

## **DIFFUSION OF SCIENCE THROUGH COMMUNITY SCIENCE CLASS IN DAEGU AND GYEONGBUK IN KOREA**

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### **Abstract**

The Community Science Class in the Daegu-Gyeongbuk area was inaugurated in October, 2004, by the Association of Daegu-Gyeongbuk Women in Science and Engineering, with the support of the Korea Science Foundation. At present, it is conducting 19 *dong*(subdistrict) level classes in Daegu City, 2 classes in Gyeongbuk Province, and 6 orphanage classes, A class accommodates 10-25 children, from the third to the sixth grade. Classes are held once a week at *dong* offices, and once a month at orphanages; well qualified instructors teach math, physics, chemistry, and biology. It also conducts four special programs a year--such as environmental exploration, visit to science museum, and participation in science festivals in town. A class is run by a team of three instructors including a head instructor. They regularly meet for discussion and participate in at least four workshops a year to review the contents of their teaching materials. and different programs were run in each term. In 2005, the average rate of class attendance was above 90%, and the rate of students' satisfaction was also high. The increase in parents' interest resulted in the inauguration of the "Science Mom" program. Overall, our program contributed to the diffusion of science. But we have yet to solve these problems: the standardization of teaching material, a better linkage with science teaching in elementary schools, increase in time of student participation, and measures to ensure instructors status.

### **1. Introduction**

A proper understanding of science is essential for human life in the 21st century, and the advancement of science provides the dynamics of development for a community, a country, and the humanity. Recently, however, Korean high school students tend to shun science and engineering, making the prospect of science rather gloomy.

The Korea Science Foundation devised community science class as a means of tackling this problem. This program purports to cultivate affinities to science among the general public and enhance the level of scientific knowledge among the children responsible for science tomorrow. Our association introduced this program to the Daegu-Gyeongbuk area in October 2004, which grew from 3 subdistrict-level classes at the outset to 27 classes today, including 6 orphanage classes.

In this program, we let the students conduct the lab experiments they read about in their school books and realize how interesting a subject science is. The students also conduct experiments on some common phenomena they observe daily, so that they can realize how much science has to do with our daily life. Children from low-income families and in orphanages, who had little access to extracurricular education, can now enjoy special opportunities of science education, and we hope this would facilitate their social adjustment as well.

The CSC instructors were selected from well qualified women with graduate education in the basic sciences, and they went through training session. Now they handle the students, teach the classes, and design programs for lab experiments.

In this report, we will summarize our CSC operation, from October 2004 to May 2006, commenting on its achievements, limitation, and prospects.

## **2. Operation of Community Science Class**

### **2.1. number of classes and students**

In October 2004, we inaugurated 3 classes at subdistrict(*dong*) offices in Daegu: Bangchon-dong(Dong-gu), Samdeok-dong(Jung-gu), and Sindang-dong(Dalseo-gu). We added 7 classes in January 2005, and added another 5 classes in March 2006--thus conducting 15 classes by the end of the year. In January 2006, we added 4 classes in Daegu and 2 classes in Gyeongsan city, Gyeongbuk province. By May 2006, we conduct weekly, an-hour classes at 21 subdistrict offices. We visit 6 orphanages in Daegu once a month to conduct an-hour classes. Table 1 lists the names of those subdistricts and orphanages, and the number of participants.

### **2.2 Operation of the basic program**

We divide a year into four terms, two 4-month terms (spring and fall semesters) and two 2-month terms (summer and winter vacations), in line with the school schedule. The first term runs from March to June, the second from July to August, the third from September to December, and the fourth from January to February. Two weeks before the beginning of each quarter, we send official notes to the participating subdistrict offices, together with our program brochures and application forms. Then the subdistrict offices relay these material to elementary schools in their vicinity, with their own official notes. The elementary schools send the lists of applicants to us via the subdistrict offices. Then we make the rosters of the classes and buy accident insurance for the students. In case of the orphanages, officials of Daegu city visit the facilities, select the ones for CSC, and make the schedules. The classes are held once a week at subdistrict offices, and once a month at orphanages.

