 2022). Yet, as this review will show, many PBE science curriculum materials are designed with the assumption that learners have access to particular types of natural settings. Few PBE materials are explicitly designed for learners in city schools or urban settings.

Review Methodology

As a first step in conducting this study, I needed to understand what place-based curriculum materials are available for teachers. During my research process I reviewed two different sets of literature; the first was practitioner literature which are journals that are aimed at a particular professional market, and the second was research literature which is intended to communicate or synthesize results from investigations.

The practitioner review focused on a handful of well-known sources specifically for science educators: the four National Science Teacher Association (NSTA) journals (*Science and Children*, *Science Scope*, *The Science Teacher Connected Science Learning*), and *Bank Street Occasional Papers* which focus on elementary education. NSTA is the leading professional association for science teachers, and Bank Street is one of the leading colleges for early

childhood education. These journals publish descriptions of curriculum materials and their implementation, which means they provide one way to understand what type of place-based science materials are in use, and who they are designed for.

In the initial stages of developing this study, I had planned to focus on elementary place-based science education because, at the time, I was teaching at an elementary school. Thus, the practitioner review, which was one of my first steps in study planning, focused on elementary grades only and used the search terms "place-based education," "place-based education AND elementary," "place-based education" and "place-based education AND elementary." The NSTA website was used to search their journals, and the Bank Street College site was used to search the Occasional Papers. Collectively, the searches yielded about 50 results. Later in the project, when my interests expanded to include middle and high school grades, I went back to the NSTA website and located additional articles for these grade levels.

To narrow the search results, I had to browse each article for important terms (e.g., PBE, localized, equitable, urban, and rural schools); these terms helped to directly pull up articles that would have the greatest relevance to my study. Some of the articles were not related to my work. There were many that mentioned place-based education peripherally, but they did not actually provide information involving PBE. There were other articles that were interviews conducted with people who had done numerous studies using PBE but did not provide lesson plan information for practitioners. After removing the articles that were not relevant to the study, I still had about 35 articles left to read. The articles I used for my research were written in response to place-based educational projects conducted with groups of students ranging from various ages and grade levels. As shown in Appendix A, many of the projects were conducted

with early childhood students starting in grade levels as early as Pre-K and they continued up to kindergarten, first grade, second grade, third grade and then on to middle school and high school.

My practitioner literature review addresses the following questions: (a) What is place based education? and (b) What equity and access considerations are needed for successful place-based learning? These questions provide important background knowledge needed to design an interview protocol for my conversations with science curriculum developers.

Initially, I thought that science PBE would mostly vary by location, and that all place-based education was focused on the local area. In reading the practitioner literature, I noticed different versions of place-based science, beyond just the differences in location. For example, Smith (2002) described place-based learning as something that can be adapted to places. Most of the place-based curriculum/lessons had a very consistent pattern and end goal for the learners. Place based learning is also underutilized in urban areas; very few of the practitioner articles included urban settings.

Practitioner Literature Review Findings

Place-based education is defined in many ways

Gregory Smith has conducted many studies on place-based education. In one of his most highly cited articles, he describes three approaches to place-based education nature study, culture studies and real-world problem solving were three focus areas for his article (Smith, 2002). He writes that one of the primary strengths of place-based education is that it can adapt to the unique characteristics of places, and that because of this PBE can help to close the separation between school and children's daily lives. Gregory notes that the students they worked with learned in the

studies and that the PBE lessons were very closely tied to their own experiences which made it easy for the students to connect. This gave them the opportunity to share their projects and creations with local audiences that would appreciate the projects. Smith's writing clearly conveys that "learning to be where we are" as learners, teachers, and as people is something that he feels deeply about. His work reiterates the benefits of place-based education and ways that it could help to connect urban learners to their own community and support a feeling of belonging.

In addition to uncovering very influential scholarly articles such as Gregory Smith's work, my practitioner review also revealed that "place-based" seemed to have different meanings to different educators and researchers. To some, "place" means exactly that, and they only focus the learning on the actual place the students have direct access to. For example, Tsai, Kang, Chang, and Cassese (2022) focus on deep knowledge of the history of the local geographic place where students live and go to school:

> Through this practice, we recognize the history of the place, show respect to the ancestors who had lived on this land, and acknowledge the enduring relationship indigenous people have to this area. Students then reflected on why they should care about this land by sharing their personal stories (p. 46).

In this article, Tsai et al. describe a place-based unit where the students are exploring the land they live in, investigating the effects of wildfire on their land and how they would need to repair it. The students realized during this study that no matter what each other's race or differences they all had something in common and it was the area where they all lived. They also shared the stress of seeing their homeland constantly damaged by wildfires. This was an example defining place-based lessons as a study done in a student's direct or immediate geographic surroundings. In this example, PBE was implemented to connect children to their community and give them a

feeling of belonging. The curriculum is also intended to help students be global thinkers and solve problems together.

However, to other practitioners, a place can be whatever they can create and or wherever they have the means to travel to with the students. For example, a school with no garden may take a class field trip to a greenhouse to learn a specific topic, or they may even build a greenhouse outside of the school. In the article, “Piloting virtual field trips during a pandemic,” educators took students out of their actual place by providing virtual field trips to other communities (Duong et al., 2022). This article makes place “wherever you have means to travel to.” These students stuck inside their homes for months due to the pandemic could travel outside of their walls using the virtual trips and explore their communities along with other communities.

Although this idea did not come up in my partitioner literature review, I want to make note that the concept of "sense of place" extends far past physical space. It is not just the geographical location that defines a place, but also the web of relationships, traditions, and identities that inhabit it. A place is filled with the stories of its people, their shared experiences, and the memories that give it meaning. A place becomes a living entity, reflecting and influencing the lives and experiences of those who call it home.

Another interesting point in the practitioner articles is that they rarely offered a clear definition of place-based education or what they think are required elements for a curriculum to count as place-based.

Environmental science topics are popular in place-based science curriculum

Place based education has been integrated into science for many years now, with some of the articles in my review published as early as 1990. In science teaching, place-based education

has primarily focused on the environmental connection and everything environmental is science. Practitioner journals feature place-based lessons on environmental science topics ranging from wildfires (Tsai et al., 2022), to watersheds and beach clean-ups (Boling, Longhurst, & Lott, 2022; Waters, Schroeder, & D'Agostino, 2018), to ecological interdependence (Kesler, 2015). However, place-based education is not restricted to environmental science. Practitioner literature also revealed PBE focused on theater arts (McNamara & Andes, 2015), winter activities (Hammack, & Vo, 2021), and building picnic tables (Burke, & Lazarowicz, 2021).

At the elementary level specifically there has been a huge focus on connecting children to the communities and reconnecting them with the environment. Some of the projects conducted have proven to be highly effective in promoting positive social learning interactions, out of the box critical thinking skills, and connecting students to their environment. *Adopt-a-beach!* (Waters et al., 2018) was one of my favorite studies, it connected the students to their environment by using various beaches. The students would choose a beach within the range of their community, and they all pitched in collectively to save the beach. The Adopt-a-Beach clean-ups are done by volunteers or in this case a team of students who clean the beach and collect data on the type of litter they find. After the clean ups end, they enter the data on the litter to help form an idea of the coastal litter across the great lakes region to help them keep track of things to look for and ways to keep it clean. Students also explored different animal life on the beach and learned why pollution is so harmful to those creatures. The connection to "place" in this curriculum was for the students to engage and understand their importance in keeping their community clean.

However, we know many schools in other areas such as cities would not have this opportunity mainly because of the access to this type of environment. What can we do as

educators to make sure all learners get to experience first-hand life lessons such as *Adopt-a-Beach*? This is where intentional planning comes into play. We study a beach unit over a period and then at the end of the unit we take the students on a bus trip to the nearest beach for a day. During this day students can clean the shore, collect data, and document their experiences just like the students who live near beaches were able to do. Or students could complete a similar activity near a local river, lake, or pond. The *Adopt-a-Beach* project was important to my study because these real-life experiences are the very type of experience many learners in urban communities are missing, be it due to lack of funds, location, or poor lesson planning Quinlan (2021).

One practitioner article that stood out as unique focused on the arts but held important lessons for thinking about equitable science learning. McNamara and Andes (2015) applied for PBE to theater arts and this study was conducted in an urban area. Although this project was not focused on science, it is relevant to this dissertation project because it took place in an urban area in New York at the District Theater. Since this is a busy city, the students did not really have a nice outside area to explore like students did in many of the other studies, so instead of exploring an outside area they were exploring the life of theater. The lessons took place indoors, inside of the theater. In this study, students could experience the life of creativity and theater firsthand, displaying what they learned by acting, drawing, and recreating what they learned during the place-based lessons. The beautiful thing about this lesson was the way the teacher made the best of the environment and was able to have structured learning in a place that was outside of the classroom even though it was not outdoors. This showed the effort and creative planning that took place when creating this curriculum. Theater arts is not only fun and engaging; it teaches self-confidence, imagination, empathy, cooperation, concentration skills, communication skills

and problem-solving skills which are all important life skills. That may or may not be easy to teach in a normal classroom setting. Realistically, the hands-on activities that are taught in these lessons give firsthand learning experiences that no textbook could supply. The lesson also demonstrated how there are unique and important resources in an urban setting that can be part of project-based learning.

Equity and access considerations are part of successful place-based learning

After reading various articles on PBE, I began to understand that the definition looks different depending on where it is used because people only see what is needed. For example, a school located in an urbanized area may be in a neighborhood that poses potential danger. The challenges that come with implementing place-based curriculum in urban schools such as safety concerns or access to resources can be daunting for educators. Taking time to break down barriers and establish the needed resources to effectively teach from a lens of PBE can be very time consuming and if school leaders are not able to see the long-term benefits, they may be less likely to dedicate the time and resources needed for urban learners.

I mentioned earlier in the Introduction that for me, equity is about access, relevance, and connection for learners. Though many of the practitioner articles offered inspiring examples of place-based education, they also raised concerns for me about the access, relevance, and connection of these lessons for students in urban communities. Most of the schools mentioned in the practitioner articles were in rural areas. The two exceptions were ones I have already discussed: the theater lesson in New York City and the project on a beach. Schools in rural areas also face equity issues such as lack of internet access or lack of funding for curriculum materials. Schools in urban areas face other challenges such as lack of environmental resources and or

schools that cannot afford to provide technology access. For place-based learning to be equitable it must be accessible for all. Certain environments will not have the same access therefore the planning and structure of the lessons will need to look quite different depending on location, but the plans should still be created. The practitioner articles in my review described how the lessons were appropriate for the place they were implemented, but did not often discuss how the lessons could be modified for other locations or with different resources available. So, I made it a point in my interviews with curriculum developers to ask about how they plan for urban environments and what types of resources are required to implement their lessons.

For teachers who are already familiar with the standards that advocate engaging students in active sensemaking of phenomena (National Research Council 2012; Schwarz, Passmore, and Reiser 2017), phenomena-based science instruction is not a new idea, but it has been discovered, that not all phenomena motivate student learning the same way. For example, Kang et al. (2022) brought students to land after a wildfire. They discussed the impact of wildfires on the land and what it was like for them to live through the wildfire. Then they discussed whether it would make sense to rebuild on that land, and what would be required to do so. The teachers felt the students were deeply invested in the curriculum because the phenomenon (wildfires) was one that they lived through.

The article raises questions for me about what it really means to increase access and make place-based learning equitable. I thought about an activity engaging students in a study on the effect of earthquakes on a community. Students may find the study to be interesting overall; but let us say this group of students live in a place that never actually experienced an earthquake. The study would teach them and open their eyes to what others may have experienced, but this study would not “hit home or make a meaningful connection” for these students, since they

would have no real connection. When given prompting questions such as, “How did the earthquakes affect the neighborhoods,” students would have to research the answers. When asked something like what safety procedures do you take when an earthquake is occurring, students would need to again research the answers or draw from prior taught knowledge. You would more than likely notice that although students would enjoy the study related to earthquakes, many students would not show interest beyond the structured lesson activities, some may or may not even be able to explain why the learning mattered to them.

However, if we conducted this exact same study with a group of students from a place like California where earthquakes are frequent and highly common to their life experiences the connection to the lesson would become completely different. As Kang et al. (2022) showed, students were able to engage from experience and did not need to Google answers. Students could be able to describe the fear, confusion, or trauma they have felt during an earthquake. They could explain first-hand how their communities were affected and what the repair process was to get the communities back to normal. They would know exactly what to do in case of an earthquake, how to stay safe and even how to save the lives of others during an earthquake. Relevance whether it be cultural, ecological, social, etc. is extremely important in making the connection to students.

As the teacher of the lesson, you would need to think of ways to make the lesson connect to the students so, what are some ways? One way a teacher could connect the students from DC to the reality of earthquakes would be a virtual zoom meeting with survivors/people who live in California who have experienced earthquakes. Hearing the stories would not only open their minds it would open their hearts, but empathy is also a huge connection for most if not all people who lived through this. Having people share their experience and talk to the students about

individual experiences would be a wonderful way to make this lesson real or “hit home” so to speak. In today's world with all the technology and social media, there is no reason we should not all be able to connect. However, these are adaptations that I produced based on my own prior teaching experience; these ideas were not offered in the practitioner article that I read. There is growing consensus among researchers that promoting equity requires teachers to adapt the existing curriculum, tailoring it to the needs of their students in a local context, instead of simply using a generic curriculum “as is" (Kang et al. 2016; Penuel et al. 2007). There is research on science learning and equity that suggest, students, in particular students of color, multilingual students, and/or students from socioeconomically disadvantaged communities, are more likely to engage in science meaningfully when they feel that what they do in classrooms matters, whether to them or to the people they care about (Birmingham et al. 2017; Calabrese Barton and Tan 2010). To create this strong connection, the teacher must establish a personal connection in the study to the students’ lives and their communities. Most of the practitioner articles did not explicitly discuss equity considerations or provide practical advice on these matters. The focus was on describing the curriculum and how it worked for *their* students.

Conclusions and new questions emerging from the practitioner literature review

Practitioner literature shows that PBE has many meanings and can be practiced in various settings, from beaches, to power plants or from theaters to backyards. Though the practitioner literature did not clearly define PBE, the articles did re-affirm my impression that place-based education can increase students’ exposure to diverse topics, help create a generation of learners that appreciate and feel deep connections with their local communities. Each of the articles described in detail how they designed the lesson with their students and local environment in

mind. But since most of the practitioner literature described environmental projects in rural environments, that left me as the teacher to think about ways to adapt those lessons so they could be accessible and relevant to students in urban environments.

Chapter 3: Research Literature Review

Introduction and Review Methodology

As my research continued, I began to think more deeply about the process of place-based science education. I realized that in every article I had come across, the teachers were the ones implementing the place-based education (PBE) curriculum and or modifying the lessons for their learners. That led me to wonder: what was the role of the curriculum designers for these lessons? Were the lessons collaboratively made with teachers or just provided for teachers to use? What areas did they have in mind when designing? What learners had they imagined, and lastly, what data motivated their curriculum? These questions frame my review of research articles about place-based science education.

Whereas my practitioner review focused on articles written for teachers, the research review focused on articles published in high-impact research journals, such as the *Journal of Research in Science Teaching*. As with the practitioner review, I searched these journals for keywords such as “place-based lessons designed by teachers,” “place-based lessons designed for” east or west coast, “place-based lessons for urban areas,” and “place-based education.”

The research review discusses empirical studies of place-based science education focusing on these projects' learners, settings, outcomes, and the methodologies the researchers used. Another section of the review examines research on curriculum developers specifically since they are the focus of my study.

Research Literature Review Findings

In what ways is PBE beneficial for learners?

Urban learners can be engaged through local learning opportunities grounded in their communities, neighborhoods, and city life. Some of those opportunities may include field trips to local parks, museums, and community centers and inviting guest speakers from the community who can share their experiences and expertise with the students. By connecting students to their environment in a meaningful way, educators can help develop their sense of place and personal identity (Kudryavtsev, Krasny, & Stedman, 2012). PBE also emphasizes incorporating local customs and traditions into the curriculum, as this can enhance students' cultural knowledge and appreciation for diversity (Lai, 2012; Gay, 2013). Although it is usually recommended to encourage students to become local researchers and work towards improving their communities, place-based education strategies for urban students also involve trans-disciplinary approaches that integrate subjects such as literacy, social science, and ecological studies (Paulsen, 1991; Achinstein, 2016). Since urban student's literacy levels seem to be an area of concern in many schools, implementing a PBE literacy curriculum could be highly effective in improving and closing the ongoing achievement gap.

Semken and Freeman (2008) emphasize teaching earth, ecological, and environmental sciences in places that are culturally and emotionally significant. This approach allows learners to connect scientific concepts with the meaningful context of their local and regional environments. The article also highlights that people develop emotional attachments to meaningful places; it also proposes that a "sense of place," including place attachment and place meaning, can be measurable learning outcomes of place-based science teaching.

Buxton (2010) describes an SPSS project that engages middle school-aged youth in studying local environmental challenges. The involvement in real-world issues helps to enhance the students' engagement and interest in learning by making the content more relevant and applicable to their lives. The project connects local environmental challenges to global and regional implications for human health and well-being. This holistic approach helps students see the broader context of the issues they are studying, fostering a sense of global perspective. The article implies that place-based education, as demonstrated by their SPSS project, is beneficial for students by enhancing engagement, connecting learning to real-world issues, fostering collaboration, and promoting transformative learning experiences beyond traditional subject matter. Additionally, the authors suggest that place-based education can contribute to broader societal and cultural goals.

MengWen, YuanChen, and TzuHua (2014) report exactly how the curriculum was approached, who the curriculum was designed for, and even the location/area of study utilized by the learners. I was excited to find this information, which provided transparency on the goals and the reason behind its creation. This study established science curriculum development principles based on Taiwan's indigenous culture, and it was used to teach both elementary and middle school students who were a part of the Atayal tribe and the Han tribe. This study was divided into five focus areas of focus (namely cognitive style, learning interest, learning effectiveness, place-based, and cultural responsiveness). The study found that learning assessments for Indigenous students should consist of operation-style items with illustrations. Also, the curriculum design should contain game-based reading and learning activities, outdoor teaching activities, and personal experience expeditionary learning. Most importantly, the curriculum should improve the Indigenous learner's confidence and self-worth. The science curriculum

development principles for this guide will be used as a guide for teachers as they develop science curricula for Indigenous learners. With this information in mind, as I reviewed the curriculum, I could vividly see how learners could engage and learn through using the curriculum directly created for them. At this point, I began to wish that other curriculum designs I had read were as direct as their intentions.

The research literature about place-based science shares underlying values and reported similar advantages for the learners. There are many important reasons for caring about students' sense of place, global perspective, and community connections. It is not just about academic success but also about nurturing well-rounded individuals who are socially responsible, culturally competent, and prepared to navigate the complexities of our interconnected world. When we think about students in urban communities or urban communities in general, we know many people share spaces and differently designed housing. With shared spaces, each person needs to do their part to keep the locations neat and presentable for all. Understanding one's individual importance in their community helps to educate people on how and why their individual actions matter as far as not contributing to pollution, as well as appreciation of other contributions and things of that nature. If these are things we want people to learn, they must be taught and developed by connecting people to places.

Lowenstein et al. (2018) emphasize that PBE is gaining recognition and is perfect for bringing about a shift in learning, teaching, and community. The article did not report a research study (Lowenstein et al., 2018). Instead, it was an informative article that advocated for the use of PBE and supported the most effective models. The article discussed an example of PBE they implemented across the university (Lowenstein et al., 2018).

One of the strengths of PBE is its flexibility, which allows for the authentic representation of individual communities. In this article, the authors found three main components that underpin their work with PBE: inquiry-based instruction, connection to place, and informed civic engagement (p.11). These anchors serve as transformative elements in teacher education, guiding/shaping the learning experiences of both teachers and students (Lowenstein et al., 2018).

Lowenstein et al. (2018) propose a shift in how teaching and learning are structured, envisioning education in public spaces and the community. They suggest that schools prioritize the overall health and well-being of individuals and the community instead of focusing only on cognitive success. The curriculum designers believed the change would benefit teachers and help with the demands of a continuously changing society and the need for more holistic, community-centered teaching practices (Lowenstein et al., 2018).

Although PBE is said to be one of the most effective ways to educate, Smith (2007) raises questions about the potential of PBE to challenge the regularities. Lowenstein, et al. (2018) offer a response. They state that PBE, which incorporates local cultural, environmental, economic, and political concerns into the curriculum, is emerging as an alternative approach that addresses the limitations of traditional environmental education (Lowenstein et al., 2018).

While PBE is not yet widely implemented, it can bridge the gap between social and environmental concerns within schools (Lowenstein et al., 2018). This approach aligns with David Gruenewald's vision of decolonization, where schools become sites for transformative learning experiences. Stevenson's observation of the disconnect between the structure and purposes of public schools and the goal of environmental education provides insight into why

environmental education has struggled to gain prominence in school reform agendas (Lowenstein et al., 2018).

The emphasis on standardized knowledge, teacher-centered information delivery, assessment based on convenience, and student control has hindered the integration of environmental education into mainstream practices (Lowenstein et al., 2018). The designers of this curriculum recognized the need to address these regularities to enable educational practices that fostered community integration and civic engagement. The article reflects on how, in the late 1990s, the teachers at Kualapu'u School in Moloka'i, Hawaii, implemented a program called Providing Resolutions with Integrity for a Sustainable Moloka'i (PRISM) (Lowenstein et al., 2018).

