

**Influence of Teaching Calculus Issues in
Rabbinical Literature on of Ultra-Orthodox
Students Positions Towards Math**

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Abstract

The Academic studies in the Ultra-Orthodox sector phenomenon has developed and grown in recent years. As a result, many academic preparatory programs are opening in order to prepare Ultra-Orthodox students for academic studies. These programs provide Ultra-Orthodox students with an in-depth exposure to the world of math for the first time in their lives.

We have found numerous references to various math issues in rabbinical literature and quite a few math books were written by Rabbis throughout the generations.

This research is composed of two parts:

The first part is a **theoretical study** that includes exploration of three math issues related to differential calculus in Rabbinical literature. This research presents the Yashar of Qandia proof about two lines in Maimonides' Guide to the Perplexed, both mathematically and visually, while comparing it to accepted mathematical knowledge – to our knowledge, this is the first such presentation. Additionally, the research presents Rabbi Shlomo Halama's proof; he was the author of Merkevet Ha-Mishna about the maximal ratio between the mass of a box and its total surface. Finally, the research explains the Maimonides interpretation for the Aruga Mishna in Kilayim tractate.

One of the research fields in math teaching, developed by the mathematician D'Ambrosio (1985) is Ethnomathematics. This field deals with cultural influences on mathematics instruction and learning in various ethnic groups (in the social context involving language, behavior norms, and symbols of a particular cultural group). Following Ethnomathematics research literature, the **second part** of this study aims at examining the influence of teaching mathematical issues found in Rabbinical literature in relation to the beliefs and positions of Ultra-Orthodox students who study in preparatory academic programs towards math; e.g., beliefs about math in general, its nature, students' self-competence in math, and the relationship between the Torah and mathematics.

The sample included 195 male Ultra-Orthodox students who study math at a 4-point matriculation level in academic preparatory programs. An "ultra-orthodox student" in terms of this research is someone eligible to be enrolled in one of the special programs for the Ultra-Orthodox preparatory programs, according the instruction of the Higher Education Council; i.e., a person whose high school years were spent in Yeshiva without

secular studies for a minimum of four years (three in a Yeshiva Ktana and one in Yeshiva Gdola). In addition, this person must have a certificate of exemption from military service or, alternatively, a certificate of civil service (meaning he doesn't qualify under Torato Umanuto arrangement status). The students who participated in the research were divided to two groups: the research group in which the mathematical issues were taught (n=108) and a control group (n=87).

The research was conducted in four phases:

1. Distributing a preliminary questionnaire to the entire student population to examine students' positions toward math upon beginning the preparatory program.
2. Teaching three mathematical issues found in Rabbinical literature and connecting them to the research group's preparatory program curriculum.
3. Distributing the questionnaire to the entire student population for a second time to examine any change in Ultra-Orthodox students' positions and beliefs towards math.
4. Distributing the questionnaire for a third time (after some time) to the entire student population, in order to check whether an effect of intervention over time exists.

The research findings show that teaching mathematical issues in Rabbinical literature brings a positive change in the students' attitudes towards math and its various aspects.

The contribution of this research is conveyed in the practical aspects of math instruction for ultra-orthodox students in the academic system. According to the research hypothesis, teaching math to Ultra-Orthodox students by connection mathematical issues found in rabbinical literature, which belong to their cultural world, improves a positive approach to the field of math. The change of attitude will be conveyed in their beliefs about the nature of math, their self competence in math, and the relationship between Torah and mathematics. In light of this, it can be surmised that math should be taught to Ultra-Orthodox students using mathematical issues, as found in rabbinical literature.