A Study for Examining International Baccalaureate Diploma Programme Mathematics Teachers' Conception of Interdisciplinarity

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The primary objective of this study was to investigate how Turkish mathematics teachers utilizing the International Baccalaureate Diploma Programme (IB-DP) integrate interdisciplinarity while teaching mathematics. The qualitative data were collected via semi-structured interviews. A semi-structured interview was conducted with eight teachers from Istanbul to understand their general conceptions about interdisciplinarity and the International Baccalaureate Diploma Programme. The interviews were analyzed using two approaches: (i) coding for teachers' conceptions of interdisciplinarity about the IB-DP curriculum and (ii) thematic analysis. The analysis of eight teachers revealed the presence of three elements: curriculum, interdisciplinary thinking, and the implementation of interdisciplinarity. The study revealed that teachers' interdisciplinary competencies are influenced by their personal conceptions of interdisciplinarity and their familiarity with the International Baccalaureate Diploma Programme.

Keywords: Interdisciplinary thinking, Interdisciplinary learning, Interdisciplinary teaching, Implementation of interdisciplinarity, Curriculum implementation.

Theoretical Background

The genesis of this inquiry stems from the recognition that all scientific pursuits are initiated with the identification of a problem. The fundamental objective of the scientific disciplines is to formulate effective solutions to the problems that are identified. In instances where a single discipline proves inadequate in addressing this problem, the utilization of multiple disciplines becomes imperative, thereby transforming the problem into an interdisciplinary one. The development of new applications and expressions is often facilitated by interdisciplinary research, which involves the integration of distinct elements from multiple disciplinary subjects. This approach aims to generate novel perspectives, useful applications, or artistic expressions through collaborative efforts. Furthermore, it can be posited that when a given body of knowledge is employed across multiple disciplines, it is designated as interdisciplinary knowledge. Therefore, the objective of educational settings is to establish connections and integrate diverse academic disciplines, professions, and technological frameworks, along with their distinct perspectives and methodologies, to facilitate a comprehensive task involving environmental integration and to develop a suitable interdisciplinary integrated curriculum.

The International Baccalaureate Diploma Programme (IB-DP) was developed with the objective of providing students with a comprehensive education, facilitating cultural and geographic mobility, and promoting global awareness for individuals between the ages of 16 and 19. IB-DP comprises a core element that incorporates the Extended Essay (EE), the Theory of Knowledge (TOK), and the Creativity, Activity, and Service (CAS) components. Students are required to complete six groups at the standard level (SL) and six subjects at the higher level (HL) (IBO, 2023). Interdisciplinarity is articulated as a component of the IB's broader educational ethos throughout cross-program documentation. (IBO, 2021, p. 82). A critical examination of the integration of interdisciplinary studies within the IB-DP curriculum, and the manner in which courses facilitate this integration, is imperative (IBO, 2023). Turkish IB-DP mathematics teachers' conception of interdisciplinarity usage while teaching their lessons will provide insight into the implementation of interdisciplinary applications in the context of mathematics lessons within the IB-DP curriculum.The objective of this study is to examine Turkish IB-DP mathematics teachers' conception of interdisciplinarity usage while teaching their lessons by addressing the following research question: The following inquiry seeks to ascertain the manner in which Turkish IB-DP mathematics teachers incorporate interdisciplinarity and interdisciplinary thinking into their pedagogical practices. The investigation will employ Williams and Roth's model of interdisciplinarity inquiry (2019).