The PRISM program aimed to academically engage fifth- and sixth-grade students while addressing important community issues. The Kualapu'u School serves a diverse population of students. Many are non-white, low-income, and at risk of school failure. The community faced environmental justice concerns related to shifting from an agriculture and subsistence-based economy to tourism. Students at the Kualapu'u School worked closely with resource managers and community members from outside organizations to study topics critical to community health, such as fishpond restoration, ecotourism impacts, wildlife habitat loss, recycling, and water rights (Lowenstein et al., 2018).

At the end of each academic year, the students organized a two-day symposium where they presented their findings to their families and neighbors. This influenced other public meetings on the island and highlighted the quality of student work (Lowenstein et al., 2018). Following the symposium, students developed action plans based on their learning. These plans included working with a state representative to propose a 'Bottle Bill' to the state legislature,

writing newspaper columns, establishing recycling programs, or participating in the restoration of traditional fishponds (Lowenstein et al., 2018).

In conclusion, the assessment of environmental education's challenges within the constraints of public education appeared to be accurate and worked well (Lowenstein et al., 2018). The example from Kualapu'u School demonstrated how PBE can empower young students to engage with complex environmental issues and take meaningful actions within their communities (Smith, 2007; Lowenstein et al., 2018). This study shows how important real-world relevance is and how the ability to incorporate it into the projects can enhance engagement and learning, so when studying PBE curriculum developers, I will need to focus on how important this step is in their decision-making process.

Although the recent discoveries in my literature review were exciting, I still searched to understand if equity for all learners had ever been at the forefront of developing the PBE curriculum. As I found amazing, fun studies, my research slowly made it clear that most of the current PBE science curriculum was not created with the "urban learner" in mind. Intentionally or unintentionally, this trend of finding exciting science curricula that could not be used in an urban setting was becoming a problem. I began to feel frustrated; I found myself back in that space I had experienced as a child in middle school and high school, wondering why my school did not get to dissect frogs or engage in real science fair projects. I began to think this was unfair; I began to answer my questions. I told myself that curriculum designers did not think about considering Black children or the schools in the urban communities when they were developing content. As much as I wanted to prove these thoughts of inequality in learning to be untrue, my work was composed to show otherwise. So now I need to find out why.

How could this process of not creating and designing for an entire group of learners have happened? Let us see, I thought, out of sight, out of mind. I imagined living in a country place miles and miles away, creating a curriculum for learners in that environment. If I lived in this area and only taught kids from this age, it would be easy for me not to think creatively and design for other areas. So, there is this idea, and then there is the idea that if I were contacted by a specific school and asked to design for particular learners again, I would only focus on what I was paid to do. I thought this idea also could be because, despite the increasing popularity of place-based learning in education, a limited number of curriculum developers are creating place-based curricula for urban schools.

This is a perplexing issue that needs further investigation. While investing, I realized another reason more curriculum developers may not be creating place-based curricula for urban schools is a need for more understanding of this approach's potential benefits and possibilities. The focus is on other democratic principles, such as equity, access to resources, and opportunity, seen as more pressing concerns for urban schools. As a result, despite the potential benefits of place-based learning for urban students, such as creating meaningful connections with their local community and developing a deeper knowledge of their surroundings, it may not be given priority in curriculum development.

Determined to find answers, I kept digging into articles, and one day, I finally hit gold. Quinlan (2021) was like finding a pot of gold at the end of a rainbow; she argued that K-12 science curriculum development neither considered the needs of African Americans nor was developed with Blacks in mind. This article was a twin flame to my work. Many questions arise related to what might be considered important for Blacks to know along with who should make the determination, and from whose perspectives. I was astonished to find another researcher who

had done similar research to my interest with almost identical views on the science curriculum and content. In the article, Quinlan (2021) shows how the voices of black learners were being left out in curriculum design; she states that:

> The science curriculum and content are representative of the narratives and lived experiences of White western culture which means the science capital and contributions of Blacks in America are not included in the science content. Since we did not have African Americans as the sole authors of their experiences nor the main beneficiaries of the K-12 science curriculum, the science curriculum was not created with their narratives and lived experiences in mind. The research shows that not even science educators were able to articulate what cultural relevance would look like outside of a designated diversity course (Underwood & Mensah, 2018). (P.1-2)

So, her research intended to figure out what meaningful integration and representation would look like.

In developing her curriculum, considerations were given to social, cultural, historical, political, cognitive, and scientific lenses. This study explored considerations that led to creating two kinds of multimedia products – video clips and animation. Her research examines how the lived experiences and narratives of African American Gullah Geechee of the southern Coasts of the United States could be integrated into the science curriculum using video clips. Her research also explores the creation of a culturally representative animation to explicate considerations made when using the social, cultural, and historical foundation of Black people in America. Her work highlights the research methodologies and the meaning of representation that have implications for meaningful Black cultural representation in the science curriculum. More

specifically, Quinlan (2021) asks, “If the sole use of White narratives created a framework that led to considerations of a science for all, what would a science curriculum that is both culturally representative of African Americans and beneficial to all look like?” (p. 2317). Although Dr. Quinlan’s work shows that she is specifically focused on minority groups, no statement in the article shows that the curriculum she is developing is specifically for elementary, middle, or high school. The grant project that supported the work described in the article shows that undergraduates at HBCUs were involved in the design.

Dr. Quinlan’s research was recently conducted in 2021, which led me to believe that these statistics are still close and right for this year. The research said that 80% of the kindergarten through twelfth (k-12) teachers were white while only a small 7% were African American; if you are wondering why this is relevant, here is something to consider. Suppose White teachers are leading implementers of the curriculum that Black children receive. How can one create a science curriculum that many White teachers will consider important enough to implement without diminishing African American narratives? How was truly the question? Since there were no prior examples of meaningful integration of African American culture in the science curriculum's concepts that would, at the same time, help students understand black heritage, this research highlights the process and products generated from this research. This research was most relevant to my study because it mirrored many of my research questions, thoughts, and passions. The passion to advocate for African American learners was clear, the drive to identify the missing pieces in the science curriculum for children of promise, and the determination to fix the ongoing inequities in education was evident.

What research exists on PBE in urban settings?

One of the critical components in creating an effective place-based science curriculum for urban students is contextualizing environmental learning activities within the local geographic area. Research has shown that this approach can help students improve their understanding of land use and ecological concepts and increase their engagement with learning (Kudryavtsev, Krasny, & Stedman, 2012). In addition, taking a place-based approach also allows educators to address specific issues unique to the urban environment and explore real-world problems that are relevant to students. Successful strategies for creating a place-based curriculum for urban students involve incorporating local knowledge and culture, connecting students to their environment through hands-on experiences and field trips, and integrating trans-disciplinary approaches that address real-world issues (Kudryavtsev, Krasny, & Stedman, 2012; Lai, 2012; Gay, 2013 Leather & Thorsteinsson, 2021).

As I researched and studied the amount of PBE curriculum, I found that PBE for urban learners was slim compared to studies in rural areas. However, there were a few notable examples. One of the articles, "Urban Fifth Graders Concepts during PB Inquiry Unit on Watershed," by Endreny (2009), involved a group of fifth graders studying watersheds in their community. This article had a clear focus on whom it was designed for (a group of urban 5th-grade learners in the northeastern region of the United States), and it was also evident on what "location" it was designed for, as there was a specific focus on the community those students lived in. Most of the students were African American however, this was a very mixed, diverse group of students, and they came from various financial backgrounds, but they all lived in the area, and as the study developed, they came to understand that their watershed was part of an urban environment where water drains from the surrounding land into a body of water. So, they

began to understand how urban land use affects water quality. Which turned out to be an interesting and informative project for the students. This study's researcher was also the teacher who designed this place-based activity for her learners.

Kudryavtsev et al. (2012) studied PBE environmental science programs in the Bronx, New York City. The programs were run by community-based organizations and focused on "stewardship, recreation, skills development, and students' ecological place meaning" (p.1). Some of the activities the students did were canoeing, kayaking, and rowing. Students completed two surveys (pre- and post-) measuring their "place attachment" and "place meaning" (p. 3). Results showed an increase in place meaning, such as seeing nature in the Bronx, but not an increase in place attachment. Part of this may be because what they chose to study was not an authentic representation of the city environment. Instead of creating lessons based on the urban environment, they tried to focus students on the limited, traditional notions of nature that were available (e.g., trees, rivers) and to see New York as a place of nature and not a city. Students in other non-PBE environmental programs did not show an increase in either place meaning or place attachment.

Another article I came across that was conducted with a group of learners from an urban environment was "social problem solving through science" (Buxton, 2010). This study was also conducted with a group of middle school-aged students. The students studied local environmental challenges that have implications for human health and well-being, both globally and locally. Students considered environmental risk factors in a series of structured activities to develop background knowledge of environmental health issues. This study was conducted in "a large coastal city in the Southeastern U.S." (p. 122). Even though the students came from a variety of neighborhoods, they were paired together and worked together on relevant topics of

their choice to create and share “public service announcements" in the form of posters to educate their peers, family, and community members about one of the public health topics they had studied. This study was relevant and did an excellent job connecting the learners to their community.

The following article, Glasson et al. (2006), was a 2-year study investigating Malawian teacher educators' perspectives towards teaching about ecological sustainability issues in Malawi, a developing country in sub-Saharan Africa. The study investigates earth systems science by understanding nature, knowledge, and cultural systems from local, place-based perspectives. Their goal was to learn more about eco-justice issues related to Malawi's environmental degradation. The strategies used for this study included dialogue and reflection, role-playing, class discussions, curriculum development activities, teaching experiences with children, and field trips to a nature preserve. They analyzed postcolonial data to understand better the hybridization of viewpoints influenced by Western and Indigenous science that impact sustainable living in Malawi. Their findings suggested that Malawi's colonial legacy continues to impact deforestation's ecological sustainability issue. The Malawian teachers embraced inquiry-oriented pedagogies and connections to Indigenous science to help involve students in environmental issues investigation and decision-making.

In another article, environmental education researchers felt a need to act responsibly toward the environment (Wright et al., 2021). The environment of this study was a Western United States mountain area, but I am not sure of the exact state. However, this study also focused on the environment. Knowing about place-based learning, rebuilding, and taking pride in the environment is a big part of the work, but unfortunately, the teachers in this study did not know how to develop this place-based lesson. To help students use the information they have

learned on environmental knowledge and put it to use, the teachers had to collaborate on ideas. This study focused on a local PBE curriculum for a group of middle school science students and the goal was to encourage the students to take care of their environment. The study utilized a unique tool of cameras to capture the true nature of wildlife when people/students were not present. This was important because it allowed the students to experience nature in real-time and to see and understand the animals' behaviors. This study was conducted using grounded theory. The study informs environmental education professional development leaders who they thought should allow teachers to explore their curricular agency first. They also encourage educators to explore how PBE can create opportunities to instruct students about civic engagement.

Gallay, Flanagan, and Parker (2021) discuss the underrepresentation of Black and Latinx students in STEM courses and careers in the United States, attributing it to a lack of culturally relevant opportunities and broader social justice issues. The study focuses on a place-based environmental civic science approach, where students collaborate with STEM community partners to tackle local environmental problems. The students could connect their project work to real-world applications of science. In this study, they used open-ended reflections from 291 students; the paper showed that the students saw the value of science helping to make positive change in their community. The approach supported confidence, purpose, and interest in STEM for the students, which helped address the under-representation of students of color in STEM.

These five articles provided evidence that a PBE curriculum was directly created for this group of learners; however, the lessons and attached goals seemed extremely different from the standard PBE lessons I had read. Most practitioner-oriented articles focused on a holistic learning approach, which allowed groups of learners to use the style of PBE to learn diverse topics/subjects with a wide range of focus areas. However, the articles specifically created for

urban learners were all developed for specific reasons. They all were geared toward fixing problems within the African American community. For example, in one project, students must take care of land to improve the health of the local watershed (Endreny, 2009). Middle school students also made public service announcements to educate their parents and community about public health issues (Buxton, 2010). I thought focusing on fixing problems was understandable since community development and addressing social issues play a crucial role in place-based education (Wright et al., 2021). One of the five "thematic patterns" that Smith (2002) describes is "real-world problem solving," and these articles were all highly focused and geared towards that (p. 589). In urban-focused, place-based education articles, they wanted the students to solve a problem they did not create. Environmental and recycling issues have been around for years and are especially ignored in urban communities. The thing that shifts the concern towards fixing these environmental issues in these communities the most is when gentrification starts to take place, a process I have observed in my hometown (Anguelovski, Malini Ranganathan, & Hyra, 2020).

Only one of the five thematic patterns in Smith's (2002) article was evident in the research literature review. The other themes, even though they could be very engaging for kids — such as studying local culture or nature — were not the focus of place-based research studies in urban settings. It was especially surprising to me that the "cultural studies" theme was not showing up more often in these articles, given the research that suggests the importance of connecting to learners' culture and history. The "nature study" theme showed up in the practitioner review with the *Adopt a Beach* and the *Wildfire* curriculum in ways deeply connected to the group of learners and their place.

Environmental issues and types of community can vary from place to place, which has a lot to do with the difference in the curricula created to support learners in their areas. Sianturi et al. (2018) aim to assess the impact of a PBE curriculum on an Indigenous teacher and 11 Indigenous students in Papua, Indonesia. These curriculum designers believe in empowering and improving Indigenous students' learning achievement. This study employed a mixed-methods approach, specifically a concurrent triangulation design, and was conducted in a remote indigenous elementary school in Papua, Indonesia. Students were taught to appreciate local plants as their primary source of food, understand the values of their land, and respect their rituals and culture.

The curriculum was developed directly by the teachers at the school. This study aimed to examine the development and implementation of this curriculum by an Indigenous teacher in a remote Indigenous elementary school in Indonesia and to investigate the impact of the PBE curriculum on Indigenous students and their learning achievements (Sianturi et al., 2018). The study's findings indicated that the PBE curriculum effectively facilitated the teaching process for the indigenous teacher (Sianturi et al., 2018). To effectively instruct Indigenous students, the Indigenous teachers needed to center their teaching around the PBE curriculum, ensuring it aligned with the student's cultural and educational needs. Secondly, the curriculum had to be designed to incorporate the students' everyday experiences and cultural context, making the learning relevant and meaningful to their lives. Finally, the cultural elements and values of the Indigenous community had to be integrated into the curriculum, allowing students to connect with their heritage and facilitating their learning achievement (Sianturi et al., 2018).

Sianturi et al. (2018) used a mixed methods research design, specifically the concurrent triangulation design procedure. Both qualitative and quantitative data were collected during the

same phases of the study but were analyzed separately. The qualitative and quantitative data were mixed during the interpretation and discussion stages. The study was conducted at YPPGI Nokapaka Elementary School in Yirene Village, which is in the central mountainous region of Indonesia (Sianturi et al., 2018). The impacts of the PBE curriculum on the Indigenous teacher and students were analyzed using a qualitative approach. In contrast, the student's learning outcomes were measured using a quantitative approach, specifically a pre-experimental or one-group pretest-posttest design (Sianturi et al., 2018).

The qualitative data Sianturi et al. (2018) collected during the study were analyzed by moving from surface-level observations to deeper interpretations and understanding of the data. The researcher interpreted the qualitative data to identify patterns, themes, and insights. The qualitative and quantitative analyses were compared and connected to provide a comprehensive understanding of the findings. Sianturi et al. (2018) revealed that the impact of the PBE curriculum was broken down into two parts: the first was the effect it had on the teachers, and the second was the impact it had on students. The article says the teacher impact is focused on the changing teacher practices due to the implementation of the curriculum and that the effects for the students are focused on their learning achievements. The study suggests that implementing a PBE curriculum can empower Indigenous teachers, improve Indigenous students' learning achievements, and foster cultural awareness among educators (Sianturi et al., 2018).

If, as place-based advocates suggest, this approach to learning is so effective, then why isn't it more widely utilized in urban schools? Is place-based education another example of widening inequities, where more privileged learners with the resources and access are given

additional opportunities, through PBE, to learn and advance? To be honest, I see each answer as the same; in understanding the history of education, I find this disheartening.

Quinlan (2021) states that K-12 science curriculum development did not consider the needs of African Americans, nor was it developed with Blacks in mind. This made so much sense as I thought about what I have experienced as an educator and the years of studying I conducted. In some research, I learned how black people were murdered/hung for attempting to learn how to read. I have researched the countless differences that existed between Black-only schools and White-only schools during the times of segregation and the poor learning conditions along with the second-hand materials that are given to schools in the poorer communities. It is hard to imagine that even after all the battles fought for equality in education, even after all of Dr. King's speeches, and after the amazing contributions or creations of black people in the world, there could still be a hidden agenda to leave the entire culture of learners behind. The article “Against the Dark: Anti-Blackness in educational policy discourse” explains how a theorization of anti-blackness allows one to identify and respond to racism in education discourse and in the formation and implementation of education policy more precisely. The article expressed how deeply embedded within racialized policy discourse is not merely a concern about disproportionality or inequality but a concern of the bodies of Black people and their Blackness and the threat posed by the Black to the educational well-being of other students. It used school (de)segregation as an example to demonstrate how policy discourse is informed by anti-blackness and consider what an awareness of anti-blackness means for educational policy and practice.

These articles helped to shape my thoughts and expand my wonders. I had many questions in mind for curriculum developers, and I have always wanted to know the basics. Why

was this work important to them, what were the learners designing for, what areas did they have in mind when creating, and did they think budget and affordability played a role in the types of schools they hired them to make? During my research, the curriculums were designed for specific groups of learners. Usually, a classroom teacher had ideas of using PBE to teach specific skills. However, I also found researchers with grants to focus and create for various demographic groups in many specific places (Africa, Hawaii, and Michigan, to name a few). After seeing such a wide variety of places being utilized for PBE, the schools that do not use it may not know how or have the funding. By finding and wondering so much more, I now have more questions. I want to ask developers how they feel about anti-Blackness and if it feels present in their world of education PBE preparation. I want to ask if personal biases exist to them when creating content; I wonder if they think having such a small number of Black educators affects the quality of education being received by black students, and if so, why? These articles brought me many new thoughts and helped me to prepare my next steps and interview questions for the investigation process.

During the years I was obtaining my master's in education, I learned that there were different voices in education. The student voice and teacher's voice: I was taught as the teacher that a considerable part of my job was to include student's voices and have student-led lessons. I was taught to meet students where they are and to teach through multiple lenses to meet all learning styles. So, when I saw a lack of learning in students being left behind academically, my first thought was that the problem is what or how the teacher is teaching. I used to think teachers chose what they taught until I learned about curriculum designers and how schools choose curriculum for their learners. During my research, I recently learned of a third voice, the curriculum designer's.

In the article “The Voice of Curriculum Developers in Teachers Guide,” Ahl, Koljonen, and Helenius (2017) state that by combining linguistic analysis with metaphors for translating between a body of knowledge and teaching practice, we exemplify curriculum developers' voices in teacher guides. Here, they discuss two types of voices: that of the Expert, who talks through the teacher and restricts the pedagogical agency of the teacher, and that of the Philosopher, who speaks to the teacher and affords the teacher agency concerning pedagogical ideas and practices discussed in the teacher guide. This unexpected discovery would now shift my thinking away from the idea that teachers were responsible for what content students received to understand that teachers do not have all the options or power when utilizing curriculum. The curriculum designer's voice matters because it plays a crucial role in shaping what students learn and how they learn it. The curriculum designer's decisions, teaching methods, and assessments directly influence students' overall learning experiences. A well-designed curriculum can engage and inspire students, promote critical thinking, and align with educational goals. It can also impact the overall effectiveness of teaching and learning. The voice of the curriculum designer is instrumental in creating an inclusive, relevant, and comprehensive educational framework for students' growth and success.

What approaches have researchers used to study curriculum design?

In this study, I aim to delve into the perspective of curriculum developers who have created place-based science materials. Understanding their design processes, including their target audience and the context of their designs, is crucial. To prepare for these interviews, I have thoroughly examined the literature on the curriculum design process, recognizing the importance of understanding the curriculum designer's perspective to improve the interview process.

Squire et al. (2003) discusses the importance of considering the local culture and context when designing school curricula. They emphasize the significance of incorporating elements of the student's cultural background, beliefs, and experiences into the educational content to create a more meaningful and effective learning environment. They also emphasize the importance of the curriculum designers thinking of diverse ways the teacher could teach the curriculum to suit the local context (Squire et al., 2003). Ontong et al. (2015) focus on PBE, particularly in South African schools, with Greenfields Primary serving as a case study. PBE emphasizes learning connected to the local environment, community, and culture. The design for this article was based on critical race theory, with a direct relation to (Gruenewald, 2014). The authors explore the benefits of this approach, such as fostering a sense of belonging, promoting environmental awareness, and engaging students in their immediate surroundings (Ontong et al., 2015).

Squire et al. (2003) address four case studies of teachers implementing an interdisciplinary, technology-rich, project-based environmental science unit called the Active Ink Air Quality module. The curriculum was developed through a partnership between educational technology faculty, science educators, instructional designers, and K-12 teachers (Squire et al., 2003).

