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Comparison and Analysis of Math Study between Students of the Tuyao and Han Ethnic Groups in Hezhou City

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Through the mathematics semester examination results of the Tuyao and Han ethnic groups in Hezhou city, the local government's slanting policy for the Tuyao ethnic group is shown, by their achievements and the existing questions. There are some ways to improve the results of the Tuyao ethnic group: stimulate students' motivation from multiple perspectives, make full use of Tuyao ethnic students' cooperation, and integrate mathematics history into mathematics teaching. The Education administration department and government should give strong support.

Key words: Tuyao, ethnic education, math achievement, average marks difference, fringing coefficient.

Introduction

Tuyao is one of the branches of Yao ethnic groups. They mainly live scattered in ShaTian and ETang town's junction, deep in DaGui mountain's MingMei, DaMing, CaoZhui, JinZu, XinMing, and ShiDong. These six villages stretch hundreds of miles in ShanChong, It has a population of about 6169. Tuyao people live in mountainous areas, gully staggered, and its traffic is very occluded. Over 80 percent of villages have no highways. They still have to follow the ancients' paths, bear the mountain goods on their shoulders and walk on the narrow meandering footpath between the mountain and the town.. Due to the discrimination of local government and the neighboring ethnic group, many school-age children in bad living standards can't go to school. The foreign women are reluctant to marry Tuyao men, so they have to marry in the same group for generations. They hardly go out of the mountain except ChuHei (GanXu, where they have to start out at three or four o'clock and return at twenty-three o'clock at night.)

Under the autonomous region's finance's funding in 2003, two towns' primary
and high schools were founded. The government centralized the fourth to sixth grade students in the town's central primary school, the seventh to ninth grade students in the town's central high school. The children are exempt from miscellaneous school fees. Every one of them can subsidize 60 Yuan living expenses. All these are to guarantee at the school-age Tuyao students can accept the compulsory education legally. The first to third grade Tuyao students are too young, so they study in a nearby mountain teaching school. Until now, the policy has been implemented for three years. The author hopes to understand the government's slanting policies' of achievement for the education of nationalities. Through this Tuyao and Han ethnic groups' mathematics study condition investigation and analysis of the existing questions, we hope to provide some improvement measures, and help the Tuyao to follow the country's step.

Method

There are three Tuyao mathematics teaching schools in two towns each. We sampled a different grade from the first to third grade in each of three teaching schools. Then we compared some mathematics semester examination results with Han ethnic students of the same grade in the town central school. We did the same with a sample minority class and Han class from the fourth to sixth grade in the central school, and the seventh to ninth grade in high school. Then we compared their mathematics scores in the same semester. This area's school semester tests are unified and carried out at a unified time, so these students' mathematics' scores are reliable. Moreover, combined with the new class sign goal request, they design tests suitable for this area's students' mathematics study situation (see index). We draw at random 100 minority class students and 86 Han ethnic students from the two town schools to test. Then we interviewed some mathematics teachers in two town schools and 20 Tuyao students (10 from each town). We interviewed the teachers mainly about the prominent teaching problems in minority classes and its countermeasures. We interviewed the students mainly about the interests, methods of mathematics study and how to make them reassign their initiatives to study mathematics through the improvement of school and teachers' teaching methods.

Results and Analysis

Results

Academic record difference. The data of table 1-4 indicate: the average mathematics difference of Tuyao and Han ethnic students is over 20 points in lower grade elementary school, 15 points in higher grade elementary school and 10 points in junior high school. The overall tendency in the disparity reduction is to become less with grade progression. Moreover, the balance in the degree of scores is becoming evident with grade progression. The minority classes' scores are more balanced than the Han ethnic class in junior high school.

Table 1

Tuyao and Han Ethnic Students' Mathematics Scores Comparison Table of QiuShaTian Town in Fall 2006

Grade	**First**		**Second**		**Third**		**Fourth**		**Fifth**		**Sixth**	
Comparison item	ShiDong	Centrol school	XinMing	Central school	JinZu	Central school	Minority class	Han ethnic class	Minority class	Han ethnic class	Minority class	Han ethnic class
N	24	196	32	202	54	195	103	183	107	225	67	219
M	66.7	87.2	68.3	88.5	60.2	83.6	53.7	69.8	66.8	86.7	54.2	71.7
M2	20.5		20.2		23.4		16.1		15.9		17.5	
SD	23.02	13.88	22.06	11.53	20.95	16.39	18.01	14.38	17.03	11.88	18.64	17.8
CV	34.5	15.9	32.3	13.1	34.8	19.6	33.5	20.6	25.5	13.7	34.4	24.8

