

# An Investigation of Children's Interested and Not Interested Science Topics in Textbooks

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The purpose of this study was to investigate the science topics that children felt interested and not interested in textbooks for compiling science texts to improve their learning. Four hundred and eighty-eight fifth and sixth graders were invited to finish ISTQ (interested science topics questionnaire) which was composed of three subscales: (1) The science contents in textbooks (textbooks); (2) Science-related ads (ads); and (3) Science news (news). The findings in this study were based on the data collected in textbooks subscale. The analyses were conducted by *t*-test and descriptive statistics, including percentage and bar chart. The results indicated that more than 50% of the students felt interested in the five most interesting topics shown in ISTs, with only a few exceptions. However, the number of interested students dropped to about 30% when it came to the five least interested topics in ISTs. Moreover, the results of *t*-test also revealed that there were significant mean differences with different effect sizes in science achievement between different genders and between graders and areas. Finally, some implications for future research and science teaching were discussed.

*Keywords:* interest, science topic, textbook

## Introduction

It is important to realize motivation, interest and attitudes on achievement in science, these variables are school-related and significant predictors of achievement in science and amenable to change by educational interventions (Boekaerts & Boscolo, 2002; Singh, Granville, & Dika, 2002). For decades, motivation, interest and attitudes are considered as affective variables, and little bit overlapped in nature. However, they are different in the definition in the research. Motivation drives, arouses, directs and sustains people into doing something, such as an internal satisfaction, feeling of achievement, financial reward and enjoyment (Glynn & Koballa, 2006; Watkiss, 2004); Interest comprises affective and cognitive constituents. The affect constituent is positive emotions, while the cognitive constituent refers to the process of learning. They are interacting (Hidi & Renninger, 2006); Attitude refers to an evaluative, emotional reaction towards a particular object. It can be inferred, but not directly observed (DU, 2009; Tsai, 2010). Interest is more attractive to us than the other affective variables, because the majority of science experiences of scientists and graduate students began their interest before middle school (Maltese & TAI, 2010), as well as interest can be considered as a medium for learning, it is important to detect students' interest (Hoffmann, 2002).

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In recent years, numerous studies (Chang & Cheng, 2008; Hung & Hsieh, 2008; Lavonen, Byman, Uitto, Juuti, & Meisalo, 2008) stressed that interest is important for science learning. These studies have examined the relationship between interest and science learning. For example, Chang and Cheng (2008) have shown students' self-confidence and interest significantly explain the variance of their science achievement with large effect size; Hung and Hsieh (2008) found that affective response had significantly direct effects on scientific creativity and reasoning; Lavonen et al. (2008) pointed out that it is useful to know what kind of experiences that students have had in science related activities. By developing and validating the ISTQ (interested science topics questionnaire), Hsieh and Lee (2009) pointed out that the top five ISTs for elementary students were leisure and entertainment (87.1%), computer (82.1%), stationery (80.1%), innovative communications (72.1%) and environmental protection (68.3%). The ANOVA (analysis of variance) showed that science news was the most interesting topic for children.

Within these findings, it was indicated that understanding the role of interest on learning in science has attracted serious attention in recent years. However, there is a distinct lack that describes and explains interest development from the textbooks, and it differs from previous studies in the way that students' interests might clearly reflect the contents in textbooks. This study presents aspects of interest development from a further perspective. Accordingly, the three purposes of this study are: (1) To report the actual state of students' interest in science; (2) To investigate the differences in science achievement across different variables; and (3) To recommend science teaching and future research.

## Methodology

### Subject

The participants in this study were selected from five elementary schools in Kaohsiung city and county, Taiwan (R.O.C.). The subscale of textbook in IST (the science contents in textbooks) was administered to 488 fifth and sixth graders and the purpose was to explore their top five ISTs and non-ISTs in the textbooks. The participants were also divided into higher-textbook group ( $N = 72$ , scores  $\geq 108.270$  points) and lower-textbook group ( $N = 66$ , scores  $\leq 68.180$  points) based on their scores in this subscale, in which the higher and lower groups mean one standard deviation higher or lower than group mean scores.