### **2.3 Instructors**

Instructors are selected from those who have masters degrees in basic sciences, with an eye to an optimal distribution among the four fields of math, physics, chemistry, and biology. Except for the first batch, they have to go through training sessions, and attend four CSC sessions as assistant instructors before they conduct their own classes. From 2006, those who have completed our 'Science Communicator' courses are given

Table 1. List of Community Science Classes and Number of Students in Daegu and Gyeongbuk

Area	Community center		Orphanage	
	Name	No. of student	Name	No. of student
Daegu	Daemyung 4-dong	10	Aesang	16
	Samdeok-dong	21	Daesung-Won	23
	Beomeo-dong	12	Bethany	14
	Bangchon-dong	23	Nasum	16
	Sindang-dong	15	Sungrim	22
	Shinam 4-dong	25	Dague-Shinmangae	11
	Shinam 5-dong	20		
	Shinchun 3-dong	13		
	Ansim 1-dong	14		
	Ansim 3,4-dong	10		
	Wondae-dong	13		
	Yongan 1-dong	26		
	Yongan 2-dong	15		
	Janggj-dong	21		
	Dowon-dong	13		
	Igok 2-dong	24		
	Haean-dong	20		
	Hyomok 1-dong	15		
	Hyomok 2-dong	16		
	Gyeongbuk	Jungang-dong	17	
Seobu 1-dong		18		
Total		361		102

priority in their appointments as instructors. Each quarter, instructors in the same fields hold workshops and discuss their contents of instruction. We take the instructors' major fields into account when we draw up the teaching schedules. In addition to teaching classes, the instructors are responsible for communications with the students, parents, and subdistrict offices. Assistant instructors should have a bachelor of science degree, and they have no obligation to attend the training programs. Table 2 show the composition of the current instructors.

#### 2.4. Operation of special programs

Special programs were outdoor activities including observation of plants and fishes, visits to science education institute and participation of Daegu science festivals. The ones in year 2005 were listed in Table 3.

**Table 2.** Majors and Status of Instructors of Science Classes in Daegu and Gyeongbuk

Major	Status (Number)			Total	
	Ph.D	M.S.	B.S.	Number	%
Mathematics	2		2	4	29
Physics	1		1	2	14
Chemistry		1	2	3	21
Biology	2			2	14
Others	1	1	1	3	21
Total (Number)	6	2	6	14	100

**Table 3.** Special Programs for Science Classes in Daegu During Year 2005

1	Program	Visit to Youngnam Ecology Institute		
	Date	2005.2.21 - 23	Number of participant	132 CSC students
2	Program	Outdoor observation of fresh water fishes and plants		
	Date	2005. 5. 28	Number of participant	130 CSC students
3	Program	The 3 <sup>rd</sup> Daegu Science Festival		
	Date	2005.10.15 - 16	Number of participant	~2000 Elementary students in Daegu
4	Program	Visit to Daegu Science Education Institute		
	Date	2005. 12. 24	Number of participant	69 CSC student

### 3. Evaluation

An evaluation of CSC operation was conducted in both ways: quantitative and qualitative. The quantitative evaluation was conducted with questionnaires on (1) attendance rate, (2) student satisfaction, and (3) instructor devotion. The attendance rate is based on the 2005 data, leaving out the data from the first quarter of 2006 now in progress. The qualitative evaluation is drawn from the answers to subjective questions in the questionnaire as well as the opinions of the people involved in the project.

## 4. Achievements and secondary effects

### 4.1. Development of contents for class instruction

In the four quarters of 2005, textbooks comprised 53 items of lab experiments, and Table 4 shows their breakdown by fields. Physics entries accounted for over 40% of the total, whereas biology items were quite few. This does not match either with the breakdown of instructors' major fields shown in Table 2.

Table 4. Fields and Number of Experiment Items Used in Science Classes in Daegu in 2005

Field	Mathematics	Physics	Chemistry	Biology	Others	Total
Number	13	22	13	4	1	53
%	24	42	24	8	2	100

### 4.2. Quantitative achievements

#### 4.2.1 Registration and attendance

Table 5 shows the total numbers of registration and attendance, term by term, at 15 subdistrict(dong) science classes in Daegu, 2005. The attendance rates were very high at above 90%, evenly spread through the four terms. In orphanages, the attendance rates were almost 100%, as the classes were held at the facilities where the students lived.

Table 5. Attendance Rate of Fifteen Science Community Classes in Daegu in 2005

Term	Period	Number of Registration	Average number of Attendance	Rate of Attendance (%)
1	Jan - Feb	152	139	91.4
2	Mar - Jun	240	218	90.8
3	Jul - Aug	241	217	90.0
4	Sep - Dec	222	202	91.0
	Annual total	855	776	90.8

#### 4.2.2. Students satisfaction

One hundred thirty nine students (74 boys, 65 girls of mostly 3<sup>rd</sup> to 6<sup>th</sup> grade) in the CSC finished the questionnaire consisted of time of attendance, motivation of participation, satisfaction with the CSC. As shown in Table 6, majority of students were satisfied with CSC and three fourths of them regarded the CSC helpful to understand science better.

