

Courage Hope Care Institute

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1. Introduction

1.1. Introduction to CHC STEAM and Vision

CHC was established to help more children develop future science and technology capabilities in line with rapid changes in the industrial structure. CHC's vision is to narrow the STEAM gap by increasing awareness of STEAM education among disadvantaged children and enhancing their access to educational opportunities. Our primary goal is to address the STEAM education gap that persists nationwide and within the Washington, D.C. area. As a nonprofit organization, we are dedicated to promoting equality in STEAM education by providing free after-school STEAM programs to children in low-income areas. Our core values are to raise awareness of the importance of STEAM education and to help children gain easier access to STEAM education.

1.2. The Importance and Current Status of STEAM Education

- **Industrial Structural Changes and the Need for Future Competencies**

In line with the rapidly changing industrial structure, it has become essential to help children develop future science and technology competencies. In particular, robotics education teaches children basic skills that are becoming increasingly important in today's technology-driven world. It has the potential to lead to successful careers in the STEAM field. Through such education, children can gain analytical, problem-solving, and innovative skills, as well as practical experience in STEAM fields. Additionally, exposing children to STEAM concepts at an early age stimulates their natural curiosity and interest, helping them prepare for a future where technology plays a central role.

- **National and Washington, D.C. Regional STEAM Education Gaps**

Despite advances in STEAM education, persistent achievement gaps exist between specific demographic groups in STEM subjects nationwide. In particular, many schools in underserved communities lack sufficient STEM resources, curricula, and qualified teachers. Washington, D.C., also faces significant limitations in providing STEAM education opportunities, and public schools in low-income neighborhoods struggle to offer comprehensive STEM programs. As a result, many schools, such as Savoy Elementary School in the D.C. public school system, lack the time and resources to implement STEAM education.

- **Analysis of Accessibility Barriers, Including Financial Burden**

One of the main factors limiting access to STEAM education is the high cost of education. According to the report "America After 3 PM STEM: STEM Learning Is Growing, but Barriers and Gaps Persist," after-school programs that offer STEM learning are significantly more expensive than those that do not.

STEM after-school programs cost an average of \$107 per week (\$3,852 annually), while non-STEM programs cost an average of \$74 per week (\$2,664 annually). Programs that offer STEM activities two or more times per week have an average weekly cost of \$116 (an annual cost of \$4,176), and this financial burden is a significant contributor to educational inequality.

2. Overview of CHC STEAM Programs

2.1. STEAM Programs Target and Objectives

- **Main Target Children (K-5)**

Our programs are designed for children (K-5) and are conducted through hands-on activities in a group setting. Exposing children to STEAM concepts at an early age is crucial for developing their cognitive abilities and reasoning skills.

- **Goals for Developing Children' Future Science and Technology Competencies**

The goal of this program is to help children develop the ability to recognize real-world problems, devise solutions, and verify them through experimentation. Specifically, we aim to build the following future science and technology competencies:

- **Improved problem-solving and critical thinking skills:** Children develop multifaceted problem-solving skills by applying their knowledge to real-world STEM problems, learning through trial and error, and combining logical thinking with creativity. In particular, we help them develop skills in problem definition, information gathering, creative solution proposal, step-by-step approach, result analysis, and proposal for improvement.
- **Strengthening collaboration and communication skills:** Through team-based projects and group activities, children develop effective communication and collaboration skills as they share ideas, listen to one another, and work together to find the best solutions.
- **Increased interest and knowledge in STEAM fields:** The program successfully enhances children's interest and expertise in STEAM fields, particularly through robotics education, equipping them with the skills essential in today's technology-driven world and laying the foundation for successful careers in STEAM fields.
- **Improved understanding of mathematical concepts and increased confidence:** Children are supported in developing a deeper understanding of mathematical concepts and number sense, which enhances their problem-solving skills and fosters the confidence to tackle more complex concepts.
- **Development of spatial reasoning, creativity, and innovation skills:** The introduction of 3D concepts improves spatial reasoning, problem-solving, and creativity, which are essential elements for success in STEAM fields such as animation, game design, and architecture. Children have the opportunity to design their creations and exercise their creativity and innovation.
- **Providing cutting-edge technology experiences:** We offer digital and cutting-edge technology experiences, such as virtual reality (VR) devices and STEM robot kits, to help children learn in a technology-friendly environment and adapt to the future.