### Instrument

The IST questionnaire developed by Hsieh and Lee (2009) was composed of three subscales of: (1) the science contents in textbooks (textbooks); (2) science-related ads (ads); and (3) science news (news). The topics of ads and news were based on students' responses to an open-ended questionnaire, whereas the items of textbooks were based on 26 science topics in 5th and 6th science textbooks, for example:

Item 10: on the topic of "combustion and fire-fighting" introduces manufacturing and testing of oxygen and carbon-dioxide, as well as fire-fighting methods;

Item 19: on the topic of "understanding of the sun" introduces the observation, location and effects of the sun;

Item 20: on the topic of "introduction & classification of plants" introduces the structure and functions of flowers, fruit, seeds, leaves, root and stem.

Modification of the questionnaire has undergone with two experts' reviews. Item analysis conducted on critical ration and corrected item—total correlation, the critical ration of each item was significant, and corrected item-total correlations were higher than three, as well as significant, which meant that the results of item analysis were fitted

the criteria. Cronbach's standardized alpha values were computed for the three subscales and the total scale and resulted in internal consistencies of 0.926, 0.857, 0.855 and 0.944, respectively. The discriminant validity described as the correlation of each scale with the other two scales is presented in Table 1. The moderate correlations for all scales were from 0.513 to 0.668, which suggest that scales measure distinct, but somewhat overlapping.

Table 1

*Discriminate Validities for the Textbooks, Ads and News Scales*

Correlation with other scales	Textbooks	Ads	News
Textbooks	1	0.526***	0.668***
Ads	0.526***	1	0.513***
News	0.668***	0.513***	1

Note. \*\*\*  $p < 0.001$ .

**Procedures**

There is a five-point scale in each ISTQ item. The scores in textbooks subscale were used as indicators to display their degree of interest in textbooks and it was the only data analyzed in this study. In order to get a general picture, the analyses were only *t*-test and descriptive statistics. Since three points is treated as the midpoint in IST, the percentages of points one and two were totalized to reveal the percentages of students feeling the topics boring and the five highest percentages of boring topics were denominated to be the top five non-ISTs. On the other hand, the percentages of points four and five illustrated the percentages of students feeling the topics interesting and the five highest percentages of interesting topics were to be named as the top five ISTs.

**Findings****Percentage of Students' ISTs and Non-ISTs**

The top five ISTs for these students were: (1) combustion and fire-fighting; (2) mechanism applied; (3) introduction and classification of animal; (4) constellation; and (5) learn about sounds. There were 59.7% to 65.3% of students who felt interested in these topics and only 14.9% to 22.5% of them felt bored about them (see Figure 1). On the other hand, the top five non-ISTs for these students were: (1) introduction and classification of plants; (2) understanding of the noise; (3) understanding of the sun; (4) production of compass; and (5) siphon phenomenon. There were 29% to 33.7% of students who felt bored about these topics while 39.2% to 46% of them felt interested in them (see Figure 2).

**Differences of Science Achievement Among Different Variables**

Table 2 presents the mean scores and *t*-test results among different variables. In higher group, the mean of SA (science achievement) was 84.820, *SD* was 11.224, in lower group, the mean of SA was 84.232, *SD* was 12.112, *t*-value is 0.296 ( $p = 0.768$ ,  $d = 0.05$ ). It is clear that there was no significant mean difference in SA between higher-textbook and lower-textbook groups.

