**Research and Accountability Department**

# EVALUATION REPORT

**BUREAU OF PROGRAM EVALUATION**

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## *New Century Energy Program: The Use of Games to Influence Attitudes, Interests, and Student Achievement in Science, 2010-2011*

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*The New Century Energy Game (NCE) was funded by Chevron and developed by Tietronix Software, Inc. in collaboration with the Houston Independent School District (HISD, industry, academic, and government partners. Through this partnership, a unique "immersive micromanagement" Smart computer game was created to provide a transformative learning experience for middle and high-school science students. NCE combines aspects of strategy, construction, and games management, requiring players to build energy companies, gaining dominant market share and meeting the needs of cities throughout the U.S. over the next 50 years. Cooperative teams of students play against artificial intelligence competing across three levels of difficulty. Variations in difficulty are incorporated into lessons that students must master in order to open options within the game. Lessons and questions are designed to lead players to game-play decisions that require understanding of physics, chemistry, earth science, and math concepts. In addition, a meta-site is available outside of game play for students to supplement their learning and success for subsequent game play. Lessons are carefully crafted within the game to encourage learning through inquiry. Lessons are aligned to the Texas Essential Knowledge and Skills standards (TEKS) (NCE, 2011).*

### Data and Methods

Qualitative and quantitative analyses, including descriptive statistics, paired t-test, and correlation were conducted to measure the impact of the New Century Energy (NCE) game participation on students' academic achievement, interest in science activities, and changes in attitudes concerning the benefits of learning science. In addition, data were captured regarding students' feelings about learning more science and pursuing careers in science before and after participation in the game. Academic achievement was assessed through the use of 10 science test items from the National Assessment of Education Progress (NAEP). NAEP is the largest nationally representative and continuing assessment measuring what America's students know and can do in various subject areas (U.S. Department of Education, IES, 2010). Released NAEP items were used by project staff in a pre/post-test assessment based on the assumption that they were aligned with TEKS and science content covered in the game. Students' interests and attitudes were gathered via a paper-and-pencil survey at pretest; however, an electronic survey format was used at posttest. Students accessed the electronic posttest survey on the Tietronix Software, Inc. website. Past research has identified issues related to the comparability of online and paper assessments (Waley, 2006). However, the survey administration format was modified to improve the response rate and to ensure students' anonymity. While the level of participation in the game could have influenced students' interests, attitudes, and assessment results, these relationships were not measured since personal identifying information on students was not collected by game administrators.

**Study Sample**

All HISD middle and high school teachers were invited to participate in the NCE game, to be played over a course semester (approximately 3 months). Although more than 600 students were captured in the NCE game as participants at various levels (Tietronix Software, Inc.), only students identified by teachers as participants are represented in the data. The paired sample used in

Table 1: Profile of Students Participating in New Century Energy Game (NCE) Project, 2010-2011

| Social Factors | NCE Game Students (n=224) | | HISD (grds. 6-10) (n=65,611) | Academic Factors | NCE Game Students (n=224) | | HISD (grds. 6-10) (n=65,611) |
|---|---|---|---|---|---|---|---|
| **Grade Level** | **n** | **%** | % | **Special Ed.** | **n** | **%** | % |
| Middle (6th, 7th, and 8th) | 189 | 84.4 | 58.5 | Yes | 20 | 8.9 | 10.7 |
| High (9th and 10th) | 35 | 15.6 | 41.5 | No | 204 | 91.1 | 89.3 |
| **Gender** | | | | **G/T** | | | |
| Male | 134 | 59.8 | 51.4 | Yes | 73 | 32.6 | 14.8 |
| Female | 90 | 40.2 | 48.6 | No | 151 | 67.4 | 85.2 |
| **Ethnicity** | | | | **CTE** | | | |
| Hispanic | 121 | 54.0 | 60.0 | | | | |
| African American | 80 | 35.7 | 27.8 | Yes | 34 | 15.2 | 27.4 |
| White | 11 | 4.9 | 8.0 | No | 190 | 84.8 | 72.6 |
| Asian | 11 | 4.9 | 3.1 | | | | |
| Pacific Islander or Bi Racial | 1 | 0.4 | 0.7 | | | | |
| **Economically Disadvantaged** | | | | **ESL** | | | |
| Yes | 186 | 83.0 | 77.6 | Yes | 28 | 12.5 | 15.5 |
| No | 38 | 17.0 | 22.4 | No | 196 | 87.5 | 84.5 |

the statistical analysis was comprised of only students with both pre- and post-test survey and assessment results.

