The Content Analysis of Guidance-school Mathematics Books in Islamic Republic of Iran According to the Principles and Components of Constructive Realism Approach

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Abstract

Introduction: This paper evaluated the contents of guidance-school mathematics books in Iran according to principles and components of constructive realism. Method: The method of content analysis is used in this study. 5 principles including 22 components were used for doing content analysis. Results: The results showed that two principles (establishing conceptual links between materials inside the book; fostering creativity in order to get learners to create new constructs) are confirmed at the level of 30%. Only one principle (the conceptual link) was confirmed at the levels of 50% and 70%. Conclusion: We conclude and suggest that components of philosophy of mathematics according to constructive realism should be used in providing better math books.

Keywords: Constructive Realism, Content Analysis, Guidance-school, Math books, Iran.

1. The Constructive Realism Approach in Mathematics Instruction

The constructive realism approach has been developed since decades ago (Rescher, 1987; Wallner, 1994; Bagheri, 1995). This approach was posed to adjust the relativism inherent in constructivism and has tried to oppose the relativism that had emerged in science. In mathematics, constructive realism is comprised of Plato’s realism in mathematics and the Piaget-oriented constructivism, in an attempt to adopt the advantages of both approaches and to avoid their disadvantages. One advantage in Plato’s external realism is its emphasis on the description nature of the mathematics knowledge; for it is only through exploration one can say that he/she has “knowledge” of something. (Bagheri, 2011)

In defining the constructive realism approach in mathematics can be said: constructive realism in mathematics includes a philosophical perspective that emphasizes on representation of mathematics knowledge to the external...
reality. Additionally, this perspective adopts existence, independence and description of mathematics. Due to the complexity of reality, this perspective seeks to produce the more sophisticated constructs through dealing with the mental, dynamic, innovative and fallible constructs concerned with social-cultural interactions to trap the reality and access knowledge about math things. (Bagheri, 2011)

2. Method

In this research, content analysis is used as a method (Borg, Gall & Gall, 2003; Connally & Clandinin, 1991; Burgess & Rosen, 1997) for analyzing mathematical books in guidance schools in Iran (Farzan, et al. 2009a; Farzan, et al. 2009b; Farzan, et al. 2009c). It is necessary to determine unit analysis and visible indicator in that unit for doing (practicing) content analysis. From one prospective, since the content of mathematics books have a special characteristic, one specific unit cannot be considered to analyze it; thus, for the content of mathematics books have been shaped a complicated and cohesive system with the consistence of Persian texts, table, figure, and mathematic symbols, they must be searched (investigated) in the bigger and multiple unit analysis. The following categories are used for content analysis of mathematics books: Creating an insight as to the real existence of the mathematical world, Making use of subject materials including human being’s individual and social experiences, Creating correspondence between mathematical language and learners’ spoken and written languages, Fostering creativity in order to get learners to create new constructs, Establishing conceptual links between materials inside the book.

3. The Findings of the Content Analysis of Mathematic Book 1

As the table below shows, the results indicate that in the mathematic book 1 with the hypothesis of the meaningfulness of components in level 30%, only nine components: 7, 12, 14, 15, 17, 18, 20, 21, and 22 are meaningful. By assuming the meaningfulness at the level of 50%, it is seen (that) only four components: 7, 17, 21, and 22 are meaningful. By increasing the level of meaningfulness, the meaningful components lessen in a way that with the hypothesis of 70% in the level of meaningfulness, only two components 21 and 22 are confirmed. Now, if we want to present in percentage the grade (scale) of book’s possession of the principals from the components related to each principal, as it is seen in the table, in the 30% level of meaningfulness only two fourth and fifth principals (the principal of training creativity for making new construction, the principal of conceptual connecting and joining) and in the levels of 50% and 70% of meaningfulness only the fifth principal are confirmed that it shows that in the mathematic book 1 only the conceptual connecting and joining principal is based on constructive realism.