Table 1

Tuyao and Han Ethnic Students' Mathematics Scores Comparison Table of QiuShaTian Town in Fall 2006 *(Cont.)*

Grade	First		Second		Third		Fourth		Fifth		Sixth	
Comparison item	DaMing	Central school	CaoZhui	Central school	MingMei	Central school	Minority class	Han ethnic class	Minority class	Han ethnic class	Minority class	Han ethnic class
N	27	138	25	148	31	142	85	156	65	171	58	125
M	41.5	66	43.2	65.5	44.4	67.5	58.9	75.5	59.2	74.6	48.5	65.6
M2	24.5		22.3		23.1		16.6		15.4		17.1	
SD	14.03	9.58	14.85	10.55	13.73	9.65	20.38	16.92	19.95	15.82	15.23	13.58
CV	33.8	14.5	34.4	16.1	30.9	14.3	34.6	22.4	33.7	21.2	31.4	20.7

Note. the third line of the table "N"：the sampled students' total number；the fourth line M：average score of mathematics；the fifth line M2：the difference of average score of Tuyao and Han ethnic students；the sixth line "SD"：standard deviation；the seventh line "CV"：fringing coefficient（the same below）.

Table 2

Minority and Han Class' Mathematics Scores Comparison Table of ChunShaTian Town's Fifth High School in 2006

Grade	Seventh		Eighth		Ninth	
Comparison item	Minority class	Han ethnic class	Minority class	Han ethnic class	Minority class	Han ethnic class
N	66	347	31	342	30	303
M	27.5	36.2	35.3	47.6	36.2	46.4
M2	8.7		12.3		10.2	
SD	5.39	12.63	9.18	15.52	7.78	12.87
CV	19.6	34.9	26	32.6	21.5	27.3

Table 3

Tuyao and Han Ethnic Students' Mathematics Scores Comparison Table of ETang Town in Spring 2006

Grade	First		Second		Third		Fourth		Fifth		Sixth	
Comparison item	DaMing	Central school	CaoZhui	Central school	MingMei	Central school	Minority class	Han ethnic class	Minority class	Han ethnic class	Minority class	Han ethnic class
N	27	138	25	148	31	142	85	156	65	171	58	125
M	41.5	66	43.2	65.5	44.4	67.5	58.9	75.5	59.2	74.6	48.5	65.6
M2	24.5		22.3		23.1		16.6		15.4		17.1	
SD	14.03	9.58	14.85	10.55	13.73	9.65	20.38	16.92	19.95	15.82	15.23	13.58
CV	33.8	14.5	34.4	16.1	30.9	14.3	34.6	22.4	33.7	21.2	31.4	20.7

Table 4

Minority and Han Classes' Mathematics Scores Comparison Table of ETang Town in Autumn 2006

Grade	**Seventh**		**Eighth**		**Ninth**	
Comparison item	Minority class	Han ethnic class	Minority class	Han ethnic class	Minority class	Han ethnic class
N	41	445	34	382	24	376
M	32	41.8	24.3	36.2	38.6	49.2
M2	9.8		11.9		10.6	
SD	6.53	12.91	5.55	11.43	6.47	11.42
CV	20.4	30.9	22.9	31.6	16.8	23.2

The data in Tables 1 to 4 indicates: The average mathematics difference of Tuyao and Han ethnic students is over 20 points in lower grade elementary school, over 15 points in higher grade elementary school, and 10 points in junior high school. The overall tendency is for disparity reduction is becoming evident with grade progression. Moreover, the balanced degree of scores is becoming evident with grade progression. The minority classes' score are more balanced than the Han ethnic class in junior high school.

Differences on study motive, interest and custom. The test results on 100 Tuyao students and 86 Han students manifest that: the percentage of study motive and interest in which Han students participated is obviously higher than that of Tuyao students, especially on interest, 20 percent higher; this is more apparent, as shown in the questionnaire among the Tuyao students from grade 1 to grade 3 in this region: Referring to those questions on "motive," the answers all turned out as "I cannot tell;" as for the questions on "interest," all the replies seemed to be like "I hate it." Similarly, Han students tend to be more positive on thinking and solving the math problems; the percentage is 10-20% higher than that of Tuyao students. This is in accordance with the situation that we encountered when we conversed with Tuyao students.

