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A Study on the Attitudes toward Mathematics of High School Students - Comparison of a General Public High School and a Foreign Language High School -

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The purpose of this study was to investigate the attitudes towards mathematics of high school students by comparing students of a general public school and a foreign language high school. The researchers were interested in how the two groups, middle or middle lower achievers and high achievers, showed their attitudes toward mathematics and where their attitudes were derived from. For the investigation, the researchers surveyed 121 students of a general public high school and 64 students of a foreign language high school. Reliability, mean difference with t-test and frequency were analyzed. The results showed that many students from both groups had negative attitudes toward mathematics. However, the causes of the attitudes were different between the two groups. This implies that we need to reform the instructional methods and curricula of mathematics courses.

Key Words : Attitudes toward mathematics, General public high school, Foreign language high school

Ⅰ. Introduction

Korean students have routinely scored high in mathematics achievements compared with most students in other countries in TIMSS(Trends in Mathematics and Science Studies) and PISA(Programme for International Students Assessments). However, they have shown low attitudes toward mathematics compared with the students in most of the other countries. The researchers of this paper wanted to study this discrepancy because it could serve as an index for identifying the problems and strengths of Korean

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mathematics education.

What makes this paper unique is that it compared two groups that had a common middle school education but have received different high school education in different environments. The students of the general public high school studied the Korean standard curriculum that the Korean government has provided. On the other hand, the students of the foreign language high school studied a special curriculum devised to prepare the students to study at colleges in other countries such as the United States, the United Kingdom, Japan, and so forth.

In this study, by comparing and contrasting these two groups, we expected to discover the differences of attitudes toward mathematics of Korean students who learn mathematics in different situations. By studying the two groups, we believe that the positive and negative outcomes of the Korean mathematics education will be easier to identify. As the importance of mathematics education becomes increasingly greater and as Korean parents are keen in providing better education for their children, the researchers found more value to this study in that it can identify the differences of students' attitudes toward mathematics under the Korean mathematics curriculum and the American one.

We also decided to analyze the factors of attitudes that either encourage or discourage a student to excel in mathematics because we believed that these factors can greatly influence the mathematics education itself. Attitudes toward mathematics are important because they are driving forces for students to study mathematics. Thus, we focused on the factors that influence students' attitudes toward mathematics and suggested some implications in mathematics education in Korea.

II. Some Theoretical Underpinnings

Other than cognitive domain such as students' achievements, there are other important concepts of affective domain such as values, motivation, feeling, interest, and anxiety, which have been considered important in teaching and learning mathematics in more recent years. Students' attitudes toward mathematics is one of the main research issues in mathematics education in Korea because many Korean students have negative attitudes toward mathematics.

In the 2003 ICME(International Congress on Mathematical Education), new directions for research on affective domain in mathematics education were proposed(e.g., Evans, Hannula, Philippou & Zan, 2003). The TSG on students' motivation and attitudes at ICME-10 subsequently addressed some of the goals identified. As well as the congress, there have been other studies related with attitudes toward mathematics.

Gadalla(1999) compared the factor structure of boys' and girls' responses to the TIMSS mathematics and questionnaires for attitudes. Gadalla identified that, at age 13, some gender differences in attitudes toward mathematics were apparent and concluded

that attitudes explained more of the variation in achievement for the older group. Randel, Stevenson, and Witruk(2000) investigated attitudes, beliefs, and mathematics achievement of German and Japanese high school students. Compared to Japanese students, German students were less critical of their academic achievement and had different attitudes in excellence in performance of mathematics. Papanastasiou(2002) studied the effects of background and school factors on the mathematics achievement. The study demonstrated that attitudes had direct effect on mathematics outcomes. It was also found that family educational background, school climate and beliefs affected attitudes toward mathematics. The study also showed that there was also evidence that SES directly affected school climate and that teaching directly affected attitudes toward mathematics.

Ma(2003) examined the effects of early acceleration of students in mathematics on attitudes toward mathematics across junior and senior schools. The results of the study showed that accelerated regular students increased their negative attitudes significantly faster than unaccelerated regular students. However, accelerated gifted students did not increase their negative attitudes toward mathematics. Sanchez, Ursini and Orendain(2004) argued that students showed a more positive attitude toward mathematics if mathematics was taught with computers. However, self-confidence in mathematics decreased for both boys and girls. Watt(2005) studied with secondary mathematics teachers in Sydney, Australia on attitudes with the use of alternative assessment methods in mathematics. He investigated how teacher efficacy influenced the use and success of new procedures of both "regular" and alternative/authentic assessment.

