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Compulsion of STEM Subjects

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Abstract

This report investigates the features of after-school program at a charter school in the Southeast US, highlighting the interactions of students with these after-school program activities and their benefits. To clarify the viewpoints and perspectives of students about the tasks and their learning trajectories, a qualitative case study framework was used. Data from the study was gathered through formal and informal analyses, semi-structured one-on-one interviews, and field notes. The results of the study found that these practices prioritize open-ended and interactive scientific research in the areas of science, technology, engineering, and mathematics (STEM) and offered an arena for students to demonstrate diverse applications of 21st century skills. The relevance of collective learning communities, the success of after-school program, participation in STEM areas, and the importance of activities to the growth of skills in the 21st century have been identified and clarified. These results indicate that STEM-related practices have the ability to encourage collective learning and study and to contribute to the growth of skills in the 21st century. These effects have also been explored in terms of how after-school activity programs related to STEM benefit the learning of students.

Keywords: *STEM Fields, After-School Activities, Programs, Self-Development, Adaptability*

I. INTRODUCTION

Education of science, technology, engineering, and mathematics (STEM) is a recently emerging concept that focuses primarily on the fields of science and mathematics, but also incorporates technology and engineering. In order to address interdisciplinary challenges and learn skills and expertise in order to support scientific innovation and economic development in the United States, STEM education is considered a way of helping people develop diverse techniques. Latest surveys show that the next generation is not prepared to respond to any existing or future demands [1]. International metrics such as TIMMS and PISA report that in mathematics and science, US students exhibit a low level of results. Moreover, there has been a decline in the number of STEM graduates. Individuals qualified for STEM-related careers have been inadequate to fulfill the demands of the region, both in terms of total quantity and standard of skills. These results thus reflect a call for STEM education to be initiated and career participation in STEM fields to be expanded. Many programs and efforts have been initiated and introduced in order to raise the

participation of students in STEM subjects and to cultivate STEM literacy [2]. An initiative, 'Educate to Invent,' was introduced by the US government to promote student involvement in STEM-related activities and to encourage interest in STEM-related professions. Studies on fostering STEM literacy have shown that STEM's science and mathematics components have gained popularity as opposed to the engineering and technology components in promoting exploration and creativity in a community [3]. Yet, in both middle and high school curriculums, several researchers have incorporated engineering subjects. For instance, Apedoe et.al created an eight-week high school curriculum unit that uses engineering design to teach chemical concepts. Via the engineering design process, they helped students understand atomic interactions, reactions, and energy differences in reactions. A professional learning unit for in-service teachers was developed by Cunningham et al. to experiment with the engineering design method in which teachers were interested in designing the lesson plans of the unit [4]. By using LEGO Mindstorm Sets, Wendell incorporated engineering design into the science curriculum. They observed that, contrary to conventional science teaching, students were more able to understand science principles by using LEGO Mindstorm Kits. In accordance with these attempts, the interrelationships between astronomy, mathematics, engineering and technology are emphasized by some curriculum requirements. It is considered a way to raise participation in STEM subjects and promote STEM literacy to have students engage in STEM events. Within this century, individuals are required to learn a range of problem solving skills and to fulfill the needs of society. These needs could contribute to a shift in the levels of education and in the consistency of the education system. In this regard, in today's dynamic environment, a number of scholars have identified and established 21st century skills that apply these skills to social, economic, cultural, and political issues. They also mentioned skills of the 21st century such as strategic thought and problem solving, teamwork and leadership, resilience and adaptability, initiative and entrepreneurialism, productive oral and written communication, data access and study, and curiosity and imagination. Adaptability, dynamic communication/social skills, and non-routine problem solving, self-management/self-development, and system thought have been described by other scholars in the 21st century. In the everyday life efforts of people, fostering STEM literacy is correlated with creating and utilizing skills of the 21st century. The next generation will be armed with the skills needed to address their everyday challenges and to contribute to fulfilling their society's ever-changing needs by learning these skills. The development of these abilities thus further enhances the value of STEM literacy.