Analysis

Influencing Factors of the math achievement of Tuyao students from Grade1-3 in this region. (1) Severe living conditions and cultural background factors affect the mathematics mental vitality of Tuyao students. Ms Jiang, a math teacher of Daming Elementary School, commented that "the way that Tuyao students think about math problems is not broad enough. After learning the "18×12" approach in E'tang center, I utilized this method in one of my classes with the goal to diversify and optimize the algorithm, but I found the students negatively responded, even though I enlightened them many times. I had to ask them to read the textbook, then a few students just thought out the upright calculation. However, the operation that the urban students figure out like 18×6×2； 18×4×3； 9×2×12； （10＋8）×12； 18×（10＋2） the Tuyao cannot even think out at all. (2) Not forming good learning habits. Several teachers noted that some Tuyao students do not do the teacher's assignment, and after the feedback reached the parents, the situation improved. An example is Zhao Yazai, a grade 1 student from a family of four children. His parents work hard from dawn until dark to support the family. They told

the teacher that they just hoped their children would be in a favorable situation in business through studying. (3) Shortage of instructional resources and the poor instructional conditions. In the Tuyao region, except for the six central primary schools, almost all the instructional places are of small scale, usually constituted of only two tile-roofed houses, one used for the classroom, the other for teacher's office combined with the functions of dorm and kitchen of teachers. In the Daming Dakuzhu instructional place, which was established in 1956, the only instructional equipment for the math class was an old set of squares. (4) Shortage of teachers. Most of the "backbone" teachers in Tuyao are merely elementary graduates or middle school graduates who were recommended to the normal school for training in the 1980s. As one of them revealed, "I was sent to the normal school for instructional training shortly after I graduated from primary school. I have been teaching for 30 years, and I don't have the chances to update my knowledge. My attainments are even poorer than a grade 5 student of Dongwai primary school. When I was in their teachers' office, I read one of their math exercise books. I felt so embarrassed because I could not figure out most of their math exercises, let alone cultivate the students' interest of math". So as time passes, it is not odd that the students hate math.

The reason for the gradually narrowing math gap between Grade 4-9 national classes and Chinese classes. (1) Teachers and teaching facilities are relatively good. The schools requested, by their supervisors, to arrange for a stronger sense of responsibility and teaching ability, and have a college education for mathematics teachers with national classes, and these teachers to take full advantage of better schools for teaching and learning, and teaching equipment for schools in the mountains; it is difficult to explain thoroughly abstract mathematical knowledge visualization, promoting a national push on students' understanding of knowledge, and to consolidate and improve it. (2) Adverse social influences impact students in the smaller territories of Yao. From interviews with teachers and students, we learned that many Chinese students indulge in online games, some boys smoke, gamble, extort, participate in gang fights and other bad behavior. But the simple nature of the students of the soil of Yao, with diligence, discipline, and active cooperation with the teachers, showing good co-operation, and, therefore imitate and mechanically memorize during the majority of the 4-9 mathematics grades, ethnic students progress relatively fast at this point. (3) The gradual elimination of language barriers, plenty of learning time compared to the past. Yao territories from the fourth grade students, day and night, get along with

the Han students and gradually learn Mandarin, as with the increase of exchanges between the Han nationality students, some students learn from the Han students good habits of learning and methods. Guaranteed learning time in schools with teachers counseling, contribute to a gradual increase in academic performance. In the two towns each year 2 to 5 Yao math students entered the 6-9-year experimental class.。

Effective measures to stimulate motivation and increase interest in students learning mathematics. From here, (1) The practicality of mathematics to stimulate "motive." Goose River Tong Tai Huang teachers point out that: the use of "Mathematics and the service life of the source of the actual" experience for students to learn mathematics is useful. (2) The image "friends" of the mathematics teachers, induced "motivation，"Sha Tin Central such as the first two students of the Frederick right when he said: My favorite friends, as the current math teacher. Since he likes the math teacher, of course, he's like a math or math teacher，if not, I am sorry for the teacher. (3) The use of mathematical story to interest, stimulate, "interest." Such as geese Chen Tong Center School has quoted Professor Li Yupei writer on popular science, rational number "1" and the irrational number "π" interesting battle commander of the location of the story of mathematics, so that students with the story of Yao territories of the protagonist with the beauty of mathematics into the park, improve their interest in mathematics.

In addition, several teachers pointed out: The use of a mathematician to become an example of incentive motivation learning mathematics. Problem-solving process may also make use of the feelings, the beauty of mathematics maintain the interest of the national mathematics students sustainability.

Conclusions and Recommendations

Conclusions

The Government has implemented preferential policies in education for Tu Yao, and the effect is remarkable. With the increasing grade and more frequent learning-exchanges with the Han students, Grade 4-9 students of Tu Yao have changed their backward concepts gradually and formed positive learning motivation. Most minority students have adopted the effective learning skills and learning habits of the Han students so they have gradually narrowed the gap of learning achievements among Han students, and in junior middle school period, they achieved more balanced marks than the Han

students. Nowadays, the time of no formal educational opportunities in schools for Tu Yao for generations has gone. For example, in 1996, the first junior high school graduate of the Fifth Middle School of Shatian in Hezhou city, one Tu Yao student Deng Xiulan was admitted to a key middle high school, Fanglin Middle School in this city. Feng Lian'an and Zhao Yayi of 2005 and Zhao Biao of 2006, all junior high school graduates of Etang Middle School, were respectively admitted to the Senior High School of Hezhou. All these four students of minority were respectively sent to study in Dachang Advanced Experimental High School in Hebei Province, funded by the Ethnic Affairs Commission of Hezhou.