In Squire et al. (2009), since the study used a qualitative case study approach, it involved collecting data through multiple methods, including each of the following. First, researchers observed the implementation of the technology-rich, project-based curriculum in the four classrooms to understand how it was used and adapted (Squire et al., 2009). The next step of the data process was interviews. Researchers conducted interviews with the participating teachers to gather their perspectives, experiences, and insights regarding the implementation of the curriculum (Squire et al., 2009). Lastly, they used document analysis using relevant documents

such as curriculum materials, lesson plans, student work, and other artifacts analyzed to gain a deeper understanding of the implementation process and the impact on teaching and learning (Squire et al., 2009).

Overall, the research design effectively combines project-based learning, inquiry-based learning, and technology integration to promote critical thinking, authentic scientific investigations, and interdisciplinary understanding in the field of environmental science (Squire et al. (2003). However, this study was about developing and studying the PBE curriculum rather than the curriculum designers themselves (Kudryavtsev, Krasny, & Stedman, 2012). Still, this study gave me good insight into my research of curriculum designers and their thought processes. After reading, I could clearly see the goal of the curriculum developers was to create a curriculum that would directly engage students, promote critical thinking, and incorporate technology to enhance their learners' experience and meet students where they are. The Squire et al. (2003) study strongly focused on PBE and cultural connection but did not directly answer the question of "who" they were designing for. This made me realize that I may need to ask that question directly when interviewing participants in my study.

Ontong et al. (2015) also discuss the importance of engaging students with a curriculum that adapts to their local culture and beliefs, but unlike Squire et al. (2003), this study focused on PBE. The location of this study was South Africa. The article touches on spatial and political inequalities resulting from apartheid (Ontong et al., 2015). Ontong et al. (2015) argue that PBE can serve as a transformative educational tool but explains that for it to be effective, teachers need to be aware of their learners' sense of place. Their article is divided into four sections. The first section explores the concepts of PBE, place, and sense of place. It highlights the emotional connection people develop with the places they live in and emphasizes the need for a

multidimensional understanding of place. The second part presents a case study conducted at Greenfields Primary School, discussing its findings related to PBE. The third part discusses the ongoing political and spatial challenges faced in South Africa even after the transition to democracy. The last section concludes the article by examining the educational implications of the case study and exploring possibilities for overcoming the challenges identified (Ontong et al., 2015).

In Ontong et al. (2015), the data collected included qualitative interviews with two teachers in the Social Sciences learning area for grades six and eight. Additionally, focus groups and individual interviews were conducted with learners. The sample consisted of 12 learners, six staying in an eco-village and six staying on neighboring farms. The purpose was to understand the learners' sense of place and investigate the differences and similarities in their sense of place between the two groups (Ontong et al., 2015).

Ontong et al. (2015) analyzed the data using the constant comparative method, which involved coding to the group and re-grouping the data into meaningful themes. The study's findings focused on the learners' sense of place and the extent to which teachers practiced a pedagogy of place (Ontong et al., 2015). Regarding the learners' sense of place, the interviews revealed three similarities between sixth- and eighth-grade learners. These similarities included an appreciation of the aesthetic environment, a strong attachment to the places where they lived, and the nurturing of social relationships with neighbors (Ontong et al., 2015).

Learners living in the eco-village described positive experiences, such as participating in activities to keep the environment clean and receiving rewards from the owners. However, some learners living outside the eco-village experienced racism from farm owners, leading to negative perceptions of the places where they lived (Ontong et al., 2015). The study highlighted the

negative experiences of learners and their families living outside the eco-village and the impact of such experiences on their sense of place. Issues like racism were identified as influential factors that affected their attachment and emotions toward their living environments (Ontong et al., 2015). Overall, the study aimed to explore learners' sense of place and the extent to which teachers implemented a pedagogy of place. The data collection involved qualitative interviews with teachers and learners (Ontong et al., 2015).

The methodology used by Ontong et al. (2015) was an interpretive paradigm to understand learners' sense of place and the extent to which teachers implemented a pedagogy of place. The data collection involved qualitative interviews with two teachers from the Social Sciences learning area, focus groups, and individual interviews with learners. The participants were 12 learners, six residing in an eco-village and six living on neighboring farms. The goal was to explore the similarities and differences in their sense of place (Ontong et al., 2015).

The curriculum designers assumed that the school context in the eco-village would be more conducive to fostering a pedagogy of place (Ontong et al., 2015). The two teachers were also part of the sample. The study's data focused on learners' sense of place and the extent to which teachers implemented a pedagogy of place. Interviews with Grade six and eight learners revealed three commonalities among their responses. The learners residing in the eco-village described positive experiences, such as participating in environmental cleanup activities for rewards (Ontong et al., 2015).

However, some learners living outside the eco-village reported experiencing racism from farm owners, which influenced their negative perceptions of their living places. These negative experiences, particularly racism, were not expected to become a part of the study, but since they happened, the curriculum developers made it a specific interest in the study (Ontong et al.,

2015). Even though the students did acknowledge the beauty of the environment, the students who experienced racism did not feel a sense of attachment to their living places. These negative experiences played a role in shaping their perception of their surroundings. The students who experienced racism had every right to feel this detachment, but the real issue to me was the farm owners (Ontong et al., 2015). I wondered what the farm owners had said or done to the students, and I also wondered if the farm owners, as children, had been taught from the lens of PBE. PBE can teach so much about accepting and respecting others' cultures along with our own, which I think is a key factor in life. When I hear racism is being inflicted on children, it hurts me, and I feel saddened by the lack of respect and understanding some people have toward other races, cultures, and communities.

In the article by Ontong et al. (2015), the authors recognized the importance of understanding race, culture, and community. They worked to understand their school by exploring the learners' and teachers' perspectives and experiences (Ontong et al. 2015). I consider the research design Ontong et al. (2015) used in this case study was effective for several reasons:

First, Ontong et al. (2015) used a qualitative approach: The study employed a qualitative research approach suitable for exploring the learners' sense of place and the extent to which teachers practiced a pedagogy of place. Qualitative methods, such as interviews and focus groups, allowed for in-depth exploration and understanding of participants' experiences and perspectives (Ontong et al., 2015).

Secondly, Ontong et al. (2015) used the interpretive paradigm: The study was framed within the interpretive paradigm, which emphasizes understanding individuals' subjective meanings and interpretations. This paradigm was well-suited for investigating learners' sense of

place and teachers' pedagogy because it focused on capturing their lived experiences and perceptions. A good example of a lived experience as it relates to this article was how the teachers took account of how their teaching methods influenced their students' sense of place and learning outcomes or personal reflection on how the learning environment impacted their educational experience and sense of belonging (Ontong et al., 2015).

Next, Ontong et al. (2015) used mixed methods: The study employed interviews with teachers and focus groups/individual interviews with learners. This mixed-methods approach provided a comprehensive view of the research topic by gathering insights from multiple perspectives. It allowed the researchers to triangulate the data and gain a deeper understanding of the learners' sense of place and the teachers' pedagogical practices (Ontong et al., 2015).

Additionally, Ontong et al. (2015) utilized purposeful sample selection: The sample included 12 learners, six of whom lived in the eco-village and six from neighboring farms. This sampling strategy aimed to investigate the differences and similarities in the sense of place between these two groups. By selecting learners from diverse backgrounds, the study could capture a range of experiences and perspectives, enriching the data analysis and findings (Ontong et al., 2015).

Ontong et al. (2015) also used thematic data analysis: The data were analyzed using the constant comparative method, which involved coding and grouping the data into meaningful themes. This rigorous analysis method helped identify patterns and commonalities in learners' responses and teachers' practices, providing a systematic and structured approach to data interpretation (Ontong et al., 2015).

Lastly, Ontong et al. (2015) used contextualization: The study considered the specific context of Greenfields Primary School, including the challenges faced by teachers, the history of

land dispossession, and the socio-political dynamics in South Africa. By contextualizing the research, the study explored the implications of these factors on learners' sense of place and teachers' pedagogical practices (Ontong et al., 2015).

Overall, the research design used by Ontong et al. (2015) provided valuable insights into the learners' experiences and the challenges teachers face in implementing a pedagogy of place (Ontong et al., 2015). This article focuses directly on a disadvantaged group of learners who felt they needed to experience PBE. The curriculum developers also described in detail how they worked with local teachers in designing the curriculum, as they thought this was a critical step in developing a supportive experience for learners. Including this information confirmed the importance of my third research question, and I need to ask curriculum developers questions about how they gather information about the places they are designing for. This dissertation uses a methodology like Ontong et al.

Wright et al. (2021) utilized a grounded theory approach to explore implementing a locally developed PBE curriculum. One of the objectives was to promote "environmentally positive behaviors" among students (p. 1519). As part of the curriculum, they had camera traps placed near schools to capture images of urban wildlife, which teachers then used during the lessons. The study's findings highlighted the importance of teachers perceiving a curricular alignment and having a curricular agency.

Teachers who felt the PBE lessons aligned well with their existing curriculum and teaching practices were willing to adopt and adapt the lessons for their classrooms. However, teachers who did not implement the PBE lessons needed more curricular agency or perceived misalignment between the PBE curriculum and their school context. Based on these findings, the study suggests that environmental education professional development leaders should prioritize

allowing teachers to explore their own curricular agency and consider their specific context when implementing the PBE curriculum (Wright et al., 2021).

Teachers need the freedom to adapt and tailor the curriculum to their students' needs and their school's unique characteristics (Wright et al., 2021). The researchers aimed to understand the factors influencing teachers' decision-making processes about PBE. In my study, I will also seek to understand how much room curriculum developers allow for teacher voice and tailing of the various designed curriculums since most curriculums included science teachers from 12 middle schools within the district. However, 11 teachers from 10 schools chose to participate in the project. These teachers were recruited for the study (Wright et al., 2021).

Although the primary focus of my research has been place-based curricula, I found some articles that were not related to place-based curricula that still provided helpful information for studying curriculum design. While it was difficult to find literature on science curriculum developers specifically, I did find some helpful ideas in the literature on instructional design.

In "Instructional Designers' Perspectives on Learners' Responsibility for Learning," Matthews and Yanchar (2018) identified a few themes on the issue of their article "Responsibility for Learning," and they questioned the lived experience of their participants. They reported those most relevant to the research questions and most capable of providing insight into the issues. Of the six themes they identified, theme six was most interesting to me. Theme six measured designers who were conflicted about their responsibility to guarantee learning. They asked the participants if they could make learners learn and what makes them learn. One of the participants indicated that even though designers can force participation in certain kinds of learning activities, she was uncertain that the resulting learning would last. Another expressed a similar reservation about the possibility of forcing learning by saying:

"I cannot make my five-year-old eat his vegetables. I mean, I guess I can… I can shove them down his throat… [but] is he really eating it? … You can drill into someone's mind the answers to a test… but I do not know that that really would count as learning, in the sense of what we want it to be." (Matthews & Yanchar, 2018, p. 120).

For both participants, there was a tradeoff between the possibility of forcing learning and the kind of learning that would be achieved (or the length and strength of retention). They realized that when you get into higher cognitive things, someone must be interested, engaged, and try to learn. The consensus among the participants was that lower levels of learning could be forced, but higher levels of learning required the participation of a willing and interested learner.

The information obtained in this article showed that some, if not all, curriculum designers were considering the effects of their work on learners. However, this still did not make clear to me if they were indeed thinking of the type or demographic of learners who could or could not utilize their designs. Gathering an understanding of the responsibility of learning "which they were doing" is vital to creating and producing a curriculum in the education process; knowing what your end goals are when designing a curriculum is a perfect guide to use when creating. As an educator, I always found planning backward to be most effective… so I could really appreciate the work done in this study. Still, the question of which learners were being designed for when creating that curriculum remained.

Kumar et al. (2022) address research related to curriculum development and the design of a course in higher education. The study focuses on the constructivist learning theory, which views learning as a process of constructing knowledge based on prior understanding and experiences (Kumar et al., 2022). The article describes the approach followed for curriculum development and the design of a specific course that was surveyed.

The methodology in the study focuses on constructively aligning the course under the survey. Constructive alignment is based on the constructivist philosophy of learning, where instruction and evaluation are aligned with the desired learning outcomes (Kumar et al., 2022). The data collection process in this article involved conducting a survey. The survey was conducted using Google Forms, and respondents included students, faculty members, alumni, industry professionals, and experienced academicians. The survey included both multiple-choice and open-ended questions. Observations were made based on the data, which led to improvements in the existing curriculum. The study provides an overview of the data collection process, and the analysis conducted to identify areas of improvement (Kumar et al., 2022).

Overall, the study aims to use all the feedback from stakeholders to better the subject's curriculum design, considering constructive alignment principles. Kumar et al. (2022) emphasizes the significance of constructive alignment and backward curriculum design in enhancing course effectiveness and achieving desired learning outcomes. By aligning instructional activities, assessments, and learning outcomes, faculty can create a meaningful learning experience for students. Although Kumar et al. (2022) was not focused on PBE, it had some of the same overall goals as Ontong et al. (2015), as both studies aimed to create meaningful learning experiences for students.

There are many different processes for developing a curriculum. Being aware of these different approaches helps me understand curriculum developers' different thought processes. Upon reading Boudreaux & Elby (2020), I learned for the first time about the development of a curriculum format called tutorials. A tutorial is a small group or one-on-one teaching where the tutor/teacher provides personalized instruction and guidance to a student. Tutorials are often used to supplement or reinforce classroom learning, address individual learning needs, or dive deeper

into specific topics. Boudreaux and Elby examined the students' responses to questions they asked about the direction of the static friction force in different situations as part of a physics tutorial.

While both authors had strong ideas for creating a tutorial promoting deeper understanding, their approaches differed significantly. This theoretical paper presents two contrasting tutorials and highlights how these differences can be attributed to their distinct theoretical orientations toward cognition and learning (Boudreaux & Elby, 2020). The authors emphasize that they do not claim superiority for one tutorial or the associated theoretical framework. Instead, they aim to illustrate two key points. Firstly, they demonstrate how the cognitive theories or frameworks, although often implicit during the creation process, shape the resulting tutorials (Boudreaux & Elby, 2020).

Secondly, Boudreaux & Elby (2020) argue that articulating and discussing their respective theoretical orientations and their impact on tutorial writing led to reassessing longstanding habits in their approach to tutorial development. Although they agreed on the incorrect reasoning patterns displayed by many students, they held different perspectives on interpreting the data. One of the authors emphasized a productive intuition underlying the students' answers, while the other focused on the student's failure to consistently apply relevant physics principles (Boudreaux & Elby, 2020).

This difference in interpretation extended to the designers' proposed approaches for developing a tutorial to enhance students' understanding of static friction. The authors' differences stemmed from the distinct cognitive frameworks they employed to analyze the student data and structure the tutorials. During the discussions and comparison of tutorials, the authors found that articulating their theoretical perspectives and engaging in dialogues helped

them identify areas for improvement in their tutorials. They proposed that the articulation, reflection, and discussion of theoretical orientations, whether formal frameworks or informal dispositions, is particularly valuable during the revision phases of tutorial writing (Boudreaux & Elby, 2020).

In one tutorial, Boudreaux & Elby (2020) showed in detail how the curriculum designers' cognitive theories (or frameworks), if tacit during the act of creation, shape the resulting tutorials. In the second tutorial, they showed how articulating and discussing the respective theoretical orientations and their influence on tutorial writing pushed for a rethinking of tutorial writing habits. The thought process behind this was that instructional intuition is shaped by explicit and tacit theoretical assumptions that function well in guiding the design of the curriculum, which their two different contrasting tutorials clearly illustrated (Boudreaux & Elby, 2020).

Through reflection and discussion of each other's perspectives, Boudreaux & Elby (2020) got revision ideas, and they concluded that active reflection and debate are intellectually stimulating and practical. I found this to be vital for me as I am searching to understand the curriculum developers' thought process of designing. It was helpful to see them use reflection and be very intentional in their revising ideas. This study highlights the impact of theoretical frameworks on tutorial design and the benefits of engaging in reflection and discussion to enhance the effectiveness and creativity of curriculum development (Boudreaux & Elby, 2020). However, theoretical frameworks matter; Boudreaux & Elby's (2020) article does not address race and biases in curriculum designers' frameworks. In the interview process with curriculum designers, I would focus less on the cognitive models that curriculum developers use and more on identifying their racial biases.

Understanding the decision-making process of curriculum designers is challenging. As I read all these 12 articles, I began to understand the choices better, but I am still unsure of the "why" in a few cases. Hoard et al. (2019) explored the competencies of multimedia makers and expert instructional designers on the design decisions they made during the instructional design process/workflow. This study focused on investigating how the multimedia production competencies of expert instructional designers influence the design decisions made during the instructional design process (Hoard et al., 2019).

The research uses qualitative survey instruments to assess and measure the production competencies of participants. The study's results, which involved 30 instructional designers, indicated that a significant number of participants selected media as an initial step in their workflow process (Hoard et al., 2019). The participants for this study were recruited from the membership of the Association for Educational Communications and Technology and the International Society for Performance Improvement professional societies. Recruitment was done through email invitations containing the informed consent statement, inclusion criteria, and a link to the multimedia production competency instrument. The inclusion criteria included having some full-time instructional design experience, knowledge of the instructional design process, English-language fluency, and access to a computer with an internet connection for video conferencing (Hoard et al., 2019).

The Hoard et al. (2019) study revealed that instructional designers often faced pressure from employers to incorporate media based on their demands and project constraints such as budget and time limitations. These external factors influenced the decision-making process of instructional designers (Hoard et al., 2019). The data procedure in this study (Hoard et al., 2019) followed the empirical protocol used by Rowland (1992) and discussed in Burton et al. (1990).

In addition to the survey, they used the primary data source for Hoard et al. (2019) was a recorded teleconference session conducted with the participants. The verbal content of each session was carefully reviewed and segmented based on pauses, intonations, syntax markers, and subject changes, following Rowland's (1992) approach. The primary researcher evaluated the segments for content and topic and grouped them according to overarching themes. The thematic groupings were continuously assessed as more sessions were reviewed, aiming for consistent categorization of themes. Special attention was given to themes related to developing skills and knowledge. A second reviewer was involved in validating the theme assignments, and in cases of disagreement, a third reviewer was consulted for resolution (Hoard et al., 2019).

During the design-aloud sessions, Hoard et al. (2019) listened for and flagged any specific development skills mentioned in the questionnaire to track how frequently and at what point those skills were introduced. For example, if a participant mentioned using Techsmith Camtasia or other video-editing software for a project deliverable, it was noted along with their response in the technical skills questionnaire for that skill. The researchers also recorded any technical development skills referenced or implied in the design-aloud sessions that were not mentioned in the questionnaire. These discrepancies were addressed in follow-up interviews with the participants to gain clarification and report on the findings (Hoard et al., 2019).

I researched specific terms such as "curriculum developers design approaches" AND "developing curriculum" which brought me to recent studies I would have never examined. Before now, I had never heard of the term public minds. Srijumnong et al. (2015) analyze the concept of public minds. Public minds refer to the collective patterns of meanings, feelings, desires, and aspirations embedded in society's social, economic, historical, and political

structures. It includes the shared assumptions, convictions, beliefs, and values that form the basis of social existence for various groups within a social order (Srijumnong et al., 2015).

The idea of public minds is to use both collective societal values and moral reasoning (Srijumnong et al., 2015). It reflects the shared understanding of social existence within a given social order, considering the range of moral development stages individuals may progress through as they mature. The purpose of this article's study was to develop a curriculum that enhances the public mind for lower secondary school students based on contemplative education; they focused on the actual development of the curriculum itself (Srijumnong et al., 2015).

The article study involved designing a curriculum that incorporated contemplative education principles and strategies to enhance the public minds of lower secondary school students (Srijumnong et al., 2015). Although this article was not related to my study, I selected it to educate myself on many ways that curriculum can and has been developed. I figured that since the topic of public mind was so unique to me, the development of its curriculum might also be. The curriculum development process included outlining objectives and conceptual frameworks and incorporating relevant theories. Once the researchers create the curriculum, they assess its effectiveness and impact in the evaluation phase. That involved implementing the curriculum with a sample group of lower secondary school students and collecting data on their public mind behavior towards family, school, and society (Srijumnong et al., 2015).

Additionally, the students' satisfaction with the curriculum was evaluated to understand their overall experience. The concept of public minds provides information on how individuals and society collectively shape and interpret meanings, values, and moral perspectives within a specific social context (Srijumnong et al., 2015). While searching for articles, I realized that a

few focused on urban schools and environments. However, Silk et al. (2009) focus on using engineering design to enhance science reasoning in high-needs, urban classrooms.

The research examines the effectiveness of a curriculum unit called Design for Science, which provides scaffolds consistent with reform science instruction to help students construct design solutions based on their everyday needs. The study involved eighth-grade students from two urban schools with a high percentage of racial/ethnic minorities and poor students (Silk et al., 2009).

The results of the study showed improvement in students' performance on a paper-and-pencil, multiple-choice assessment administered before and after the implementation of the Design for Science unit (Silk et al., 2009). The study suggests that design-based curricula can be a suitable alternative for teaching science reasoning in high-needs urban settings. A few of the things I found directly relevant in this article related to my study was the direct focus on students from urban schools. Another was how the study used a particular curriculum as an alternative to teaching science reasoning. I felt that studying this article would assist with my focus on the curriculum developer's process. The article highlights the limitations of traditional science instruction and textbook-based approaches and suggests that incorporating design-based curricula can help develop students' scientific reasoning abilities. By providing meaningful contexts and opportunities for exploration, design-based approaches offer an alternative to traditional methods in science education (Silk et al., 2009).

