

# **Abstract**

## **The Alternative Conceptions Held By Grade-11 Students in the Topic of Chemical Bonding**

**By**

**Musa Al-Khaldi**

**Supervising Committee : Dr. Maher Hashweh..... Chairperson**

**Dr. Sami Sayrafi**

**Dr. Sumayya Muhtaseb**

The study aimed to diagnose the alternative conceptions that grade-11 students hold about the chemical bonding topic using a paper-and-pencil instrument that was developed for that purpose. Additionally, a content analysis of the textbook was performed to reveal the probable role of the textbook in developing students' alternative conceptions.

The significance of the study arises from the fact that it deals with a very important subject, i.e. alternative conceptions in chemical bonding. Identifying these conceptions has practical and instructional implications. Another significance of the study is that it developed a comprehensive instrument to diagnose the alternative conceptions in chemical bonding. Developing this instrument may be helpful for teachers and researchers working in this area, particularly, because the educational literature lacks such a comprehensive diagnosing instrument. Therefore, the present study satisfies theoretical and practical needs in the field of science education.

The population of the study consisted of all grade-11 students (723) in Ramallah and Al-Bireh District. A sample of 332 students distributed in twelve schools was selected from the above-mentioned population.

Five sources were used to develop the instrument; these sources were examining the related literature, conducting semi-structured students' interviews, conducting

unstructured teachers' interviews, analyzing the textbook, and participation in a workshop for teachers of the the new curricula for grade-11.

The 20-item diagnostic test was based on a two-tier multiple choice format. The first tier of each item consists of a content question having two choices ; the second part of each item contains four possible reasons for the answer given in the first tier. These alternatives included the correct answer, the identified alternative reasons involving alternative conceptions, and in some cases some wrong answers were included to reduce the effect of guessing.

The test was validated by science educators and secondary science teachers. The discrimination values of the items ranged from 0.3 to 0.7. The Cronpach- Alpha reliability coefficient was 0.63. The students of two schools of the sample were re-tested a month later , the test-retest reliability coefficient was found to be 0.86 indicating a good reliability.

The percentage of students selecting the alternative responses of the second tier of each item that had been included in the test as alternative conceptions was calculated. The study assumed that the alternative conception exists if it is held by 20% of the sample at least. It also assumed that a student holds the alternative framework if he or she simultaneously holds all the alternative conceptions forming the framework.

The study results revealed that the students hold 23 alternative conceptions about chemical bonding out of 34 that were identified using the five sources previously described. Furthermore, two alternative frameworks about the topic were identified. The study also pointed out that the textbook has a role in developing nine alternative conceptions held by the students.