

BITRIC®

The Binary Measurement System

District of Columbia Education Research Practice Partnership

- Researching the Effectiveness of Culturally Relevant STEAM Curriculum

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BITRIC®

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1 Executive Summary

I worked with members of the BITRIC® organization here in South Africa while they were performing research to further develop curriculum for BITRIC®'s African Math™ program. I believe BITRIC® displays a commitment to closing the achievement gap and bettering academic outcomes for people of all ages from all backgrounds.

“Underserved populations”

BITRIC® is a Washington, DC based non profit organization that specializes in creating culturally relevant STEAM curriculum to lessen achievement gaps. The organization focuses on modernizing and reintroducing indigenous maths systems to battle dyscalculia and increase maths performance. BITRIC® implements designed based research intended to provide parents and educators with rich effective learning materials. We create culturally responsive play based child centered math games, activities and curriculum. We collaborate with parents and educators to develop best practices. We've learned that a consistent feedback loop between parents teachers and our organization is critical to the development of effective curriculum design.. It is our aim to implement and research the impact of culturally relevant STEAM curriculum in Washington, DC and similar urban areas. Our programs have been developed to directly respond to ouras well as the widening Nation's long standing gender and achievement gaps. We are also designing curricula to address the International Achievement Gap, which indicates a decline in math performance between Americans and our international peers.

2 Mission & History

Mission

Close the achievement gap by providing designing, testing and implementing effective culturally responsive STEAM curriculum.

History

Our journey as research practitioners began for my wife and I when we became parents. We were challenged with living in a neighborhood that had low performing schools. Our travels throughout the US introduced us to a disappointing reality. Our country's school system was consistently producing low performance outcomes in certain neighborhoods. We realized that as a parent it is our responsibility to solve the academic problems facing our children and community. We researched ancient Ethnomathematics programs and designed curriculum to revive the hidden potential of multiple indigenous math systems. This method can be especially beneficial when teaching children of African descent. We designed curriculum to revive the hidden potential of multiple indigenous math systems. We also leveraged graphic design skills to design games and activity sheets to satisfy the math requirements outlined in Common Core. We learned about the importance of "Child Culture". Children were more enthusiastic about colorful, play based and child centered materials and activities. Children seemed to also feel more comfortable with learning material decorated with people that they could identify with and relate too. Our research in Africa also helped to reinforce our awareness of the importance of being taught math in a familiar language, ideally the language predominantly spoken at home. We've been researching and implementing our culturally relevant learning materials to our children and other children in our homeschool network. We've produced impressive results. We'd like to have our results measured, replicated, and implemented on a larger scale. We look forward to designing, testing, and implementing an effective culturally responsive STEAM curriculum with The DC Education Research Consortium and similar organizations throughout the country.

Period of Commitment

BITRIC® has been registered with the DC Government as a non-profit since 2013. The BITRIC® founders and leadership are 2nd generation Washingtonians who have made a commitment to supporting public education in the District.. After conducting 7 years of research in Florida and South Africa, our organization leadership returned to Washington, D.C. so the data gathered could be used for curriculum development. We believe in maintaining and building new long lasting relationships with education DC education stakeholders. BITRIC® plans to remain headquartered in DC and be available to conduct research well beyond the next 10 years. There are many benefits and resources that come with being housed in the Nation's capital which we plan to continue to leverage. In addition, BITRIC® has made long term investments in the city which will help enable us to provide continuity and stability for the education research practice partnership. Lastly, we have a Memorandum of Understanding (MOU) with NIKKINNI LLC, a for-profit company in DC which helps BITRIC® through in-kind contributions.

All BITRIC® programs and curriculum are intended to be researched and developed continuously here within the nation's capital and similar urban areas.

1. Each curriculum program is intended to be continuously designed, researched, tested, developed and implemented into American Society in perpetuity.
- 2.
3. We are here to serve the needs of Learners, Parents, Educators by providing child centered curriculum and resources that utilize Concrete, Pictorial, Abstract (CPA) and STEAM.
4. The National Mall is a destination for millions of domestic and international tourists. We envision local residents having increased interaction on The Mall by having our math program held at museums throughout the city.

Consortium

We plan to establish a partnership with the University of the District of Columbia (UDC).

Effectiveness Study of Culturally Relevant STEAM curriculum

BITRIC® plans to establish a research and development agreement with UDC where students

1. Pilot case study at UDC Early Childhood Education Center
2. The Effectiveness of Culturally Relevant STEAM Curriculum
3. Learners collect Data on programs effectiveness
4. Learn from UDC professors how to develop professional development curriculum
5. Recruit recent graduates to become program facilitators at sites throughout the city.