However, in girls' group, the mean of SA was 87.472, *SD* was 9.348, in boys' group, the mean of SA was 84.280, *SD* was 12.234, *t*-value is 3.173 ( $p = 0.002$ ,  $d = 0.296$ ); in fifth group, the mean of SA was 83.701, *SD* was 11.735, in sixth group, the mean of SA was 88.617, *SD* was 9.279, *t*-value is -5.082 ( $p = 0.000$ ,  $d = -0.468$ ); in county group, the mean of SA was 84.219, *SD* was 12.102, in city group, the mean of SA was 87.657, *SD* was 9.365, *t*-value is -3.458 ( $p = 0.001$ ,  $d = -0.320$ ). These findings revealed that there were significant mean

differences with different effect sizes (Cohen, 1988) in SA between different genders, graders and students’ resident areas.

When the factor of gender was taken into considerations, some differences were found. The girls’ top five ISTs were “learn about sounds”, “constellation”, “combustion and fire-fighting”, “food preservation”, and “introduction and classification of animal”. There were 58.4% to 66.5% of girls felt interested in these topics, whereas only 15.9% to 20.2% of them felt bored about them (see Figure 3). On the other hand, the girls’ top five non-ISTs were “understanding of the sun”, “production of compass”, “introduction and classification of plants”, “rocks and minerals”, and “flowing water and the terrain”. There were 30.4% to 39.7% of the girls who felt bored, while 34.7% to 43.9% of them felt interested in these topics (see Figure 4).

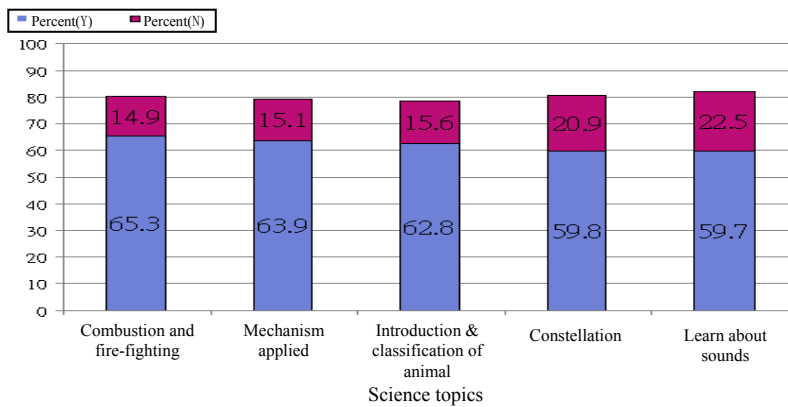


Figure 1. Top five ISTs from all samples.

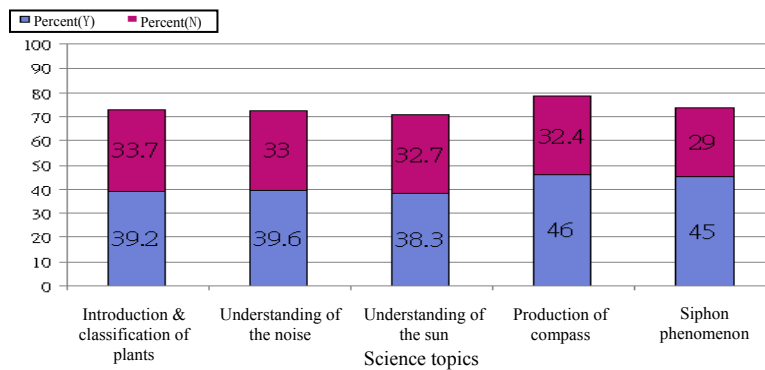


Figure 2. Top five non-ISTs from all samples.

Table 2

Mean Scores and T-test Among Different Variables

Variables	Groups	N	Mean of SA	SD	t	p	d
Textbook scores	higher	72	84.820	11.224	0.296	0.768	0.05
	lower	66	84.232	12.112			
Gender	girls	231	87.472	9.348	3.173	0.002	0.296
	boys	236	84.280	12.234			
Grader	fifth	260	83.701	11.735	-5.082	0.000	-0.468
	sixth	212	88.617	9.279			
Resident area	county	240	84.219	12.102	-3.458	0.001	-0.320
	city	232	87.657	9.365			

Notes. The original total number of students was 488. However, this study treated transferor and non-labels as “missing” data. Consequently, the valid number of students participating in this study was different, as a result of invalid samples deleted.

