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Foreword:
Science as a process of inquiry and science inquiry through argumentation

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Introduction

Inquiry in science education has a long historical development across the globe while the argument in science inquiry has gained momentum in the last two decades originating from the fundamental principles of science inquiry. The main dynamics of the inquiry process such as thinking like a scientist, working like a scientist, talking like a scientist, and writing like a scientist have later become the driving influence for the scholars who have contributed to the research studies into science education in relation to argumentation. As in the case of the inquiry-based science teaching research agenda, the argumentation based science education research studies have branched out over time and generated a spectrum of advocates that have adopted different pathways for using argumentation in science education. In his recent review to map out the variation of argumentation in science education, Cavagnetto (2010) highlights three main branches of scholarly approaches to argumentation based science education: structural, socioscientific and immersion-oriented interventions. While each intervention employs different methodology, they all share certain features of the science inquiry as an overarching theme.

The special issue is devoted to portray science argumentation studies having the features of structural, socioscientific and immersion approaches. Furthermore, within the manuscripts in this special issue, such variation is also evident with the target groups researchers have worked with ranging from elementary school students to pre-service science teachers. The wide range of science argumentation implementation approaches across different age groups become even more interesting when we consider the educational and cultural settings they were drawn from. Research studies from Korea, the United States, Finland, Israel, and Turkey bring another layer of color and density to science argumentation research that is already rooted in multiple approaches. Mevlana (Rumi) has taught that "Separate not the part from the whole! Cling to the whole, for it is great!" Thus, in this issue we believe that each manuscript offers a unique perspective while also contributing to the overarching theme of this special issue of inquiry based science teaching and argument based inquiry.

Named after Rumi, The Mevlana International Journal of Education carries out the mission of searching for the whole through publishing manuscripts from across the globe. I would like to express my gratitude to all invited contributors who shared their valuable work with us, and, those who submitted manuscripts to be published in this special issue of the journal. Finally, I would like to thank the editor of the MIJE for giving us the opportunity to be part of their search for the whole.

Overview of the Articles

Maija Aksela and Matleena Boström tackled the issue of youth's interest in science, more specifically chemistry, through inquiry based lab activities. While there is alarming evidence about diminishing interest of students toward science-based professions in Europe, Aksela and Boström

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envisage that when science teaching is structured around an inquiry based framework, students develop greater interest toward science and science related issues regardless of gender. Their study provides vital evidence for science educators to provide meaningful learning environments and for policy makers to plan sustainable agenda for the science education in Europe.

Rachel Mamlok-Naaman, Avi Hofstein, and Dorit Taitelbaum demonstrate the pedagogical shift and the variation of practices of teachers through inquiry-based science teaching professional development activities. They also portray teachers' Pedagogical Content Knowledge enhancements as a result of the inquiry-based in-service trainings. The findings of the study not only validate the stumbling blocks to shifting from a teacher-centered learning environment to one that is more student-centered but also demonstrate effective professional development strategies to overcome such challenges. The study provides compelling evidence about change in teacher pedagogy and students' responses through inquiry based professional development and chemistry education.

Sibel Erduran, Ebru Kaya and Pinar Seda Cetin investigate high school students' understanding and perception about argumentation and argumentation based science classroom. Their study not only provide vital evidence about students' ability to understand and generate arguments, but also draw a crucial picture about differences among different high school programs students attend in Turkey. The survey and interview findings of the study generate convincing evidence demonstrating the strength and limitations of the high school students about argumentation and argument based discourses in science classrooms. This study by Erduran and her colleagues fills an important gap in the literature about students' understanding and capability toward argumentation.

Myeong-Kyeong Shin and Jeonghee Nam focus on pre-service science teachers' understanding and use of argumentation based science inquiry through laboratory practice course. They demonstrate changes in scientific practices after adapting group questioning strategy in terms of scientific reasoning and consistency among elements of scientific practices including questions, methods, claims, and evidences based on pre-service teachers' lab reports on elementary level science activities. Their study offers significant evidence to structure pre-service science teacher education around inquiry based learning environments and to rethink the underpinnings of school science education settings around development of scientific reasoning.

Brian Hand and Emily Schoerning use argument based inquiry structure to decode classroom discourse in the elementary school settings. They aim to compare business as usual pedagogy and argument-based inquiry pedagogy implemented through the SWH approach on teachers' and students' discourse behaviors. The study utilizes quantitative methodology to compare intervention and treatment group teacher and student discourse pattern frequencies, and qualitative methodology to illuminate critical elements of teacher pedagogy to create student-student interactions where the scientific reasoning is cultivated. Within the framework of linguistic behavior analyses, their study provides principal indications about key elements of the teacher pedagogy where the argument based science inquiry takes place.

Benhur Oral scrutinizes the merits of an argument based science inquiry approach (the Science Writing Heuristic) from the perspective of Deweyan pragmatist aesthetics. In this theoretical paper, Oral frames both the current school of thoughts in the area of science education through inquiry and argumentation and their theoretical connections to Dewey's theory of inquiry. After carrying out a highly pertinent articulation of Dewey's notion of "consummatory learning experience," the study situates the SWH approach within the consummatory learning experience from both teacher's and student's perspectives. The paper is an exemplary work that provides a philosophical and theoretical account as to the merits of argumentation based science education

Funda Hasancebi and Sevgi Kingir analyze the problems faced during the argument based inquiry implementation and the strategies developed by the teacher to overcome such obstacles. They conduct discourse analyses through video recordings, and theme development through interviews. While their findings highlight the significant benefits of longitudinal professional development activities for teachers to conceptualize and implement argument based science-learning environments, the findings also illuminate some of the shortcomings during the implementation process such as problems in grasping the Argumentation Based Inquiry through the Science Writing Heuristic (SWH) by the teacher, teacher and student questioning, classroom interaction, classroom management, and accessing resources and equipment. The study has particular importance for the area of professional development and science teacher education since it highlights some of the major limitations that hinder effective inquiry and argumentation implementations in the primary school settings.

Melike Ozer Keskin, Ismet Kurt and Nilay Keskin Samanci focus on high school students' ethical perceptions about euthanasia through survey and argumentative writings. While they employ quantitative methodology to disaggregate participant students' understandings and views according to their demographic variation, they adopt qualitative methodology through argumentative writings in response to given scenarios to deeply tease out students' beliefs and perceptions toward euthanasia. Whilst their initial findings about students' perceptions toward a selected ethical subject provide valuable insights for those scholars working in this area, their adopted methodology where they use scenarios to prompt students to write argumentative paragraphs offers an alternative approach of measurement and scaffolding tool for the field of science education

References

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