We will support improvement in the District's public schools by contributing the following to the consortium

1. Innovate culturally relevant educational material.
2. Implement curriculum and educational material through local pilot programs as case studies.
3. Provide professional development to educators through Teach DC Leap professional Development program
4. Collaborate with local Universities and involve interested education majors, professors and doctoral candidates in the implementation and data collection of each culturally relevant curriculum program to monitor the effectiveness.
5. Report the findings of our research
6. Streamline best practices into a complete standard aligned curriculum
7. Replicate success and share with similar consortium groups in need of similar curriculum

3 Vision

BITRIC® produces DBIR designed based implementation research curriculum and materials. Our emerging practices have increased student achievement. We envision tracking the effectiveness of our DBIR material in real time through diagnostic, formative and summative assessments. We'd like to base our research in local universities. We seek to collaborate with local university faculty and their students to develop best practices and Common Core aligned education materials. University students can also be actively involved in continuous case study research. We plan to provide ongoing case study research in DC Public and or Charter School System. We seek to provide DCPS educators culturally relevant STEAM materials and consistent ongoing professional development in the implementation o.f our programs. We plan to compare the outcome of the control group to the experimental group. Our goal is to make an immediate and lasting impact on the performance outcomes of our community. Our materials are designed to be familiar, relevant and relatable to the end user.

BITRIC® considers the differences that exist from children of all backgrounds. We believe partnerships help to generate knowledge, hence we will solicit research partners in and outside the District to conduct qualitative and quantitative research.

A successful research partnership will have buy-in from practitioners and trust from the schools and education entities where research is conducted. In accordance with the RPP Act, education research would be conducted as a long-term collaboration between BITRIC®, the Advisory Committee, practitioners and other researchers. The research practice partnership would use the following guiding principles and goals.

- Accountability
- Transparency
- Independent
- Neutrality
- Utilization of industry-recognized methodologies
- Qualitative Research
- Quantitative Research
- Collaboration
- Partnerships
- Clear and Meaningful Communication
- Diversity
- Capacity Building
- Annual Reporting
- Data Protection
- Data Accessibility & Availability

Specifically, BITRIC® would work with the Advisory Committee to develop a Research Plan for both qualitative and quantitative data collection. We will most likely need support with Data collection. We are a Design Based Implementation Research organization. Most of our data is qualitative. We are seeking to collaborate with universities and other stakeholders to better collect quantitative data.

Research will include but not be limited to gathering best practice data from educators in the areas of:

- a. Lesson Planning
- b. Common Core Alignment
- c. Content Delivery Methods
- d. Parent Enrichment and Engagement
- e. Professional Development Strategies
- f. Assessment Strategies
- g. Use in intervention
- h. Differentiated Learning Approach
- i. Scaffolding

Being a culturally responsive STEAM curriculum provider, we would also seek to conduct collaborative education-related research by piloting our culturally responsive STEAM curriculum in select DC public and charter schools. We would also seek to expand or pilot program to include randomized trials of our PK - 12 culturally responsive STEAM curriculum .. Some of the potential locations we have identified for different BITRIC® programs are:

AMERICAN MATH

- Architect Institute of America (AIA)
District Architecture Center (DAC)
- Natural History Museum
- The National Building Museum
- Anacostia Museum
- University of the District of Columbia (UDC)
- American University (AU)

BITRIC® MATH

- National Air and Space Museum
- National Children’s Museum (starting Fall 2020)

GIRLY MATH

- The National Museum of Women in the Arts
- The Mary McLeod Bethune Council House
- Daughters of the American Revolution
- Clara Barton National Historic Site

MAYAN MATH

- DC Bilingual
- Centronia
- Carlos Rosario Center
- The National Museum of the American Indian

AFRICAN MATH

- National Museum of African American History and Culture (NMAAHC)
- National Museum of African Art
- Benjamin Banneker Circle
- University of the District of Columbia (UDC)
- Howard University
- HBCU Museum

4 Knowledge and Expertise

Expertise in Education Research for Urban School Districts and States

BITRIC® is a grassroots education organization who is seeking to partner with the DC Office of the State Superintendent of Education (OSSE) to learn best practices on implementation and curriculum effectiveness. We develop curricula that is child centered and play based. Our Concrete Pictorial Abstract (CPA) program differs tremendously from the rote memorization strategies familiar to most parents and educators here in America. We would like to conduct research to further our knowledge on CPA approaches and the effectiveness of other methods used in classroom settings.