Fonseca(2007) was interested in the reduction of students' negative attitudes toward mathematics. Fonseca argued that the development of some basic learning skills such as time planning, reading, team work or oral presentation contributed for their attitudes toward knowledge acquisition. The new technologies will also change the teaching style and the learning style drastically and consequently use them for students' positive attitudes toward mathematics. Orhun(2007) investigated the mathematics achievement and attitudes towards mathematics with respect to learning style according to gender. This study aimed to investigate whether there is a relationship between gender and learning style, mathematical achievement and attitudes toward mathematics. In the study, mathematics achievement and attitudes toward mathematics were not dependent on gender. It was also noticed that while most female students preferred the convergent learning style, most male students preferred the assimilator learning style.

Along with the emphasis of affective domain of the current mathematics curriculum (The Ministry of Education, 2007), there have existed some studies related with attitudes toward mathematics in Korea. Kim(2004) studied the relationship between home environment, mathematical achievement and attitudes toward mathematics. The results of the study showed that SES had indirect influence on students' mathematics achievement and attitudes toward mathematics by means of students' interactions with parents. However, the researcher did not mention about the causal relationships among SES, students' interactions with parents, learning attitude, mathematics achievement, and

attitudes toward mathematics. Kang, Kim, Jung, and Lim(2006) analyzed affective variables for learning mathematics along with attitude, interest, mathematical anxiety, and learning habits of gifted students in mathematics. Seo, Ryoo, and Choi(2006) investigated the effect of learning and ability-focused inclination on the mathematical belief, attitude and knowledge. In the study, teachers having a strong inclination for mathematical belief have shown high achievements of mathematical knowledge of function conception.

In the current study, we focused on the attitudes toward mathematics of students from two school systems, a public general high school and a foreign language school.

III. Methods

1. Participants

The participants in this research were two groups of high school students located in Yongin, Kyunggi province in Korea. One group was composed of 121 11th and 12th grade students attending a general public high school, where students are studying mathematics according to the standard mathematics curriculum of Korea. The other group was composed of 64 11th and 12th grade students of a foreign language high school, where students are studying mathematics according to the American mathematics curriculum. The students of the foreign language high school are considered high achievers in Korea because they must pass an entrance examination to enroll in foreign language high schools. These types of schools are categorized as schools with special purposes and the attending students receive a relatively higher quality education. In recent years, students of these schools have been increasingly excelling in entering prestigious colleges. Comparing the attitudes of these two groups of students who represent general high school students and foreign language high school students would be a good way to compare the attitudes toward mathematics of the students from the different systems in Korea.

2. Data collection and analysis

The researchers collected the data by distributing a survey containing 18 questions with some background questions about the students. The background questions included the hours students spent on studying mathematics during middle schools and high schools, dream schools, expected majors and future careers. The survey questions focused on students' attitudes toward mathematics including their elementary, middle and high school achievements, comparisons of achievements between middle and high schools, teaching and learning styles, and curricula of two schools.

The researchers analyzed the data using SPSS 12.0 for Windows version. The analysis consisted of question reliability with Cronbach α, comparisons of two groups with t-test, and frequency analysis.

IV. Results

1. Reliability

In the survey, questions 7, 8, 9, 13, 14, 17 and 18 were deleted for the reliability analysis because the scales between two schools were not constantly scaled and item 18 was required to be described by the students on mathematics education. The highest reliability yielded Cronbach's Alpha .858, which is fairly high reliability. The reliability statistics and the summary for the 11 questions are as follows.

[Reliability Statistics]

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.858	.860	11

[Summary Item Statistics]

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	2.786	2.245	3.565	1.321	1.588	.168	11
Item Variances	1.644	1.134	2.499	1.365	2.203	.219	11
Inter-Item Correlations	.358	.090	.686	.597	7.653	.023	11

The covariance matrix is calculated and used in the analysis.

[Scale Statistics]

Mean	Variance	Std. Deviation	N of Items
30.65	82.186	9.066	11

2. Mean Values(T-test)

There was a difference between the two groups except questions 7, 8, 9, 13, 14, 17 and 18 with the $p<.05$. The excluded items did not have equivalent scales.