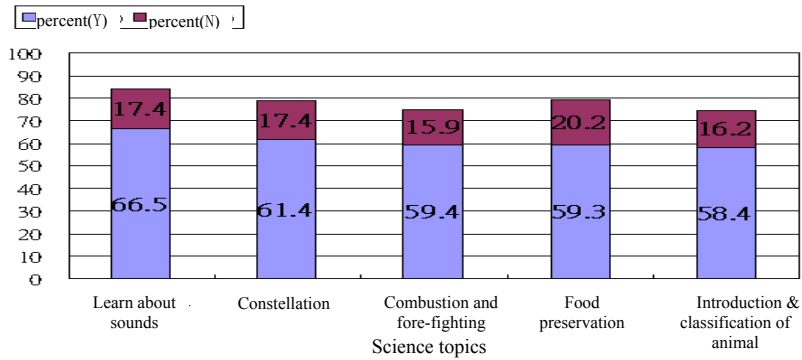


Figure 3. Girls’ top five ISTs.

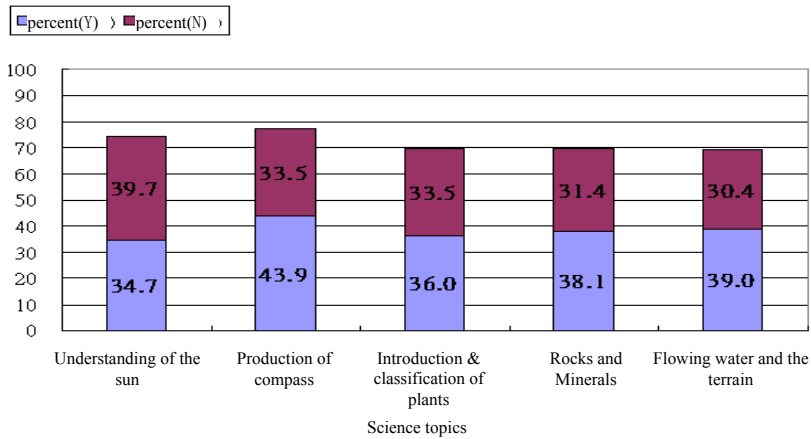


Figure 4. Girls’ top five non-ISTs.

When it came to boys, their top five ISTs were “mechanism applied”, “combustion and fire-fighting”, “introduction and classification of animal”, “movement mechanics”, and “electric magnet”. There were 64.3% to 71.6% of the sixth graders felt interested in these topics, whereas only 12.6% to 18.1% of them felt bored about these topics (see Figure 5). On the negative side, the boys’ top five non-ISTs were “understanding of the noise”, “introduction and classification of plants”, “production of compass”, “learn about sounds”, and “siphon phenomenon”. There were 27.5% to 39.9% of them who felt bored about these topics, while 34.1% to 53.1% of boys who felt interested in these topics (see Figure 6).

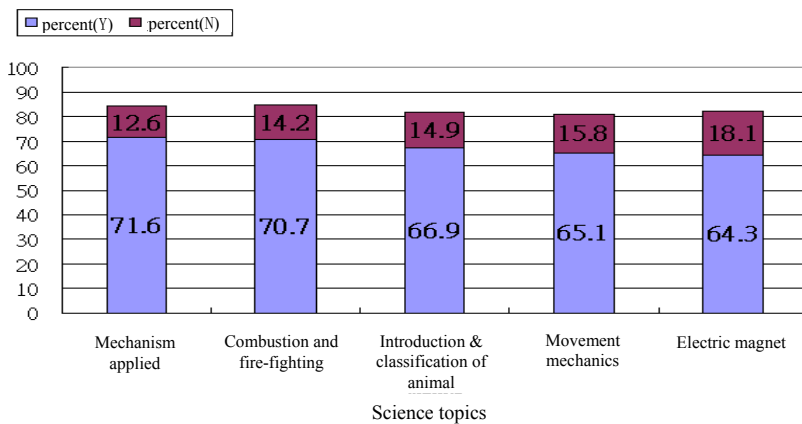


Figure 5. Boys’ top five ISTs.