Table 6. Students' Motivation and Degree of Satisfaction with the Community Science Class in Daegu

Sutdents' Motivation	Parent	Teacher	Friend	Self	Others
	74 (51%)	13 (9%)	3 (2%)	46 (32%)	4 (3%)
Time of Attendance	< 6 Mo		6 Mo – 1 Yr	> 1 Yr	
	98 (68%)		11 (8%)	28 (19%)	
Satisfaction	Yes : 119 (87%)		No ; 18 (13%)		
Help to Understand Science	Yes : 104 (75%)		No ; 33 (25%)		

#### 4.2.3. Instructor Devotion

Instructor devotion was evaluated by 6 observers in different classes filling questionnaire consisted with preparation, operation, teaching content, finishing-up of the class. Evaluation was graded with 5 scale measures from 1 to 5. As shown in Table 7, all the items were evaluated as over 4.5 except safety education.

Table 7. Evaluation of Instructor Devotion in Community Science Class in Daegu

Category	Items	Average point
Preparation	Starting on time	4.5
	Preparation of experimental materials	4.7
	Safety education	4.3
Operation	Drawing the interest in the study subject	4.8
	Drawing attention	4.7
Teaching contents	Explaining the subjects at the student's level	4.8
	Explaining with proper examples	5
	Teacher's comprehension of the subject	5
Finishing-up	Proper conclusion, quiz and homework	4.8
	Cleaning	4.5
Total average point		4.7

### 4.3. Qualitative achievements

#### 4.3.1. CSC at subdistrict offices

Generally, participating students' interest in science has been increasing. About half of the classes was so successful that the applications for the next term far exceeded our capacity. Such favorable response can be attributed, in part, to the initiatives of subdistrict offices (Bangchon-dong, Janggi-dong, and Wondae-dong), and to parental enthusiasm (Bangchon-dong Samdeok-dong, Sindang-dong, Yongsan 4-dong). In Sandeok-

dong, the principal of an elementary school in vicinity took a great interest in our program and played an active role in the selection of participants and the conduct of classes. In Daemyong 5-dong, where students come from low-income families, the number of participants are smaller than other subdistricts, but they are participating consistently, and their passive attitudes at the start are turning to active ones, with increasing interests in science. In about half of the class, however, there are either no increases or even declines in enrollment.

#### **4.3.2. CSC at orphanages**

Children in orphanages had access to extracurricular education like Tae-Kwon-Do or piano lessons, but no access to science education. They enjoy our csc programs, as they can perform science experiments for themselves, develop their interest in science, and pursue their inquiry into natural phenomena.

#### **4.3.3. Special programs**

Special programs like environmental observations were very popular, as they entail outdoor excursions. We set the number of participants at 100, but the applications exceeded this ceiling by more than 25%. In many cases, mothers, subdistrict officials, and school teachers accompanied the children. This provided a good opportunity to enhance their understanding of the CSC and science in general.

#### **4.4. Secondary effects**

Their involvement in our programs had impact on the outlook of subdistrict officials and parents. The officials became more positive to other science programs and more cooperative to their implementations; more parents attend the classes as observers and make suggestions on how to improve our programs. In response, our Association offered "Science Mom" classes, one in 2005 and another in 2006. In 2004, we operated 3 booths at the Science Festival held by Daegu City; in 2005, we opened 10 booths to meet the demand.

### **5. Problems to be tackled**

#### **5.1. Enlisting students**

Here we are facing a precarious situation. When we enlist students, we have to depend entirely on the subdistrict officials responsible for such matters. They may be quite helpful or restive. The head of the municipal/provincial government agreed to cooperate, but the official agreement does not seem to carry much weight at the subdistrict level. So we have difficulty in enlisting students, especially when we want to enlist students from low-income families. An incentive system might encourage the officials to be more cooperative. When it comes to small and medium-sized towns in Gyeongbuk Province, the situation is much worse. Here it is extremely difficult to enlist not only students but also instructors. This problem awaits a solution.

#### **5.2. Inadequate conditions for lab experiments**

Subdistrict offices generally offers us conference rooms for CSC programs, and they are not adequate for lab experiments. The use of fire and water is quite limited; there are no facilities for safe storage of tools and

materials for lab experiments. As a result, we have to conduct much more physics experiments than chemistry or biology experiments, as already shown in Table 4. This imbalance is unfortunate not only to the students but also to the instructors with chemistry and biology backgrounds.

### **5.3. Diversification and systematization of lab experiments**

Lab experiments so far proved quite successful, but we can improve upon them in two ways. One is to develop a great number of new items. Many students want to participate in more than one-year program. If we decide to accommodate them, we have to diversify our programs. Individual instructors can contribute much here through brainstorming. Another is to systematize and give structure to diverse programs. It will take much more time and energy, as it requires revamping and overhauling of the whole program.

### **5.4. Operation of special programs**

Special programs are very popular among students, especially when they are done outdoors, but they often cost much due to high-fare transportation of larger number of students. To reduce the expense a help is needed from the district office or other private sectors in the community. Closer cooperation with the whole community is to be sought as well as development of various programs.