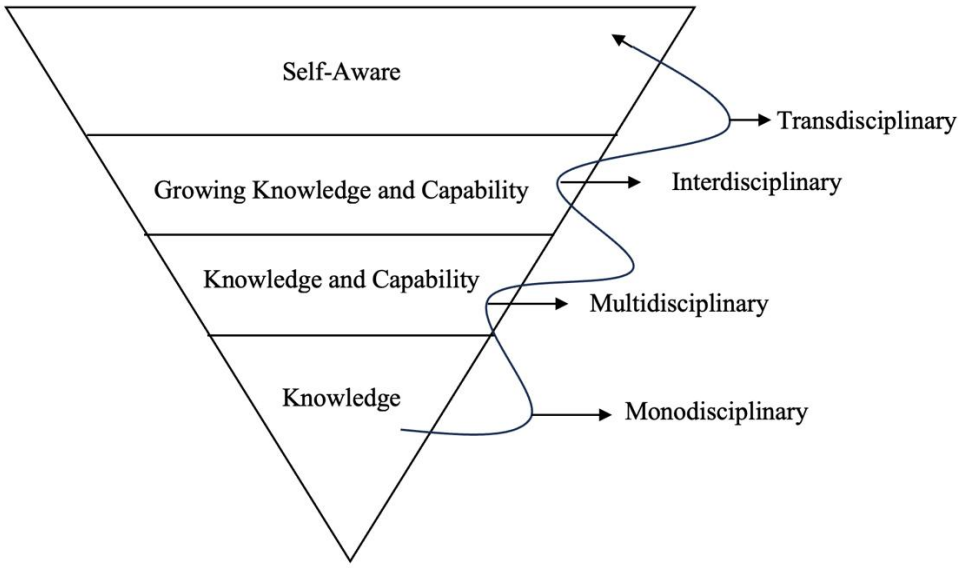

Figure 1: Interdisciplinary inquiry

Method

The objective of this study is to examine the general understandings of the principles of interdisciplinary learning and the structure of the International Baccalaureate Diploma Programme held by different IB-DP teachers. The participants were IB-DP mathematics teachers from various settings in Istanbul. A total of eight educators from each Analysis and Approaches Standard Level (A&A-SL) and Analysis and Approaches Higher Level (A&A-HL) category at private and state schools participated in the study.

The present study was conducted with the objective of gaining in-depth insight into the practices of eight IB-DP mathematics teachers who were selected from a group of IB-DP mathematics teachers who teach at different public and private schools in Istanbul.

The interviews were structured around seven core questions, with additional inquiries posed by the researcher based on the participants' responses. Semi-structured inquiries are designed to elicit information regarding the definition of interdisciplinary examples, the design required for instruction that aims to cultivate students' interdisciplinary thinking skills, the thoughts concerning the role of the implemented curriculum to support students' interdisciplinary skills, the extent to which and the properties of IB-DP are suitable for interdisciplinary teaching, and the interdisciplinary teaching approach incorporated into the teaching process. The participants' responses indicated that they employed a categorization system based on their conceptualization of interdisciplinarity and their teaching approach, utilizing William's Framework as a reference.

The findings were evaluated according to Williams and Roth (2019), and curriculum, interdisciplinary thinking, and implementation of interdisciplinarity were identified as themes. According to Williams and Roth (2019), Arda's approach is monodisciplinary. In contrast, Ece, Elif, and Efe's approaches are multidisciplinary, while Buket, Ceren, Eren, and Nil are interdisciplinary, suggesting an ongoing process of development.

Findings

Curriculum

The initial theme addressed was curriculum, which garnered the most attention from the participants. The focal points of this discussion included an examination of the nature of the IB-DP curriculum and other curricula administered in Turkey, such as those designated by the Ministry of National Education (MoNE) and the Advanced Placement (AP) curriculum. The IB-DP encompasses both requirements and implementation areas. The former encompasses the development of a learner profile, the integration of teaching and connecting within and between disciplines, and the application of curriculum. The latter includes a learner profile, the nature of mathematics, alternative curriculum perspectives, and teachers' flexibility for implementation.

Interdisciplinary thinking

The second theme pertained to interdisciplinary thinking, encompassing the following aspects:

- Teachers' conceptualizations of the nature of mathematics
- The relationship between mathematics and other disciplines
- Pure mathematics and interdisciplinary mathematics topics
- Their perspectives on teaching IB-DP mathematics

Implementation of interdisciplinarity

The final theme pertained to the implementation of interdisciplinarity in instructional methodologies and assessment procedures. These procedures encompass external assessment, internal assessment (IA), and the extended essay (EE). It is evident that educators possess a wide array of strategies, approaches, and perspectives on instructional methods and assessment procedures. Consequently, each teacher was assigned to examine these two situations independently. According to Williams and Roth (2019), Arda's approach is monodisciplinary. In contrast, Ece, Elif, and Efe's approaches are multidisciplinary, while Buket, Ceren, Eren, and Nil are interdisciplinary, suggesting an ongoing process of development.

Discussion

The findings of this study indicate that Turkish IB-DP mathematics teachers hold a diverse array of perspectives on interdisciplinarity, aligning with the varying levels delineated by Williams and Roth's (2019) model. The approaches employed by these institutions—ranging from mono- to interdisciplinary—are indicative of a developmental process in applying interdisciplinary teaching. The curriculum emerged as a significant influence, indicating that institutional frameworks shape these conceptions. Teachers who espoused more integrated views demonstrated a stronger alignment with the International Baccalaureate Organization's (IBO) holistic goals. However, a discernible gap persists between the theoretical appreciation of interdisciplinarity and its practical implementation, underscoring the necessity for enhanced professional assistance and more explicit curricular guidance. These findings are consistent with earlier research emphasizing the complex nature of interdisciplinary teaching (Nissani, 1995; Williams & Roth, 2019).

Limitations and Suggestions

While the study provides significant insights, it is important to note its limitations. The limited sample size, consisting of only eight teachers from Istanbul, precludes the drawing of sweeping conclusions. A reliance on interviews alone can introduce bias due to self-reporting. The incorporation of observations or teaching materials could have enhanced the analysis. The study's emphasis on mathematics education precluded the consideration of insights from interdisciplinary collaboration with other subject areas. Future research endeavors should involve a more diverse array of participants and utilize a variety of methods to more accurately capture the multifaceted nature of interdisciplinary teaching in IB-DP settings.

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