

Knowledge of Novice Teachers and Veteran Teachers about Students on Algebraic Concepts at First Grade of Guidance School in Second Zone of Zahedan

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ABSTRACT

In this research we tried to study the teachers' knowledge about students, the strength and weakness in learning and teaching algebraic concepts, the effects of teaching experience in the extent of knowing and understanding class environment and predicting teaching behavior and of students' untrue imageries in teaching and learning trends. The study population included 92 teachers from 2nd zone in Zahedan among which 30 teachers were novice and 62 teacher were veteran. The sample included 30 novice teachers and 35 veteran teachers that were chosen using simple random sampling. The results showed that both groups of teachers had been able to identify common students' mistakes in algebraic concepts and they identified calculating, structural and conceptual mistakes respectively. Although the novice teachers identified structural mistakes as veteran teachers, they had less ability in identifying the conceptual and computational mistakes in algebraic concepts of students compared to veteran teachers.

KEY WORDS: Experience of teachers, Knowledge of teachers, Mathematical concepts, Teaching, Mistakes of students.

INTRODUCTION

One of the most important ingredients in teachers' work is knowing individual learning borders. The students have their own extent of knowledge. They have different viewpoints because of having a unique set of rudimentary (individual) experiences. The teacher should have the ability to identify the students' individual knowledge [1]. The teacher should be sensitive to qualitatively identify the students' individual knowledge including inadequate and imperfect concepts and misunderstanding the concepts. For example, it is necessary that the teacher know the students' previous experiences about mathematics and his/her own individual imagery about concepts. The teacher should use this knowledge as a criterion to select and adjust secondary educational experience [2].

From learning viewpoint it is important that there be a permanence and balance between individual experiential knowledge and secondary experiences. Totally, it is the teacher's task to determine the level of understanding of students' knowledge and propose specific techniques for knowing and assume that supports the students' epistemological development. The teachers have a responsibility to transfer their own knowledge in the best way to the students and help them learn. If the teacher has different conceptions of mathematical concepts could provide a vast range of different views of mathematical concepts [2, 3, 4].

Vinner [1] claim that the limiting factor for learning math concepts (Calculus, Algebra and Statistics) are too limited or even untrue imageries of students. In sciences like algebra, calculus and statistics, algorithmic methods have drawn an important part of students' attention.

Students should have the opportunity to share their experiences and perceptions about mathematical concepts. It is the teachers' task to provide the appropriate situation for such discussions make the students more familiar with it. The teacher by asking questions gives students the opportunity to examine mathematical concepts from different perspectives and accelerate learning this way.

When the subject is being discussed, the individual knowledge of the students can be more informed, more interactional and more understandable [2]. Good and appropriate learning environment and social space provides good conditions for learning. However, success in this way depends on social abilities of teachers such as the receptivity and tolerance [2].

So it is necessary to strengthen the responsibility of teachers. Teachers' responsibility includes knowing students' knowledge, producing and choosing constituent secondary experiences in coordination with people's unique knowledge structure, representing various viewpoints about the subjects and creating appropriate local conditions for learning. Math teachers' responsibility in assessing students' learning levels and proposing new education methods for learning to the students is necessary and he/she should be students' progress supporter [5]. Kitab et al. [6] studied on the teachers' understanding of rubric and practices in Pakistan high schools, and

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concluded the rubrics ignored in higher secondary schools, largely. Rashid [7] extended a scale for measuring of the influence of most significant factors on teachers towards teaching as a career choice of 72 Government secondary schools of Pakistan. Tahir *et al.* [8] by using reinforcement techniques used by the private school teachers of WahCant at secondary level shown that teachers should learn new reinforcement techniques.

Three main ingredients of teachers' knowledge includes content knowledge, education and educational planning [9, 4]. The extent of teachers' knowledge affect the manner of representing it. In addition, lack of knowledge may influence the classes' discussion platform and how the teachers make use of textbook [4].

As a result, the teacher has to have a vast perspective and profound understanding of the matters. Individual learning is created because of social interaction by the teachers' knowledge [3].