Silk et al. (2009) study is divided into two parts. In the first part, the implementation of the curriculum is done by two eighth-grade science teachers in schools with high minority and economically disadvantaged students. In the second part, the gains observed in the curriculum are compared to two other approaches to teaching science reasoning. Data were collected from

170 out of the 177 students in the eight sections taught by the teachers, but because of things like absences or suspensions, they lost some of the participants. However, the high number of racial/ethnic minorities and economically disadvantaged students in the group was still enough to evaluate the effectiveness of the curriculum in a high-needs urban setting (Silk et al., 2009).

Silk et al. (2009), the authors understand why this matters and work directly with educators to see how they do it (Silk et al., 2009). The case study was effective for several reasons in the research design used by Silk et al. (2009).

First, Silk et al. (2009) used the integration of professional development: The researchers provided professional development sessions for the design teachers, introduced the research study, and provided them with practice in integrating science reasoning instruction into the Design unit. This integration ensured the teachers were well-prepared and equipped to implement the curriculum effectively (Silk et al., 2009).

Secondly, Silk et al. (2009) observed classes: The researchers observed the classes during the implementation of the design unit without interacting with the students or teacher during class time. This allowed for objective observation of the instructional process and ensured that the researchers could gather accurate data on student performance (Silk et al., 2009).

Next, Silk et al. (2009) used pre- and post-assessments: The research design included pre- and post-assessments administered to the students before and after instruction. This allowed for the measurement of students' science reasoning abilities before and after the design unit, providing evidence of the impact of the instruction on student learning (Silk et al., 2009).

Silk et al. (2009) also used curriculum-neutral assessment: Using a paper-and-pencil, multiple-choice assessment ensured that the classroom teacher could easily administer the

assessment without specialized training. This increased the feasibility of the assessment and allowed for the comparison of student performance across different curricula (Silk et al., 2009).

Silk et al. (2009) also included validated assessment items: The researchers used validated sources to select items that measured the desired aspects of scientific reasoning. This ensured the reliability and validity of the assessment instrument and provided confidence in the results obtained (Silk et al., 2009).

Lastly, Silk et al. (2009) used statistical analysis: The researchers used appropriate statistical tests, such as the Wilcoxon signed-rank test, to analyze the data and determine the statistical significance of the gains in science reasoning from pre- to post-assessment. This rigorous analysis strengthened the validity of the findings (Silk et al., 2009).

Overall, the research design was effective in integrating professional development, implementing instruction, gathering data through assessments, and conducting statistical analysis to evaluate the impact of the Design unit on students' science reasoning abilities (Silk et al., 2009). Although this article was the least concerning my interest in PBE it did help to answer a few of my questions. It told me directly who the curriculum developers were designing for and where. This study had a direct focus on eighth-grade students from urban schools. Also, the curriculum designers used a particular curriculum as an alternative to teaching science reasoning, which was helpful in my understanding of the curriculum developer's process.

In conclusion, I found that each of these articles (Squire et al., 2003; Silk et al., 2009; Ontong et al., 2015) had highly effective research design processes and were very selective with how they incorporated their designs. In this next portion, I reviewed the data collection process used by each selected article (Squire et al., 2003; Silk et al., 2009; Ontong et al., 2015) and analyzed how they used it.

The data collected by Silk et al. (2009) primarily focused on evaluating the improvement of students' science reasoning in the Design group before and after implementing the Designing Solutions (DS) unit. The Wilcoxon signed-rank test was used to analyze the statistical significance of gains from the pre-assessment to the post-assessment. The data were not normally distributed, so this non-parametric test was chosen (Silk et al., 2009).

Silk et al. (2009) also examined the improvement of students from low performance to moderate or high performance. Low-performing students were defined as those answering zero through four items correctly, medium-performing students answered five through nine items correctly, and high-performing students answered ten through thirteen items correctly. The percentage of Design students in each category was analyzed at the pre-and post-assessment stages (Silk et al., 2009).

Additionally, Silk et al. (2009) aimed to evaluate the impact of student factors on the improvement observed in the Design group. The factors considered included gender, race/ethnicity, special education classification, and government-subsidized free or reduced lunch eligibility. The improvements on the full test were disaggregated by these student factors and analyzed (Silk et al., 2009).

York and Ertmer (2016) analyze the frames of reference of experts in instructional design to explore how participants' frames of reference aligned with the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) design model. Different experts used distinct frames of reference, influenced by their roles in the field. The researchers integrated mental models of the instructional design process into these frames during problem analysis. However, designers' use of instructional models did not always align with the conventional textbook descriptions. The research also uncovered a few rules of thumb used by participants, with some universal elements across different individuals. In Ertmer, York, and Gedik (2009), designers brought their individual experiences, knowledge, and perspectives to the table when describing their design practices. Their backgrounds and expertise shaped the stories they shared and the insights they provided about their design approaches. Personal frames of reference would have played a role in how the experts identified key design challenges within the problem. Their past experiences with similar problems, their knowledge of effective instructional strategies, and their

beliefs about what works in education would have guided their ability to pinpoint the most critical issues of the design.

In Stollman et al. (2022), personal frames of reference were used as a significant component in understanding how teachers made sense of and adapted to the innovation of differentiated instruction. The study identified three types of searches for meaning among the teachers: assimilation, adaptation, and toleration. The categories were used to characterize how teachers approached innovation. Personal frames of reference played a role in influencing which of these strategies each teacher used. The study provided a detailed description of the teachers' frames of reference. This involved gathering information about their prior teaching experiences, educational philosophies, beliefs about effective teaching and learning, and attitudes toward innovation. These descriptions helped illuminate the factors that shaped each teacher's approach to implementing differentiated instruction. The study also tracked how teachers' personal frames of reference changed over two school years. While they became more similar, there were still differences. This approach allowed the researchers to observe how exposure to innovation and external factors may have influenced teachers' frames of reference and their willingness to embrace innovative approaches.

In instructional design, personal frames of reference refer to the individual perspectives, beliefs, experiences, and cultural backgrounds that designers bring to the design process. Designing instruction that acknowledges and respects these diverse frames of reference helps create more effective and engaging learning experiences (ChatGPT, 8/30/2023, “What are personal frames of reference as it relates to instructional design?”). My study directly focuses on analyzing curriculum developers’ perspectives and beliefs, which I hope to uncover with my interview questions. Connecting cultural backgrounds is at the forefront of PBE, which makes personal frames of reference an appropriate analytic framework for my study. I believe that

understanding the individual experiences and thought processes of curriculum designers will help raise awareness of how the learning needs of certain cultures are not being designed for and or forgotten about when creating curriculum.

Chapter 4: Methodology

Research Questions

The objective of this study is to learn more about what curriculum developers take into consideration when designing place-based science lessons, and whether those considerations might partially explain the apparent lack of place-based science curriculum materials for urban communities.

The study will address the following research questions: How do curriculum developers' approach PBE lesson development? Within this question I have the following sub-questions: (1) Which learners are they designing for? (2) What place(s) are they designing for, and why? and (3) To what extent do personal frames of reference account for curriculum developers' approach to PBE science lesson development?

Given the lack of place-based curriculum materials for urban learners documented in Chapters 2 and 3, I expect that urban learners are being left out of the design process because curriculum designers are not considering their unique culture and environment when designing PBE curriculum. To my knowledge this will be the first study to examine if and how PBE curriculum designers consider urban learners.

Research Design

This research design is a basic interpretive qualitative study utilizing thematic analysis of interview data. As discussed in Merriam and Tisdell (2016), interpretive qualitative research is about uncovering "how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences" (p. 6). In conducting a basic qualitative study, researchers seek to discover and understand a phenomenon, a process, the perspectives, and worldviews of the people involved, or a combination of these (Merriam, 2002, p. 6). This

qualitative study is built around 7 participants who have designed science place-based curriculum in or around the DMV area and/or curriculum developers who were from the DMV area. Chapters 2 and 3 discuss what place-based curriculum materials exist for teaching science in urban schools, but the literature reviews did not reveal as much about the curriculum developers' own perspectives or ideas. A basic interpretive design documenting interviewee participants' accounts and experience of their process of designing curriculum will help me address that gap.

The remainder of this chapter will explain how the participants were selected, the research methods used, understanding personal frames of reference and how the data collection was processed and analyzed. The chapter ends with steps taken to ensure trustworthiness and validity of the research.

Participant Pool, Recruitment and Selection

I decided speaking directly with curriculum designers would be most helpful for answering these research questions. Since they are the professionals responsible for planning and creating educational programs, they can best explain the principles, methodologies, and approaches they use to develop effective curricula. The participants are curriculum designers in the District of Columbia-Maryland-Virginia (DMV) area. I chose this location to help focus on students who live in city areas/learning environments. This is important to my work because in my initial literature review, I was only able to find four PBE curriculum designs that were applicable for urban areas. One advantage of focusing on the DMV is that I was able to conduct face-to-face interviews, which I prefer to online interviews. Also, it was important for the curriculum designers to live or work in the DMV region given my interest in place-based curriculum design for learners in urban environments like the District of Columbia.

After receiving IRB approval, the first step I took to find participants was to reach out through my professional network of colleagues in education, including my committee members, to see if they knew of any curriculum developers. I also used the internet to research education companies operating in the DMV that specialize in curriculum development and instructional design to find expert curriculum developers. After finding the selection of participants I wanted to interview, I connected with them by sending an email to request an interview, along with a consent form.

For this basic qualitative interpretive study, I aimed to recruit a minimum of 5 and up to 10 curriculum developers. Successful recruitment would yield a participant from each grade level (elementary, middle, and high school); a racially diverse group of participants; and include developers who grew up in this area. I invited 12 curriculum developers to participate in the research study. Instead of selecting random participants, I used purposeful sampling, deliberately selecting individuals in the DMV region that have developed science and/or PBE curriculum. Originally, I set out to interview curriculum developers who had designed PBE science curriculum only. However, because of the limited pool of developers in the DMV that developed both I ended up interviewing curriculum developers who designed either science or PBE curriculum. I tried to select participants who might represent a variety of perspectives. As stated by Merriam and Tisdell (2016) "the assumption that the investigator wants to discover, understand, and gain insight and therefore must select a sample from which the most can be learned" (p. 96).

Although I invited 12 curriculum developers to participate in the research study, only 7 were available. Of the seven developers who agreed to participate, three developed curricula for elementary, two developed curricula for middle school and the last two developed for high

school. So, this was a good balance as far as the variety of grade levels was concerned. Though not requested, all participants chose to identify their racial backgrounds when answering certain interview questions. The participants consist of the following racial backgrounds: half-White/half-Asian, Black, African American, Caucasian/White. I wanted a balance of racial background as well as men/women participants. I was satisfied with the variety of racial backgrounds of my participants, but I had hoped to have more equal gender representation. I also did not interview any participants who worked at universities under grant-funded curriculum projects.

My recruitment process was a strength of the research. I was able to email selected curriculum designers and gain their consent to interview almost immediately. The interview schedules were made very quickly, and all the participants were able to meet within a month's time. Upon meeting the curriculum designers, I started each interview by asking if they had any questions about my research before starting. Each participant revealed that they had read my recruitment email thoroughly and felt it did an excellent job explaining my goals and the reason behind the interviews. They each express how excited they were about my research and being a part of my study. Three of them shared with me that they were looking forward to completing my dissertation and were interested in seeing the study results.

Data Collection

The data collection took place over a two-month period. Once the recruitment email was sent out, I received almost immediate responses with availability to schedule the interviews. The DMV area was selected based on proximity and being able to have in person interviews, however due to scheduling conflicts one interview was conducted via zoom.

Once interviews were scheduled, I was able to quickly conduct them due to the

participant's quick availability to meet. During the interview I first asked the developers if they had any questions about my research, next I asked if they agreed to be recorded and finally, I reminded them to refrain from saying their names along with their companies during the recording. While conducting my interviews I used an OlympusTM recorder to capture the responses of my interviewees. The reason for doing this was so that I would not be distracted by trying to take notes while also engaging in the conversational style interview. Recording allowed me to give the participants my full attention and review the data later.

As I began each interview, I reminded myself to pay close attention to responses and to focus on listening. Once each interview was complete, later that day, I would go back and transcribe the audio, writing exactly what was said by participants. While scribing I also kept a log of my reflections in my journal from each interview to record my reflections, ideas, and questions about the research process (Merriam & Tisdell, 2016).

Interviews

The main data source of this basic interpretive research was semi-structured face-to-face interviews (using virtual as a back-up plan). Semi-structured interviews lasted 45-60 minutes with 5-10 curriculum developers. The interview questions topics include curriculum design processes, efforts to close the educational gap, curriculum design standards required or utilized, perception of impact of PBE and its usefulness, and how equity is incorporated in their curriculum.

Interview questions

In designing the interview protocol (see Appendix C) I wanted to create questions that would collect useful information from curriculum developers about their process for making

place-based materials. Each interview question has a label at the end, e.g., (prior knowledge). The tags were created while developing and refining the protocol to make sure there were opportunities for participants to speak about equity, personal frames of reference, prior knowledge, representation, and cultural background. These were topics that stood out from the literature review and are part of the theoretical and analytic framework previously discussed.

Quinlan's research into creating curriculum materials with meaningful representation for black students in the science classroom was inspiring and felt deeply connected to my work. Quinlan's 2021 article describes three themes for meaningful representation for black in the science classroom –culture, prior knowledge, and universality of Black representation. My interviews and analysis of curriculum designers' personal frames of reference focused on Quinlan's three themes with a slight modification. Because this study focuses on place-based education for urban schools, I realized that urban schools and communities can include students from many racial and ethnic backgrounds. So, I had to modify the theme of universality of Black representation to localized representation of children in urban schools. For example, question number 17 says, "I have read that the curriculum is created with the "majority" in mind. Do you think this is true in your experience as a curriculum designer? [a. Who would you say is the "majority"? b, what does this mean for the minority?]." The question asks participants to define 'majority' and 'minority' in the context of their professional work. This question could be answered in many ways such as race, religion, gender, culture, or sexuality. Understanding this was important to process because if they are designing with a majority in mind who would be their majority and who would be their minority. To be even more specific, are the kids in urban schools the majority or the minority and does this help to uncover the reason there was a smaller amount of place-based curriculum in the literature I reviewed?

Prior knowledge is a critical component of a curriculum developer's personal frame of reference. In Ertmer, York, and Gedik (2009), designers brought their individual experiences, knowledge, and perspectives to the table when describing their design practices. Many questions in the protocol are intended for curriculum developers to talk about their prior knowledge. In reference to the tag prior knowledge, one sample question is 2a. This question was asked to the developers intending to share their process of developing a new curriculum. This question could be asked to a principal, teacher or even a teacher assistant and they would all give an answer based on their own professional experience. The answers given may not align with what is best practice, but it will reveal what their prior knowledge to develop curriculum includes.

Data Analysis

Thematic Analysis

Thematic analysis is a qualitative research method used to identify, analyze, and report patterns within a dataset of qualitative data (Russo-Tait, 2023). Thematic analysis involves identifying themes and patterns within qualitative data, such as interviews or observations (Tonkiss, 2004; Castleberry & Nolen, 2018). It involves systematically organizing and interpreting textual or visual data, such as interview transcripts, focus group discussions, or written responses, to discover recurring themes or patterns. Thematic analysis offers flexibility in data collection which allowed me to adapt my approach based on emerging themes and insights from the initial interviews.

In this study I used a realist version of thematic analysis (TA). Realist is a type of TA where interpretations are "generated from connections and congruence between the different participants talk... and keeping their interpretations as close to participants concern and orientations as possible" (Terry& Hayfield, 2021, p. 80). Following Russo-Tait's (2022)

approach, the thematic analysis involved five steps. After listening to the interviews, I formulated my initial understanding of the data, coded for the personal frames of reference using deductive coding, identified themes, revised themes as needed and defined the themes.

Transcripts

As I listened to my recorded interviews, I began to write word for word what I heard. which would be consistent with a “naturalized” transcription approach (Bird (2005). As I listened to the recording, I realized a lot of times people say “ummm” or “humm” before answering a question and as I transcribed, I typed those sounds. If they laughed, I put laughing with an asterisk beside the word to identify that they laughed. I did this to capture more of the exact thoughts and feelings felt in those moments. It was important to my basic interpretive study and analyzing personal frames of reference that captured the thoughts and feelings in response to hearing the interview questions. Bird (2005) highlighted some information about transcription for researchers that help me learn how to own the process of transcribing in a way that made it feel doable in a well-paced step by step process.

Familiarization

Terry & Hayfield (2021) explain "Familiarization" is to the process of getting familiar with the data. In my process of familiarization, I went through multiple rounds of listening to my recorded data and taking notes of the ideas and topics that either stood out or raised questions for me.

Merriam and Tisdell (2016) state, “the rigor in qualitative research derives from the researcher’s presence, the nature of the interaction between researcher and participants, the

triangulation of the data, the interpretation of perceptions, and rich, thick description" (p. 191-192). I kept my own analytical notes while transcribing. This helped me to capture my initial thoughts and ideas. The reflections were handwritten after each of the interviews inside of a notebook used specifically for my research data. For example, during my very first interview I was recording but I wanted to take notes while the participant was speaking. However, I found it most effective to make eye contact and use that time to interact instead of taking notes. So that was what I did. I listen to her speak. Later that afternoon, I replayed the recording with my notebook in hand and I wrote down each thing that stood out to me as the participant responded to my questions. Some notes were things I loved, while some were ideas, I had questions about, and a few were responses I did not really think I understood. This note taking process was important because it helped me to recognize my biases by highlighting my immediate feelings to response and understanding why they did or did not resonate with my knowledge or assumptions.

An example of one question I asked was, "Can you tell me all the steps needed to develop a new curriculum, and who is at the table?" The interviewee's answer to this question was, "It is critical to have a cross section of people at the table. We use teachers, administrators, we use parents, people from the community and even students. When developing a curriculum, you need to have all voices be heard. Even if they are not there for all sessions their voices need to be heard. However, I have worked for companies who do not include all voices, and I have even worked with companies who expect you to develop everything on your own, I do not particularly prefer that. Based on her response to this question my note said the following: *CD (curriculum developer) feels it is critical to have a cross section of people at the table and does not like settings where she is asked to develop alone. Too many voices are left out.* Although a lot more was said, this was a key take-away of what was put in my analytical notes when I reflected on

that response.

Coding

Coding plays a significant role in thematic analysis by helping to organize and categorize the data. In thematic analysis, coding involves systematically labeling parts of the data with descriptive or interpretive labels, that can later be grouped into themes. The themes represent patterns or recurring ideas found in the data, allowing the researcher to identify and analyze underlying meanings and concepts. Coding helps to streamline the analysis process, making it easier to identify patterns, draw conclusions, and generate insights from the data Terry & Hayfield (2021).

For my coding process, I was inspired by Quinlan's (2021) implications for meaningful representation for black in the science classroom. Emergent themes in Quinlan's work, like "representations to highlight cultural resources" (p. 2326), was something I found to be extremely relevant in the thought process of understanding how or if there was a lack of PBE present or being developed for urban communities. Therefore, I began the coding process deductively, by looking for evidence of Quinlan's implications.

I used color coding to keep track of my coding process. Initially, I had three colors which were teal, purple, and yellow: teal standing for prior knowledge, purple standing for cultural background and yellow standing for representation. Ertmer's (2008) version of prior knowledge refers to the curriculum developer's prior knowledge — any knowledge that they would have gained either via education or in life that allows them or equips them to respond to the interview question in that moment. This is the version of prior knowledge that I reference and utilize for this research.

Example 1: Prior Knowledge Code

Interviewer: As a curriculum developer I imagine the thought process for curriculum creation must be detailed, can you give me some insight on what that process entails?

Person 1: To develop a curriculum, we look at several things. We look at standards and make sure it is broad enough that teachers can input ideas but narrow enough that it can be replicated across the country. Some states have requirements so we may also have to include that.

If the response explicitly referenced the curriculum developer's own race and cultural background, or their knowledge of students' race and culture then the response was coded as *cultural background*. (Initially, this code was focused on the curriculum developer's background only, as part of their personal frame of reference. However, during the first interviews, participants often spoke about students' backgrounds, so the code was expanded.)

Example 2: Cultural Background Code

Interviewer: How do you think curriculum design relates to equity in education?

Person 1: 1st of all when I think of equity in education, I think of a culturally responsive curriculum. Meaning the children see themselves in the curriculum. We want them to see a global perspective, but we also want them to see themselves.

Finally, if the interviewee responded to a question about where or what area they designed for or have been hired to design for, that was coded as *representation of place*. When interviewees talk about the locations they are designing for, and the why behind the selection of that area, their responses are coded as representation of place. A place could be geographic, like the DMV, or the setting, like urban schools.

Example 3: Representation of Place Code

Interviewer: Have you designed a curriculum for schools located in urban communities?

Person 1: Yes. I most often design curriculum for urban schools. However, I have also designed for other areas as well.

More details about the codes identified during the analysis process are described in Chapter 5: Results and Findings.

Coding in thematic analysis can have several approaches. Terry & Hayfield (2021) teach that latent coding involves identifying the underlying meanings, concepts, or themes that are not explicitly stated in data but may be implied or inferred. Semantic coding involves labeling or categorizing the data according to its literal surface-level content. This research design has a mixture of both. Originally, I designed the coding process to capture the answers related to that of my research goals through a deductive approach. However, as I did multiple rounds of reviewing and coding the data, I identified three more codes through a bottom-up, inductive process.

