

Maria Karnezou¹, Christina Tsaliki², Petros Kariotoglou³

¹Thessaloniki Science Center and Technology Museum – NOESIS

^{2,3}University of Western Macedonia

SCIENCE MUSEUM EDUCATORS' VIEWS ABOUT INQUIRY

Abstract. *This paper refers to a study which looks into science museum educators' views about inquiry and their practices when they design and implement educational programs in non-formal venues, such as NOESIS, the Science Center and Technology Museum in Thessaloniki, Greece. However, due to the covid-19 pandemic and the imposed lockdown, we had to postpone the part of the research related to the observation of the museum educators' practices and reschedule our research. On this ground, we developed an interview protocol to use as a basis in the semi-structured interviews conducted with four science museum educators to cast light on their views about inquiry when they design and realize educational programs for school groups. The protocol comprised 9 main and sub-questions, mainly open ended, focusing on the educators' views about inquiry, the types of inquiry, the way they got familiar with inquiry, the degree inquiry is adopted as an approach by the educator when they design educational programs, the goals they set and their role during implementation, the degree inquiry can be employed in a formal or a non-formal setting, students' gains when they are engaged in inquiry based activities. Data analysis showed that the science museum educators who claimed they know about inquiry are those who have attended a post-graduate course in science education. They all agreed, though, that inquiry is easier adopted in non-formal settings and argued that students' main gain when they get engaged in inquiry based activities, is the active involvement they experience. In our presentation, we will present in detail the questions and the findings from the interviews with the four science museum educators.*

Keywords: *non-formal learning environments, inquiry-based teaching, professional development*

INTRODUCTION

Current science curricula adopt inquiry as a basic component in their proposals, namely, as a prominent teaching - learning proposal, while at the same time they place emphasis both on the non-formal aspect of education and on mixed education (a mixture of formal and non-formal education) (NRC, 2012). Non-formal learning environments, such as museums, science centers, environmental centers, etc are challenged to move away from traditional, teaching methods and toward inquiry-based, engaging learning practices (Allen & Crowley, 2014). Research in the field underscores that it is easier for museums to implement innovative programs with inquiry features due to the non-formal and non-evaluative character of education (Kisiel, 2013). In these places, science museum educators are the ones who design and implement educational programs and play a critical role in the museum experience offered to school children (Tran, 2007). Actually, the practices that the science museum educators adopt during the programs, possibly guided by their views, shape the learning environment which either supports or deters the nurturing of inquiry procedures on students' part (Astor-Jack, McCallie & Balcerzak, 2007). According to Allen and Crowley (2014), school trips rarely exploit the unique opportunities for science learning offered in non-formal learning settings and look more like formal learning taking place in a non-formal setting. The researchers argue that this has to do with the ways science museum educators conceive and employ models of learning such as the traditional model, which usually reflects their own learning experiences at school. Research (Allen & Crowley, 2014) supports the idea that science museum educators are in need of a community of practice, a concept which is rooted in the participatory model of learning, an important aspect

of inquiry. Working in a community of practice is likely to empower science museum educators to reflect on their own views and practices, discuss with other colleagues, exchange ideas, and utilize this knowledge in order to adopt less didactic, more learner-centered practices. Other researchers support that science museum educators' (Bevan & Xanthoudaki, 2008) engagement in a guided or open inquiry educational program may affect their perceptions about learning in a museum and help them perceive learning as a process that entails students' active involvement. From another perspective, Author (2019) studied teachers and science museum educators' views about inquiry practices after attending a joined professional development course. They underscore that those who were already familiar with inquiry were the ones who had attended a post graduate course on science education while both the teachers and the science museum educators claimed that inquiry is better adopted in a museum than at school, mainly due to time restrictions imposed from the school curriculum. Still, a rather limited number of studies have actually reported on science museum educators' practices (Tran, 2007) and in particular on inquiry-based practices.

Based on the brief literature review we conducted, we can support that science museum educators' views about inquiry are still under investigation. In this direction, we will study the views of four science museum educators about inquiry and their practices when they design and implement educational programs at NOESIS. However, due to the covid-19 pandemic and the imposed lockdown, we had to postpone the observation of the museum educators' practices and reschedule our research. Our study is part of a broader research conducted in the context of a Greek funded research project that is currently taking place in Greece. The main goal of this project is to recommend ways to promote inquiry practices among science teachers and science museum educators in non-formal science education settings.