## Background

Many researchers are challenging educators to employ more innovative approaches to science education. This is partly due to cognitive research highlighting the multifaceted process required to learn science (National Research Council, 2005, 2007, 2009). Mundie (2011) maintains that "Technology has the potential to help reinvent the education process, and excite and inspire young learners to embrace science, math and technology" (p.1).

In efforts to add to the body of knowledge, researchers have discovered that, "the best educational activities connect not only to important concepts but also to students' interests and passions" (Games for Learning Institute, 2011, p.1). Computer games are inherently interactive, and have increasingly become a new and innovative approach to teaching and learning science as they capture the attention of youth. In addition, computer games allow students to be transported into another reality and engage in activities that simulate the real world while exploring natural phenomena that they cannot directly observe (Games Research, 2011; Mundie, 2011).

There are few studies that examine the extent to which games motivate students' interest in science and science learning. There is even less evidence regarding whether games support other science learning goals. The National Science Foundation (n.d.) reports positive learning benefits associated with computer use in schools; however, the magnitude of the benefits vary based on student characteristics, subject matter, and computer application. While there are gaps in the research on which gaming features contribute to student learning, this study may build on the body of evidence relative to the effectiveness of games toward enhancing students' perceptions of science.

## What was the profile of students who participated in the NCE game?

There were more than 600 students who created avatars for the NCE game; thus, demonstrating some level of participation. However, to ensure anonymity to external collaborators, no personal identifying information was captured on these students, rather team names. Consequently, a profile, depicting social and academic factors of only students whose teachers identified them as participants, is represented in this evaluation.

### Social Factors

**Table 1** represents the profile of NCE game participants. As shown in Table 1, 224 students were included in the student sample. Eighty-four percent of the students were enrolled in HISD at the middle-school level compared to 15.6 percent at the high school level. The majority of students were Hispanic (54.0 percent). African-Americans were the second highest represented student group at 35.7 percent. Students were far more likely to be economically disadvantaged than not.

Comparatively, there were higher proportions of students district wide than students participating in

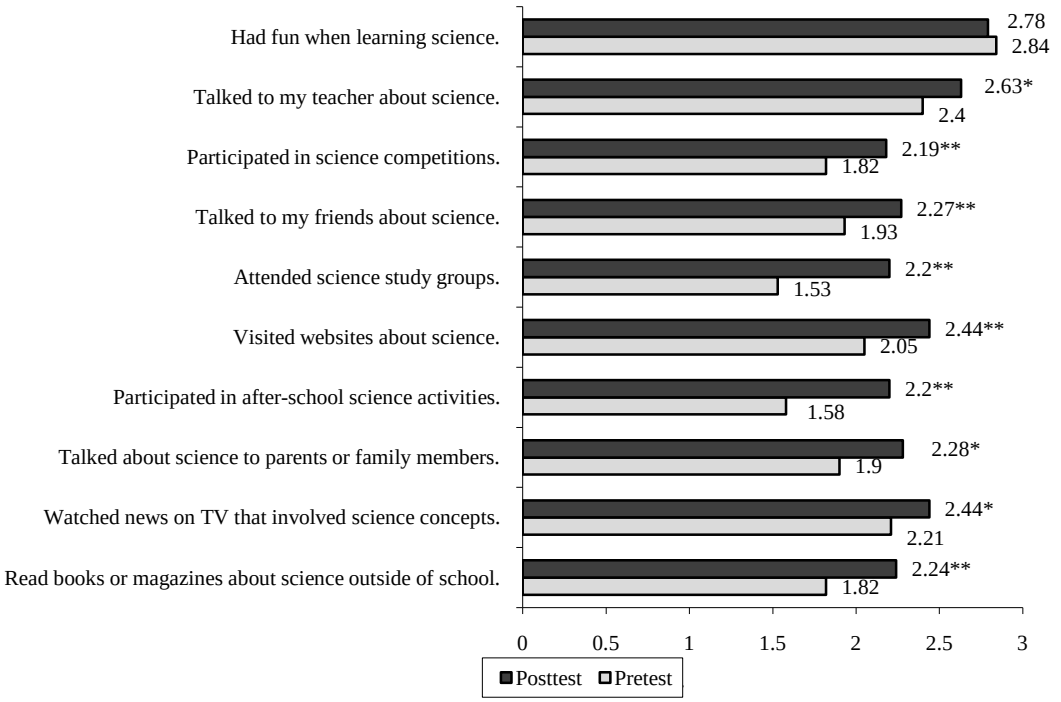


Figure 1. Mean rating on survey items measuring interest in science on sample of students (n=88).
***Note: Values with ** represent statistical significance at p<.001, * p<.05; Statistical significance detected in overall mean interest rating from pre- to post-test (p<.01).***

the NCE game who were middle and high-school students. At the same time, a higher proportion of males than females were represented among participants of the NCE game than the comparable district wide subgroup of the population. Relative to ethnicity, African American and Asian students were more likely to participate in the NCE game, while Hispanic, White, and Pacific Islander/Bi-racial students were less likely to have participated in the NCE game than their district wide counterparts.