In addition, Saldana (2012) describes the "lumper" and "splitter" approaches to coding (p. 18). These two different approaches to coding are also commonly used. In lumper coding, researchers group data into broader, more inclusive categories or themes. This approach captures overarching patterns and trends within the data. Lumper coding is useful for identifying large, overarching themes that share a wide range of data points. Splitter coding on the other hand, is breaking down data into smaller, more specific categories or themes. This approach is to capture nuance details and variations within the data. Splitter coding allows researchers to delve deeply into the data to uncover subtle distinctions and nuances. Either coding system can be used depending on the research goals, the complexity of the data, and the desired level in the analysis.

After researching this information and observing how my research goals and what information I was looking to understand, I identified that the most effective coding style for this research would be lumper coding.

Table 1. Draft Code Book

Code	Description	Apply this code to...	Non-Example
Prior Knowledge	Information the curriculum developer knows about education, schools, curriculum development and design, learned from their own education, life, and work experiences	● Standards they must follow ● What standards are appropriate for age groups ● Steps to develop curriculum	● NOT information the interviewer shares and then the curriculum developer discusses ● A guess or an assumption
Cultural Background	Information the developer knows about their own or students' race and culture to write curriculum	● Culturally responsive ideas about teaching ● Descriptions of upbringing ● Desire to highlight the voices of racial minorities ● Questions asked about cultural background or race	● Not just referring to a race or culture as a label.
Representation of Place	References to specific or general geographic location; physical or virtual place	● Learning settings (beaches, museums) ● Landscapes (city, rural) ● Locations (states, cities, etc.)	● Not a metaphysical place ●

Funding issues Inductive	Information curriculum developers shared in reference to schools or programs' funding or resources	● Mentioning donors ● Funding climate ● Budget cuts ● Allocation of financial resources	*A teacher not having money to uber to work.
Equity Deductive and inductive	Information curriculum developers shared in reference to inequitable learning material access and or environments.	● Access (materials, qualified teachers, equipment) ● Reaching all learners (physically, or differentiating) ● Representation	A teacher does not have the same number of kids in their class as another teacher.
Assessment Inductive	References to school testing or "high stakes" assessments	● Score requirements for a school to stay open ● Test score trends	● Not assessments within a specific PBL lesson

The first code book, shown in Table 1, was developed after a couple rounds of coding. As I continued to re-read and re-code the data, I made updates during the process to capture new ideas and codes. For example, in the first code book I did not code for personal frames of reference, but after multiple rounds of coding, and discussion with my committee I later decided to add personal frames of reference to the code book. The final code book is shown in Table 2.

Table 2. Final Code Book

Code	Description	Subcodes	Non-Example
Prior Knowledge	Information the curriculum developer knows about education, schools, curriculum	● STANDARDS (required, or standards are appropriate for age groups) ● STEPS to develop curriculum (e.g., being	● NOT information the interviewer shares and then the curriculum

	development and design, learned from their own education, life, and work experiences	contracted, getting feedback) ● KNOWLEDGE OF LEARNERS ● TYPES of curricula ● EFFECTIVE STRATEGIES for instruction ● COLLABORATORS ● SCHOOL PARTNERS	developer discusses ● A guess or an assumption
Cultural Background	Information the developer knows about their own or students' race and culture to write curriculum	● CULTURALLY RESPONSIVE ideas about teaching ● Descriptions of STUDENTS' UPBRINGING ● Desire to highlight the VOICES of racial minorities	● Not just referring to a race or culture as a label.
Representation of Place	References to specific or general geographic location; physical or virtual place	● SETTINGS for learning (beaches, museums) ● LANDSCAPES (city, rural) ● LOCATIONS (states, cities, etc.)	● Not a metaphysical place
Funding issues	Information curriculum developers shared in reference to schools or programs' funding or resources	● DONORS Mentioning donors ● FUNDING climate ● BUDGET cuts ● ALLOCATION of financial resources	
Equity	The principle of fairness and inclusivity in all educational opportunities. Access to resources,	● ACCESS (materials, qualified teachers, equipment) ● REACHING ALL LEARNERS (physically, or differentiating)	Giving everyone the same lesson without scaffolding as needed.

	and fair treatment for all students.	● REPRESENTATION	
Assessment	References to school testing or "high stakes" assessments	● TEST SCORE REQUIREMENTS for a school to stay open ● TEST SCORE TRENDS ● TIME	● Not assessments within a specific PBL lesson
Personal Frame of Reference	"Individual experiences, knowledge, and perspectives" (Ertmer, York, & Gedik, 2009) instructional designers bring to the table	● CHILDHOOD experiences that they connect to their professional work. ● LIFE EXPERIENCES that influence preference in professional settings. ● Past PROFESSIONAL EXPERIENCE (e.g., curriculum design projects) ● BELIEFS about what works in education ● Professional PREFERENCES (e.g., designing for a specific grade band)	● I do not like pink. ● Not preferring to read the back of

Identifying and Defining Themes

As described previously, after transcription and familiarization, I completed multiple rounds of coding. After a couple of rounds of coding all the transcripts, I look for potential themes by examining the patterns in the codes. I looked for codes I found in many of the interviews and potential relationships between them. After discussing a theme with my committee, I revised it and reviewed it multiple times to check for other key patterns. Terry & Hayfield (2021) showed that the process of coding and identifying themes required careful

reading, critical thinking, and an understanding of the data which could only be done thought multiple rounds of coding and rereading the data.

Trustworthiness

To assure that my research is trustworthy, I have taken a few steps. It was important to try to transcribe participants' responses word for word to ensure honest data as a part of the study's credibility. Presenting direct quotes also allows anyone reading my results to have their own interpretations of the data. Having my transcripts and notes allowed me to be able to go back and review the data multiple times to gain a deeper understanding of the information collected. I conducted 7 rounds of analyzing the data, and this process allowed me to go from my 3 initial deductive codes to identifying a few more that emerged directly from the data.

Recognizing and managing my own perspectives/bias was important to this study. For example, I have a few questions in the interview that I had expected would spark conversation about racial inequalities in education. However, with one participant the responses came in a way that made me feel like they were being race evasive. But being aware of my own bias I made sure not to share their responses in a way that would paint how I initially received them but instead took the time to process and find various viewpoints to understand their response and I shared the data in a way that transcribed verbatim what was said. I include my research methods and include any limitations or biases that may affect the way I would interpret my results.

My next step was to review existing literature to understand what has already been studied, what methods had been used, and what gaps existed in the knowledge of curriculum design. This helped me to build on existing research and keep from duplicating what information is already out there. Also, I did my best to make sure I used sources that were credible, peer-reviewed, and from journals or books instead of just relying on internet sources.

Finally, my entire process was documented because I used an online word processor document for my dissertation writing and coding. The changes and revisions I made to the coding scheme and chapters are evident in the history of these electronic documents.

Reporting Results

Because the curriculum development community in the DMV area is small and well connected, and this is a "small n" study, it was important in presenting the results to avoid accidentally identifying participants. Therefore, results will be summarized by research questions and along sets of interview questions. For example, all participants' responses to questions asking about cultural relevance will be combined. The findings are summarized in narratives. Direct quotes are included in the findings when they relate or contribute to working ideas or ways to fix ongoing issues in curriculum design. However, quotes will not be linked to specific participants to protect identities (e.g., "a participant said" and not "participant 1 said."). Exemplary responses for each question will be used (PBE) curriculum for urban learners, which is a significant and under-researched area in education.

Research Ethics

This study was reviewed by GW Office of Human Subjects and was approved as an Exempt – Limited Review study. To protect participant confidentiality, I took a few steps. Participants were not asked to sign a consent form that would tie their name to the research. Instead, I requested a "waiver of documentation of consent" which was approved based on "The research presenting no more than a minimal risk of harm to participants and involved no procedures for which written consent is normally required. The next step I took to keep their identifying information confidential was to ask them not to reveal their name or company of employment during the interviews. This step was important to ensure that if the recording device

were misplaced during transit, the participants' identifying information would not be on the device. The last thing I did was to make sure not to label any of the data with names or personal information, instead I labeled the interview data by number 1, 2, etc. There was no link between the interview number and the participant; this way no names or information was attached to the participants data. When sharing the data in my research I was mindful not to use names or direct companies that would connect any participants statement to their identity.

Strengths and Limitations

This study is designed to generate new understandings of what might explain the lack of place-based science curriculum for urban schools/ The research questions are well-defined and cover essential aspects of curriculum development, including the learners being designed for, the places studied, and the data used. The study provides a clear direction for investigating the influence of curriculum designers on accessibility of curriculum materials and potential neglect of urban learners' unique cultural and environmental needs. Also, the study adopts a strong theoretical foundation by drawing on the concept of personal frames of reference, which has been applied to study instructional designers in other subject areas. The use of qualitative research methods is also a strength. Interviews allow for in-depth exploration and understanding of curriculum developers' perspectives, practices, and decision-making processes. The choice of thematic analysis as the data analysis method is appropriate for capturing recurring themes and patterns within the qualitative data, ensuring a rigorous and systematic approach to data interpretation. The last strength is the focus on urban learners. By focusing on urban learners' needs and experiences, the study addresses an important educational context that can lead to valuable insights and recommendations for improving curriculum development. This study will help me gain insights into the curriculum developers targeted audience for PBE curriculum

development. They can provide information on the specific characteristics, needs, and backgrounds of the learners they are designing for. Through interviews, curriculum developers can share their perspectives on the places they consider valuable for studying and integrating into the curriculum. Understanding their reasoning can shed light on the decision-making process behind the selection of specific places in the curriculum. My study can provide valuable insight on the strategies, considerations, and methodologies used by curriculum developers when creating PBE lessons for urban learners. By understanding their approaches, this study will identify areas of improvement and make recommendations to enhance the effectiveness and inclusivity of PBE curricula for diverse urban populations.

One limitation of the study is sample size. Since my study relies on a small number of curriculum developers in the DMV area who are available for in person interviews, it might restrict the generalizability of findings to a broader population. The next potential limitation is bias in participant selection, if the recruitment process only finds participants that are from certain types of educational institutions or have similar backgrounds it could limit the diversity of perspectives. For example, I mentioned earlier that none of the participants were involved in grant-funded curriculum development led by universities. The single interview approach was meant to reduce the burden on participants in terms of their time committed to the study, and potentially increase recruitment yield. However, the single interview data collection approach could be a limitation. The single interview potentially prevented an in-depth exploration of all aspects related to curriculum development for PBE. In the moment, a person might provide an answer without fully thinking out their response, which means the interview data may not fully represent their curriculum design processes. Participants may feel pressure to answer the questions in ways that do not actually reflect their beliefs or processes, for example saying what

they think the interviewer wants to hear. Relatedly, during the interview, a question might be triggering for the participant, which could lead to prematurely ending the interview. Lastly, since the study involves real-world settings and participants, I have limited control over external factors that could influence the process. Although many of my questions will be answered by conducting the interviews, I also know the study will not directly measure the effectiveness of the implemented PBE curricula on academic performance or learning outcomes for urban learners. Although my study can highlight the considerations curriculum developers make, it may not directly capture the experiences and challenges faced by urban learners when interacting with the PBE curriculum or directly address the financial and logistical challenges schools or educational institutions face when adopting and implementing PBE curriculum. So, while my study can provide valuable insights into the curriculum development process for PBE lessons and the considerations of curriculum developers, it will not address the effectiveness of the implemented PBE curriculum, the experiences of urban learners, long-term impacts, or financial challenges. Despite these limitations, as Chapter 5 shows the study was able to generate important information about how designers create curriculum for urban learners in the DMV.

Chapter 5: Analysis and Findings

Summary of Findings

This study aimed to explore how curriculum developers' approach PBE lesson development to better understand why PBE materials are lacking for urban schools. This qualitative study is built around 7 participants who have designed science place-based curricula in or around the District of Columbia-Maryland-Virginia (DMV) area and/or curriculum developers from the DMV area. This chapter will present a detailed analysis of curriculum developers' interview responses, which asked about how they approach and design place-based lessons and if it is done in a way that the curriculum can be used for students in the urban DMV area.

After the first few interviews, I felt that the questions I was asking were helping me gather important key details about each of my participants. With the data gathered, I was able to know what areas/location the participants felt the highest need to design for and why, their opinion on the relevance of teachers' race and if it played a factor in the effectiveness of teaching the lessons, what demographic and age they had design preference for, what they felt most passionate about as it related to PBE design, and how or what things they consider before and while designing their curriculum. The interviews also helped reveal developers' thoughts around equality and inclusion while designing the curriculum and whether it was necessarily being considered in the design process.

The curriculum developers in this study all have different approaches to developing curricula, although they all have certain starting points and guidelines that they follow. A few things that varied depended upon things like the location they were designing for, the age group, and their time constraints. For example, one curriculum developer lived and developed in

another mostly rural state, so all the PBE watershed curriculum she created was strictly designed with this area in mind. This was done because this is the area she was contracted to design. Another curriculum developer who lived and worked in Washington D.C. shared that they designed for a metropolitan region in another state. Still, they tried to make all their curriculum in a way that could be adapted to be used by other urban areas such as Washington D.C. Another curriculum developer who grew up outside the US shared that although she had done a ton of place-based curriculum around the world, Washington D.C. was unique. She needed to study and explore the area before designing here. Though the details of their relationship with DC differed, for many developers, the location where they work and live influences what places they design for. Since each state has different standards, the curriculum developers often start with those standards at the base of their design to ensure that they are using standards that cover what those states are teaching and making their curriculum products easy to market and sell. I found this bit of information to be important because one of the factors that I imagined would play a role in what curriculum is designed or developed is who was paying for the development and how much freedom or control the developer would have in what they were designing.

Curriculum developers were very intentional about the type of curriculum they developed over the years. Each of them expressed their direct passion for PBE and science learning while explaining how or why they felt it was important to work for the world of education. Five of the developers explained how they used their location to develop their curriculum directly for the area. In contrast, two of them explained that they designed curricula for other states where they were not living or working on a day-to-day basis. They each expressed how some decisions regarding what goes into the curriculum are based upon who is paying them to develop it and what ideas they are asking them to include. One developer also explained how she only took jobs

that aligned with her goals and would allow her the space to narrate positive images of Black people.

Participants who developed the curriculum independently shared with me that, at times, they were given complete autonomy in the design process, with only one or two requests to accommodate, for example, to include a specific exhibit. Participants who worked for companies said they were often designed with clear base instructions and content in the mind of the company request for the curriculum, so they, in this case, had little freedom on what went into their curriculum design. Again, though details varied, curriculum developers frequently mentioned contracts and scopes of work as part of their development process that influenced who and where they designed for.

When I asked the curriculum developers about "which learners" they had in mind when designing, these answers varied in many ways. Some instantly made this connection to race, while others focused solely on age and preference on the age group they felt would benefit most from this type of curriculum and why. However, many developers had themselves in mind, saying things like, "When I design curriculum, I imagine myself as a child and what things I enjoyed doing." This is where I began to be able to see how much curriculum developers' frames of reference played a part in their decision-making process. Their connections to learners' race led all of them, their learning styles, and their passions for the content and the demographic of students they were creating for. One developer shared that her childhood lack of exposure to science PBE growing up in the urban area was the sole reason behind her work developing curricula for urban students. In contrast, another shared that their experience with place-based learning was so amazing as a child growing up in another state that they could not understand why it was not more utilized here in Washington D.C. and that this was the "why" behind the

work he did as a curriculum developer in the DMV area. Another developer shared that as a young Black woman, she grew up hearing so little about positive black faces in her community that she now "only" takes jobs where she can amplify the positive black voice through her work and shed light on the amazing things African Americans have done throughout the curriculum she develops. Each developer I interviewed had a story filled with personal reflection and connection to their title and work.

Coding Results

After multiple rounds of inductive and deductive coding, seven broad categories of codes were applied to the interviews. Each broad category of codes includes multiple subcodes, described in the following sections. The complete code book is available in Table 2.

Cultural Background

Cultural background in this research context was identified explicitly when CDs referenced their race and cultural background or their knowledge of students' race and culture in their responses during the interview. Initially, this code was focused on the curriculum developer's background only as part of their frame of reference. However, participants often spoke about students' backgrounds during the first interviews, so the code was expanded. The expanded codes created a development of subcodes; these subcodes were as follows: culturally responsive ideas about teaching, descriptions of students' upbringing, and a desire to highlight the voices of racial minorities.

In the interviews, developers described how cultural background can influence curriculum design in a few ways. One way is how diverse perspectives are or are not incorporated into the curriculum. Five of the curriculum developers who were sensitive to cultural diversity were

adamant about providing information that displayed how they actively sought ways to include materials, examples, and viewpoints from various cultural backgrounds to provide a more inclusive learning experience for all learners. For example, one curriculum developer stated that "different cultural backgrounds may favor different teaching methods and pedagogical approaches." The curriculum developers spoke of using culturally specific teaching strategies, storytelling traditions, or experiential learning practices that resonated with the code/theme of cultural background.

Six of the seven participants said their cultural background did not affect how they designed the curriculum. Some participants explicitly referenced their own race and/or gender during the interview while explaining what curriculum they developed. For example, one participant said, "I feel like if I am excited about something, I am energized, and that is when I do my best work. I get excited to learn new things and learn ways to show my culture in a positive light. I feel like I am now very selective in my partnerships, so the work I do serves the community I want to reach." They shared stories of either growing up in underprivileged areas lacking educational resources or having close friendships with those who grew up with this experience. They shared a deep passion for escaping the classroom walls and introducing Black and brown children to more hands-on experiences. During the interview, one developer expressed their thoughts: "Getting out of the walls of the classroom. Do hands-on activities and find beauty in various communities. Just leveraging the space that you are in. Being able to understand how I see myself in this." Like this developer, each developer was sure to highlight their passion for narrating positive stories of African American culture to learn so they could see themselves reflected in greatness instead of inferiority or shame. They spoke about the beautiful nature and museums in communities surrounding the DMV area and how they have worked hard

to create exposure to these places. Hence, the students see the deprived areas filled with liquor stores and their community's problems. These women both had a common goal to break the chains of stereotypes among Black communities and paint over them with a vision for change and pride.

Another developer made note of their “white privilege” being an advantage in many areas, as they said, with education being one of the main areas. A different developer shared that she had witnessed so many inequities in education as it pertained to race, resources, and voices that it was heartbreaking to her. She said, “We need more voices at the table.” She said, “We need more ideas and perspectives when designing, but instead, it is normally just a table full of white women.” The other two curriculum developers shared their childhood experiences and stated how fortunate they were to have learned in outdoor atmospheres. They each shared how badly they wanted all learners to experience this and how their cultural background was the reason behind their work. Being white and privileged was great but doing something about the people who do not have the same privileges was better than great. They felt their cultural background allowed them to see areas of the world that needed help, and education was one of those areas.

Prior Knowledge

A curriculum developer's prior knowledge can influence curriculum design, informing decisions, content, selection, instructional strategies, and assessments. Curriculum developers can use their expertise and experience to determine learning objectives and design activities that align with learners' needs and abilities based on their prior knowledge (Ertmer, York, and Gedik, 2009). Their familiarity with effective pedagogical approaches and educational theories helps

them create meaningful learning experiences. Identifying what curriculum designers used prior knowledge tools will also help inform an understanding of their design process.

Participants talked about many kinds of prior knowledge in the interviews. Some described the standards, while others related to steps of curriculum design. Prior knowledge codes are available in the following subcodes: standards (required, or standards are appropriate for age groups), steps to develop a curriculum (e.g., being contracted, getting feedback), knowledge of learners, types of curricula, effective strategies for instruction, and collaborators and school partners.

Of the seven curriculum developers who participated in the research interviews, they all drew on prior knowledge throughout the interview. Each of them used prior knowledge to give detailed accounts of their thought process for curriculum creation, along with all the steps needed to develop a new curriculum and who was at the table. One response that came up repeatedly among the designers when asked about the thought process was that they all mentioned that looking at standards was one of the first things they would do, along with starting with the end goal in mind.

The next thing agreed among the curriculum developers was the importance of who was at the table. Five of the seven developers stated they are usually at the table alone because they are contacted directly and asked to develop a curriculum. However, they all said the curriculum was best designed when everyone was at the table. They told the table that they needed voices, parent, student, community, and teacher voices to go along with the curriculum developer's voice. All the participants felt their best work was developed when they had input from multiple voices; many of them explained that they had access to more voices in their past roles. So now that they are in new positions where they design alone, they do their best to reach out to teachers and have

observations with the learners to ensure they are developing a curriculum that will fit the group of learners they are designing for.

During the interviews, I quickly learned that while I was interested in the curriculum developer's prior knowledge, some of them were interested in students' prior knowledge. Four curriculum designers I interviewed shared that they consider students' prior knowledge when structuring lessons, sequencing content, and selecting instructional strategies. One designer said, "Understanding what students already know helps educators tailor instruction to meet their needs and bridge gaps in understanding."

Two curriculum developers expressed that they design curricula for students in other states they do not live in. Since this means they are not close enough to visit the schools or observe the learners quickly, they find other ways to educate themselves on the types of learners they are designing for, such as researching existing data on the learner's culture, studying their community/environment, and looking at students' data the schools have for the learners. They use these tools to help create PBE for locations and students with whom they have never had a direct connection.