METHOD

In our study, we selected the multiple case-study method (Yin, 1994) to look into the views of four science museum educators. All of them studied Physics, and their work experience as museum educators at NOESIS varied from 10 – 20 years. Two out of four also took a post graduate course on science education. Semi-structured interviews were conducted with each of the educators, as it is recommended in qualitative studies with few participants (Cohen, Manion & Morrison, 2011). The interviews were conducted using a web platform (zoom) due to the the covid-19 pandemic restrictions.

We developed an interview protocol to use as a basis in the interviews to cast light on their views about inquiry when they design and realize educational programs for school groups. The protocol comprised 9 main and sub-questions, mainly open ended, focusing on the educators' views about inquiry, the types of inquiry, the means they got familiar with inquiry, the degree inquiry is adopted as an approach by the educator, the educator's role and their goals, the chances inquiry can be adopted in a formal or a non-formal setting, the gains students get when they are engaged in inquiry-based activities. The sub-questions helped the researchers ask for clarifications or examples in order to specify the interviewees' responses (Cohen, et al., 2011). All interviews were recorded and transcribed. As our sample was small and convenient, we used content analysis and sorted out the educators' views according to the questions we set (Cohen et al., 2007).

RESULTS

Data analysis showed that the science museum educators who claimed they know about inquiry are those who have attended a post-graduate course in science education. In regards to the types of inquiry, almost all of them said they could not distinguish any. They all agreed, though, that inquiry is easier adopted in non-formal settings than at school where time restrictions, due to curriculum requirements, apply. Another common view they shared, was that when students are engaged in inquiry based activities, their main gain is the active involvement they experience. All the interviewees also agreed that their primary goals are to intrigue students and cultivate a number of skills such as experimental skills, and cooperation. In regards to their role, one of the educators identified a repertoire of roles from being a lecturer to act as a facilitator,

while others stated that their role is to facilitate students. The educators also underscored that their role, as well as the content, are likely to be partly modified after getting feedback from colleagues.

DISCUSSION AND CONCLUSIONS

In line with other studies (Author, 2019), we found that the science museum educators who claimed they knew about inquiry are those who have attended a post-graduate course in science education. This fact highlights the necessity for science museum educators' training that will introduce them to inquiry as an approach. In unison, all the educators underlined the fact that inquiry procedures are easier adopted in non-formal settings than at school, as other studies argue (Kisiel, 2013). All the interviewees also claimed that students' active engagement is a critical point when designing a program. This view is on the same wavelength with other studies which underscore the importance of science museum educators' role, as they are expected to facilitate students' involvement in inquiry procedures (Astor-Jack et al., 2007), once they perceive learning as a process that entails students' active involvement (Bevan & Xanthoudaki, 2008). In our research, we also found that the science museum educators may modify their role, and make changes related to the content after getting feedback from colleagues. This procedure bears strong resemblance to the notion of a community of practice that Allen and Crowley (2014) address as a major point that may empower science museum educators to adopt inquiry based practices. Our study will contribute to the relatively unknown field of science museum educators' views and practices. Gaining insight into these aspects of their profession will help us design a professional development program on inquiry that will empower science museum educators to expand their views and enrich their repertoire of practices.

ACKNOWLEDGEMENT



The research work was supported by the Hellenic Foundation for Research and Innovation (H.F.R.I.) under the "First Call for H.F.R.I. Research Projects to support Faculty members and Researchers and the procurement of high-cost research equipment grant" (Project Number: 1828).

REFERENCES

- Allen, L.B., & Crowley, K.J. (2014). Challenging beliefs, practices, and content: how museum educators change. *Science Education* 98, 84-105.
- Astor-Jack, T., McCallie, E. & Balcerzak, P. (2007). Academic and Informal Science Education Practitioner Views About Professional Development in Science Education. *Science Education*, 91(4), 604-628.
- Author, 2019 [details removed for peer review]**
- Bevan, B., & Xanthoudaki, M. (2008). Professional development for museum educators: Underpinning the underpinnings. *Journal of Museum Education*, 33(2), 107 – 119.
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed.). Abington, Oxon: Routledge.
- Cohen, L., Manion, L., Morrison, K., & Morrison, R. B. (2007). *Research methods in education*. Routledge
- Kisiel, J. (2013). Introducing Future Teachers to Science Beyond the Classroom. *Journal of Science Teacher Education*, 24(1), 67-91.
- National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academy Press.
- Tran, L.U. (2007). Teaching science in museums: The pedagogy and goals of museum educators. *Science Education*, 91, 278-297.

Yin, R.K. (1994). *Case study research: Design and methods* (2nd ed.). Thousand Oaks, CA:Sage.