Since our formation in 2013, we have performed a lot of independent research on instructional practices that positively impact student success for the youngest of learners to adult learners. Over the years we have designed, planned, and conducted educational research using both qualitative and quantitative methodologies. Between 2013 - 2016 we conducted research in a South Florida urban area. During this time we worked with 3 small independent schools (MISSK, Black Homeschoolers Network, Children of

the Sun) and urban community groups (Sankofa Cypher, House of Kuumba,) to determine the effectiveness of culturally responsive STEAM curriculum.

We have studied the successes of programs in urban areas across the country. One example is that of EngageNY which led to the creation of Eureka Math. Although a formal Research Practice Partnership is credited, Eureka Math was created using research and partnerships. The BITRIC® organization has performed and continues to perform independent research on instructional practices and curriculum in use both domestically and internationally. Our findings have resulted in the development of our culturally responsive STEAM curriculum. *(See Appendix A - BITRIC® Biography & Programs)*

Expertise in Partnering with Government

On March 28, 2019 D.C. Law 22-268; D.C. Official Code § 38-785.01 et seq. was updated to include the “District of Columbia Education Research Practice Partnership Establishment and Audit Act of 2018.” The legislation established a “research practice partnership” and an “audit.” Although the act calls for an “audit” BITRIC® plans to emphasize the “research practice partnership” portion of the act when engaging with schools. Auditing will be performed but the focus will be on gathering the information schools need to improve. Reason being, auditors are typically not the most popular people. While conducting research we will make it clear that . . .

“We are researchers who care and are there to help.”

During the summer of 2014 we split time between FL and DC to work with the District of Columbia Public Library system to host a series of BITRIC® - African Math™ workshops at Dorothy Height, Francis Gregory, and Lamond Riggs libraries. The workshops were well received by the library staff and participants.

During Fall 2014 we partnered with the Washington, DC Department of Parks and Recreation to deliver BITRIC® - African Math™ sessions at the Deanwood Recreation Center in NE DC. The sessions were provided as a part of Deanwood’s after school program which primarily serves DC Public School students. Quantitative data was not captured at Deanwood but the qualitative data obtained was very insightful. During these sessions we were able to engage with learners daily and a few involved parents. We learned the tremendous impact parental engagement or lack thereof has on student outcomes. We were also able to witness the learners' responses to our culturally responsive STEAM materials.



Between 2017 and 2018 we self funded a year-long research mission to South Africa. While there we partnered with the University of KwaZulu-Natal (UKZN) South African Department of Science and Technology (DST) – National Research Foundation (NRF) Centre in Indigenous Knowledge Systems (CIKS) to deliver training and professional development to students and educators. The information presented was based on findings from qualitative research and volunteering at a South African school. <https://ciks.org.za/news/indigenous-mathematics-in-early-childhood-development/>

(See Appendix B - Ctr Indigenous Knowledge Sys Article)

Prior to leaving the country we were able to record the positive impact culturally relevant curriculum had on student's outcomes. Seeing their culture in the curriculum peaked the learner's interest and increased their desire to learn.

(See Appendix E - Afrikology Reference Letter)

After leaving South Africa we returned to Washington, DC where we have been performing qualitative and quantitative research for the past 18 months. This research has taken place through surveys, observations and interviews using case studies, ethnography, and testimonials.

1. Math and Literacy Support in a NE DC Urban Community
2. Parent & Student Engagement at a NE DC Public School (Phelps ACE High School)
3. Recorded BITRIC® - African Math™ live online classes with elementary aged children *(See Appendix C - BITRIC® - African Math Class Testimonial)*

Plan to Leverage Best Practices of RPPs

BITRIC® plans to leverage best practices of research practice partnerships that mirror the Districts demographic. Seldom are there one size fits all solutions. Therefore, our research approach will take many factors into consideration.

Some of the best practices we plan to leverage are development of surveys, assessment tools, and other instruments; the development of co-design protocols; and the upkeep of data archives and matching systems.. Since we are not currently supported by an Institutional Review Board (IRB), it would be beneficial to use one.

We also plan to perform randomized trials of new curricula, conduct participatory studies with student and family co-researchers. The research will be designed to focus on teacher classroom practices and methods. We will also call on community partners that service DC public school students to determine what instructional practices they have found to be successful.

