

THE DEVELOPMENT OF SOCIOPOLITICAL CONSCIOUSNESS BY MATHEMATICS: A CASE STUDY ON CRITICAL MATHEMATICS EDUCATION IN SOUTH KOREA

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This is a case study on critical mathematics education lessons in South Korea. This study explores the development of the social consciousness of students via critical mathematics lessons in which students use mathematics as a tool to analyse social issues and to justify their claims about social issues. However, student's rarely demonstrated much development of their agency for social change after taking part in such lessons. This phenomenon is interpreted in the light of the students' Korean sociocultural background and is explained as 'reserved agency.'

INTRODUCTION AND THEORETICAL BACKGROUND

Critical mathematics education (CME) is a compelling field of mathematics education research (Stinson & Wager, 2012). However, CME has primarily been studied among students of a Western sociocultural background; CME research conducted in countries with an Eastern cultural background (including South Korea) is difficult to find. The South Korean educational environment emphasizes social mobility via educational achievement, a phenomenon which is sometimes called 'education fever,' and constitutes the distinguishing feature of education in South Korea. Thus we expected to find some interesting outcomes from CME research conducted in a South Korean sociocultural context. Based on this assumption, I conducted a case study of CME lessons given in a Korean context. Frankenstein (1983), Gutstein (2003, 2006), and Turner (2003) have all conducted research on CME lessons. Their studies about CME are based on Freire's educational theory (1972), particularly with regard to his notions of conscientization, a problem-posing pedagogy, and generative themes. The lessons in this case study are also designed based upon Freire's theories (1972). The focus of this study is the development of the sociopolitical consciousness of students through CME lessons. The development of the sociopolitical consciousness of students is explained as a developing sense of agency (Gutstein, 2003). Gutstein (2006) separates the concept of a student's agency into 'using mathematics' and 'going beyond mathematics'. 'Using mathematics' means that, through mathematical analysis, students develop an understanding of and critical mind toward social issues. 'Going beyond mathematics' means that students have a positive perception about their sociocultural background, and realize that social change can be made by collective action. This study explores the development of social consciousness in students via CME lessons through interpretation of the agency of the students.

RESEARCH METHOD

The CME lessons which serve as the basis of this study were conducted at a middle school in South Korea where the researcher worked for two years as a teacher. The lessons were conducted for five days during the students' summer vacation. The research participants consisted of students of various levels of academic ability and from a variety of socioeconomic backgrounds. The lessons were designed and conducted by the researcher. Each lessons contained a generative theme related to social issues in South Korea. The themes of the lessons were 'the gap between the rich and the poor', 'the minimum wage and the minimum cost of living', 'lookism', and 'school violence'. Each theme was chose in hopes of garnering student interest. Of the previously mentioned themes, two lessons ('The gap between rich and poor' and 'The minimum wage and the minimum cost of living' lessons) were analysed for the purposes of this study. The tasks to be solved in the lessons contained two social issue contexts and mathematical problem solving. The students participated in small group activities and whole group discussion repeatedly throughout the lessons.

Audio recording data for each group and video recording data for the whole classroom were collected. Each student's worksheets, survey and interview data were also collected as well. All data was analysed using ground theory methods. Triangulation to obtain validity of research was carried out using various sources of data and participant checking. An audit trail and constant comparison method were used while conducting data analysis.

RESEARCH RESULT AND ANALYSIS

Identifying social conflict situations through numerical analysis

The task that the students engaged in the classroom was to compare the wealth held by the six Americans, who share 59% of the world's wealth with that held by the twenty people worldwide who share 2% of the world's wealth. The students obtained detailed values related to social conflict while they solved the task.

미 59%를 가진 미국인 6명 중 한 사람은 2%를 가진 20명 중 한 사람과 비교했을 때, 몇 배의 부를 갖고 있는가?

$$59 \div 6 = \frac{59}{6} = 9.83...$$
$$\frac{2}{20} = \frac{1}{10} = 0.1$$

98배

98, 1. = 98배

Figure 1: Student's written work

Students compared the value obtained by dividing 59% into 6, and the value obtained by dividing 2% into 20 (Figure 1). They noticed that the wealthy have 98 times more than the poor. After the specific value was obtained, the students talked in small groups, as transcribed in the conversation that follows (all names of this paper are pseudonym):

- Su-bin: Oh, 90 times – that’s crazy! They’re earning 900,000 Won while I’m earning 10,000 Won. And they’re earning 1,800,000 Won while I’m earning 20,000 Won.
- Gun-yung: Wow. That’s a really big difference.
- Su-bin: Hey, this is about 100 times.
- A-reum: Yeah, it’s an amazing gap.