**Academic Factors**

Additional demographic characteristics of the NCE game student sample included students in special education, Gifted/Talented (G/T), Career and Technical Education (CTE), and English as a Second Language (ESL) programs. G/T students were nearly one-third of the NCE student sample compared to about 15 percent of the district subgroup of middle and high-school students. There was slightly less representation of students in special education (8.9 percent vs. 10.7 percent) and moderately less representation of CTE students (15.2 percent vs. 27.4 percent) among NCE game participants than the district student group.

## How were students' interests in science affected by participation in the NCE game?

**Figure 1** depicts survey results, captured using a Likert-type scale, rating the extent students engaged in activities conceptualized as measuring interests in science. The scale used for measurement was: very often-4; regularly-3; sometimes-2; and never or hardly ever-1. The pretest survey was administered prior to participation in the NCE game. The same survey was administered at the end of the project. Errors were coded as missing data, resulting in a sample size of 88 students who completed both the pre- and post surveys. The findings should be viewed with caution, considering the small paired sample size in proportion to all NCE game participants. (Additional interests survey results can be found in **Appendix A**.)

The mean interest ratings depicted in Figure 1 show that, survey participants were more likely to have engaged in activities, such as science groups ($p<.001$), science competitions ($p<.001$), read books or magazines about science outside of school ($p<.001$), participated in after-school activities

(p<.001), watched news on TV about science (p<.05), and visited science websites (p<.001) after participating in the game. In addition, a higher percentage of students indicated having talked to teachers (p<.05), friends (p<.001), as well as parents and family (p<.05) about science after the game compared to before the game. At pre-test, the mean rating for the items ranged from 1.53 (between never and sometimes) to 2.4 (between sometimes and regularly). In contrast, a slightly lower percentage of students indicated that they had fun when learning science after (2.78) vs. before the NCE game (2.84). It should be noted that this activity received the highest rating among all items at both the pre- and post-test intervals, which could have resulted in the regression in the mean rating over the time span.

A paired t-test analysis showed a statistically significant increase in the overall mean rating from pre-test (M=2.01, SD=.59) to post-test (M=2.36, SD=.42, t(82)=6.641, p<.0001). The 95% CI [.448, .241] for the difference of two means did not include zero, which provides additional evidence that there is a significant difference between the pre- and post-test mean interest rating. The eta squared statistic (.39) indicated a large effect. Again, statistical significance was detected at p<.001 (**) and p<.05 (*) for selected items (Figure 1.)

**To what extent were students' attitudes about science influenced by the NCE game?**

A similar Likert-type scale measuring students' interests in science was developed to rate their attitudes about science. The scale used to detect attitudes was: strongly agree-4; agree-3; disagree-2; and strongly disagree-1. The same instrument was administered at pre- and post-test. Eighty-eight students completed both the pre- and post-tests. Only these data were included in the analysis. The results should be viewed with caution due to the small sample size relative to all NCE game participants. (Attitudes survey results can be found in **Appendix B**.)

A mean attitude rating was calculated for each survey item (**Figure 2)**. Survey respondents were more likely to express a positive change in attitude concerning having a career involving energy (oil, wind, solar, nuclear, biomass, natural gas) (p<.001), having a career involving science (p<.05), and studying science after high school (p<.001) after participation in the project. Further, a slightly higher proportion of students acknowledged that they would like to work on science projects as an adult and that science is useful to them after participation in the NCE game compared to before the game. The rates reflecting positive change increased from 2.01 (between disagree and agree) at pre-test to 3.18 (between agree and strongly agree) at post-test. The largest positive difference from pre- to post-test was noted on the item indicating that they would like to have a career involving energy (2.01 at pre-test and 2.37 at post-test), followed by a career involving science (2.50 at pre-test and 2.76 at post-test).