Prior to finalizing the Research Plan we would conduct a formal review of similar partnerships implemented in other states and cities to be performed by all partners and the Advisory Committee. We would then compile all questions and comments and seek to hold informational meetings with the stakeholders from those partnerships.

Lastly, we would work to solicit funding dedicated to the development of skills and expertise in conducting research in partnership for graduate students and early-career professionals and researchers.

Philosophy

Our philosophy is simple. Improve STEAM outcome. We create, create, and disseminate culturally relevant STEM curriculum. We start by identifying and interacting with those in need of support. Our philosophy is to “Go where the need is.” Once we have clearly assessed the needs of a specific community, we simply create solutions to address the problems identified. We implement the solutions and test the results. Most of our research outcomes have been qualitative. Quantitative research typically receives more support than qualitative research because it is measurable. We have gotten great qualitative data. We are eager to join this RPP to get solid quantitative data to support our findings. *(See Appendix B - Ctr Indigenous Knowledge Sys Article)*

Networks

Members of our proposed project team have varying experience with DCPS Central Office, Phelps ACE High School (NE DC), Martin Luther King Jr. Elementary School (SE DC) and a some DC Public Charter Schools (DC Bilingual and Friendship). We also have close ties with the Washington, DC Homeschool Network and some DC Neighborhoods. Many of our relationships stem from relationships we have built as curriculum providers. We would seek to broaden existing relationships and expand to

create new ones that would benefit the research partnership. In addition, we would solicit the input of our overseas network to assist where appropriate. *(See Appendix D - UKZN CIKS Support Letter)*

Expertise in Coordinating and Conducting Community Outreach

BITRIC® has successfully coordinated and conducted community outreach activities in Washington, DC, Florida, and South Africa. In all three places we have gained the trust and support of educators and families. In the Washington, DC area we have successfully engaged education and business leaders along with City Counsel Representatives. Our plan is to engage all stakeholders which are defined as any and all who live, work, engage with and invest in the District.

Our organization currently hosts live online classes with participants in urban areas. In addition, we currently support a small NE DC Community by providing homework assistance to elementary and middle school aged learners. *(See Appendix F - Community Member Testimonial)*

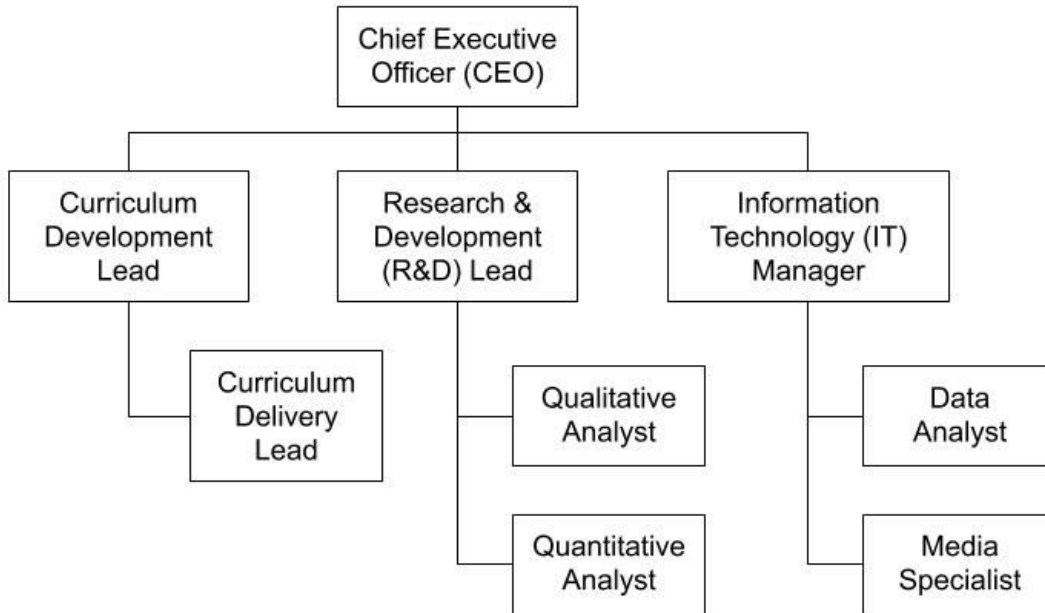
Our organization is proficient in utilizing video and web conferencing to communicate to diverse audiences. The internet gives us the ability to reach broad audiences using images, pictures and videos that are visually appealing and informative. We will also utilize existing DCPS and Charter School communication vehicles to communicate research findings.