Teacher status has been under attentions of researchers from scientific and personal aspects, indicating the importance of education in the community. In the article, after representing necessary general concepts and preliminary about the subject, we tried to comprehensively study constructive role of the teacher in knowing the students in order to choose better and more effective methods and strategies in teaching mathematics and especially algebraic concepts and to compare teachers' abilities in terms of teaching experience. Thus, after explanation of purposes and understanding the requirements, the related data have been collected, analyzed and finally concluded that can be seen completely in different parts of the article, showing the positive role of the teachers with the ability to identify and predict educational behavior of students toward other teachers in overcoming math teaching obstacles and creating satisfaction and improving educational productivity.

RESEARCH METHODOLOGY

Method type

Considering the research structure and objectives the research method has been chosen and here in addition to reading materials in order to examine literature review and necessity of examining previous studies in the area of teachers' knowledge we have conducted field researches along with data collection using questionnaire. All the sample members have been chosen randomly, and among all educational zones in Zahedan, the 2nd zone has been chosen because of wideness and diversity. Therefore, the questionnaire was designed and after explaining the research objectives by math teachers, the questionnaires were filled. Then some of the teachers participating in research have been chosen randomly and their students filled other questionnaires.

The population

The research population or target population was math teachers of first grade of guidance schools of 2nd zone of Zahedan consisting of 92 math teachers.

The Sample and the census

In this study simple random sampling method has been used in a way that among educational zones of Zahedan because of its social and educational diversity and its qualitative and quantitative wideness, the 2nd zone was chosen. Thus, we gained the list of all teachers qualified for the research in the 2nd zone and as we mentioned before they were chosen using simple random sampling. Among the participators were 37 men and 28 women and meanwhile 16 teachers had MSc degree and 49 teachers had BSc degree and also 30 teachers had less than 10 and 35 teachers had more than 10 years of teaching experience.

Data collection tools

Data were collected using two designed questionnaires for teachers and students.

Student's Questionnaire:

In this questionnaire students solved three mathematical questions that was designed based on the algebraic concepts.

Teacher's Questionnaire:

This questionnaire was designed in order to recognize the teachers' abilities in understanding the mistakes of students to answer the three questions of algebraic concepts.

Data analyzing methods

Using descriptive statistics (frequency distribution table setting, figure, setting of central tendency and dispersion) and inferential statistics (chi-square) the data were analyzed with 95 percent significance using SPSS software.

Research Validity

Using a panel of experts, the questions of validity were examined by 5 mathematics teachers and their forms and contents were approved by them.

Research Reliability

For reliability, Cronbach's alpha was used in a way that the questions of the research were given to 15 teachers and according to their answers, Cronbach's alpha was gained as 0.85 showing that the research reliability is in a good state and the student's questions were given to 30 students and for reliability test the Cronbach's alpha was gained as 0.72 that shows the questionnaire reliability as well.

We should mention that since the questionnaire's questions had been selected from final exam of the students and also two article, their reliability and validity were verified, but we also used the above methods to support.

Data Analysis

In the study, at first all teachers' answers to the questions were examined and then were classified into several subset after validity test and the results were compared using rectangular figures, in this way answers of all teachers, including novices and veterans, the answers of all students to algebra questions segregated separately and Fig. 1 and Fig. 2 have been drawn.

In the first questionnaire (for teachers) in order to determine the teacher's understanding about the students' imageries and educational behavior and predicting the students' probable mistakes some questions have been added. In the second questionnaire (for students) the same questions have been asked in a test and finally the mistakes has been classified into three groups and the results are shown in Fig. 3 and Fig. 4.

Table 1 shows considering the 0.99 value that there isn't a significant relationship between the reality and teachers' understanding about common mistakes of students in algebraic concepts. This means that the novice teachers have succeeded to identify students' mistakes and untrue imageries in algebraic concepts.

Table 2 shows considering 0.065 that there isn't a significant relationship between the reality and teachers' understanding about common mistakes of students in algebraic concepts. This means that the veteran teachers have succeeded to identify students' mistakes and untrue imageries in algebraic concepts.

Now according to the above tables we compare the understanding of the novice teachers and the veteran teachers as below:

Table 3 shows considering the 0.136 value that there isn't a significant relationship between the novice and veteran teachers' understanding about the reality in students' mistakes in structural mistakes meaning that both teacher groups have succeeded in identifying students' structural mistakes.

Table 4 shows considering the 0.030 value that there is a significant relationship between the novice and veteran teachers' understanding about the reality in students' mistakes in conceptual mistakes meaning that the veteran teachers had better understanding about the students' conceptual mistakes rather than novice teachers.