Recommendations

Reflecting features of math teaching in the class of minority and stimulating their "motivation" to learn mathematics. (1) Highlight the features of the minority class at the teaching pace. The successful experience of a teacher surnamed Huang in a key school of Shatian is that teaching pace in the class of the minority should not be too fast but should be one step at a time. He suggested that teachers should go to the classes frequently and offer tutorship, trying any means to enable the students to learn knowledge of every new lesson, and settings of homework should not be too much remote and deeply, which would provide kind of "successful experience" to the students and stimulate their motivation to study further. (2) Include the features of the minority class when designing after-class task. For example, after polygonal areas lesson, teachers can set an open question like this: If we want to tile the floor of our classroom, which specifications and designs of floor tiles to be chosen are both good and cheap? This requires students' cooperation, measuring the square meters of the classroom's floor with their own hands, going to the market to investigate the specifications, designs and prices of various floor tiles, and at the end deciding floor tiles that are both good and cheap after calculation. Owing to different aesthetical concepts, the answers to the question may also be different. But the whole process can improve students' visual and kinesthetic intelligence and arouse their interests to learn mathematics. (3) Show the features of class of minority in evaluation measures. Evaluations of Tu Yao students' math learning achievements should be diversified. For example, diversification of evaluation subjects means not only teachers are the evaluation subjects, but also the students. Allowing students to take part in the evaluation and analyzing the results helps students

improve their consciousness of self-determination and their abilities of reflection through self-evaluation, that is, as Bandura emphasized, arousing students' math learning motivation through "alternative enforcement and self-enforcement".

Making use of Tu Yao students' cooperation in teaching to develop their innovative mind. Teachers can make use of the characteristics of simple nature, diligence and more cooperative of students, and continuously create problematical contexts to develop students' innovative mind.

For example, after Fundamental Operation of arithmetic on integral, teachers can set contexts as: Calculate the products the following figure groups: 15×15, 25×25, 35×35, 45×45, 55×55, 65×65, 75×75, 85×85 and 95×95, and ① hypothesize the rule according to the outcomes. We can conclude that in each figure group, the product's last numbers are the product of the two multipliers' very last numbers, and its first two numbers are the product of the multiplier's second last number multiplying the addition of this number and 1, for example, the product of 45 and 45 can be analyzed as: 5×5＝25，4×（4＋1）＝20, so the product of 45 and 45 is 2025. ② Try to prove the rule by using the Fundamental Operation of arithmetic on integral. ③ Use this rule when calculating the products of those double digits figure groups such as 21×29，32×38，43×47，54×56，69×61，78×72， 87×83 and 96×94 ect., which in every group the multipliers' first numbers are the same and the addition of their very last numbers is 10, and then test the outcomes.

Applying math history into classroom teaching in class of minority. For example, by applying the Function Concept into classroom teaching along its development line beginning from the bud of Function Concept, its initial definition, its conventional definition, to its modern definition, students can not only know the history of math and grasp its nature, but also can improve their own consciousness of problems gradually when understanding other mathematician's consciousness of problems.

Offering strong support through schools, educational and administrative departments, and government agencies. Teaching facilities are deficient in minority class, especially in each Tu Yao teaching centre in the mountainous regions, problems of teaching facilities and of construction of teaching faculty are pressing. So in these Tu Yao teaching centre it is imperative to increase funds for education, to strengthen in-service teacher training which can enable teachers in these teaching centre to constantly update their knowledge in order to improve teaching standards, as well as to

establish special allowance to encourage young teachers with higher teaching capability to teach in the mountainous teaching centers. What's more, there are still gaps in math learning achievements among Tu Yao students and the Han students, which is greatly related to poverty and for generations' only within-the-group marriage that has caused the relatively low IQ offspring. Most students drop out of school because of poor marks in school, which is also an important cause of the higher rate of dropouts of Tu Yao students. Therefore, relevant government departments should follow the example of preferential policies in education for Tu Yao, take "betterment for their traffic" as a breakthrough to help them develop their economy, and offer long-term support through policies so that problems related to the intelligence and non-intelligence factors affecting Tu Yao's education can smoothly be solved.

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