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Analysis of the Relationship Between Algebraic Thinking Levels and Intelligence Domains of 7th Grade Students

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Abstract

The purpose of this study is to analyze the relationship between algebraic thinking levels of 7th grade students and their intelligence domains. For this purpose, the study was based on the relational model. The participants of the study consist of 297 students from five different schools in Batman city center during the 2010–2011 Education Year Spring Semester. Of the participants, 156 (%52.5) were girls and 141 (%47.5) were boys. Algebraic Thinking Test has been employed to detect algebraic thinking levels of students. This test developed by Hart vd. (1998) and was adapted to Turkish by Altun (2005). Multiple Intelligence Inventory adapted to Turkish by Oral (2001) to assess students' intelligence domains. During the research, it is determined that a statistically meaningful and positive relationship between logical, verbal, musical intelligences and algebraic thinking levels. No significant relationship was found between students' algebraic thinking levels and their visual, physical, social, internal and naturalistic intelligence.

Keywords: algebraic thinking, multiple intelligence domains, algebraic thinking level and the relation of multiple intelligence domains

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Extended Summary

Purpose

Algebra is amongst the significant domains in mathematics teaching. Having learnt arithmetic through numbers and geometry through shapes, the students get acquainted with algebra by making use of symbols and letters. Similar to arithmetic, algebra also requires considering not merely one or a few numbers but all numbers as well as set of numbers. In this respect algebra is a generalized form of arithmetic and more abstract compared to arithmetic. Regardingly the process of passing from all-evident arithmetic to algebra may be hard for students. One of the reasons students have difficulty in algebra course is that while teaching algebra, the algebraic thinking level of students is disregarded. Hence to achieve an effective algebra teaching it is crucial to preconsider students' diversified thinking levels on algebra during teaching and teach in line with the learning level of each student.

In order to reach the target objectives, in addition to the thinking level of student another point should also be taken into account during the teaching of algebra; although individuals might be similar in terms of learning skills they differ in their learning styles. Not all students can benefit equally from teaching activities that are planned without considering these differences. To make sure that all students benefit equally from educational activities, an educational approach that values personal features and aims multi-dimensional mental development should dominate the educational system. Teaching through only a few intelligence domains may obstruct the development in the rest of fields and jeopardize the achievement of program objective. This reality makes a rich method system in teaching process compulsory and promotes the application of Multiple Intelligence Theory. It is believed that learning environments that are backed up with abundant experiences appropriate to Multiple Intelligence Theory shall be rather assistive in teaching algebra topics which students experience difficulty in learning and it shall also contribute greatly to meaningful learning. In this case it bears utmost significance to detect the relation between algebraic thinking levels of students and their intelligence domains. In this context present study, which aims to identify the relationship between algebraic thinking levels of students and their intelligence domains, is considered significant.

Method

In present study that aims to analyze the relationship between algebraic thinking levels of primary education 7^{th} grade students and their intelligence domains, scanning model has been utilized. The participants of the study consist of 297 students from five different schools in Batman during the 2010–2011 education year spring semester. In present research Algebraic Thinking Test has been employed to detect algebraic thinking levels of primary education 7^{th} grade students. This test developed by Hart vd. (1998) and was adapted to Turkish by Altun (2005). In determining intelligence domains of students, Multiple Intelligence Inventory developed by Gardner has been utilized. Turkish adaptation of this inventory was actualized by Oral (2001). Percentage and frequency calculations were used to

determine 7th grade students' algebraic thinking levels and general distribution of their intelligence domains. The relationship between students' algebraic

Results

During the research, it is determined that 7th grade students focus level-1 in terms of algebraic thinking. According to findings of this study, in terms of algebraic thinking, all of the students had level 1 in which a letter's value can be found as a result of arithmetic operations and problems which require concluding a transaction without giving a value to the letters can be solved. It was determined that students have an advanced level in all of the intelligence areas except for logical intelligence. This study emerged that logical intelligence areas of students have developed at medium level. it is determined that a statistically meaningful and positive relationship has been detected between logical, verbal, musical intelligences and algebraic thinking levels. No significant relationship was found between students' algebraic thinking levels and their visual, physical, social, internal and naturalistic intelligence.

Discussion and Conclusion

It has been detected that 7th grade students concentrate mostly on level-1 algebraic thinking. It has also been found out that level-4 is the algebraic thinking which has the least concentration level. Based on these findings it can be alleged that a good number of 7th grade students manage to, at the end of arithmetical processes, obtain the value of a letter, solve the problems where letter-containing processes can be solved without giving value to letters; nonetheless they perceive the letters as unknown and go though difficulty in solving mathematical processes on such unknown letters. This finding is supported with the idea that primary education 7th grade students are possibly on level 1 and level 2 to a great extent.

It was determined that students have an advanced level in all of the intelligence areas except for logical intelligence. This study emerged that logical intelligence areas of students have developed at medium level. These findings suggest that development level of students' intelligence areas are close to each other in all of the intelligence areas. Based on this finding it can be suggested that students shall face no difficulty in comprehending learning activities addressing to various intelligence domains. Therefore it is expected that algebra teaching that is supported with abundant experiences appropriate to multiple-intelligence theory shall render contribution to the development of all students' algebraic thinking levels irrespective of their dominant intelligence domain.

Present research has manifested that the relationship between algebraic thinking levels of primary education 7th grade students and their visual, physical, social, internal and natural intelligences is not statistically meaningful. On the other hand a statistically meaningful and positive relationship has been detected between logical, verbal, musical intelligences and algebraic thinking levels. Since in primary education more time is allotted to logical and verbal intelligence compared to other intelligence domains it is possible that in addition to intelligence domains, algebraic thinking levels of the students selecting this course also rises. This may be one of the explanations clarifying the meaningful relationship existing between algebraic thinking and logical and verbal intelligence domains. The meaningful relationship

detected in this research between musical intelligence and algebraic thinking level is supported with the findings of some previous researches.

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