A. Interest in STEM Fields:-

STEM interest is characterized as the positive attitude of an individual towards subjects of science, technology, engineering, and mathematics; in other words, an individual who has formed an interest in the substance of these subjects and activities. This curiosity, in fact, is an opportunity for them to explore some of the STEM topics in their future careers. Studies say that it raises their early interest in STEM by encouraging students to participate in authentic learning experiences

while they study STEM subjects at school. Yet, practices detached from real-world challenges and the everyday life experiences of students act to diminish their participation in STEM. To cause individuals' interest in STEM, several researchers propose providing after-school program coupled with supplemental schooling experiences. After-school activity program tend to have the opportunity to have ample time and space for students to partake in collaborative and open-ended initiatives in STEM areas without the restrictions of a formal school curriculum. There are other viewpoints that seek to encourage STEM literacy and to raise the participation of individuals in STEM topics. Current research concentrates on advanced completion of coursework, raising the participation of students in STEM areas, and having in-class encounters with STEM-related events [5]. In addition, public schools have updated their curricula and charter schools, in particular, have started providing after-school services to instill proficiency in STEM subjects for K-12 low-income students and to promote their 21st century skills growth. Yet, there is no study investigating after-school STEM-related activities that support the perspectives in student classrooms. In this research, we sought to describe STEM-related activities offered at a small-scale charter school in an after-school initiative and to clarify the thoughts of students regarding these activities in terms of their academic growth, abilities, and motivation in pursuing STEM careers [6]. Through doing so, we went on to research the possible effect of these practices on the creation of STEM identities by students, their motivation in pursuing STEM careers, and then link these findings to STEM literacy.

B. After-School Activities and Programs:-

In educational cultures, a number of complementary programs to conventional schooling have gained popularity. In a clear framework in which learners create their own interpretation, people participating in after-school program develop solutions to real life challenges posed. Science clubs and trips to libraries, zoos, planetariums, national parks, and natural settings are correlated with after-school activities at first sight. In addition to these locations, electronics, physics fairs, Science Olympiads, and Mathematics Olympiads can also be part of after school activities. As long as the aims and content of activities delivered in after-school programming are clearly established, after-school program are a way of 'promoting interpersonal maturity, helping to identify life goals, and promoting educational performance.' Students learn how to collaborate and engage with their classmates and mentors through after-school activities in ways distinct from their experiences in daily classrooms [7]. The practices of the after-school program have become a way for learners to better understand science principles, processes, and procedures. These exercises help them to learn science thinking skills, to develop scientific thinking and to enhance their ability to communicate. These events lead to higher achievement scores in science and encourage students to collaborate together and share with each other their thoughts, expertise, and expertise. Students, in particular, take control of their thoughts and learning, while still fostering a feeling of collective identity. Students who see themselves as part of a learning group in this respect are more inspired and more capable of contributing themselves to the tasks to be done. The programs in the after-school

program frequently play a role in prompting students to engage in active science fairs and Science Olympiads. Students involved in these events are told that they will compete during the semester with other students from other groups. Such a competition environment allows students and their instructors to develop joint relationships with graduate students and scientists [8]. This will, in fact, allow them to establish multi-memberships. Thus, in order to meet its aims, after-school activity events should serve as a bridge linking students to people in diverse cultures.

III. CONCLUSION

STEM based afterschool activity programs offered at a charter school were viewed in this report. Students were granted the ability to form collective learning communities through these exercises. The students preferred the activities of the after-school program over their daily classroom activities because they were able to participate in open-ended activities that helped them to address ambiguous issues with more community freedom and versatility. In fostering their interest in STEM, these operations played an important part, hence considering a STEM topic as their potential profession. The events that encourage dedication and membership in a community is a way for students to improve and exercise their lifelong learning communication and teamwork skills. Our inference is that events that demonstrate teamwork, encourage the dedication and ownership of students, and create a community have the ability to help students learn from each other, gain skills, and transfer their focus into STEM fields. Such after-school activity events should be considered a way of cultivating STEM literacy because not only were students interested in open-ended and real-world topics, but they were also offered the ability to develop both problem-solving skills and knowledge close to what they would face in their everyday lives. STEM literacy can be further strengthened by the community building function of these STEM-related events as participants are given the means to cultivate a group membership, follow its expectations and rules to meet their responsibilities as defined by the group, and form a shared relationship with other individuals in various groups to solve problems in the group. One aim may be to build a robot that helps scientists, engineers, or surgeons to gather, analyze, and interpret data in order to explain natural phenomena, while another goal may be to plan, model, and construct a bridge with maximum efficiency and minimal cost to solve a traffic jam problem in a metropolitan city. However, in order to promote student engagement in STEM fields and their learning outcomes, our study results offer measures and indexes of the ability of after-school program events. After school program practices in this century may encourage the growth of competitiveness, entrepreneurialism, and skills in collaboration. The young generation in all countries can learn these skills through the use of these, or equivalent, after-school programs and events in order to contribute to their country's efforts to secure a leading role in an ever-changing digital age. In brief, we conclude that planning after-school program events related to STEM along with 21st century skills is the first step in aligning classrooms with educational expectations of the 21st century, which will then help the young generation becoming lifelong learners.

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