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper

Item1	Equal variances assumed	4.279	.040	-2.518	183	.013	-.505	.201	-.901	-.109
	Equal variances not assumed			-2.676	151.802	.008	-.505	.189	-.878	-.132
Item2	Equal variances assumed	24.665	.000	-7.032	183	.000	-1.450	.206	-1.856	-1.043
	Equal variances not assumed			-7.960	174.574	.000	-1.450	.182	-1.809	-1.090
Item3	Equal variances assumed	.960	.328	-2.490	183	.014	-.479	.192	-.858	-.099
	Equal variances not assumed			-2.559	138.619	.012	-.479	.187	-.848	-.109
Item4	Equal variances assumed	58.647	.000	-10.290	183	.000	-2.002	.195	-2.385	-1.618
	Equal variances not assumed			-12.244	182.970	.000	-2.002	.163	-2.324	-1.679
Item5	Equal variances assumed	.423	.516	-2.352	183	.020	-.457	.194	-.841	-.074
	Equal variances not assumed			-2.351	128.327	.020	-.457	.194	-.842	-.072
Item6	Equal variances assumed	.045	.832	-.495	184	.621	-.110	.222	-.548	.328
	Equal variances not assumed			-.496	131.840	.621	-.110	.222	-.548	.328
Item7	Equal variances assumed	11.179	.001	1.808	183	.072	.221	.122	-.020	.461
	Equal variances not assumed			1.974	166.021	.050	.221	.112	.000	.441
Item10	Equal variances assumed	2.877	.092	-2.163	184	.032	-.359	.166	-.686	-.032
	Equal variances not assumed			-2.202	137.834	.029	-.359	.163	-.681	-.037
Item11	Equal variances assumed	1.086	.299	-2.930	184	.004	-.479	.164	-.802	-.157
	Equal variances not assumed			-2.861	122.501	.005	-.479	.168	-.811	-.148
Item12	Equal variances assumed	.002	.968	-.932	183	.352	-.154	.165	-.479	.172
	Equal variances not assumed			-.934	132.096	.352	-.154	.165	-.480	.172
Item15	Equal variances assumed	1.200	.275	-2.951	184	.004	-.558	.189	-.931	-.185
	Equal variances not assumed			-3.006	138.098	.003	-.558	.186	-.925	-.191
Item16	Equal variances assumed	1.750	.187	-2.395	184	.018	-.402	.168	-.733	-.071
	Equal variances not assumed			-2.543	154.739	.012	-.402	.158	-.714	-.090

3. Frequency

The researchers analyzed the results of questions 7, 8, 9, 12, 13, 14, and 17.

(1)Analysis of question 7 (comparison of current mathematics grades to middle school grades)

A higher percentage of the students of the general public high school answered that their mathematics grades have improved since middle school(GPHSS 21.7%, FLHSS 7.7%). It seemed natural that the FLHSS had a low percent of students whose mathematical scores were improved because most students at the school were competent in mathematics.

(2) Analysis of question 8 (reasons for improvement of grades)

Among the GPHSS who answered that their mathematics score has improved, they only answered *①I made more efforts in my high school days(77.8%), ③teachers taught well in the high school(14,8%), ⑤and so forth(7.4%)* for the main reason of their improvement. Most of the students replied that their improvement was because they studied harder after entering high school. Some students who chose ⑤replied that the level of students' achievement of the school was relatively low so their grades automatically improved, and they needed additional studies at private institutions.

On the other hand, the FLHSS answered ①50.0%, ②33,3%, ③16.7% each. Like the students of the other group, these students replied that the main reason their grades improved was that they studied harder. Especially, the reply *②the mathematics that is taught in high school is more interesting* took up a great portion of the answer. This might be because the foreign language high school offers a different mathematics curriculum such as calculus courses taught with English textbooks.

(3) Analysis of question 9(reasons of declining grades)

Among the students who replied that their grades have declined, both groups answered evenly for each answer and for both groups, the greatest percentage of students chose *②the math taught at high school is harder to understand.* The inappropriate level of mathematics for students was the reason for the students' declining grades.

(4) Analysis on question 12(satisfaction toward mathematics teachers)

Question 12 asked about the students' satisfaction toward their current mathematics teacher, choice *③fair* was the most frequent answer for both groups. Almost over half of the general public high school students chose *③fair*(49.2%) and the rest chose *② bad*(16.7%), *①poor*(15.0%), *④good, ⑤excellent* which reflects that the students showed fair or low satisfaction toward their mathematics teacher.

On the other hand, the students of the foreign language high school chose *③ fair(38.5%), ④good(24.6%), ②bad(20.0%), ①excellent, ⑤etc.* which showed the similarity in that both groups chose ③fair for the most common answer. However, the percentage of *④good* and *②bad* was similar, implying that students varied in their opinion of their mathematics teacher.