2.2. Educational Methodology and Features

- **Hands-on Activities-Centered Project-Based Learning**

Our STEAM programs are designed to actively engage children in hands-on activities-centered group projects from an early age (grades K-5). This learning method bridges classroom learning to the real world, enabling children to identify real-life problems, devise solutions, and test them through experimentation. For example, through math games that use fake money and interactive electronic math games, children learn math concepts in a fun and immersive way, improving their problem-solving skills. Each group works on a project that requires them to produce a specific result, providing an experience that extends beyond simply acquiring knowledge and enables them to achieve tangible outcomes.

- **Use of Various STEAM Kits and Tools**

Our STEAM programs utilizes a variety of kits and cutting-edge tools to help children better understand and apply STEAM concepts.

- **Virtual Reality (VR)** is primarily used in science subjects, providing an immersive learning experience that allows students to participate in virtual field trips to museums, natural environments, historical sites, and even space, helping them visualize and interact with complex concepts. However, it is limited to 10 minutes per child and must be conducted under the supervision of an adult.
- **Robot kits and coding robots** are used in technology and engineering subjects. For example, remote-controlled robot toys, such as Sphero coding balls/apps, and mini drones, are used to explore how technology works and how it is controlled, exposing students to basic coding and programming concepts. Robotics kits, such as LEGO robot kits, integrate mechanical components, including motors and gears, to enable children to learn about design, construction, and mechanical and electrical systems. This contributes to the development of a wide range of skills, including problem-solving, critical thinking, creativity, and collaboration.
- **Tools such as 3D pens and puzzle** shapes are used to enhance spatial reasoning, problem-solving, and creativity. Children learn to think in three dimensions, design and construct simple structures, and understand the engineering design process.
- **Drones** are used to provide children with hands-on experience in STEM, enhancing problem-solving, creativity, and collaboration. These activities build essential digital skills, boost motivation, and help bridge the digital divide, preparing all children for a technology-driven future.

- **Ways to improve teamwork and problem-solving skills**

Our program focuses on improving teamwork and problem-solving skills.

- **Group projects** encourage children to share ideas and collaborate to achieve common goals. Robotics kits are specifically designed for group projects to foster teamwork, communication, and collaboration skills.
- **The iterative problem-solving approach** is a fundamental engineering skill that allows students to experience the process of identifying problems and solving them through multiple iterations. This fosters strategic thinking, critical thinking, and logical reasoning.
- **Individualized feedback and improvement plans** are also provided. Instructors evaluate students' problem-solving skills and collaborative work, analyzing areas that require additional support, such as creative problem-solving, result analysis, and reflection, as well as role distribution in teamwork, to help individual students improve their weaknesses. This helps students maintain their overall strengths while strengthening their weaknesses.

3. Key Programs and Achievements

3.1. Community-based STEAM programs in partnership with DC Public Libraries

CHC partners with the DC Public Library (DCPL) to operate a community-based, informal after-school STEAM program. This program is not just about education, it's about making a real difference in the community. It addresses the STEAM education gap in underserved areas and promotes educational equity. The organization offers the program at the DCPL Parkland-Turner branch during the school year and at the Anacostia branch during summer break. Both library branches are in Southeast DC (Ward 8), an area with a high concentration of low-income and African American residents, making it a community in urgent need of educational support. Our program targets K-6 students in these areas and contributes to increasing educational

accessibility by alleviating the financial burden of after-school STEM programs, which amount to \$3,852 annually.

Our organization provides program content, resources, and qualified instructors, and has established a strategic partnership with the DCPL Parklands-Turner branch. The Parkland-Turner Branch provides a dedicated children's library space for the program, and our children's librarians work closely with our organization to significantly contribute to the program's success. This collaborative model extends beyond simply providing space by reserving the children's library from 3:30 p.m. to 4:30 p.m. and ensuring the participation of children's librarians, which leads to full student participation during the 50-minute program. This approach ensures consistent instructor availability and high-quality education, thereby increasing the program's sustainability. Key Achievements: Through this partnership, CHC has achieved the following significant results.

