Results and Analyses of TIMSS 2011 (Science) (4)
Chinese Taipei’s Case

李哲迪
LEE, Che-Di John
臺灣師範大學 (National Taiwan Normal University)

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1 Purpose
The purpose of participating TIMSS 2011 is to evaluate the outcome of education system through international comparison and trend analysis.

2 Method
1) Sample: Two stage stratified cluster sampling was applied to select students. 4284 4th graders from 150 primary schools and 5042 8th graders from 150 junior high schools participated in TIMSS 2011.

2) Instruments: The instruments for each grade include 14 booklets for achievement test, one student questionnaire, one science teacher questionnaire, and one school questionnaire.

3) Implementation: In Taiwan, the main survey was conducted between 16 May and 27 June in 2011.

3 Results
1) The overall science achievement of Taiwanese 4th graders was 552 points and did not change significantly from TIMSS 2003 to 2011; science achievement of 8th graders was 564 points and did not change significantly from TIMSS 1999 to 2011.

2) Taiwanese 4th grade students’ attitude of liking science was 10.1 and has no significant difference to international average (10.0), but this attitude of 8th graders was relatively low (9.0).

3) Taiwanese 4th graders' self-confidence of learning science was 10.1 and about equal to international average (10.0), but comparing 8th graders to other countries' students, this attitude was much low (8.3).

4) There were rural-urban differences in science achievement for both grades. It was even more serious for 8th grade students (Table 1).

4 Discussion
1) In Taiwan, there was an important curriculum reform of the Grade 1-9 Curriculum Guidelines implemented in 2004 for all grades of students. The results of TIMSS 2007 and 2011 indicated that students' academic achievement remained outstanding. However, as examining the performance of three cognitive domains (knowing, applying, and reasoning), for 4th graders, reasoning was better than knowing, but for 8th graders, the order was reversed.

2) Liking science is important for students to keep learning science and choose science-related professions. Comparing Taiwanese 8th graders to 4th graders and other countries' students, Taiwanese 8th graders did not like school science. The reason may be that in Taiwan, 4th graders have more time and chances to participate in inquiry activities and 8th graders spend more time to memorize facts and rules.

3) Rural-urban differences had been noticed by MOE of Taiwan, but according to TIMSS data, related policies did not success.

5 Conclusion
According to the above mentioned result, there are three issues should be put on the agenda of Taiwan’s educational reform.
1) Developing students’ ability of thinking.
2) Remaining the science achievement level and raising the attitude of liking science and the self-confidence of learning science at the same time.
3) Assuring students’ opportunity to learn by decreasing the rural-urban differences.

Table 1 : Rural-urban differences

<table>
<thead>
<tr>
<th></th>
<th>Population above 500,000</th>
<th>Population below 50,000</th>
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<tbody>
<tr>
<td></td>
<td>Perctage</td>
<td>Avg. Score</td>
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<tr>
<td>4th Grd</td>
<td></td>
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</tr>
<tr>
<td>Taiwan</td>
<td>10 (2.6)</td>
<td>565 (4.5)</td>
</tr>
<tr>
<td>Intl.</td>
<td>18 (0.3)</td>
<td>500 (1.9)</td>
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<tr>
<td>Avg.</td>
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<tr>
<td>8th Grd</td>
<td></td>
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</tr>
<tr>
<td>Taiwan</td>
<td>19 (3.0)</td>
<td>594 (5.8)</td>
</tr>
<tr>
<td>Intl.</td>
<td>20 (0.4)</td>
<td>494 (1.7)</td>
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<tr>
<td>Avg.</td>
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Note: Standard errors appear in parentheses.

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