(5) Analysis on question 13(reasons of satisfaction by the teachers' teaching)

On the reason why students were satisfied by the methods of their current mathematics teacher, the GPHSS mostly chose *③the teacher is welcome to questions and understands the students well(42.3%)* and the rest answered in the order of *① teaches systematically, ②the teacher's teaching methods suit the particular student, ④ the teacher has professional knowledge on mathematics, ⑤etc.*

On the other hand, the FLHSS mostly chose *④the teacher has professional knowledge on mathematics(45.5%)* and the rest answered in the order of *③the teacher is welcome to questions and understands the students well, ①teaches systematically ②the teacher's teaching methods suit the particular student, ⑤etc.*

The GPHSS tended to be satisfied with the teachers' kindness in the classroom, whereas FLHSS were content with their teachers' professional knowledge of mathematics.

(6) Analysis on question 14(reasons of dissatisfaction by the teachers' teaching)

On why the students were not satisfied by their teacher's teaching methods, the majority of the GPHSS chose *④the materials are too hard and the teacher teaches it too hard(30.0%), ②the teaching methods of the teacher does not suit the particular student(27.8%)*, indicating that most students think that the mathematics teacher teaches with inappropriate methods and material. The rest answered in the order of *⑤etc.*, *③the teacher does not understand the students and is not welcome to questions, ①the teacher does not teach in a systematic way.*

Explanations for option 5 were, mathematics was hard in the first place and that the classes were mainly problem-solving sessions so students could not understand the teacher's explanations.

The FLHSS answered in the order of *③the teacher does not understand the student and is not welcome to questions(34.1%), ④the materials are too hard and the teacher teaches it too hard(24.4%), ②the teaching methods of the teacher does not suit the particular student(22.0%).* For the description, they gave reasons such as *the teacher only teaches matter discussed in the textbook, the exams are too hard, and the test questions require too many meticulous calculations.*

Many students from both schools were unsatisfied with the teaching methods of the teachers and with teachers' lack of careful considerations of students' mathematical abilities.

(7) Analysis on question 17 (the ways of having positive attitudes toward mathematics)

On what would make the students more enthusiastic and confident in mathematics, the GPHSS answered in the order of *④the teacher must know the situation of the student and utilize appropriate teaching methods(33.3%), ①teachers must select the right matter and material for each student(20.8%), ⑤etc., ②teachers must first teach the*

students mathematics that are applied to daily life, ③students must work in groups. Thus most students wanted improvement of the teacher's understanding of each student, level of material and matter, and teaching methods.

The reasons for option ⑤ were, *students who do not want to learn mathematics should spend less time on mathematics, it is inevitable for students to resort to private tutoring if they want to improve their grades, the matter and material of mathematics classes seem to aim for the high-achievers, incorrect information on college admissions mislead to abandoning mathematics, teachers must emphasize the importance of mathematics, students should learn mathematics applied to daily life, and mathematics must be studied slow and steady which makes it difficult to improve grades.*

The FLHSS answered in the order of *④the teacher must know the situation of the student and utilize appropriate teaching methods(43.1%), ①teachers must select the right matter and material for each student, ②teachers must first teach the students mathematics that are applied to daily life, ③students must work in groups, and ⑤etc.*

The explanations for option ⑤ were, *I am pressured at the fact that I must learn mathematics to an advanced level although my future major does not involve mathematics, teachers must utilize books and various materials to evoke interest in mathematics, teachers must employ appropriate teaching methods and an welcoming attitude towards the students because high school mathematics is a big leap from middle school mathematics, classes should be divided into groups of students of the same level, and teachers must first teach the students mathematics that are applied to daily life andteachers must emphasize the importance of mathematics.*

4. Dream schools and careers

For both groups, the greatest percentage of the students did not give an answer to the question asking about dream schools and careers. The researchers conclude that this happened because they did not decide on their future plans yet or they realized the discrepancy between their dreams and reality. The details of those who did not give any answers about Dream School and Career and Major are 17.4% and 11.6% at GPHSS, and 21.5% and 9.2% FLHSS, respectively.