When asked what they thought were the most important features of science place-based lessons, all seven of the developers said some version of "the hands-on out of a classroom experience." a few suggestions were museum lesson that connects to history, another was a curriculum on environmental cleanup and how it would be beneficial for communities and also there was mention of a dap curriculum that students could study to understand how a simple hand gesture was used in their community could support positive interactions. Three of the other developers also included connecting the learners to the community as an important feature of PBE.

Five developers said none when asked what knowledge a teacher would need to implement their curriculum. They each explained how they tried to think of everything required beforehand so that the teachers would not have to do anything outside of teaching the lesson. Two developers also explained how they made some sections with options so that teachers could interject some of themselves into the lesson if they preferred to. They mentioned that teachers may need to scaffold or modify some lessons depending on their students. Two other developers explained that they also provided all the materials and resources for the lessons so that equity and access to materials would not become an issue for teachers or learners. However, they did mention that teachers would also need content knowledge.

One question that provoked various responses among the developers was: Do you think the teachers' race/ethnicity matters in teaching PBE lessons? Why/why not? This question qualified as a prior knowledge and a cultural background question because the interviewee would have to use their expertise and experience working with students or both data they have researched to explain their thoughts. Three developers felt that race would not matter when teaching the PBE curriculum, while the third said yes, it did matter. This developer went on to say how it would not stop a teacher from teaching, but that if a teacher was teaching a PBE lesson in an urban area that did not have knowledge of the area or those learners, then the lesson may not go so well. The developer explained how incorporating diverse perspectives and examples in PBE lessons can make the learning experience more relevant and engaging for all students: "connection matters," sharing.' "I mean, any race can teach any race, but a teacher needs to do the work to ensure she or he knows the children they are serving." In addition to emphasizing the importance of prior knowledge about students in the design process, this interviewee shared

specific examples of supports her organization had put in place to ensure equity and inclusion were consistently provided to the children she worked with.

Another curriculum developer had a unique perspective, sharing “I mean, it matters just in understanding your relations to people. I think that anyone of any race can teach anyone. However, for example, for me, going into schools as a person who is half white, half Asian, one of the first things they ask is where I am from and if I speak Spanish. Or if I am from Korea, they are just genuinely curious. So, when you are teaching lessons that have to do with race you have to keep in mind you do not have the same experiences as others.” This response from the developer helped me see how their frame of reference or life experience related to education and race had no major connection to the race they were teaching, but it was truly relevant, nonetheless. For example, as a Black woman growing up, I have always felt the two connect. Education and race, for me, had always been in the same pot. Learning about slavery, segregation, and racism as a young adult and processing my understanding of history and why it was illegal for people who looked like me to learn to read and write was all a part of my process. This made it almost impossible for me not to be curious as a child. When meeting teachers of different races, I thought about how nice it was to see various skin colors and how pretty their hair was blowing in the wind. I used to wonder how I could make mine blow, and about the different colors of hair I would see, I was just typically thinking of a young girl. However, as an adult, my ideas were more like wondering if other races of teachers took the job just for a paycheck or if it was out of pity for what Black and brown children had endured over the years in education. It was never my assumption that they were there because they loved our race, and the interesting thing to me is that I am not sure why the switch in my thoughts occurred. They changed because of what I overheard in adult conversations, or they were based on a few

individual experiences, or both. Either way, the connection I am making here is that with the curriculum developer who had grown up in Korea, this would never need to be things she would think about or experience as their own curriculum and education experience were much different from Americans as far as racism and segregation in education history.

Six of the other developers thought the teacher's race did not matter at all, or not very much, for example. One developer stated, "It doesn't matter if the teacher is knowledgeable of the children she is teaching and their culture as long as she is willing to incorporate that into the lessons." Another developer had an argument that supported both that it mattered and did not: "I would not say it matters to teach it, but you do need to know our students. However, I could not imagine a white teacher teaching about dap (laughs), but I do not think it would stop anyone from teaching if it were a context that makes sense. So, it does matter."

Representation of Place

PBE recognizes the importance of communities worldwide and local environments and cultures in enhancing learning experiences. An underlying assumption of PBE is that if the curriculum is created with students' place and lives in mind, teachers can make learning meaningful, more engaging, and relevant to learners. So, the representation of place was important to pay attention to in the participants' interviews. Whenever a curriculum developer mentioned a setting or location for learning, such as beaches, museums, states, cities, or rural areas, these were coded as representations of place. Initially, I only applied the code to places the curriculum developer had designed for. However, later coding expanded it to include the preferences and hypothetical settings mentioned in the interviews.

Five of the seven developers said yes when I asked the curriculum developers if they had ever designed a curriculum for an urban city/area. While some developers were developing curricula for urban areas, not all urban areas were the same. One developer designing for an urban district in Maryland explained how their urban areas were different from what Washington, DC, urban areas looked like. Because of these differences, the developer did not feel that the place-based curriculum developed for Maryland would be adaptable for DC. When asked how the process differed from place to place one developer said, "developing a PBE curriculum that celebrates the cultural heritage and diversity of a community takes time" and went on to say, "each community has its one story to tell so from location-to-location things will always vary."

Two developers shared that sometimes the difference they would run into was what materials or resources the school would have access to conduct the studies/activity. So, to prevent students from having access to needed materials, their companies are now sure to supply everything needed for the lessons. One developer said, "If it is something as small as scissors and colored pencils, we just bring it with us. Even if the schools have it, we still just bring the materials."

Another developer stated, "Curriculum that reflects the unique customs, traditions, languages, and histories of a particular place will never be identical to another place, so, when I am thinking of our students. I am thinking about what the street on Benning Road is right down. Specifically, in DC we focus on our place and what beauties surround us." When I asked this same curriculum developer, do you imagine a specific setting for your curriculum to be implemented? " They added, "Our curriculum is very DC specific because we built on the curriculum and made it very applicable for D.C, and the curriculum that we wrote was directly

created for D.C." While I was fortunate to interview three curriculum developers who were a part of companies that dedicate their work to creating science PBE for the DMV area this was not the case for most of the developers—a few of the developers designed for New York, Vermont, and Texas.

When asked, "Do you imagine a specific setting for your curriculum to be implemented by the other curriculum developers?" Developers gave a variety of responses. One developer stated, "Well, I know we will be at the museum, so I imagine whichever location we are scheduled to be at for that day." At the same time, another said, "I design directly for specific settings, museums, etc. So, it depends on who is hiring me to do what type of curriculum. However, I always want to bring light to the voices that are the least heard from in the curriculum." The last response resonated with me because of the personal connection to this topic I shared in Chapter 1. This developer said, "Where I grew up. Schools that I went to. I imagine having highly qualified teachers. We got away from that at some point with the shortage of teachers. So, whenever I write a curriculum, I want to give kids all I got." This stood out most because it said much more than just a location. It told a story of the past and present. This statement not only speaks of where and why but also of where education is and what she plans to do to help it improve.

Funding Issues

Although funding was not an initial code, it emerged from the data. When asked certain questions during the interview, many answered that funding is a present issue and leads to a lack of access to PBE. So, this code included any mention of donors, the funding climate, budget cuts, and the allocation of financial resources.

In the learning process, place-based learning involves using local resources, like communities, museums, field trips, and hands-on experiences. However, if schools have limited funding, they may struggle to do these activities. So, suppose schools, particularly urban schools, do not have enough funding for transportation and materials. In that case, teachers will struggle to implement and engage students in meaningful PBE activities. They must travel if they do not have access to resources in their own backyard. One developer explained, "...I think resources can be a big barrier. Some as simple as getting a bus for transportation can stop students from being able to travel to destinations..."

As mentioned earlier in the dissertation, some urban environments have safety concerns that can interfere with access to place-based activities at the school. Considering the need for funding for certain security measures or travel is one-way urban students face barriers regarding access to outdoor spaces and communities, which can impact a school's ability to include local activities in their curriculum safely. As I continued conducting each interview, these ideas and information about funding were a major concern continuously expressed in different statements. For example, another curriculum developer stated, "Urban schools serve a diverse student population, and some of those students are from low-income households or communities. Since some urban schools have fewer resources and struggle to provide students with the same opportunities as schools in more affluent areas, we always try to provide all the materials we can. We do not want to widen the achievement gap. That is not the goal." This developer said, "As an external company, we push in to teach, but for this to be continued, teachers may need funding for professional development. A place-based curriculum requires training and support so the teachers can effectively have the knowledge to integrate local contexts into their teaching process. If funding limits are in place that limits the opportunity for them to receive professional

development. Workshops or conferences that focus on PBE are great resources but with no access to training the teachers may lack the knowledge needed to implement PBE effectively."

Developers were very conscious of ensuring materials were supplied for the schools they partnered with to avoid running into any funding issues for the PBE curriculum. However, developers mentioned one issue about funding: some schools were against the idea altogether. The schools would have funding but did not feel it was important to allocate it towards using PBE learning experiences. None of the developers indicated that funding was a deciding factor in developing the PBE curriculum; however, they all thought it was important to mention that funding influenced principals' decision to implement PBE.

Equity

Since equity is defined in so many ways in the literature and practice, for this section of coding, I decided to code for the areas of access, which would include (materials, qualified teachers, and equipment) and the area of reaching all learners, which included differentiating instructional needs and supports (Tsai et al., 2022).

One concern I had going into the research, in addition to understanding the curriculum developers' thought process, was whether the process used equity as a base for designing and if it was important to the developers that they reach all learners, including those in the urban community. Urban communities have been forgotten for many years regarding equality in education (Sharkey, 2013). Among my interview questions and sub-questions, seven of the questions were related to equality and equity. I will discuss and share the data collected from those questions in this section.

The first question was, how do you think curriculum design relates to equality in education? The first developer said, “Well, first, when I think of equity in education, I think of a culturally responsive curriculum. Meaning the children see themselves in the curriculum. We want them to see a global perspective, but we also want them to see themselves.” Another developer responded, “I feel like when you are thinking about place-based or science, it is related because a lot of it takes place outside, and sometimes schools are not in the best locations to go outside. The curriculum development piece is how we can get to equity. If we create for all learners and the curriculum is adopted.” I thought this was an interesting response for a few reasons. Firstly, it was related to one of the reasons I was doing this research. Secondly, understanding the dynamics of a certain school's place or location can make all the difference in how the students may or may not be able to go outside for PBE. Things like this would cause planning for students to take field trips to other locations so they can conduct PBE. The last curriculum developer interviewed responded to this question by saying…

> The curriculum should include a broad audience, so it is not specific to a group of students. For example, it is two-fold. It should highlight and enlighten students of all races so that they all feel important. Reading should not be a barrier, of course kids need to read but that should stop them from being able to experience learning and sharing their thoughts. (Interview Transcript)

I loved this idea; she explained her response by saying. “We all know that reading can be a barrier for many learners so I try to create a curriculum that students can do and be successful doing even if they are not fluent readers. Reading should not stop students from being able to participate and learn.” This idea was one that I found to be simply amazing. Reading has been a barrier to many learners, so students struggle to stay engaged in lessons. So, using the

opportunities of drawing, verbal, visual, and hands-on to teach an entire lesson seemed to be a very refreshing way to approach the learning.

When asked if they think equality considerations should always be present when designing curriculum, the answer was "yes" across the board. "Absolutely," some even said. One developer stood out by saying, "Of course, I don't see how you can design a curriculum without considering equality." I was excited to see the glare in her eyes with this statement and her body language, which clearly showed that this topic was extremely important to her. Another developer who said yes also said, "There have been states that use curriculum talking about things that other populations had no exposure to. One of the things I realized is that if the kids lack exposure to certain things, it is foreign to them. So, they do not have the same advantage or connection." Exposure is an important experience for learning. This comment brought me back to my reflection at the start of my research, where I discussed how lack of exposure caused me to give up on my dreams of different career options growing up due to my thinking that they were not realistic options for me as a little black girl. So, I could connect to and understand this logic firsthand.

Another question asked during the interview related to equality was, is equity at the forefront of your thinking when creating curriculum, and if so, how do you and what does it look like? Six of the seven curriculum developers who participated in this study said yes. The first developer interviewed said, "If I am thinking of race equity, I am thinking of economic supply equity, space equity. To be in schools with small classes and cramming a lot of kids is not fair. Kids need space, I have been in schools where none of the teachers were the same race as the students. I am not saying all children of one culture need to be taught by their own culture, but they need to be educated on the culture that they are teaching."

Another curriculum developer responded to this same question by saying, “Exposure is a part of this because of how the curriculum helps the students to see themselves. This plays a crucial role in equality. Especially for me, I work with a lot of special education students, and many of them do not think they can be successful or do certain things. Being able to design a curriculum that supports them in a way that they can feel successful and something that allows them to see themselves reflected in a positive light and to show their importance in the world is important.” Again, we see that exposure piece coming up. Exposure comes up once more when this curriculum developer responds by saying “again that equity is such a big term, but we think about providing intellectual experience. We engage in successful and high-level content. We watch students along the journey and see all students being able to participate and being able to ask questions. We also think about exposure and how to introduce students to ways of thinking and ideas for career choices. Career exposure and building interpersonal skills to connect with people at places they would normally experience. Like if you want to stay in D.C understanding how we live right near NASA so that is a career option and being able to work with space made be some kids dreams so understanding they can do that here in D.C is great.”

Exposure, removing barriers, and providing equal opportunity were recurring concerns throughout the equality questions. Exposure is crucial in education because it broadens perspectives and understanding of the world. Exposure to diverse ideas, cultures, and experiences can create empathy and help students with critical thinking skills. Exposure allows students to connect what they are learning in class to what is happening in the real world, making learning more relevant and meaningful. Exposure also helps students discover their interests, strengths, and potential career paths. Therefore, playing a vital role in providing well-rounded education and preparing students to thrive in communities and diverse society.

One thing I noticed when asking questions related to equity/inclusion was the different responses and the variety of thoughts they all seem to go into instantly. In the area of equity, the next question I asked developers was. What equity issues do you see in curriculum design and development? One developer said “What I have experienced is many school districts bring in outside experts that may or may not have any knowledge of the culture they will be working with. As a result, I have seen unrelatable curriculum and suggested text that are now out of print.” So, her instant thoughts were about an overall issue in education she had seen over years in the field. In comparison, other developers seem to immediately focus directly on their work to speak to ways of preventing equity issues. One developer said, “Our organization's point is to solve equity issues within the schools and close the holes of schools who don’t have it by providing everything that’s needed.” So, her instant thought when receiving this question was about herself/the company identifying what they saw as equity issues. Another developer responded similarly by saying “I mean there are always going to be issues. We try to preplan, supply, and prepare everything ahead of time to avoid running into any.”

The next developer asked what, if any, equity issues he sees in curriculum design and development. He said “the biggest one I think is designing curriculum towards highest achieving students instead of all. There is a bigger focus on the students who are most successful instead of all. Also, we can do better by not generalizing the place-based lessons because there are so many direct issues and things to learn about in their specific communities. So, it would be more equitable to design for those direct areas. Like, why talk about polar bears and climate issues they have in Antarctica when there are relevant local climate issues you can discuss right here.” So, he instantly thinks about the issue of equity as how we serve all children.

Understanding how curriculum developers feel and think about equity allowed me to imagine how or what developers may think when designing. Based on the next set of responses to the last few equity questions, I could see how equity-minded curriculum developers prioritize the inclusion of diverse perspectives, voices, and experiences in the curriculum and the classroom. They try to use a variety of cultural backgrounds, identities, and lived experiences to ensure that all students see themselves reflected in the curriculum and have opportunities to engage with content that relates to their backgrounds.

The next equity question asked was, do you have any idea on how to address these equity issues? Six of the seven developers really dug deep to provide solutions. All except two of the developers, gave what I felt were basic responses by saying, "We make sure we bring everything for schools that may not have materials." This was a surface-level response, or what Russo-Tait (2023) calls an "equity as equality" view. Another response was, "Well, I do think that if you create a new process with a focus on student engagement and academic language, it is a good place to start. If we do not think about how they will connect, we will never get them where we need them to be."

However, some developers really got into this question, providing equity-rich responses like,

> Yes. Thinking about whose voices we are elevating in our curriculum. We need more diversity and perspective of ideas on whose voice is elevated. If a museum has Picasso but also has African American art, why are we only focused on the Picasso? That is what I mean. In my experience, we always try to be diverse and tell more than one story. There is a document at one location we visited about emancipation that says Lincoln freed the

> slaves and we were like whatttt... You know it is not about a whitewashed history, so we had to take time to teach the true lesson. (Interview Transcript)

This was a thoughtful and impactful response for me, reminding me and whoever may read this dissertation of positive ways to combat the day-to-day issues we see in education regarding equity. Another good equity-rich response I received was,

> ...we can start to fix these issues by being more intentional about who is at the table. We need more faces, races, perspective, and ideas at the table. We need voices of diverse perspectives. As a white woman, I can try my best to include what I think others' voices may sound or look like, but it would be most effective to hear from those voices. We need more than a table full of white women. That would be a great start. Providing the necessary opportunity for more voices. (Interview Transcript)

These equity-rich responses were both enlightening and inspiring. Equity-minded curriculum developers care about designing a fair, unbiased, and inclusive curriculum. They clearly recognize the diverse ways in which students demonstrate learning and incorporate multiple ideas of how to reach learners and teach them in a way that the skills taught will feel meaningful and relevant to their experiences. They care about student voices. As the interview went on, we discussed how the curriculum is designed with the majority in mind, who the majority was, and what this would mean for the minority. This also sparked some rich dialogue. When asked (who was the majority?) One developer said, “Umm, good job slipping that question in because that is where I was headed. The majority is whoever has more power in society. As an environmental community, we are trying to figure that out. Cause if we focus on issues that are not in the communities of the learners, we are working with then it that is an issue also. Another

developer said, “I would say the majority is predominately white.” while another said, “I would say that is your white, affluent men or people who identify as males. Christian, straight males are who the curriculum is designed for.” Six of the seven developers answered similarly to these last two. All except the last developer who said, “Kids between the 55th and 75th percentile on test score,” referring to statistical distribution.

When asked what this means for the minority? one developer shared this:

> I think that specifically in history it creates a problem because it not only leaves their stories out, but it also tells a different version of history that is not most accurate. I know you are looking especially at science but like with our history units we make sure to tell minority stories. The narrative is that President Lincoln freed the slaves but that is not true. The emancipation proclamation gave slaves a choice to fight for freedom. So, they freed themselves. To correct the narratives to center the minority voices that would normally be left out of history. We are being more accurate. That is important. (Interview Transcript)

This was a detailed “equity as justice” (Russo-Tait, 2023) equity-rich response, like most developers said. One other developer said, “I think what this has meant is that you are constantly in the space of never seeing how your group has contributed to society, or the world and you never get to see the value of yourself. And there is a lot of self-censoring that happens when you think there is a standard you must strive for. Part of the problem is that people are afraid to ask why.”

The last equity question asked of the curriculum developers was as follows: *If clothes and shoes were only made in one or two sizes, I imagine people around the world would be upset and*

work to do something about it. Why do you think there is no more urgency to meet ALL children's needs with a place-based curriculum? Of the responses I received, the one that hit home the most was when a developer said, “I hate to say this, but if my children have it, then I am okay. You know what I mean? I could move to a better school district or area, but urban kids who do not have those options are usually locked in for life. People who develop curriculum are usually well paid and they have options of where they take their curriculum.” This response made me sit and think. The response suggests awareness that the kids left out of PBE are not kids living where the curriculum developers live.

Responding to the same interview question, another developer said, “I don't think people see it as an issue if it doesn't directly affect them.” Another said, “Wow that was a good metaphor. It is because it is hard to differentiate instruction and we tend to try to meet in the middle with instruction, curriculum design and day-to-day teaching. It is hard to produce 30 different lesson plans.' As I listened to him speak, I thought about the amount of time it would take to do this much differentiation, and I could not help but relate. The last response I will share to this question is from the developer, who said:

> ...umm it is expensive, time consuming and the priority is not there. I do not know why that is, but I know one of the things is we get so fixated on standard test scores that we only push for that or things that would give immediate results for testing. Our measurements are misplaced as far as how students think and understand. If we are only measuring kids based on test scores, I see why we put the money there, but it is short sighted. Also, there is not enough evidence out here on the efficacy of place-based learning. So, that is also a barrier, understanding how many people are doing this well. Making sure the meaning of place based is understood and consistent is important

because if people are not sure of its benefits, they will be less likely to put funding there. (Interview Transcript)

Time, money, and test scores produced by each curriculum developer when asked about why they thought there was no more urgency to meet *all* children's needs with a place-based curriculum. When schools invest only in test scores, it can undermine the overall learning process by narrowing the curriculum to just English and math, emphasizing memorization over understanding, increasing pressure and stress, and limiting ways to measure success. This can also help unintentionally contribute to a teacher's burnout. For these reasons, curriculum designers feel that schools need a holistic education approach that values the diverse needs of students to help promote inclusive, equitable learning experiences for all learners.

Assessments

As I interviewed the curriculum developers, two topics came up that were not questions: funding issues, already discussed, and high stakes testing. Many developers discussed the importance of high-stakes assessments and how schools often prioritize standardized tests. Since this topic was reoccurring, I developed a code for assessments focusing on test scores, test score requirements for schools to stay open, test score trends, and time (how time focus in other areas, such as PBE, would affect test scores).

