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Implementing STEM-related Activities for School Aged Users

Abstract

Published literature acknowledges the importance of Science, Technology, Engineering, and Mathematics (STEM) education in various educational institutions and its contributions to the future of a nation's economy. This paper focuses on successful library STEM-based programs that were undertaken from August to September 2019 for school-aged users in a public library. This paper also explores users' perceptions in attending STEM-based activities in the library as well as their feedback on how future library programs on STEM could further be improved. These findings seek to provide new perspectives for librarians, educators, teachers, and staff in creating opportunities for STEM-based initiatives in an informal learning environment.

Keywords: *Public libraries, STEM, young adults, school libraries*

Introduction and Statement of Research Problem

Published literature acknowledges the importance of STEM in various educational institutions and its contributions to the future of a nation's economy. Informal learning environments such as libraries and museums can play a vital role to develop students' skills and knowledge for STEM and even ignite student interests about STEM (Denson et al., 2015). Despite the continuous emphasis on the importance of STEM needs, many public libraries are still struggling to design their own program due to the lack of training support, resources, and right approaches that are geared for students' needs (Baek, 2012). With this, this paper explores the innovative roles of a public library in facilitating STEM-based programs for school aged users and how users perceive library STEM-based programs as part of their learning experience.

Literature Review

Public Libraries and STEM

Several international organizations and professional associations in library and information science highlight the significant roles of public libraries in fostering STEM by creating a space that provides access to authentic learning experiences (Australia Library and Information Science, 2017; Young Adult Library Services Association, 2013). Roberson (2015) claims that STEM-based library activities are becoming popular among library users. It is believed that libraries are part of a "STEM learning ecology" that provides invaluable resources, particularly

for children and families, to cultivate their learning and development (Lopez, Jacobson, Caspe, & Hanebutt, 2019, p. 9). Duncan and Murnane (2014) identify libraries' roles in fostering STEM within the community through various events such as makerspaces, exhibitions, and children- and family-oriented activities that provide opportunities for attendees to learn STEM concepts (as cited in Lopez, Jacobson, Caspe, & Hanebutt, 2019, p. 5). Similarly, Dusenberry (2013) argues that having STEM programs in libraries creates more opportunities to engage users, particularly in science and technology. Lopez et al. (2019) explain that public libraries link formal and informal environments while providing opportunities for children and young adults to collaborate with their families. They also state that libraries have the capacity to support students' STEM needs which could also lead to meeting the future job demands. Through partnerships and collaborations with other schools and education organizations, libraries are enabled to fill the gap in the learning needs (Fitzgibbons, 2000).

Partnership Between Schools and Public Libraries

Evidence supports the need for establishing successful collaborations between schools and public libraries. Shannon (1991) believes that partnerships between school and public libraries maximizes resource use and allows students to effectively meet their learning needs. Potter and Johnson (2017) describe public libraries and school libraries as “natural partners” that share common users (p. 24). They note that both types of libraries undertake meaningful collaborations in order to address patron needs not only for resources, but also to support curriculum and activities, particularly to assist student achievement. Likewise, Dotson, Yontz, and Jones (2018) indicate that this kind of collaboration creates opportunities for students to cultivate deep knowledge, attain effective learning experiences, and promote lifelong learning. They affirm that this is a “win-win” situation in which both parties gain various benefits such as “improved access to resources unavailable in school libraries; increased equity in terms of student access to varied materials; improved academic success; increased student engagement and literacy; increased knowledge of resources to support life-long learning; and learning is extended beyond the classroom with access to more resources” (p. 5).

Methodology

As mentioned above, this paper explores the innovative roles of a public library in facilitating STEM-based programs as well as users' perceptions in participating in STEM-based library activities. Fifty four library users from grades 3 to 10 completed a paper-based survey as part of the monthly library programming, which took place from August to September 2019. Library activities included: Building blocks, STEM for young adults, LEGO making (see Figure 1). This data collection was performed at the end of each program. Survey questions centered on demographic profile, previous library program experience, frequent participation, source of information about library activities, perceptions about STEM concepts (Roberts et al, 2018), and feedback about improving future library programs. Users who have difficulty understanding

some survey questions received assistance from their parents or an Arabic or English speaker library staff.