(1) The order of the top 5 dream schools

For the GPHSS, the order was Seoul National University(9.9%), Dankuk University (6.6%), Yonsei University(5.8%), Korea University(4.1%), Kyungwon University (3.3%), and Kangnam University(3.3%). The preference might partially come from the location of their residences. On the other hand, the majority of the FLHSS pursued colleges in the United States and Great Britain. The order for colleges in the United States(9.2%) was Harvard University(6.2%), Cornell University(4.6%), an Ivy League school(4.6%), Stanford University(4.6%), New York University(3.1%), Carnegie Mellon University(3.1%), Georgetown University(3.1%), and Undecided(3.1%). The percentage of students who pursued Korean Universities was Seoul National University(1.5%), Yonsei

or Korea University(1.5%), and Ewha Women's University(1.5%).

(2) The order of the top 5 majors

The top 5 most wanted majors of GPHSS were medical school(5.0%), early childhood development & education(4.9%), architecture(4.1%), public health(3.3%), and electronics(2.5%). On the other hand, the FLHSS answered political science, international relations(13.6%), economics, business, finance(9.2%), biology, biological engineering(7.7%), law(7.7%), drama(4.6%), robotics, computer science(4.6%), and medical school(4.5).

For the study hours, we examined using the independent sampling t-test between two groups. There was statistically meaningful differences ($P<.00$) between the FLHSS and the GPHSS in the amount of mathematics study hours in their 3rd year in the middle schools. However, there was no difference about the amounts of study hours between two schools in their high school days. In their 2nd and 3rd years, the GPHSS even studied mathematics more hours than the FLHSS without statistically meaningful difference ($P<.01$). This was caused from the fact that the FLHSS have comparatively less class hours at those periods. In this study, gender difference and major difference was not considered because they were too small to analyze.

Students responded the followings to question 18 that asked to give a free description on mathematics education in schools. Their descriptions are summarized as differentiated curriculum and instructions, teachers' teaching styles and contents, and characteristics of mathematics. Here are some quotations of the students.

Some GPHSS argued that *"most teachers do not consider students' mathematical abilities and just teach at the high level mathematics. Thus, many students already give up learning mathematics. Differentiated instruction should be adopted."* Some FLHSS also wrote that *"mathematics attracts curiosity, but the inappropriate difficulty of mathematics and the teachers' enforcements make us dislike mathematics."* Regardless of the school systems, many students felt that the level of mathematics is too hard for them to learn and they needed to learn appropriate levels of mathematics.

Students were not satisfied with the teaching styles of mathematics teachers and wanted the teachers to be more kind enough to approach with questions. Some students wrote that *"I want to learn interesting mathematics. Also, I really want to see how mathematics apply to our daily life."* They complain that they should not have to rely on private tutoring or extra learning from private institutions. They are also tired of endless pushing towards college entrance examination. Some students wished to learn mathematics without being forced and with free inclination.

Some students expressed that mathematics has its own characteristics. They wrote, *"we need to invest too much time to raise mathematics scores and if we missed a certain step, then we cannot catch up again."* Thus, students keep pouring their time on studying mathematics without any alternative way. Many students felt that they were just like Sisyphus, who appeared in the Greek myth, that rolled a huge boulder up a

hill, only to watch it roll down again, and to repeat this throughout eternity.

V. Discussion and Recommendation

This study investigated the attitudes toward mathematics of general public high school students and foreign language high school students. Researchers examined what and why the students had those attitudes and investigated the meanings of the research results. The findings of the research are follows.

Motivation and attitudes toward mathematics are recently more emphasized in teaching and learning mathematics(The Ministry of Education, 2007; National Council of Teachers of Mathematics, 2000). Brain scientists such as Yuheon Seo at Seoul National University also argue the importance of positive attitudes in learning. Compared with the emphasis of mathematical achievements, effective aspects in teaching and learning have been neglected in Korea. In this study, we obtained the following conclusions.

First, regardless of the schools, students had negative attitudes toward mathematics. Both mathematics curricula and the level of the students' mathematical achievements of the two schools are different. However, many of them showed negative attitudes toward mathematics and the causes of those mainly came from the discrepancy of levels of mathematics and teachers' instruction. In general, at foreign language high schools and particularly this one, though there existed individual differences, the level of the mathematics classes were usually aimed at the middle to high achievers.

Also, the classroom circumstances are not as favorable because about thirty students are in one classroom, and the teachers are the ones who move from one classroom to the other, not the students. Naturally, it is very difficult to conduct various levels of mathematics classes and so the teacher usually sets the level to the average achievers. However, in this foreign language high school, like many other foreign language high schools, the school and the teacher have high expectations and assume all the students to be high achievers. Thus, the material can be difficult and the exams tend to be difficult as well. Yet, what society and schools are overlooking is the fact that there are quite a portion of foreign language high school students who do not excel in mathematics. This is partly due to the fact that students who tend to prefer languages, social studies and humanities over mathematics and sciences usually pursue foreign language high schools.