Table 5 shows considering the 0.008 value that there is a significant relationship between the novice and veteran teachers' understanding about the reality in students' mistakes in computational mistakes meaning that the veteran teachers had better understanding about the students' computational mistakes rather than novice teachers.

Analyzing the Figures and Their Results

As we see in Fig. 1 and Fig. 2, there isn't a considerable difference between the most repeated mistakes' type between novice and veteran teachers. Both groups often believe that computational mistakes of students in algebraic concepts are more than other types of mistakes. But Table 3 shows that there isn't a considerable difference between novice and veteran teachers' understanding about structural mistakes of students in algebraic concepts and tables 4 and 5 also show that the understanding is not different in conceptual and computational mistakes showing that veteran teachers have better understanding about their students compared to novice teacher, so we can say that teaching experience can be one of the most important components in understanding the students and their success in learning.

Table 1: comparing the teachers' understanding and the reality for novice teachers

	reality	Teachers' understanding	P- value
veteran teachers	252	241	0.136
novice teachers	196	152	

Table 2: Comparing the teachers' understanding and the reality for veteran teachers

	Structural mistakes	Conceptual mistakes	Computational mistakes	Summation	P- value
reality	252	199	367	818	0.065
Teachers' understanding	241	210	388	839	

Table 3: Comparing the novice and veteran teachers' understanding about the reality in students' structural mistakes in algebraic concepts

	Structural mistakes	Conceptual mistakes	Computational mistakes	Summation	P- value
reality	196	187	286	669	0.99
Teachers' understanding	152	143	223	518	

Table 4: comparing the novice and veteran teachers' understanding about the reality in students' conceptual mistakes in algebraic concepts

	reality	Teachers' understanding	P- value
veteran teachers	199	210	0.030
novice teachers	187	143	

Table 5: Comparing the novice and veteran teachers' understanding about the reality in students' computational mistakes in algebraic concepts

	reality	Teachers' understanding	P- value
veteran teachers	367	388	0.008
novice teachers	286	223	

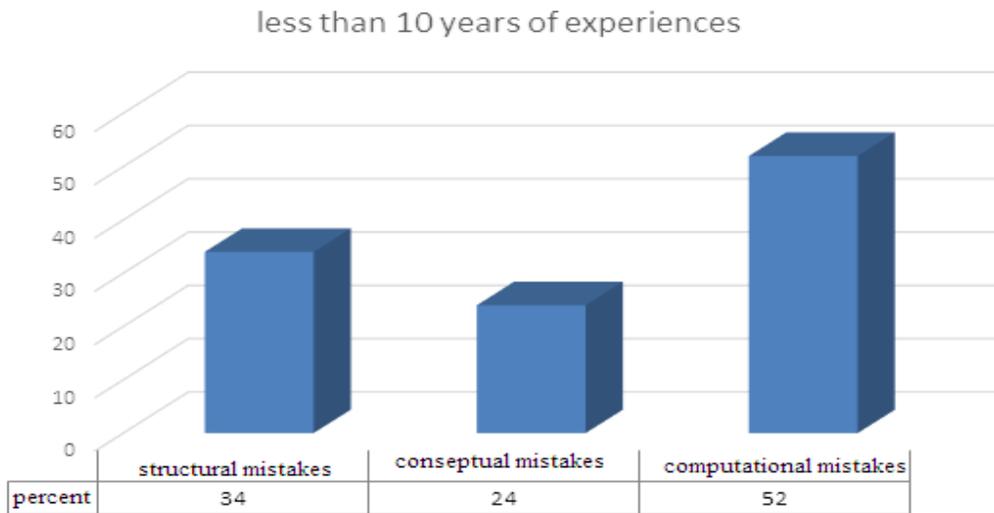


Figure 1: Extent of novice teacher's knowledge about students' potential mistakes