Figure 1

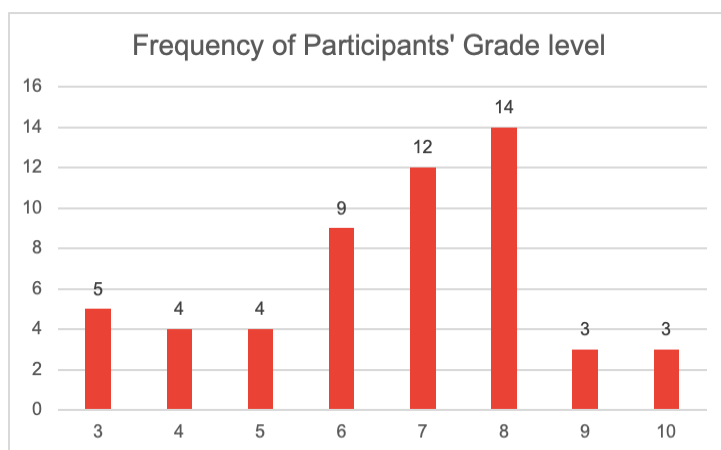
Sample STEM activities that were held at Qatar National Library



In terms of grade level(see Figure 2), a majority of them are Grade 8 (26%, $n = 14$), followed by Grade 7 (22%, $n = 12$), and Grade 6 (17%, $n = 9$). There were some attendees in Grade 3 (9%, $n = 5$), Grade 4 (7%, $n = 4$), Grade 5 (7%, $n = 4$), Grade 9 (6%, $n = 3$) and Grade 10 (6%, $n = 3$).

Figure 2

Demographic Profile



Results

Source of Information

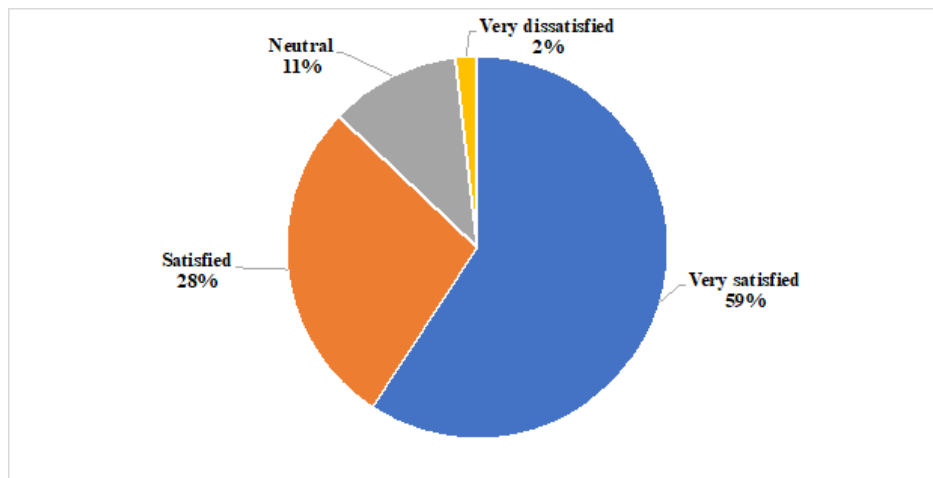
Participants were asked how they knew about the program, and a majority of the attendees (80%, $n = 43$) mentioned the library website. Six (11%) of them said others, and five (9%) selected word of mouth. Others specifically identified their source of information as a parent's influence, invited by friends, and library visits. This gathered data explains that the library website seems to be the most effective marketing tool to promote STEM-related activities in the library and to attract school-aged users to attend these sessions. What this data tells us is that a library website could be an effective tool to further strengthen the library's marketing strategy in promoting STEM-based programs. This also provides a clear picture that the library website could be a starting point to introduce new programs on STEM and encourage the community to participate in future library programs.

Users' Registration Satisfaction

The library provides different ways for participants to register in library programming either through an online registration or walk-in during the library event. Online registration requires users to provide information such as personal details and email address, while walk-in participants need to fill out the attendance sheet in the actual library session, which is a first-come first served basis, in order to ensure a slot. In terms of the registration process (see Figure 3), most of the participants (59%, $n = 32$) indicated "very satisfied", and 15 (28%) respondents expressed "satisfied" with their overall registration experience. Six (11%) attendees said "neutral," while only one participant (2%) said they were very dissatisfied. It is evident here that participants' registration experience is also a factor when it comes to facilitating library activities because this determines the accessibility and convenience for users to participate in library events.