This successful program, based on in-depth data analysis, is outlined in our Case Study, **'Partnership with DCPL Parklands-Turner,'** written by Dr. Lan Joo, Founder and CEO of CHC Institute.

4.2. School-Based STEAM Programs in partnership with DC Public Schools

The partnership with DC Public Schools was initiated to help more children across the country develop future-ready science and technology skills in response to structural changes in industry. In particular, DC public schools in underserved communities face challenges such as limited STEAM resources and curriculum, as well as limited time to teach STEAM during the regular school day. Our organization partnered with DC public elementary schools, specifically Title 1 schools in Ward 8, to address STEAM education gaps and improve access for students in grades K–5.

For a more detailed overview of our partnership and achievements, please refer to "A Case Study: Partnership with DC Public Turner Elementary School, School Year 2025-2026," written by Dr. Lan Joo, Founder and CEO of CHC Institute

3.3. Achievements

Our STEAM programs have achieved various positive outcomes, providing quality STEAM education to underprivileged children and helping to reduce the STEAM education gap. This reduction is evident in the increased number of students from underserved communities who have gained access to quality STEAM education, as well as the improved performance of these students in STEAM-related subjects. The main achievements are as follows.

- **Raising community awareness:** Our program has not only effectively communicated the importance and meaning of STEM education to the community but also successfully increased interest and participation in STEAM education within the community. Parents of students who participated in the program have come to realize the importance of STEAM education and have begun to encourage their children to actively participate in the program. This success is an essential catalyst for a more optimistic future, with increased support and participation in STEAM education within the community.
- **Demand-driven program development:** Our program has established itself as a demand-driven program that goes beyond simply providing education, encouraging students to participate voluntarily. This is thanks to the use of diverse activities such as robotics workshops, science fairs, and coding camps, and experience-based materials like interactive learning kits and virtual reality simulations that allow students to participate directly and have fun. The participating students demonstrated high satisfaction and participation in the program, as they found it both interesting and enjoyable.

- **Bridging the gap in school STEAM education:** Our program has played a crucial role in filling the gaps in STEAM education that school education alone could not address. By offering diverse STEAM activities and learning materials that are often unavailable in schools, we have provided free access to quality STEAM education for children in underserved communities. This is a cause that will resonate with all stakeholders, fostering a sense of empathy and support for our mission.

4. Strategic Vision and Forward Plan

4.1. Driving Program Innovation Through Applied Educational Research

CHC is evolving its STEAM programs by prioritizing research and publications to drive educational innovation. The organization will provide evidence-based recommendations to schools and policymakers, using rigorous analysis to support data-driven decision-making. These efforts aim to empower children with the essential competencies needed to thrive in future society.

4.2. Building Strategic Partnerships for Lasting Impact

Establishing strategic partnerships and close communication

Establishing strategic partnerships with institutions such as DC public libraries and DC public schools is essential to building a solid foundation for our program and securing the necessary support. To identify potential issues early and work collaboratively toward shared goals, we will maintain regular and open communication channels. Participation in external events, such as the STEM Fair, will also be a part of these partnerships, serving as an essential platform for engaging with communities and raising awareness of our organization's vision.

Building an active collaboration model

We aim to implement an "active" partnership model similar to what is seen at Savoy Elementary School and Parklands-Turner public library, where staff members are directly involved in operating the program. Their involvement ensures the consistent delivery of high-quality STEAM education, which is key to the success of the program.

Leveraging complementary strengths

Our organization provides STEAM education content, resources, and instructors, while the partners offer safe learning spaces, skilled staff members, and ensure students' attendance. By leveraging each other's strengths, we have enhanced the quality of our programs. We will continue to maximize the synergy of our collaboration by fully utilizing the expertise of each partner.

Defining a clear role and shared vision

When establishing new partnerships, it is essential to define the roles and responsibilities of each institution clearly. Engaging in in-depth discussions about leveraging each other's strengths and resources will improve mutual understanding. Additionally, setting shared visions and goals—particularly in addressing gaps in STEAM education—and working together to achieve them is vital for the success of our partnerships.