Second, both the attitudes and achievement in mathematics was greatly influenced by the teachers' teaching styles and mathematical contents. Most students who had negative attitudes towards mathematics felt difficulty in learning mathematics and were not satisfied with the teaching styles of the teachers. We need to give more attention on teachers' instructional and even professional development.

Third, the amount of effort foreign language high school students put into mathematics gradually decreased whereas the general public high school students

increasingly spent more time on mathematics. Until entering high school, foreign language high school students spent much time on studying mathematics compared to other students but as they entered high school, especially referring to this study, they were exposed to the American curriculum. What they first learned was Pre-calculus which is mostly dealt with in Korean middle schools. As these students faced materials and exams that were not challenging, many did not study as much as they did before. Even official tests such as the SAT I mathematics section or the SAT II Math IIC were too easy for the students because the tests mentioned above required the Korean middle school level education in mathematics to obtain a high score.

However, as the curriculum focused on Calculus BC for the remaining two years of high school, students started to feel difficulty in studying mathematics for mainly three reasons. First, many lost their habit of studying mathematics rigorously and justified their indulgence that they did not need to study as hard as they did before because what they were already capable of was enough to get them by the exams required for prestigious American colleges. Second, Calculus BC was a big leap for these Korean students who were familiar with the Korean high school curriculum. The different order and methods of the Korean and the American mathematics curriculum left many lost in this gap. Even at foreign language high schools, there exists individual differences and thus there were students who excel in mathematics regardless of these circumstances but those who had weak abilities in mathematics faced a sharp decrease in both attitude and achievement in mathematics.

Finally, to analyze further, the attitudes and achievement in mathematics is strongly influenced by the college admissions systems. There are usually more than 30 students in a classroom and thus differentiated instruction and learning are very difficult. Both teachers and students just focus on the requirements of the competitive college admissions. High schools need to provide several tracks according to students mathematical abilities so that they can learn mathematics effectively.

With the findings of the research, we want to suggest the following recommendations.

First, every high school needs to prepare differentiated mathematics instructions for various levels of students. For example, most American high schools divide mathematics classes by level, such as algebra, pre-calculus, calculus, and so forth. Students need to attend an appropriate course to earn most from the classes. In addition, schools need to provide mathematics tutoring centers, where students can do make-up study without time restriction.

Second, teachers should make effort to develop their instructional strategies aligned with students needs. Teachers need to give more attention to the students' understanding of mathematics. Many teachers seem to not consider the difficulties students face when learning mathematics. Teachers need to listen to students' voices more, adjust the level of mathematics and develop more effective ways of teaching mathematics.

Third, the mathematics requirements of college admissions should be minimized. Most

of the severe competition and inappropriate levels of mathematics education is due to the aspirations to have higher scores in mathematics, which is considered more competitive in entering good colleges. Colleges should reduce mathematics requirements that are unnecessarily difficult and intense.

Most high school students have difficulties in studying mathematics and have negative attitudes toward mathematics, but the causes of these two phenomena were different. Students' attitudes toward mathematics are affected in a subtle way by their learning process. As Ma(1999) recommended, teachers need to know not only mathematical contents, but also students' affective aspects toward mathematics. Thus, we need to a long term and in-depth research on students' psychology, curriculum, teaching and learning methods, and college admission systems.

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초 록

본 연구는 일반 고등학교와 외국어고등학교에 다니는 학생들의 수학에 대한 태도를 연구하는데 목적이 있다. 연구자들은 학업성취도가 중간 정도의 학생들인 일반 고등학교의 학생들과 상위 수준에 있는 외국어고등학교 학생들이 수학에 대하여 어떤 태도를 가지고 있고, 이런 태도는 어디에서 온 것인지를 탐구하였다. 이를 위하여 경기지역의 121명의 일반 고등학교 학생과 64명의 외국어고등학교 학생을 대상으로 설문을 조사하여 신뢰도, 문항 간 평균 차이, 빈도를 분석하였다. 연구결과 두 그룹의 학생들 모두 수학에 대하여 부정적인 태도를 가지고 있었으나 수학에 대한 태도의 원인은 달랐다. 본 연구는 고등학교 수학교육과정 및 각 학교에서의 수학 교육과정 및 교사들의 교수방법에 대하여 재고할 필요성을 제시하였다.

주요용어 : 수학에 대한 태도, 고등학교 학생, 외국어고등학교

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