When students first undertook this task, they didn’t show any emotional response to it. However, after they understood the social conflict situation through mathematical analysis, they spoke about their feelings. Students’ comments like “90 times – that’s crazy!”, “Wow”, and “It’s an amazing gap” are evidence of how impressed they were by the information. Specific numbers like “about 100 times” help students to become aware of and understand more concretely the problem of the gap between the rich and the poor.

(3) 내가 속한 대륙의 사람들과 느낌을 공유해보자. 그리고 간단하게 기록해보자.

내가 속한 대륙 : 남이

사탕을 나눠받았을 때의 느낌 : 나눠받지 않았다. 그리고 아시아와 아프리카의 세계의 원인으로 보았다

Figure 2: Student’s comments about intercontinental resource (wealth) distribution

Some students applied the understanding of social issues that they acquired through the CME lessons to a broader context. While students solved the task related to intercontinental resource (wealth) distribution, one student remarked, “It helped me to understand the causes of the civil wars in Asia and Africa” (Figure 2). This concrete awareness that arose from mathematical analysis helped this student expand his thinking about social issues.

Justifying assertions using mathematical investigation

Students tried to justify their assertions using mathematical investigation. One student analysed the annual data about the minimum wage and the minimum cost of living by proportional thinking (Figure 3).

연도 (1월기준)	2001	2003	2005	2007
최저임금	1,865원	2,275원	2,840원	3,480원
최저생계비	956,250원	1,019,411원	1,136,332원	1,205,535원

1: 512 1: 448 1: 400 1: 346

마침내 수정은 2015년도의 최저임금을 결정할 수 있었다. 수정 적고, 그 이유를 설명하시오.

Figure 3: Ye-jun’s worksheet

This analysis was conducted to account for the rate of increase of the minimum wage by showing it as a ratio of the minimum wage and the minimum cost of living. Because the ratio gradually reduced, (1:512, 1:448, 1:400 and 1:346), though, the student's analysis couldn't be used to account for the change. However, his use of data was meaningful because it emerged from his own thought. After a while, he changed the focus of analysis from the ratio of the minimum wage and the minimum cost of living to the rate of increase of the two components.

Ye-jun: Look! In 2000, the minimum cost of living was 928,398 Won, and now, it is 1,546,000 Won. The minimum cost of living has increased 1.7 times, but the minimum wage has only increased 1.08 times. So the minimum wage should be higher.

He said that the rate of increase of the minimum cost of living and the minimum wage are 1.7 and 1.08 each, so he claimed that the minimum wage should be increased in proportion to the minimum cost of living. This demonstrates how he used mathematics to justify his assertions with regard to a social conflict issue, i.e. his 'using mathematics. (Gutstein, 2006).

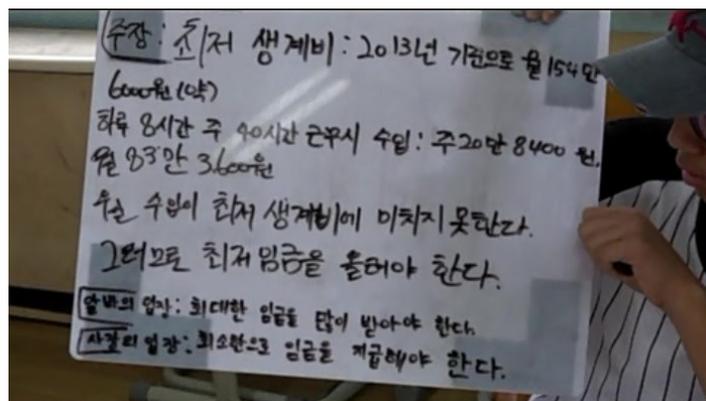


Figure 4: Student's assertion regarding minimum wage

Another student analysed one's total monthly income when one works for minimum wage (Figure 4). He found that the monthly income of a labourer who receives minimum wage is 833,600 Won (about 800 U. S. dollars) in 2013. He thus showed that this level of income was lower than the minimum cost of living and asserted that the minimum wage should be increased. It is another example of a student using mathematics to justify his own claim.