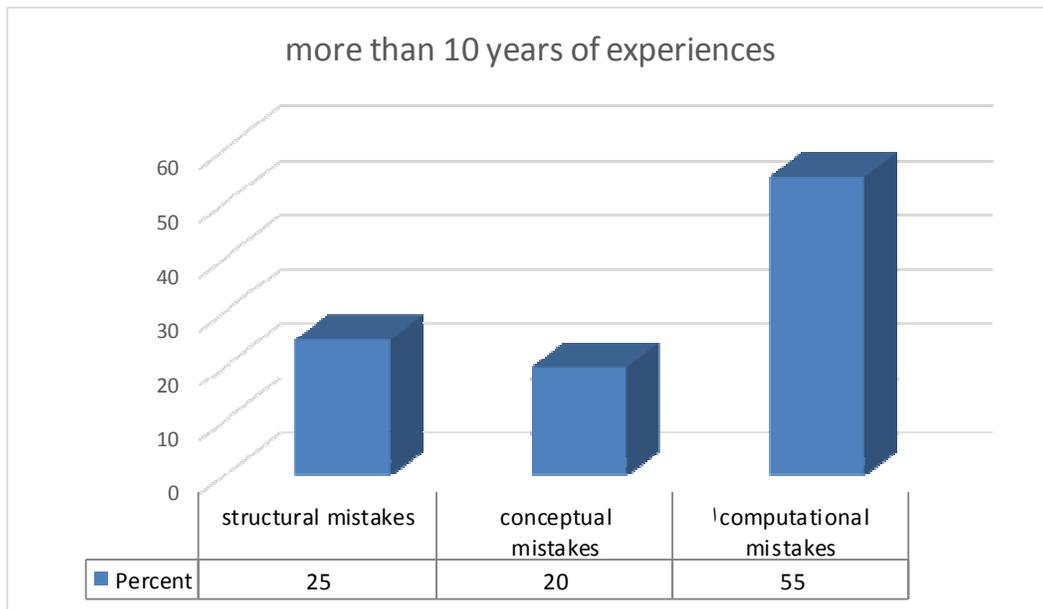


Figure 2: Extent of veteran teacher's knowledge about students' potential mistakes

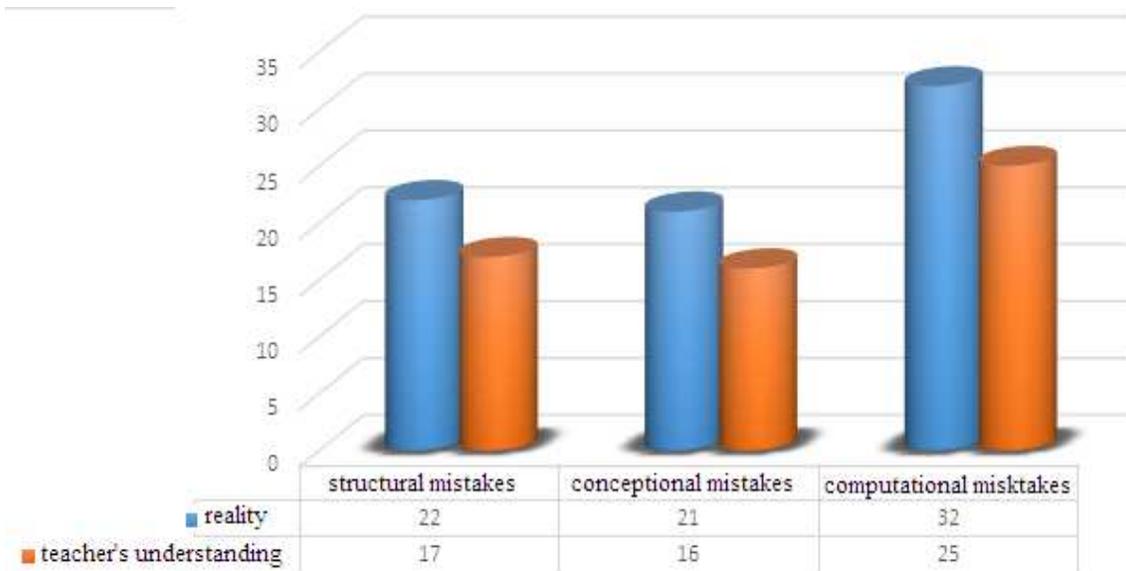


Figure 3: Comparing the teachers’ understanding and the reality for novice teachers