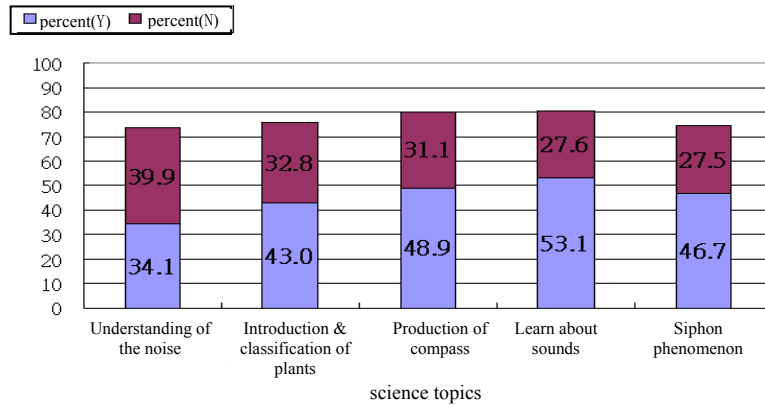


Figure 6. Boys’ top five non-ISTs.

When the factor of grades was taken into considerations, there were also some dissimilarities could be found. The fifth graders’ top five ISTs were “constellation”, “combustion and fire-fighting”, “introduction and classification of animal”, “changes in water”, and “learn about sounds”. There were 60.7% to 68.2% of the 5th graders felt interested in these topics, whereas only 13.6% to 22.8% of them felt bored about them (see Figure 7). On the other hand, the 5th graders’ top five non-ISTs were “understanding of the noise”, “introduction and classification of plants”, “understanding of the sun”, “production of compass”, and “rocks and minerals”. There were 30.4% to 38.1% of the fifth graders felt bored about these topics, while 36.7% to 48.7% of the fifth graders felt interested in these topics (see Figure 8).

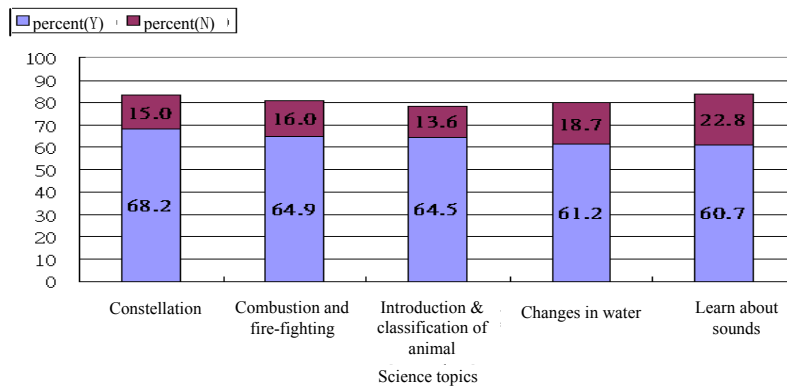


Figure 7. The fifth graders’ top five ISTs.

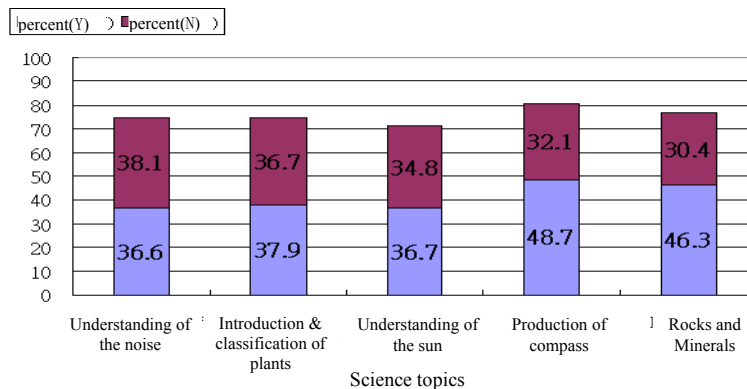


Figure 8. The fifth graders’ top five non-ISTs.