Sense of agency for social change

One's sense of agency is a person's reaction to a social conflict situation as a member of society. The agency for social change of students can be seen in their 'going beyond mathematics' (Gutstein, 2006). The previous examples show that mathematical analysis was actively occurring in the classroom. However, the students didn't take an active stance with regard to the individual's role in social change.

■ 오늘 수업의 소재(분배, 정의)와 나는 어떤 관계가 있는걸까?

도둑이
하위층은
잘살려면 공부해야한다

Figure 5: Student worksheet #1

■ 오늘 수업의 소재(분배, 정의)와 나는 어떤 관계가 있는걸까?

빈부격차의 심각성을 느껴야한다는 생각이 들
국가나 나라 무관하게 빈부격차 양극화가 다뤄지는 것을 개악했다.
상당한 것 같다.
너도 열심히 살아서 상위 1%가 되어보겠다.

Figure 6: Students worksheet #2

In the first student response (Figure 5), the student asserts that, “We should help the lower class. In order to have a good life, I have to study.” These sentences present the student’s awareness of the gap between the rich and the poor, but it doesn’t mention any concrete actions one can take to reduce that gap. The only action the student mentions is that “I have to study” to achieve social success. The second student response (Figure 6) repeats a similar sentiment. Although the student mentioned “The severity of the gap between the rich and the poor,” the student also said, “I will live in the top 1%, so I have to work hard.” In short, the student’s perceptions about the social conflict situation and their vision for their role in bringing about social change are not consistent. This is quite different from the results of previous studies by Gutstein(2003, 2006) and Turner(2003) which showed growth in the critical agency of the students involved. In the case at hand, the students didn’t mention any actions that they could take to bring about social change, but instead focused on their own personal success. However, interviews with students showed that students are not just selfish. But that they already understand the prerequisites for social change.

Teacher: Why do you say that nothing is going to change?

Ye-won: Umm... I have seen many social movements, but such movements failed to reach a critical mass and bring about real social change... Still, many people have no interest in social change, they just want to become upper class. Some people’s struggle for social change will fail. Now, only people with wealth and power can change our society. Otherwise, every endeavour for social change will fail.

Teacher: So, you don’t think that we can solve such socioeconomic problems?

Ye-won: I think it’s possible to make a movement of a small number of people. But a small number of people has no power.

Yoon-seo: Our government doesn’t do anything for (poor) people.

Ye-won: We have a government that is only interested in money...

Yoon-seo: I think the gap between the rich and the poor is a serious problem in our society. Our government frequently talks about welfare policies and how to fix this problem, but they do nothing.

The students saw people’s participation in social movements and support of policies to help unprivileged groups as preconditions for social change. However, in their view, the Korean socio-political situation, so the students couldn’t see a way to bring about

social change via collective social action. In response to this reality, the students chose a more individualistic way. They decided to “study hard.” If we take a superficial view of this notion, such a choice seems far from affecting social change. This differs from previous studies where the participating students wanted to act to bring about social change, a sentiment which appears to be more proactive on the surfaces. The results of CME methods are closely connected to the social environment in which the research is conducted. Therefore, an attempt to interpret the students’ ideas as to how to affect social change based upon their sociocultural background is reasonable and consistent with the purpose of this study. Thus the interpretation of the students’ responses with regard to their Korean sociocultural background is as follows.

First, we should consider several features of the study’s participants. The participating students chosen in Gutstein(2003, 2006) and Turner’s (2003) studies were typically social minorities. Because the identity of each group was largely homogenous, the participants expressed a common stance toward social conflict situations. However, the participants in the present study were students of various socioeconomic level and members of the ethnic majority of their country. Accordingly, the participants did not have a common position on social problems, and their awareness of social issues varied by student. Therefore the students tended to choose the more individual way of “studying hard” rather than collective means of seeking social change.

Second, we should consider the sociocultural context in Korea. In Korea, educational achievement is emphasized as a means of social mobility (Lee, 2006). Students are pressured to to enter a prestigious university, get a well-paying, respectable job, and work for the advancement of their family. Therefore, students are encouraged to focus on trying to get higher grades rather than participate in social movements. Meanwhile, the participation of secondary school students in social movements is considered unnecessary, and most parents of such students would not approve of such pursuits. Based on this background, the students that participated in this study thought that they couldn’t act for social change because they are students. Students regard taking action to affect social change as the exclusive property of adults. Consequently, the range of their imagination as to their role in affecting social change was limited to simply “studying hard”.