In contrast, the data reflected a decrease in the proportion of students who expressed that the game would help them learn difficult science theories that they did not understand without seeing it in the game and who indicated that they like studying science. Moreover, a statistically significant decrease was noted on the items where students expressed that science would help them become more successful (p<.05), studying science will improve their career opportunities (p<.001), that studying science will help them get into college (p<.001), and that they were interested in learning more science (p<.001). All of these items were among the most highly rated items at pre-test, possibly resulting in a regression toward the mean rating. A paired t-test analysis found a slight increase in the overall mean attitudes rating from pre-test (M=3.08, SD=.61) to post-test (M=3.09, SD=.71, t(77)=.022, p<.983). These results were not statistically significant at the p<.05 level. The 95% CI [-.117, .119] for the difference of two means contained zero, further indicating no significant difference between the pre- and post-test mean attitude ratings. Statistical significance was detected on items as denoted by ** (p<.001) and *(p<.05) (Figure 2.) The eta squared was less than .01, indicating no meaningful program effect.

**What were students' overall impressions of the NCE game?**

Students were asked to describe in their own words how the NCE game has helped them. A sample of 101 students provided responses to this question. The responses were categorized based on recurrent themes using the Survey Monkey Text Analysis feature. Several themes emerged from the data. About 38.6 percent of respondents indicated that the game 'helped me learn' about science and 44.6 percent indicated that the game 'helped me learn' more about science. One student wrote, "This new science energy game has helped a lot because it has [taught] me a lot of science and engineering." Another student wrote, "There are some types of energy that I really didn't know much about but, after playing the game, I was able

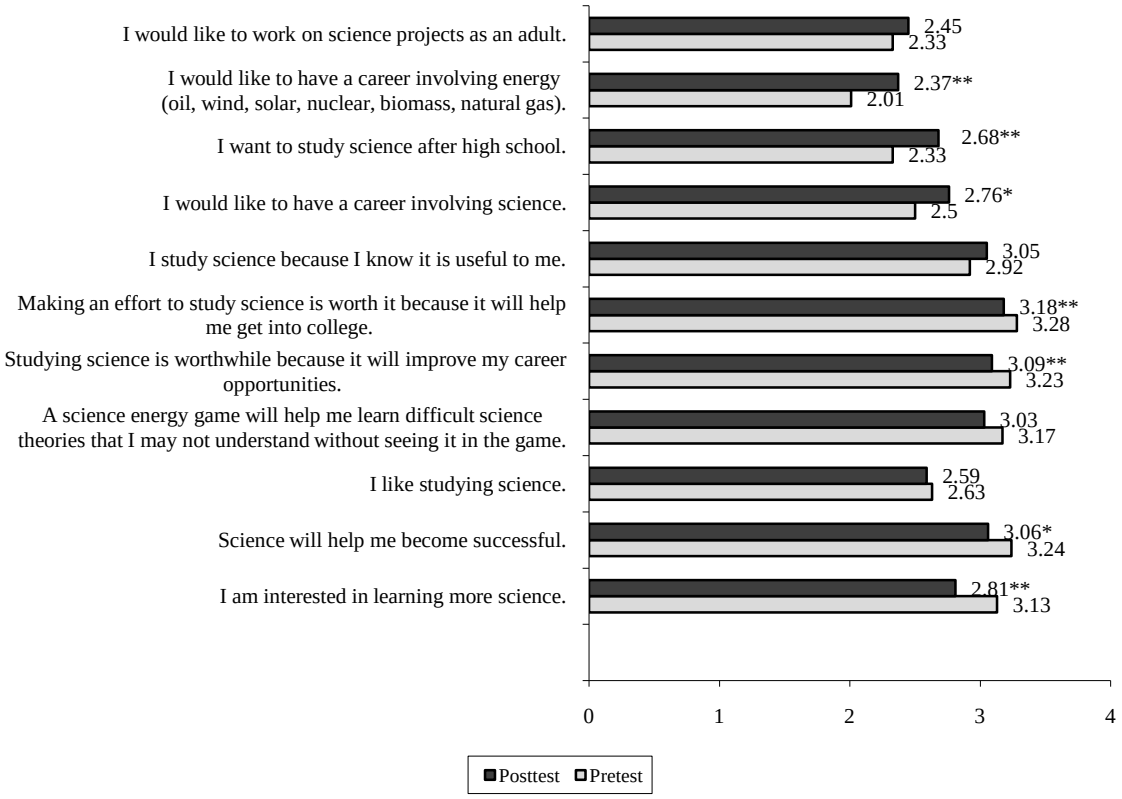


Figure 2. Mean rating on survey items measuring attitudes in science on sample of students (n=88).
***Note: Values with **represent statistical significance at p<.001, * p<.05; Statistical significance detected in overall mean attitude rating from pre- to post-test (p<.01).***