When it came to the sixth grade, their top five ISTs were “mechanism applied”, “combustion and fire-fighting”, “alien species”, “introduction and classification of animal”, and “movement mechanics”. There were 58.7% to 68.1% of the 6th graders felt interested in these topics, whereas only 12.7% to 18.8% of them felt bored about these topics (see Figure 9). On the negative side, the 6th graders’ top five non-ISTs were “production of compass”, “understanding of the sun”, “introduction and classification of plants”, “constellation”, “siphon phenomenon”, and “changes in water”. There were 28% to 32.7% of them who felt bored about these topics, while 40.4% to 49% of the six graders who felt interested in these topics (see Figure 10).

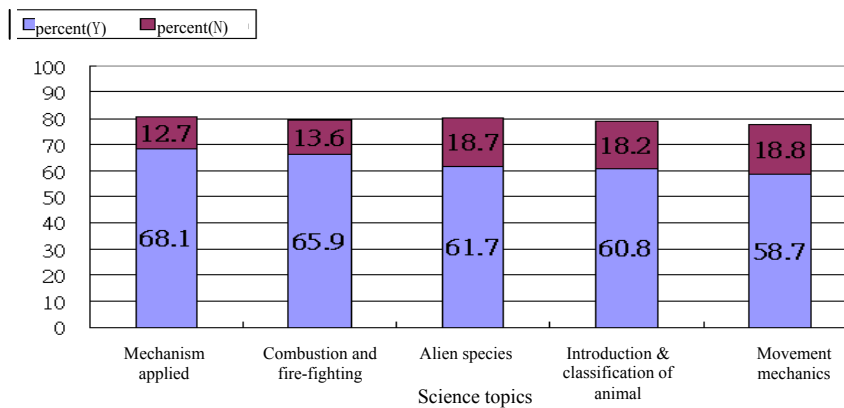


Figure 9. The sixth graders’ top five ISTs.

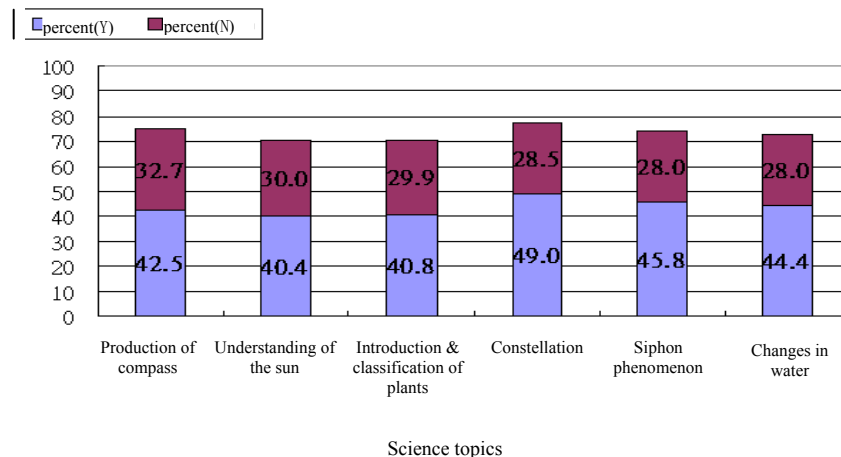


Figure 10. The sixth graders’ top five non-ISTs.

Residence area factors may also cause differences in students’ interested topics. The urban students’ top five ISTs were “combustion and fire-fighting”, “mechanism applied”, “introduction and classification of animal”, “learn about sounds”, and “substances in acid-base”. There were 56.8% to 67.1% of them felt interested in these topics, whereas only 13.8% to 25.9% of them felt bored about these topics (see Figure 11). On the other hand, their top five non-ISTs were “introduction and classification of plants”, “understanding of the sun”, “production of compass”, “understanding of the noise”, and “flowing water and the terrain”. There were 30.7% to 39.8% of them felt bored about these topics, while 33.3% to 41.9% of them who felt interested in these topics (see Figure 12).