Figure 3

Users' Registration Satisfaction

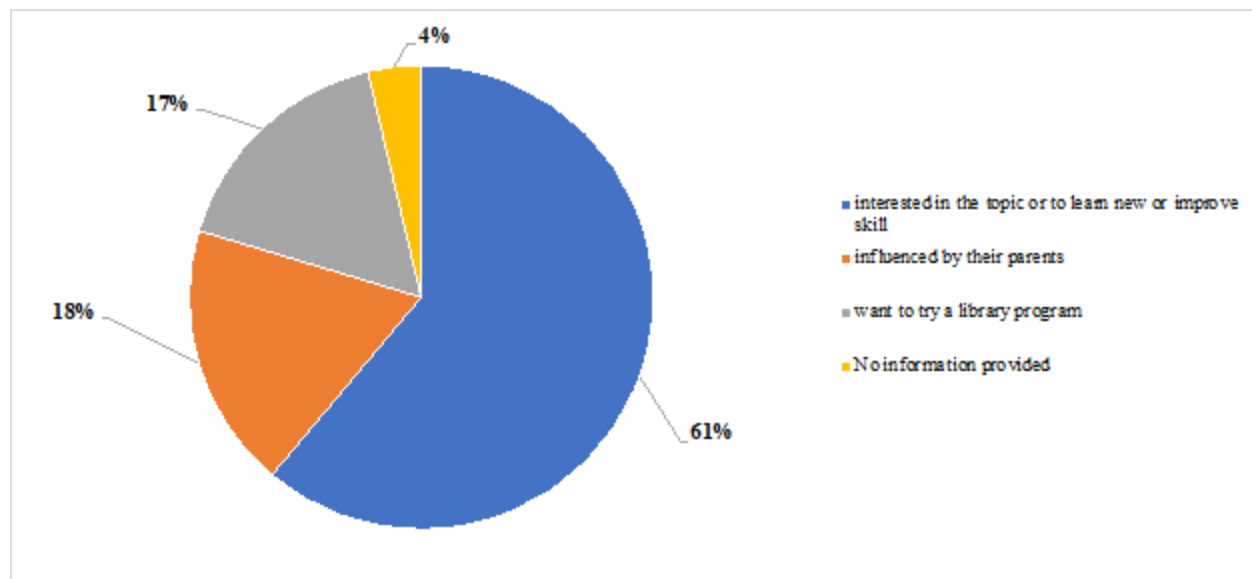


Users' Reasons for Attending the Program

The study explored the reasons why participants attended the program in the library. The survey question provided a list of choices. As Figure 4 shows, most respondents (61%, $n = 33$) answered that they are “interested in the topic or to learn new or improve skill”. Ten of them (19%) said they are influenced by their parents to attend the program. Nine (17%) participants disclosed that they want to try a library program. However, two of them (4%) did not provide any answer to this question. One of the interesting findings here is that participants are eager to learn something new and develop new skills by attending a library program, and this also notes that they perceive the library as an opportunity to learn some skills outside their classroom. Lastly, this may be a good notion that they view their public library as a place to acquire knowledge and experience hands-on learning through library programs on STEM.

Figure 4

Users' Reasons for Attending the Program



Users' Perceptions about STEM

Another question explored users' perceptions of STEM concepts. It could be noted that 15 (28%) participants incorporated the concept of STEM to Science, Technology, Engineering, and Mathematics. Eight (15%) viewed it as “Science”, five (9%) respondents thought it as “Technology,” and two (4%) said “Math.” Four (7%) believed that STEM is related to their academics or education. Only one (2%) mentioned that STEM is related to the library activity they did. Seven (13%) of them admitted that they have no idea about this. Surprisingly, twelve (22%) respondents stated unique descriptions about STEM such as “Fun,” “my future,” “plants,” “books,” “medicine,” and “the world.” What we can conclude here is that the library needs to

Conclusion

The findings presented here reveal that school-aged users see the public library as an avenue to experience authentic learning experiences such as STEM-based programs, not only as a traditional place for storage of printed and digital resources. This paper also hopes to bring new perspectives to library professionals, educators, and stakeholders in the aspect of facilitating and promoting STEM-based programs in the community that enable users to develop various skills necessary for their future workplace. By understanding the users and their needs in terms of STEM programs, this will create opportunities for libraries to revamp and revisit their programs as to how they can effectively identify the STEM needs within their community. Questions like: to what extent does the library maximize its resources in supporting STEM needs? and what professional support can be extended to ensure all library professionals are equipped in providing STEM programs? could inform future studies. With the rising needs for STEM across the globe, the role of libraries will take an important place as an informal learning environment to further engage their community in various STEM library programs.

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