One curriculum developer expressed their thoughts on this topic: "schools may feel pressure to prioritize teaching to the test, focusing on Ela and math or rote memorization is prioritized along with test-taking strategies rather than experiential, place-based education." This idea provoked all the curriculum developers when asked, "Why do you think there isn't more urgency to meet ALL children's needs with a place-based curriculum?" One developer replied,

> ...well, I hate to say it, but some people feel like as long as they have it, they do not care if you have it, another reason is because most schools focus on test scores instead. Which can result in a curriculum that neglects the learning opportunities of PBE or the experience of connecting students to their local environments. (Interview Transcript)

She then went on to say.

> ...urban schools have pressure to dedicate a substantial portion of their time and curriculum. High-stakes assessments can also dictate how funds get allocated in schools. According to curriculum developers most schools with limited funding may be most likely to put money toward PD's, test prep materials, and instructional resources. Materials that are focused on standardized content rather than supporting PBE. to test prep so that would leave only a limited time for PBE. (Interview Transcript)

Personal Frames of Reference

Personal frames of reference have many areas of focus. For this code, however, the specific focus was on childhood experiences that connect to their professional work, life experiences that influence preferences in professional settings, past professional experience (curriculum and design projects), beliefs about what works in education, and professional preferences (designing for specific grades or grade bands).

After analyzing the data, this study determined that personal frames of reference played a huge role in the curriculum design process, the areas being designed, and the people being designed.

Regarding content selection, personal frames of reference shape what the curriculum developers perceive as valuable knowledge and skills for science/place-based learning. For

example, four out of the seven participants who valued “outside learning” prioritized hands-on activities in science education, while another one who had never experienced that but had a strong background in literature emphasized classic works in English language arts and ways it could be done in museums while studying other places. The other two participants with strong backgrounds emphasized positive ways to implement PBE while connecting students to their history.

Their frames of reference also influenced the way the participants developed and delivered content. The curriculum developers all gravitated towards teaching methods that aligned with their own learning preferences or experiences in addition to whichever state-wide standards they had to include. For example, one of the curriculum developers recalled a time as a child that helped them realize he learned best through visual aids, so he made sure to incorporate diagrams and illustrations into his lessons to help target other visual learners.

Personal frames of reference also impact how learning is assessed. Six of the seven curriculum designers interviewed designed assessments that reflect their own understanding of mastery, which could vary widely depending on their individual perspectives. For example, five of those six participants shared how they all had incorporated project-based assessments into their curriculum. However, the two other participants who prioritized memorization focused more on traditional assessments after they were done with the final field activity. Each of the developers, however, mentioned how, based on their upbringing and the current state of education, they all prefer not to use assessments to dictate students' overall understanding but did so to follow the preferred request of the places/schools they partnered with.

This research also highlighted how personal frames of reference influenced decisions regarding inclusivity and diversity in the curriculum. Curriculum developers who had

experienced discrimination or racism were more dedicated to representing diverse perspectives in their teaching materials and activities, while those who had not did also still see a need to design with equity in mind, but they did not have it at the forefront of their design thought process. It came more as an afterthought, but they made statements such as “and of course it would be helpful to have a more diverse perspective,” However, it is mostly just me at the table when designing. One participant specifically stated that she now “only accepts jobs that would allow her to positively amplify the voice of black and brown children,” which I coded as personal frame of reference because it describes a preference. She also said, “I don't know who is at the table when designing all the curriculum, but I can tell you that when I'm at the table and designing I'm making some noise.” This statement was highlighted in purple for a statement of cultural background.

Personal frames of reference also play a role in ethical and moral considerations within curriculum design. Some curriculum developers expressed how they sometimes needed to navigate their biases and beliefs to ensure that curriculum materials were presented fairly, accurately, and respectfully. For example, five participants felt inclined to provide clarification for the emancipation proclamation and how they felt it was wrongly taught across classrooms. They shared how they designed curriculums and/or took the opportunity to reteach history correctly, explaining how Lincoln gave the enslaved people the opportunity to fight and gain freedom, but he did not just set the slaves free. Which was how that moment in history was being portrayed. These participants felt it was extremely important for students to know that enslaved people stood up and fought for their own freedom, they were passionate about children understanding the true history behind a story that had been, in their own words, “whitewashed” history and also passionate about students seeing black people painted in a positive light with so

many negative stories existing to tear down the image of how they see and identify themselves. It was interesting that so many developers felt the need to use this historical example while we were discussing science PBE. One developer even made it a point to shift from talking about science to history, “I know you are looking especially at science, but like with our history units, we make sure to tell the minority stories.” However, this point in the research interviews resonated with me deeply, and it made me feel a sense of pride in being able to identify other educators who have similar passions and who also felt inclined to use their voices to educate and create change for black and brown children and for students of the urban unprivileged communities.

Understanding curriculum developers was a part of the research I planned for; however, while doing so, I realized that many of the developers were equally interested in understanding students' personal frames of reference. Also, they knew that understanding the students' perspectives is important for education. Six of the interviewed developers identified how understanding the student you are designing can help to design a curriculum that resonates with their interests, experiences, and cultural backgrounds. They shared how incorporating topics and examples that are relevant and meaningful to students could increase engagement and motivation.

Overarching Theme

In refining and organizing the codes that arose from the data, I saw similarities and connections. I had no expectation of how the codes would merge, but the more I read the data and took a deeper look, the more I could see it. For example, personal frames of reference and prior knowledge had many things in common with the codes of funding and assessments.

Personal frames of reference and prior knowledge connect concepts that influence how people understand, perceive, and interpret information. PFRs are the lenses through which people view and interpret the world. They are shaped by a person's upbringing, culture, values,

beliefs, experiences, and personal character. Prior knowledge references the information, concepts, and skills a person has acquired through their experience and learning, so they both overlap easily. Since they shape how people understand information, they are both partly responsible for making decisions. PFR and prior knowledge influence decision-making by reflecting the person's personal experience and cognitive process.

Funding and assessments are intertwined in determining resources, allocation, program effectiveness, and successful data. Assessments help to ensure funding is being placed towards subjects that have a positive impact and that will be used effectively. The availability and level of funding often dictate the scope of assessments and expectations of government-funded schools, which also inform future budget allocations and policy decisions. This leads to the key overarching theme I constructed from the coding results.

Personal frames of reference vs. assessments, funding, and time

After conducting my research a few of my initial hypotheses were proven to be wrong. Initially, I thought curriculum developers were not designing PBE directly for urban learners because of their personal frames of reference, which may lead them to overlook this group of students. It turns out that I found multiple curriculum developers who are part of companies designing for the DMV area. Upon interviewing these developers, they shared information about how and what they design for the DMV urban schools. They shared with me their dreams of pushing for science PBE to be present throughout the DMV area.

In referencing their childhood, professional work, and curriculum design preferences (which all fall under the code of personal frames of reference), there was a clear connection to their awareness of urban schools needing more support in PBE learning. However, they also

shared their struggles in getting the schools to buy into the importance of PBE science education. In their review of place-based education literature, Yemini, Engel, & Simon note:

> As a result, even where there is awareness and a desire to develop and implement PBE, teachers, school administrators, and educational leaders lament a lack of funding, time, or training to permit them to fully employ PBE, as well as being limited by standards-based learning and test-based accountability measures (Brown, 2012; Can et al., 2017; Riveiro-Rodríguez et al., 2021; Velempini et al., 2018). It might be that the presence of these barriers has been a key driver of the increased involvement of external actors in PBE delivery, who are often able to bring onboard additional tangible or intangible resources. It also might be related to the general focus on US-based education, where there is a strong prevalence and influence of non-state actors in educational policy and practice. (Yemini, Engel, & Simon, 2023, p. 17)

Despite Yemini et al.'s assumption that external actors have the power to bring more PBE learning opportunities to the learning setting, interviewees in this study shared that that was not entirely true. In fact, most participants shared with me that they only partnered with a few schools due to the schools not wanting to focus on this style of PBE learning. One developer shared the journey of their company by saying,

> ...we had investors that gave us the time and money and they believed in us. That was the catalyst that allowed us to get them this type of learning into the school. We needed that investment to make this happen. That is what needs to happen to see more PBE learning happening, people need time and money, and people need permission and courage to do something different. Permission to change a schedule takes courage

> because people have to believe in this and know that it's going to work, I believe in it but I know that's a lot of pressure for an administrator because they still have to hold themselves accountable if they don't get the results they are wanting. (Interview Transcript)

The other curriculum developer working for a company that directly designs PBE for the DMV area shared some of their company's journey by saying, "To be honest recently we have lost a couple of donors because they have been told it was better to invest in less hands-on specific organizations and more on investing in communities and their growth. So, it leaves behind all the students who need the resources now. People think our types of organizations are not as impactful or important to give money to. We would love to expand, but it is hard because we are also losing money." Each of the developers of these two companies expressed their deep gratitude to the schools they can partner with. They gave me examples of how they were able to see the learners learning in real-time and the excitement they felt during those times. They shared how their companies secured funding to help address equity and ensure they purchased all the materials needed for their curriculum so their schools would not have to worry about providing. They shared how they intentionally went into neighborhoods and study areas to learn about the environment and develop a curriculum of D.C. that would connect most to their learners.

This information helped me to understand that the reason for the lack of PBE being utilized for the DMV area and other urban areas may be partially due to the lack of PBE curriculum development, but in addition to that, there was an issue of fear – fear of changing schedules or funding allocation, fear of failure on assessments, maybe even fear of discovery. The word "fear" did not show up in the interviews, so I did not make this a code. But one developer shared, "schools are afraid to try new things because they worry about how it will

affect their test scores." The curriculum developers shared that school administration such as principals, vice principals and other leaders may resist new curriculum approaches because of not knowing how these changes will impact test scores. But to implement the PBE curriculum, these changes are necessary. Students would indeed spend a lot of time outside of their now everyday classroom settings. Being able to go into the community, museums, and other locations to explore and learn means getting out of the classroom.

Chapter 6: Discussion and Implications

Discussion of Findings

One intended outcome of this work is to raise awareness of the lack of PBE being utilized in the urban area and the knowledge generated from this study may help with the improvement of inclusion and designing for the student's attending schools in the urban area.

In reference to the initial overarching research question, “How do curriculum developers' approach PBE science lesson development” it was determined that most curriculum developers mentioned who is at the table and what standards they are using when designing the curriculum. Many of the curriculum developers also have the same goals of connecting learners with their communities. The curriculum developers designed PBE lessons to effectively expose students to PBE learning related to both science and place-based knowledge, such as environmental literacy, community engagement, and problem-solving skills. What place(s) are they designed for and why varied based on what area or location they lived/worked in, what company was commissioning them to develop the curriculum, and what standards or guidelines were asked to be followed for the curriculum. Determining which learners are they designing for varied in this research study based off where the curriculum developers were located and or currently living, however three of the participants have dedicated their work to developing PBE science curriculum for urban schools in the Washington D.C area. While the others designed a variety of locations stretching from Vermont to New York based on what stars they were commissioned to develop curriculum for. Another important note is, although race of the curriculum developers was not asked, during the interview when I asked “if race mattered when it came to teaching or developing curriculum” each of the curriculum developers responding by not only sharing their

own race but also by incorporating the relevance they felt their own race had while developing or designing curriculum.

The study fills in some key details about how curriculum developers' approach PBE curriculum design. This study also adds to our understanding of why there is a lack of access to PBE for urban schools. Understanding that these deficiencies exist gives people an opportunity to address and improve this for the future world of science education. The research provides insights into the decision-making processes of curriculum developers, including the factors that influence their choices, priorities, and values. This work will help to identify patterns, trends, and best practices in curriculum design.

This study applied York & Ertmer's (2016) concept of personal frames of reference, which they originally used to understand instructional designers' approaches to their work. However, York & Ertmer's description of personal frames of reference is very general, and only a few concrete examples are provided. This study provides details about what types of experiences researchers might ask about to understand a curriculum developers' frame of reference, such as childhood experiences in science (see Appendix D). This study also goes beyond York & Ertmer because curriculum developers spoke about how those experiences influence materials they have designed. In other words, there is a direct link between the personal frame of reference and the curriculum.

In addition, this research may have been beneficial to the participants. My research contributes to the field of education by giving curriculum developers a voice to express and explain how they feel not only about their successes but also their failures and what support they need to improve.

This research promotes equity and inclusion. With a goal to shed light on how curriculum

developers consider issues of equity, diversity, and inclusion in their design process. Examining the ideas and values they have on diverse perspectives and voices being represented in curriculum materials, helps to identify strategies for promoting more inclusive and culturally responsive curriculum design practices in science place-based curriculum design. My research will help the education system by examining existing literature, identifying gaps in knowledge, and creating new insights. This new information can now serve as a foundation for future research, and practice in curriculum development.

Implications for Curriculum Designers

Consideration for developing curriculum for Urban Learners

Curriculum developers should pay attention to the unique environment of urban learners when designing place-based science curriculum materials. Each of the interviewees were explicit in sharing the importance of visiting locations and doing "the homework" on the locations and students prior to developing curriculum if they did not already have the knowledge. This would include understanding the backgrounds, experiences, and needs of students in those settings to ensure the relevance and effectiveness of the curriculum. Curriculum developers shared that visiting the location gave them firsthand knowledge of the geographical, cultural, historical, and aspects of the community. This is essential for creating a curriculum that resonated with the local context and met the needs of the learners. Going to the locations in person helped the developers identify resources, natural landmarks and community organizations that could also enrich the curriculum and create authentic learning experiences. Mawyer and Johnson (2024) share that they use a systematic process of community assessment mapping to develop PBE training for teachers:

> Looking across how PSTs at our two institutions are intentionally weaving community, culture, and place into science learning experiences highlights how this assignment is a powerful resource that empowers PSTs to make space for a multitude of ways of knowing and doing science that extend beyond both the canon and the walls of the classroom. (Mawyer & Johnson, 2024, Part 3: Designing Place-based Curriculum)

They share the importance of teaching the teachers how to directly connect students and their PBE learning to the environment, and this reinforces the same information shared with me by the interviews.

Also, this process helps to create opportunities to meet with teachers, students, parents, and community leaders to establish relationships and gain insight. Their input and perspectives were used to inform the curriculum development and ensure the lessons were relevant to the students.

Representation and Diversity

Incorporating meaningful representation of diverse backgrounds, cultures, and experiences in curriculum materials is essential. Developers should strive to include content that reflects the diversity of urban communities, fostering a sense of belonging and cultural relevance among students. For example, one developer shared a story about how they selected which exhibits to study during the museum visits with the students. They stated that there was a particular museum that they would visit and how most commonly they would study the Picasso painting that was present and give history around the piece. However, this developer has now decided to choose content that would reflect diversity and cultural relevance to the students they serve. This would mean that instead of studying the Picasso they would study the African

American artist who was featured in the exact same museum. Making this small but intentional switch was a decision that helped connect representation and diversity.

Equity and Accessibility

Curriculum developers should prioritize equity and accessibility in their design process. This includes addressing educational gaps and disparities by creating curriculum materials that are accessible to all learners, regardless of their socio-economic background or learning abilities. As Leonard et al. (2016) say, "Providing urban students of color with opportunities to learn science may promote social justice and science as a civil right" (p. 355). For example, the curriculum developers that I interviewed took a few steps to ensure equal access for their learners. One of the ways was to supply any materials that the students may need. One developer providing me with this example when they said, "we always make sure we consider all the different variables to be sure we provide an equitable experience for all the students and schools we partner with."

Another idea to keep in mind is making sure to make your curriculum available and accessible to teachers in urban areas by making them searchable online. In the initial start of my research, I searched many articles in the hopes of finding PBE science curriculum designed from urban/city areas, but I was only able to find three that were applicable to the unique characteristics of the urban communities. Most of the materials found online were for rural and Suburban areas only.

Personal Frames of Reference

Curriculum developers should recognize the influence of their personal frames of reference on curriculum design. Awareness of one's own biases, perspectives, and prior

knowledge is crucial in creating inclusive and equitable curriculum materials that resonate with diverse learners. The discovery of this research revealed that although personal frames reference played a part in some of the developers preferred teaching styles and passion for science PBE their personal frames did not interfere with lack of access to PBE learning materials. It was discovered that the personal frames of reference of these curriculum developers encouraged them to develop PBE curriculum because it was what they are most passionate about. However, since some of them lived in areas that were not so preview to the best environmental access, they would run into a few barriers due to the city environment. The developers use constant reflection to improve their design process by collecting feedback from educators and students, evaluating curriculum materials effectiveness, and adjusting the information.

Directions for Future Research

Many curriculum developers in this study mentioned that they felt administrators were not as supportive of PBE, and that led to less PBE in those schools. Researchers such as Yemini, Engel, and Simon (2023) also concluded that "even where there is awareness and a desire to develop and implement PBE, teachers, school administrators, and educational leaders lament a lack of funding, time, or training to permit them to fully employ PBE, as well as being limited by standards-based learning and test-based accountability measures" (p. 17). It is important to note that both myself and Yemini et al. came to this conclusion while doing two types of research studies. My research study was done by directly interviewing curriculum designers and gaining understanding of their curriculum design process. While Yemini et al. research was directly done by analyzing PBE literature. Interviewing school system leaders, principles, and administration about what they know about PBE, why or if they feel it is an effective way to use funds and if

they feel any hesitation towards the use of PBE learning. Understanding their reasoning behind decision making as it applies to use of allocation of funds and time allowed towards subjects may help us understand why there is a lack of the PBE science curriculum regularly being used in the urban school settings.

I went into this study thinking that science PBE is not being designed for urban schools because most of the practitioners and research literature talk about rural and suburban settings. However, after talking to curriculum developers in the DMV, there are materials being designed for urban settings, but for some reason, these materials are not being discussed in the literature. Conducting a study to track the implementation and effectiveness of place-based science curriculum materials designed with a focus on urban learners would be a great next step for research. Tracking the implementation and effectiveness of PBE on urban learners can be beneficial for several reasons. Firstly, urban environments have unique characters such as local history, cultural diversity and environmental challenges that can be integrated to make learning more relevant and engaging to students. Secondly, this study can help educators and policymakers understand how well it is to connect the curriculum to the community and provide insight that will support educational improvement and community development effort. Lastly the study helps provide evidence of the effectiveness of PBE and allow its values to be recognized by schools and administrators who may then feel more influenced in using and including it in the budget decision making process. This connects back to my theme that arose from the data.

Curriculum development is a dynamic process that unfolds over time. So, hearing the process was one thing but being able to see it done in real time would have been an amazing experience also. This research was able to capture a snapshot of curriculum developers' thought processes at a particular moment, but it would not be able to capture changes or evolution in their

thinking over time. Future research can explore the entire process of curriculum development and the time it takes to develop, along with any financial constraints that could happen during the process.

Conclusion

This study explored the design processes of curriculum developers in creating place-based science materials for learners in urban schools. This study was significant and contributed to the educational community because it is an under-researched area in education. Through this research, we gain insights into curriculum developers' design process, including the learners and places they design for, and the data and experiences that inform their design process. The interview data was interpreted through the concepts of personal frames of reference (York & Ertmer, 2016) and localized representation of children in urban schools (Quinlan, 2021). This study provides insight on the strategies, considerations, and design methods used by curriculum developers when creating PBE lessons for urban learners. The overarching theme of the interviews determined that personal frames of reference played a role in the way that PBE was being developed. However, the fear of lost time, poor assessment scores, and changes in daily structured school schedules were the biggest preventative factors that kept the PBE curriculum from being implemented. Based on this finding, curriculum developers are advised to pay attention to the unique strengths of the locations they are designing for, incorporate meaningful representations of diverse cultures and backgrounds in their materials, and prioritize equity by creating materials that are designed for specific locations. Additional research into administrators' views toward place-based education, and their decision-making regarding time and funding allocation, could be a next step to enhance access to and inclusivity of PBE curricula for diverse urban populations.

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Appendix A. Annotated Bibliography of Practitioner-Focused, Place-based Science Education Literature

Article	Definition of place-based education	Location of study	Grade level and demographics	Description of curriculum and learning goals	Results
Boling, J., Longhurst, M., & Lott, K. (2022). Watersheds, Communities, and Collaboration. *Science and Children*, *59*(4), 21-25.	"Nature-based field trip experiences that facilitate academically rich dialogue and offer learners the types of opportunities that increase persistence, problem solving skills, teamwork, and resilience" (p. 22).	This study takes place at Evergreen Junior High in Kalispell, Montana.	The study was done on a group of students in third to sixth grade.	"The project was framed around Vygotsky's Zone of Proximal Development (ZPD), which has been defined as the difference between what a child can do alone and what can be done with the support of a more capable partner" (p. 22).	Students were able to be successful "practicing mentoring experiences for older peers" and "develop a Socratic dialogue question and make purposeful connections to real-world meaning" (p. 25).
Burke, C., & Lazarowicz, A. (2021). Building Picnic Tables... and Community. *Science and Children*, *58*(4), 36-40.	In this article the teachers chose a place for the students to visualize and focus on and then created a lesson based on that place. The students did not actually travel to a place while doing this study.	The students worked on this project in their classroom but after they finished there was "a small group of students selected to present their work at a Place Based Education Community Forum" (p. 40).	This project was done with a group of third graders.	They used a third-grade science standard in engineering and design and a standard related to motion and stability.	Students were engaged in a conversation about the park and what things were symbolic or important. They all agreed on a picnic table being one thing that mattered and from there the teachers decided to have them design and build a picnic table of their own.