5 Partnership Personnel and Collaboration

Current Personnel

We are a small organization with no financial support. Our passion and commitment combined with monetary donations from personal savings have gotten us to where we are today. We are seeking stakeholders within this Partnership to assist in providing funding so we can scale up.

Organization Chart



Full-Time Equivalent (FTE) positions for the research partnership

1. Research & Development Lead
2. Information Technology (IT) Manager
3. Qualitative Analyst
4. Quantitative Analyst
5. Data Analyst
6. Media Specialist

Personnel Dedicated to the Partnership

1. Research & Development Lead
 - a. full-time dedicated staff
 - b. Manages data collection activities
 - c. supports staff managing and administering research
2. Information Technology (IT) Manager
 - a. full-time dedicated staff
 - b. Manages data storage, security, archiving, data back-ups and data sharing
3. Qualitative Analyst

- a. full-time dedicated staff
 - b. collects, processes, and analyzes data
4. Quantitative Analyst
 - a. full-time dedicated staff
 - b. collects, processes, and analyzes data
5. Data Analyst
 - a. full-time dedicated staff
 - b. Process and compile data for reporting
 - c. Performs data back-up and sharing activities
6. Media Specialist
 - a. full-time dedicated staff
 - b. Media collection, editing, production

Advisory Committee Collaboration

At BITRIC® we use forms prior to sessions to organize and capture all input
Host webinars and virtual meetings to ensure all can be included
all input matters, consider all perspectives

Consortium Coordination

We are applying as an independent non-profit organization.

6 Data Use & Protection/Research Methods

Expertise in Data Security

Our staff has experience with the collection, maintenance, storage, cleaning, use, and interpretation.
(See Appendix F - PendaB Resume & Appendix G - FrancisL Resume)

Data Management and Security Plan

We will create a complete and comprehensive data and security plan will be created prior to collecting any data. High level requirements for data management and security are as follows:

1. Use an oracle relational database management system (RDBMS)
2. Use Oracle SQL developer for report generation

3. Develop and maintain longitudinal data archives
4. The Data Management Plan will outline all security measures
5. Establish data sharing agreements with DCPS and Charter Schools to include their data in the research partnership
6. Access to all data is password protected
7. Use Complex and Secure Passwords
8. Data access is restricted to staff with authorized access
9. Will not associate the names of participants with data collected.
10. Participants will be given unique ID numbers to be cross referenced with school ID numbers that are masked within our database so identities are not known.
11. Any personally identifiable information (PII) will be kept in a secure database which only authorized BITRIC® staff will have access to.
12. Media will be collected using digital tools that can be edited to filter names
13. Use a firewall to keep intruders out.
14. Use and regularly update anti-virus software
15. Anti-Spyware Software
16. Include practices to maintain data integrity

Validity

We assure that the rights and welfare of the participants are protected by working with the Advisory committee to determine what data will be collected and how. Participant's personal information will not be captured unless deemed necessary to ensure data integrity is maintained.

Data Quality

We will implement the following measures to minimize the collection of invalid data:

1. Participants will not be pressured to answer questions or to select specific choices when applicable
2. BITRIC® staff will oversee the collection of data as opposed to solely relying on DCPS or Charter School personnel to collect
3. Collect data from large pools of participants
4. Ensure questions are clear and measure what is desired
5. The Information Technology (IT) Manager will manage quality control

Independence

Data independence will be maintained in the following way:

1. All database tables will have read-only copies
2. No applications will have the ability to write to read-only tables

7 Financial Management and Proposed Budget

Financial Management

financial management and internal accounting procedures of the entity

Potential Funding Sources

All funding will come from external sources.

Bitric will require all the funds indicated in the proposed budget from the District for Partnership initial start-up costs and annual operations.

Proposed Budget

Category	Start-up Costs	Annual Costs*
1. Staff	\$672,000	\$672,000
2. Equipment	\$15,000	\$3,000
3. Supplies	\$2,300	\$2,300
4. Materials	\$30,000	\$30,000
Total Project Costs	\$740,000	\$_707,300

* Annual costs will increase/decrease by 5% over the 10 year period.

Justification:

1. All staff will be fully allocated to the Partnership
2. Hardware and software is needed to house and share data

3. Office supplies, copies, postage and presentation tools are needed for general operation of the project
4. Professional development and classroom materials are needed for participants

Institutional Support

Our partner organization, NIKKINNI LLC will provide in-kind support in the form of workspace, media and computer equipment.

(See Appendix H - BITRIC® - NIKKINNI MOU)

Appendices (Included as Attachments)

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