As previously noted, students understand the prerequisite conditions for social change and believe in the need for social change. However, the possible avenues for social change in which they can participate is restricted by their sociocultural background. To their minds, the students’ agency can be manifested after they acquire educational achievements and social mobility. Although their sense of agency is already developed, its manifestation is delayed. I have termed this kind of later-appearing agency ‘reserved agency.’ Figure 7 below provides an explanation of reserved agency.

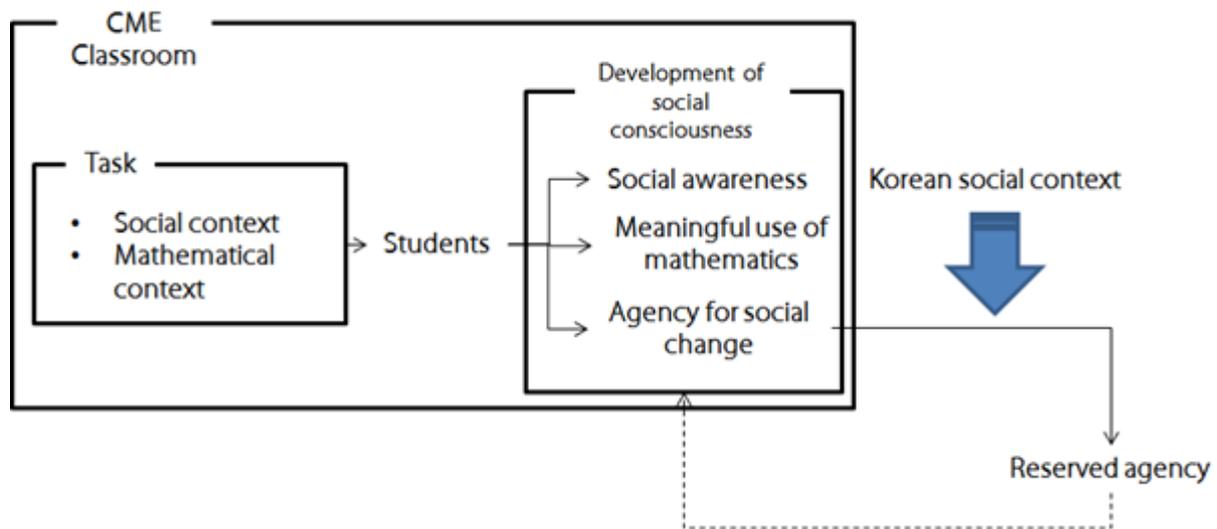


Figure 7: Emergence of reserved agency

We can conceive of reserved agency as a result of the conflict between the student's agency for social change that emerged from CME lessons and sociocultural restrictions. However, reserved agency partially affects the student's agency for social change at the present point because reserved agency gradually induces changes in the student's perspective on social issues. One student stated how her own view on labour strikes changed. The following interview was conducted 4 months after the CME lessons.

Teacher: Have you experienced any change in your attitude towards labourers after the CME lessons? For example, with regard to labour strikes?

A_reum: I think I feel bad for them now.

Teacher: How did you used to feel?

A_reum: I never gave them much thought before. After [the CME] lessons... I understand the social situation and I know why they go on strike, so I understand their position. I listen carefully to what they say.

The dotted line from 'reserved agency' to 'agency for social change' in Figure 7 means the affection of reserved agency. Thus, we can regard a change of view as an evidence of the existence of reserved agency.

CONCLUSION

This study sought to examine the effect of CME lessons in Korea. In particular, this study focused on the development of social consciousness among the study's middle school student participants. This study sought to explain why the student's sense of agency for social change is limited and reserved sociocultural restrictions. This phenomenon, termed 'reserved agency,' is a consequence of the conflict between the students' development of agency and the restrictions of their sociocultural background. However, reserved agency subtly induces the development of the students' sense of agency at the present point as well. This study show not only how CME can induce the

development of social consciousness of students in the Korean sociocultural context, but also how the Korean sociocultural background of such students influences their experience of CME lessons. This implies that practice and interpretation based on social context is important for the implementation of CME. Considering the methodological limitations of this study, the conclusions of this study may not be easily generalized to other contexts. However, this study can contribute positively to a greater understanding of how CME might be used in Korea by suggesting the phenomenon of reserved agency.

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