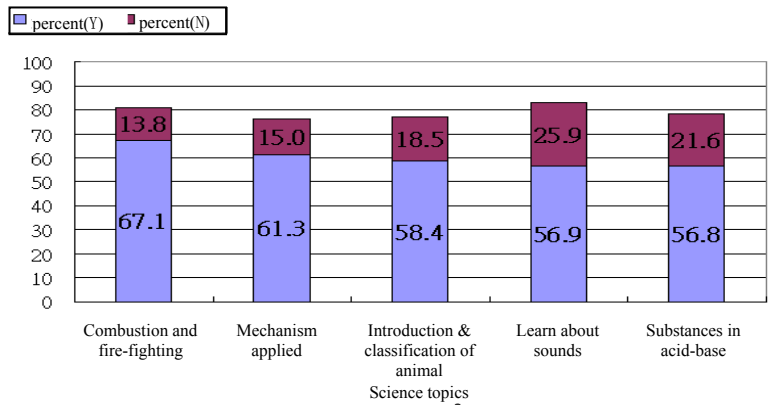


Figure 11. Urban students’ top five ISTs.

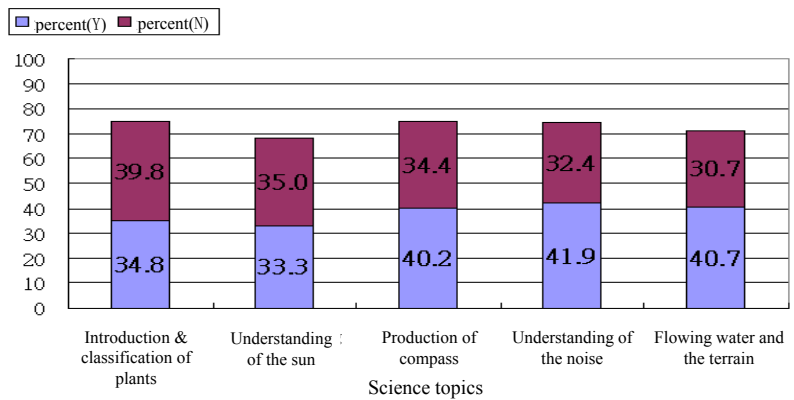


Figure 12. Urban students’ top five non-ISTs.

When it came to rural areas, students’ top five ISTs were “introduction and classification of animal”, “mechanism applied”, “constellation”, “combustion and fire-fighting”, and “learn about sounds”. There were 62.5% to 67.2% of them felt interested in these topics, whereas only 12.7% to 19.2% of them felt bored about them (see Figure 13). On the negative side, rural students’ top five non-ISTs were “understanding of the noise”, “understanding of the sun”, “production of compass”, “siphon phenomenon”, and “food preservation”. There were 27.6% to 33.6% of them who felt bored about these topics, while 37.4% to 51.6% of rural students who felt interested in these topics (see Figure 14).

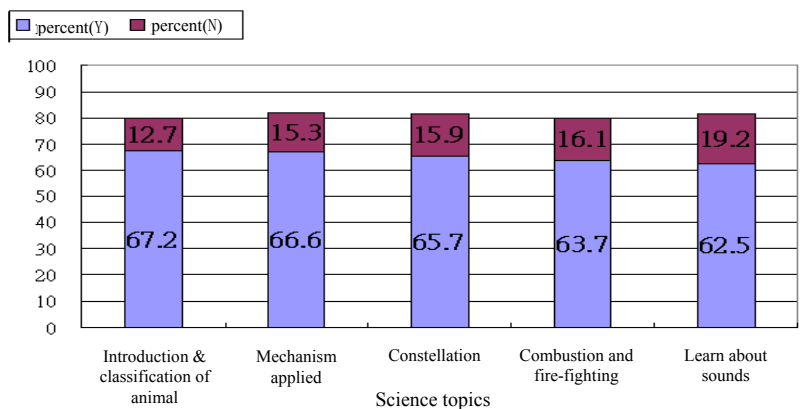


Figure 13. Rural students’ top five ISTs.