4. The Findings of the Content Analysis of Mathematic Book 2

As is shown in the table below, the results indicate that in the mathematic book 2 with the hypothesis of the meaningfulness of components in level 30%, only seven components: 7, 14, 17, 18, 20, 21, and 22 are meaningful. By assuming the meaningfulness at the level of 50%, it is seen (that) only five components: 7, 18, 20, 21, and 22 are meaningful. By increasing the level of meaningfulness, the meaningful components lessen in a way that with the hypothesis of 70% in the level of meaningfulness, only four components 7, 20, 21, and 22 are confirmed. Now, if we want to present in percentage the grade (scale) of book’s possession of the principals from the components related to each principal, as it is seen in the table, in the 30% level of meaningfulness only two fourth and fifth principals (the principal of training creativity for making new construction, the principal of conceptual connecting and joining) and in the levels of 50% and 70% of meaningfulness only the fifth principal are confirmed that it shows that in the mathematic book 2 only the conceptual connecting and joining principal is based on constructive realism.
Table: meaningful components

| Components                                                                 | Book1 | Book2 | Book3 |
|----------------------------------------------------------------------------|-------|-------|-------|
| 1. Static Description                                                       |       |       |       |
| 2. Dynamics Description                                                     |       |       |       |
| 3. Independence of the world – Math                                         |       |       |       |
| 4. Mathematics Discoveries                                                 |       |       |       |
| 5. Correspondence mathematical categories, relationships and models with the reality of the world |       |       |       |
| 6. Using math in the home and the things surrounded the kid                |       |       |       |
| 7. Applying math in individuals’ games                                     | *     |       |       |
| 8. Applying math in the social and cultural activities                     |       |       |       |
| 9. How the mankind reaches (obtains) math through during the time           |       |       |       |
| 10. The impact of culture on the growth of math                             |       |       |       |
| 11. The group and cooperative activities                                    |       |       |       |
| 12. Applying math in groups’ games                                         |       |       |       |
| 13. Proving the way for discussion and speaking about concepts              |       |       |       |
| 14. Finding roots, define and explain the meaning of signs in mathematics   | *     |       |       |
| 15. Use the observable objects in explanation of mathematics               |       |       |       |
| 16. Stating the creativities of mathematician in forming a concept or a formula |       |       |       |
| 17. Making artworks based on the mathematical shapes and concepts          | *     | *     | *     |
| 18. Use puzzle                                                             |       |       |       |
| 19. Criticizing in reasoning                                               |       |       |       |
| 20. Relation between the parts of book                                     |       |       |       |
| 21. Relation between the chapters of book                                  | *     | *     | *     |
| 22. Relation between the lessons topics of book                            | *     | *     | *     |

5. The Findings of the Content Analysis of Mathematic Book 3

According to the table above, the results indicate that in the mathematic book 2 with the hypothesis of the meaningfulness of components in level 30%, only seven components: 7, 14, 17, 18, 20, 21, and 22 are meaningful. By assuming the meaningfulness at the level of 50%, it is seen (that) only six components: 7, 14, 18, 20, 21, and 22 are meaningful. By increasing the level of meaningfulness, the meaningful components lessen in a way that with the hypothesis of 70% in the level of meaningfulness, only five components 7, 18, 20, 21, and 22 are confirmed. Now, if we want to present in percentage the grade (scale) of book’s possession of the principals from the components related to each principal, as it is seen in the table, in the 30% level of meaningfulness only two fourth and fifth principals (the principal of training creativity for making new construction, the principal of conceptual connecting and joining) and in the levels of 50% and 70% of meaningfulness only the fifth principal are confirmed that it shows that in the mathematic book 1 only the conceptual connecting and joining principal is based on constructive realism.

6. Discussion, Conclusion, and Suggestion

In studying components one by one, the results indicate that the following components are not meaningful in none of the three books of mathematics:

1- static description, 2- dynamic description, 3- knowing math as being descriptive, 4- the presence of math components, 5- the independence of math universe (related to the first principle), 6- using math in the home and in relation to the things around kids, 8- applying math in the social and cultural activities, 9- how the mankind obtain math throughout the history, 10- the impact of culture on the growth of math, 11- the group and cooperative activities (related to the second principle), 13- proving the way for discussion and speaking about concepts (related
to the third principal), 16- stating the creativities of mathematician in forming a concept or a formula, and 19-critique in reasoning (related to the fourth principle). Therefore, it can be said that these components are not considered sufficiently in the mathematic books of guidance school and there is a need to revise these books.

Thus, based on results of the survey, we can suggest the following points: 1. Reflection on natural things in mathematics categories, reflection of natural laws, emphasis on the independence of mathematics world, creativity in mathematics, correspondence between mathematics and reality, using things around kids in mathematics teaching, using cultural and social concepts in order to expand the scope of mathematics. Pupils should be encouraged to do mathematics activities in groups in order to provide discussions on mathematical conceptions.

Acknowledgements

This research was supported by University of Tehran's Deputy Dean of Research.

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