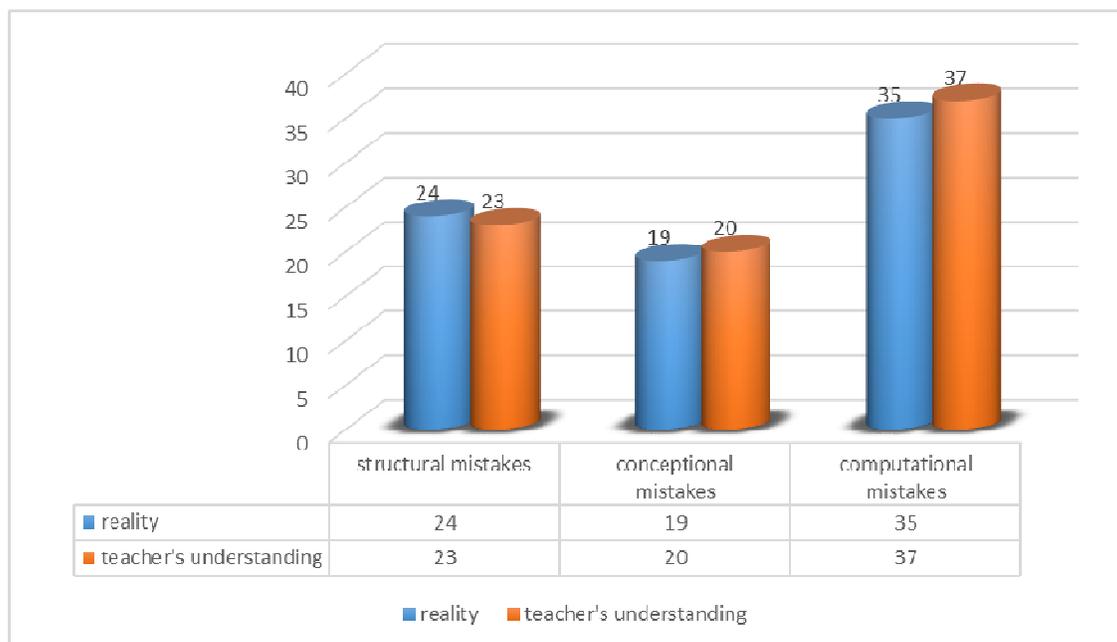


Figure 4: Comparing the teachers’ understanding and the reality for veteran teachers

DISCUSSION AND CONCLUSION

Improving the learning and performance of students in mathematics is one major issue in the field of mathematics education. Therefore, many diverse studies have been conducted in order to express a variety of strategies to achieve this goal. Of course there are differences in thinking character, belief, and innate talent in people that has always needed more work in order to provide better and more effective strategies. So in this study we have tried to examine the subject from all the different aspects and using novel theories utilize the results in order to improve education process and the perspectives ahead to increase the educational productivity.

1- How do novice teachers think about the students’ mistakes and untrue imageries?

According to the research results, teaching experience has an important role in better understanding of students and better predicting the students’ mistakes. So using the data and tables we can conclude that the novice teachers introduce common mistakes of students as in computational, structural and conceptual concepts

respectively, but this group of teachers have worse understanding about students' mistakes in algebraic concepts compared to veteran teachers. They had succeeded in identify structural mistakes in the same way as veteran teachers but had less understanding about computational and conceptual mistakes of the students compared to them. This understanding can have important effects on choosing appropriate strategies by the teacher in education process and subsequently increasing productivity in education and more success of students.

2- How do veteran teachers think about the students' mistakes and untrue imageries?

The veteran teachers also introduce common mistakes of students in algebraic concepts as computational, structural and conceptual respectively. This group of teachers has been more successful than novice teachers in identifying students' common mistakes in algebraic concepts. Thus, teaching experience can be one of the most important components in teaching and understanding students.

Nowadays, not only the knowledge is developing increasingly, but also methods of knowledge transferring and education are being modified continuously. It is evident that community development passes academic development and this academic growth is achievable through having advanced education system. Meanwhile, educational system and on its top the teachers play a key role in fostering an educated and skilled workforce. The existence of the teacher armed with knowledge and skills and utilizing innovative educational tools along with the experimental techniques can facilitate achieving important educational goals.

In this study we have tried to compare veteran and novice teachers' abilities in understanding common mistakes of students in algebraic concepts using evaluating tools and questionnaires. The results showed that both groups of teachers were able to detect common mistakes of students in algebraic concepts, but novice teachers had less abilities compared to experienced teachers in identifying students' mistakes. As veteran teachers they were able to detect structural mistakes but less than veteran teachers they identified conceptual and computational mistakes. Furthermore, the results suggest among students' mistakes in algebraic concepts there are more computational mistakes.

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