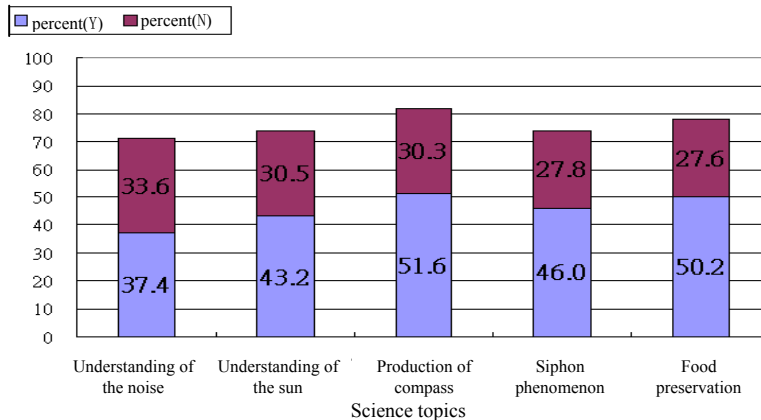


Figure 14. Rural students' top five non-ISTs.

### Implications

In this study, several interesting points were found. Firstly, there were over half of the groups who felt interested in the top five ISTs; only less than a quarter of groups did not. However, the students who felt interested in the top five non-ISTs almost dropped to less than 50%, and the students who felt bored increased by almost one-third. Moreover, “combustion and fire-fighting” and “introduction and classification of animal” are the most popular science topics for every group in these students, while “production of compass” and “introduction and classification of plants” are not. The findings reflected that most students' interest would be enhanced as they learn IST, but some students would be less interested as they learn non-IST. Secondly, there were significant mean differences with different effect sizes in SA among different genders, graders and areas. The interested percentages of boys' IST and non-IST were higher than that of girls, despite of the fact that girls outperformed boys in SA. Furthermore, the interested percentages of rural students' non-IST were higher than that of urban students', despite that the urban students outperformed rural students in SA. Moreover, there was no significant mean difference in SA between higher-textbook and lower-textbook groups. These findings are partly in accord with the results of the previous studies (Chang & Cheng, 2008; Goodrun, Hackling, & Rennie, 2001; Lavonen et al., 2008). However, Schweinle, Meyer, and Turner (2006) found that affect was essential to elementary school students in mathematics learning and positive affect could uplift students' motivation in class.

Finally, the topic of “learn about sounds” was girls' top one IST, but it was boys' non-IST and the percentages of students who felt interested in were declined by 13.4%, while the percentages of students who felt bored were increased by 10.2%. In addition, the topic of “constellation” and “changes in water” was the 5th graders' ISTs, but it was the 6th graders' non-ISTs, there was a drop of almost 20% for the percentages of students who felt interested in “constellation”, while a rise of 13.5% for the percentages of students who felt bored; a drop of 16.8% for the percentages of students who felt interested in “changes in water”, while a rise of almost 10% for the percentages students felt bored.

Some implications can be drawn from this study. For future research, since some of the 5th graders' ISTs shifted to the 6th graders' non-ISTs, it is indicated that the ISTs for most of students might be makeshift. A longitudinal study is still needed to look into the interrelation and shifts between IST and SA. For science teaching, the percentages of students' IST and non-IST in textbooks were significantly lower than that in previous investigations (Hsieh & Lee, 2009). Science teachers should connect related interesting texts to

improve students' interests and learning, moreover, they also ought to be more thoughtful of girls' responses, especially while teaching non-ISTs.

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