Cummins, S., & Newman, P. (2022). What's the Big Deal About Ocean Acidification?. *Science and Children*, This article defines PBE as the exploration of nature and the children's own communities. *59*(4), 50-54.	In this article they chose a topic "why we need a healthy ocean" and they taught lessons about the places where oceans existed and the overall importance of oceans to their surrounding communities.	This study took place in the classroom. Students read books about the ocean, interviewed an author of ocean books, and used internet sources to help them study the ocean topic.	This project/study was done with a selected group of fifth grade students.	They did not use a specific curriculum; instead, they taught 12 project-based lessons created about the role of water to the earth.	Students were able to understand ocean concepts and "explore their own personal connections" to the ocean. They also understood the link between the community and the ocean (p. 51).
Day, M., & Hernandez, D. (2015). Discovering Place-based Education in the Foothills of the Himalayas. *Occasional Paper Series, 2015* (33).	In this article they define PBE as "learning in a way that a child could discover himself or herself and the larger universe through active exploration and deep engagement with their immediate surroundings" (p. 75).	This study in the article takes place in Balwadis.	The groups for the article were preschool children ranging from ages 3-6 years old.	"In Prakriti Balwadis, the curriculum is activity-based. The curriculum consists of eight different activities" (p. 69).	In this article, the "children can benefit from every opportunity to develop as active citizens in their community and be active in shaping what their places will become" (p. 75).
Duong, T., Telemeco, M., Dean, C., & Hansen, A. (2022). Piloting virtual field trips during a pandemic: Developing curriculum, lessons learned, and recommendations. *Connected Science Learning*, *4*(2),	In this case they took students out of their actual place by providing virtual field trips to others. This article defines PBE as the exploration of nature and the children's own communities. places.	I am a bit confused about the location these students were in. I read California but was not sure if that was where the students were or only the virtual field trip location.	The age group for this virtual study was a group of second graders.	They used a virtual field trip curriculum that was aligned with second grade NGSS.	Virtual field trips gave the students hands-on science activities when they would have had no access during the pandemic.

Finch, K., & Bailie, P. (2015). Nature Preschools: Putting Nature at the Heart of Early Childhood Education. *Occasional Paper Series, 2015* (33).	This article defines PBE as the exploration of nature and the children's own communities.	Upon reading this article I did not see any specific location where the study took place, but the intro said University of Maine.	This article was based on a study that was done on a group of preschool aged children.	This article is based on "high quality childhood education programs known as nature preschools" and the curriculum they use (p. 95).	Students could connect to their environment and develop a powerful sense of belonging to their community.
Di Lello, C. (2015). Guggenheim for all: Museum education for students on the spectrum. *Occasional Paper Series, 2015*(33), 4.	This article describes a "three-part sequential program that harnesses the strengths and principles of place-based learning to foster positive learning outcomes for students on the autism spectrum" (p. 26).	This study took place at the Guggenheim Museum in New York City, New York.	This study was done on a group of kindergarten and first grade students with higher needs, and a group of teenage boys with autism.	"The teaching practices used in GFA align with researched curriculum interventions and practices for students with ASD"/autism (p. 29).	Students made artwork, such as patterns, rollers, and pictures. They also read stories and participated in read-aloud activities.
Hammack, R. & Vo, T. (2021). Engineering with Kindergarteners A fun winter activity inspires an engineering challenge. *Science and Children, 59*(2).	A "holistic approach to student learning around problem-solving, positive social learning interactions, and authentic science engagement" (p. 74).	The study was conducted by individuals at Montana State University.	For this study, the age group was kindergarten.	They just used a place-based scenario surrounding the winter outdoor activities.	Students were able to analyze data to see if their design ideas were successful. Students explained their ideas in their own words about what could cause an object to make different moves or change course.

Kesler, B. (2015). Learning Naturally: An Inquiry Study of Streams in Hawaii. *Occasional Paper Series,* (33).	In his article they see place based learning as learning through exploration and life experiences on a day-to-day basis.	The location of this study was Hawaii.	This study was done with kindergarten students.	The curriculum focused on two themes, "Needs" and "Interdependence Essential Understanding", teaching that "all living things depend on each other and their environment to meet their needs, in order to survive and thrive" (p. 79).	"…in the process the children discovered they were learners. They were productive, creative, and responsible. They learned to observe, wonder, touch & figure things out. It was very satisfying. They were developing a relationship with the place where they were living." (p. 92).
Kissling, M., & Calabrese-Barton, A. (2015, May). Place-Based Education: (Re)Integrating Ecology & Economy. *Occasional Paper Series*, 6(33).	Their definition of place-based education is something that "examines and cultivates integrity in particular places" (p. 51).	The study took place at a coal mining community in West Virginia.	The children rage between fifth and eighth graders.	They did not follow a written curriculum.	The power plant study "showed that economic and ecological considerations are inseparable" (p. 60).
McNamara, P., & Andes, B. (2015). Curtain Up: Place-based Teaching & Learning in the New York City Theater District. *Bank Street Occasional Paper Series*, 33(5).	At this school place-based education looks like the students using their local communities to explore and learn more about the world.	This study took place at the District Theater in New York City. So, instead of exploring an outside area, they were exploring the life of the theater.	The age group was also elementary students, kinder-fifth grade learners.	They used a curriculum they created on their own to study and understand the theater world.	Students were able to display what they learned by acting, drawing, and recreating the things they learned during the place-based lessons.

Merritt, E., Peterson, A., Evans, S., Marston, S. A., & Zuiker, S. (2021). Learning About Culture and Sustainable Harvesting of Native Plants. *Science and Children*, *58*(4), 69-73.	In this study students learned about PBE by observing and harvesting from land. They study focused of native American culture and ways of life.	The study took place outdoors in an area	This study was done with kindergarten through fifth grade students.	They did not use a curriculum, they used garden-based teaching to expose the students to native American ways of life.	Students were able to learn how to harvest and make slaves.
Roberts, K., Wilcox, J., & Bahnson, A. (2021). Cultivating Place. *Science and Children*, *58*(4), 53-60.	In this article place based is defined as learning that bridges a gap between children, nature, and community.	They use a community garden for the study location in an urban suburban environment.	The grades they focused on were elementary school students Kinder through fifth grade.	They used the NGSS standards and curriculum to teach across grade levels.	In discussion, students can explain their understanding of the importance of pollen, compost, and plant life.
Rabuzzi, D. A. (2016, November). Putting the City at the Heart Of Place-Based Education. Getting Smart Blog Series. *This article was not located using the prescribed search terms but is included in the review because of its relevance.	"PBE stems from the Emersonian strand of American thought about Nature and our place within it" (para. 3)	The post summarizes examples of place-based learning opportunities, including the lower east side of New York City.	Examples included Kindergarten through 12th grade.	I did not see any specified curriculum that was used for this study.	Specific results of individual projects are not described.
Rost, L., Hoversland, B., & Rost, M. (2022). Place-based cases: Museum collaboration develops mock trial CSI cases. *Connected Science Learning*, *4*(1).	This article describes PBE as an "authentic, robust way to connect classroom students to their communities" (para. 1)	This study took place at a historic museum in Baker, Montana.	This study was done with high school teachers and teachers.	Students were allowed to observe a court case and to process the details of the case by having observations of the cases.	Students took "a week processing the evidence and conducting meetings to share their findings" (sec. Step 2, para. 2).

Tsai, N., Kang, H., Chang, J., & Cassese, K. (2022). Adapting Existing Curriculum for Equitable Learning Experiences Breadcrumb. *Science Scope*, *45*(5). *This article was not located using the prescribed search terms but is included in the review because of its relevance.	In this article the authors focus on ways to make modifications by "adapting existing curricular resources to promote equitable learning experiences for diverse learners" (p. 45).	I could not identify the exact state, but the article said it was a National Natural Landmark with rich biodiversity and unusual geology. It mentioned Irvine Ranch Conservancy and Crystal Cove.	I could not identify a specific grade level. The article mentioned that this was done with middle school students and used a middle school ecology unit. It also mentioned that the study was done with a diverse group of students who came from various backgrounds.	"Students engaged in various scientific practices, such as developing and using models and analyzing data to understand the process of matter cycling. Through these activities, students reached the consensus that they should leave the dead plants in place to decompose to provide nutrients for the ecosystem" (p. 49).	With the completion of this study, they were able to help students connect to science learning with people in their classroom and by finding ways to relate themselves to their communities. Students studied and created restoration plans for the area affected by the wildfires.
Vinlove, A. (2015). Preparing Teachers for Place-Based Teaching. *Occasional Paper Series*, (33).	This article defines PBE as "education grounded in the built and human (social, cultural, and economic) world, as well as the natural world (Bank Street College of Education, n.d.)" (p. 105).	This study took place in Fairbanks, Alaska.	This study was conducted with interns who used the learned skills on various students that ranged from ages K-8th.	This curriculum focuses on "a system of trails in the woods near the school" (p. 111). They take trips on the trails for "science observations, art lessons, writing inspiration, read-alouds in the woods, math activities, and sometimes just for a quick dose of fresh air and exercise" (p. 111).	The interns gained knowledge and expertise on "how to connect students' school learning experiences to their out-of-school knowledge and experiences" (p. 116).

Waters, S., Schroeder, B. & D'Augustino, T. (2024). Place-based education: Connecting to STEM Learning Experiences. *Connected Science Learning*, 1(7).	In this article place based education is described as a "process that connects students with their local environment" while "addressing real community issues" (para. 1).	This study takes place in Michigan.	The targeted age group of focus for this study was kinder through 12th.	They used a program called Alliance for Great Lakes Adopt-a-Beach. The students were able to help with the clean-up of a beach of choice while also helping their community.	The students developed a sense of pride, and they were happy with their results. Many students were able to express how excited they were about the work and how it would help others.

Search Method

- Literature Sources:
    - NSTA (includes Science Scope and The Science Teacher) (15 results)
    - Bank Street Occasional Papers (21 results; a few not "real" results)
    - Science & Children and Connected Science Learning (23 results with an elementary focus)
- Type: journal articles; Excluded: Dissertations, Lesson Plans, Multimedia
- Search Terms: "place-based," "place based" AND "elementary"

Appendix B. Research Literature Annotated Bibliography

Authors (year)	Title	Summary of article	What theory do researchers invoke/use	What forms of data did researchers collect?	How did researchers develop and analyze data?	Who were the participants in the study?
Boudreaux, A., & Elby, A. (2020).	How curriculum developers' cognitive theories influence curriculum development.	In this article there are 2 designers with 2 strong ideas about how to write a tutorial to promote deeper understanding. Since the ideas were different, they present both tutorials and "show how their differences can be traced to different theoretical orientations toward cognition and learning" (p. 020144-1).	This article focuses on how cognitive "theories" are or can be effective. Their belief is that "instructional intuition along with thoughtful interpretation of student responses" can help shape theoretical assumptions and guide the initial curriculum drafts (p. 020144-2).	They examined student responses to questions from their two different tutorials they created about the direction of the static friction force in various situations.	They present both tutorials and "show how their differences can be traced to different theoretical orientations toward cognition and learning" (p. 020144-1).	This study was conducted on a group of students.
Hoard, B., Stefaniak, J., Baaki, J., & Draper, D. (2019).	The influence of multimedia development knowledge and workplace pressures on the design decisions of the instructional designer.	This article was about research designers trying to get to the root of what type of influence media had on the workplace and decision making for other designers.	They used a critical media theory to examine the data in this article. The goal of the study is to assess the instructional designer workflow and decision-making process.	This study uses data from a qualitative survey to "access and measure the production competencies" of participants. They used a think-aloud protocol to capture the "instructional design decision-making process for those same participants" (p. 1479).	They used "a follow-on interview after the initial design aloud session was done to triangulate and confirm any trends or findings uncovered" during the 1st design session (p. 1479).	"Results indicated that a substantial number of instructional designers (n=30) who participated in this study were selecting media as a preliminary step in their workflow process, and were often then

Authors (year)	Title	Summary of article	What theory do researchers invoke/use	What forms of data did researchers collect?	How did researchers develop and analyze data?	Who were the participants in the study?
						using analysis as a measure to confrm the early media selection" (p. 1479).
Islam, A. (2019).	Improving Educational Quality Through Curriculum Development: An Empirical Investigation Using Stakeholder Feedback Data	This article is about addressing issues of transparency of curriculum and the link of curriculum components. In the article they explore individual courses with 4 questions. They examine what courses are taught, how they are taught, when they are taught and what measures are used to determine the students' achievement.	The theory is "some jobs requiring qualified workers are remaining vacant due to the unavailability of qualified workers" (p. 69). They argue that the "gateway to creating qualitatively sound graduates is designing and implementing a good curriculum" (p. 69).	"Most of the collected data are ordinal Likert scale type data, ranging from 1 to 5. The response value of 1 indicates that the respondent strongly disagrees with the statement made in the question, whereas the response value 5 indicates strong agreement with the item statement" (p. 72).	In the article there was an "analysis of the stakeholders' responses on need assessment, curriculum design, curriculum review process, curriculum alignment, gaps in curriculum, fulfillment of employers' expectations, and comments of the stakeholders on the curriculum improvement plan" (p. 72).	The participants in this article were "228 students, 213 alumni, 16 faculty members and six staff of the Economics Department, and 161 employers who have employed graduates of the Economics Department of the Chittagong University" (p. 72).
Kumar, V., & Rewari, M. (2022).	A responsible approach to higher education	This article covers the entire process of analyzing an existing course, finding the gaps, and applying the constructive	The theory in this article is that the existing curriculum can be analyzed for flaws and fixed using the constructive alignment	The methodology followed in this article focused on constructively	The article states that the first step in the curriculum design process is to	In this article the participants were not reported.

Authors (year)	Title	Summary of article	What theory do researchers invoke/use	What forms of data did researchers collect?	How did researchers develop and analyze data?	Who were the participants in the study?
	curriculum design.	alignment principle to fill those gaps. This article covers not only the background of constructive alignment but also the steps needed to apply the principle for designing assessments, evaluating assessments, and designing teaching-learning instructions and outcome-based education.	principle.	aligning the course under surveys. The areas of improvement were established by taking a survey. The steps followed are categorized as follows: ▪ Data Collection ▪ Data analysis and findings ▪ Improvements In the Existing Curriculum	provide an outline of the learners/audience, course/subject area, and learning environment. Following this review of the instructor. This article gives information on how a teacher would collect diverse types of data.	
Lowenstein, E., Grewal, I. K., Erkaeva, N., Nielsen, R., & Voelker, L. (2018).	Place-Based Teacher Education: A Model Whose Time Has Come	In this article, the authors aim to prove "there is an imperative need to restructure and re-conceptualize teacher education so that it allows for a significant shift in thinking and practice around learning, teaching, and community. They advocate that although there are many strengths of PBE the flexibility in the model can (and must) be adapted to authentically represent individual communities" (p. 36).	Their theory is that "for PBE to be effective, we should re-conceptualize the ways in which we think about teaching, learning, and community, particularly within the context of teacher education" (p. 37-38). They want models that "will guide a transformation as well as create awareness of cultural beliefs and language that do not align with the place-based model" (p. 38).	The authors "identify three core pedagogical anchors: inquiry-based instruction, connection to place, and informed civic engagement that uniquely represent the transformative work they are doing in teacher education" (p. 36).	In this article, they used data that they had collected on the benefits of place-based education to identify how it was a best practice, and then they have ways to implement it in various classroom settings.	In this article, the participants were not reported.

Authors (year)	Title	Summary of article	What theory do researchers invoke/use	What forms of data did researchers collect?	How did researchers develop and analyze data?	Who were the participants in the study?
Ontong, K., & Le Grange, L. (2015).	The need for place-based education in South African schools: the case of Greenfields Primary.	"The case discussed in this article, together with the political and spatial challenges that South Africa faces, demonstrates the need for, and importance of PBE as a potential tool for meeting these challenges through education" (p. 54).	The theory of this article is that "PBE is particularly crucial in a South African context and can serve as a transformative educational tool to address the spatial and political inequalities that are legacies of apartheid" (p. 43).	In this article, they used interviews and focus groups to collect their data.	"Qualitative interviews were conducted with two teachers in the Social Sciences learning area for Grades 6 and 8. Focus groups and individual interviews were also conducted with learners" (p. 47).	"12 learners (six of whom stayed in the eco-village and six of whom stayed on neighboring farms) attending the school to understand their sense of place and to investigate the differences and similarities regarding the sense of place between these two groups" (p. 47)
Sianturi, M., Chiang, C. L., & Au Hurit, A. (2018).	Impact of place-based education curriculum on Indigenous teacher and students.	"This study aimed to investigate the impact of a place-based education curriculum on the Indigenous teacher empowerment and improvement of indigenous students' learning" (p. 311); "The PBE curriculum entitled 'Who is Papuans' was developed by integrating the indigenous	The theory is that "teachers as curriculum developers should consider an accessible and acceptable curriculum for the remote Indigenous students which reach out their needs. Otherwise, teachers should master the curriculum they apply to as well. So, the proper curriculum in remote indigenous elementary	"There were four data collection techniques used such as observation, interview, test, and documentation. Either observation or interview was used to gather data during development,	This mixed-methods study used both qualitative and quantitative data but the results determined that the quantitative data was best.	The study took place at an elementary school in Papua, Indonesia.

Authors (year)	Title	Summary of article	What theory do researchers invoke/use	What forms of data did researchers collect?	How did researchers develop and analyze data?	Who were the participants in the study?
		students' place" (p. 311). This study was found to be effective in teaching the Indigenous teacher how to develop and practice PBE curriculum.	schools needs to be considered" (p. 312).	practicing and evaluation of curriculum impacts" (p. 315).		
Silk, E. M., Schunn, C. D., & Strand Cary, M. (2009).	The Impact of an Engineering Design Curriculum on Science Reasoning in an Urban Setting	This article "examines the use of engineering design to facilitate science reasoning in high-needs, urban classrooms. The Design for Science unit utilizes scaffolds consistent with reform science instruction to assist students in making a design solution to satisfy a need from their everyday lives" (Abstract).	The idea and theory behind this study was to "clarify the theoretical foundations of DS curricula in terms of their potential impact on the development of science reasoning" (Introduction).	They used a "pre assessment and post assessment on science reasoning by examining the advancement of students from extremely low performance to moderate or high performance" (Results).	They compare a high-quality inquiry science unit and a traditional textbook curriculum, and the "implications for the use of design-based curricula as a viable alternative for teaching science reasoning in urban settings" (Abstract).	"Eighth grade students from two urban schools participated in the unit. Both schools contained large percentages of racial/ethnic minority and economically disadvantaged students" (Abstract).

Appendix C. Interview Protocol

At the start of the interview, participants will be asked if they have any questions about the research and if they agree to be audio recorded. Participants will also be reminded to avoid sharing their own or colleagues' names in the interview and avoid disclosing the institution or curriculum program where they are currently or were previously employed. The interviewer may skip questions if the participant does not wish to answer or if there are time constraints. The interviewer may ask follow-up clarification questions (e.g., can you explain what you mean by….).

1. As a curriculum developer I imagine the thought process for curriculum creation must be detailed, can you give me some insight on what that process entails? [prior knowledge]
2. Can you tell me all the steps needed to develop a new curriculum and who is at the table? [prior knowledge]
3. Have you designed a curriculum for schools located in urban communities? [representation]
4. How has the process differed (location, resources, etc.).
5. How do you think curriculum design relates to equity in education?
6. Do you think equity considerations should always be present when designing curriculum?
7. To what extent are your curriculum materials place-based?
8. Are there any standards you normally feel obligated to include when creating PBE science curriculum? [prior knowledge]
9. Are the standards included based on data about where students need support or selected based on grade level?
10. How do you feel about PBE and its effect on learners?
11. Do you think the PBE is utilized enough in science teaching?
12. What age group of learners are you mostly or requested to create content for? [representation]
13. If you could focus on a specific age group when designing curriculum, what age group would it be and why?

14. Can you tell me about the school or place you imagine when writing the curriculum?
15. Do you have a particular demographic in mind during the development of content? [representation]
16. Do you imagine a specific setting for your curriculum to be implemented?

17. Is equity at the forefront of your thinking when creating curriculum? How do you know and what does that look like to you? [equality/equity]

18. What do you think are the most important features of PBE science lessons and why? [prior knowledge]

19. What knowledge do you think teachers need to effectively implement your PBE science lessons? [prior knowledge]

20. Do you think that the teachers' race/ethnicity matters to teach PBE lessons? Why/why not? [prior knowledge; culture]

21. How does your cultural background help to inform the decision-making process in your curriculum designs? [culture]

22. Is cultural relevance at the forefront of your curriculum designs? [culture]

23. What equity issues do you see in curriculum design and development?
    a. What do you think may be a leading factor in the reason behind curriculum materials falling short to meet the needs of certain learners? [equality/equity]
    b. Do you have any ideas for how to address these equity issues? [equality/equity]

24. I have read that the curriculum is created with the "majority" in mind. Do you think this is true in your experience as a curriculum designer?
25. Who would you say is the "majority"?
26. What does this mean for the minority? [equality/equity]

27. What factors are outside of your control as a curriculum designer that determine who materials are designed for? [limitations of personal frames of reference]

28. If clothes and shoes were only made in one or two sizes, I imagine people around the world would be upset and work to do something about it. Why do you think there is not more urgency to meet ALL children's needs with a place-based curriculum? [equality/equity]

29. Is there anything else you would like to share that you think needs to happen to make sure

students in urban schools have access to place-based education in the future? [limitations of personal frames of reference]