to learn and understand how these types of energy work, how much money they make, the amount of pollution they make and things like that." Nine (8%) respondents implied that the NCE game made learning science fun. A student wrote, "The New Science Energy game has helped me improve science. I have learned a lot, and not only learned, but had fun. I learned to manage my own business and how to handle it without letting [it] go down. I also learned many things that I had already gone over at school which helped me improve on it." Another student wrote, "It has helped me understand [information] that [I] couldn't learn just by reading about it in a book. It put the [information] I was learning into visual form and made it fun to study science." Three students mentioned how the research component of the game increased their knowledge of science concepts. Only three students replied that the NCE game did not help them learn science at all.

## How did students perform on student academic achievement measure?

Student performance on the 10 NAEP released-item assessment was used to measure academic achievement from pre- to post-test. Items were selected by a partnering educational institution as being aligned with the concepts presented in the game. Science results from other standardized tests administered in HISD (i.e., Stanford 10 and Texas Assessment of Knowledge and Skills (TAKS) will not be available until June 2011. The scale used to score the released NAEP items ranged from 0–100, with 100 indicating all of the questions on the test answered correctly. The data were grouped using the scale: 80–100 (Excellent/Good), 60 - up to 80 (Satisfactory), and Below 60 (Poor). The results are depicted in **Figure 3**. It should be noted that students completed the pre assessment using paper and pencil and given directly to the teacher, while the post-test was done anonymously on the computer game website. Students may have been

more motivated to complete the paper and pencil test to please the teacher.

A total of 92 students took either the pre- or post assessments. Only 83 students had both pre- and post-test results. Only these results were used in the analysis. The findings should be reviewed with caution due to the low representation of game participants in the analysis. Figure 3 depicts a substantial decrease in the percentage of students scoring 'excellent/good' from pre- to post-test (36.1 percent vs. 22.9 percent), while the percentage of students scoring 'satisfactory' slightly increased by 3.6 percentage points. Further, the percentage of students scoring 'poor' climbed by nearly 10 percentage points.

A paired samples t-test was conducted also using the released NAEP science items. The analysis revealed a highly statistically significant decrease in science achievement from pre-test (M=64.13, SD=19.66) to post-test [M=57.13, SD=22.17, t(79)=-3.275, p<.002]. There are several possible explanations for these results. One explanation is the assessment was not a valid measure of the concepts covered in the game. Another reason for the results is that students may not have been as motivated to be successful on the post assessment. Unlike the pre assessment, the post assessment was conducted using a web-based format. Students may not have been as concerned about the accuracy of their responses as during the pre assessment since their identity was unknown to the researcher and the teacher.

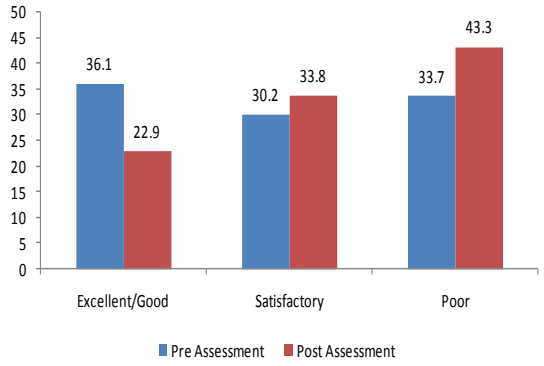


Figure 3: Science Assessment Performance of Paired Sample of NCE Game Participants, 2010–2011.

## Was there an association between student achievement and interest and attitudes regarding science learning?

The relationship between post achievement, interests, and attitudes were investigated using the Pearson product-moment correlation coefficient (**Table 2**). Preliminary analysis was conducted to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. Some of the most notable results was a slight, positive relationship between post achievement and post-test attitudes [r=.252, n=73, p=.032], with higher post achievement being associated with higher post-test attitudes. The results were statistically significant at p<.05. In addition, there was a strong, positive correlation between post-test attitudes and post-test interest [r=-.707, n=78, p= .000], with higher post-test attitudes being highly associated with higher post-test interests.

Partial correlation was used to further explore the relationship between post achievement, post-test interests and post-test attitude, while controlling for pre-achievement scores. There continued to be a strong, positive relationship between post-test interests and post-test attitudes, when controlling for pre-achievement scores [r=.722, n=67, p=.000]. The findings were highly statistically significant. A slight, positive relationship between post achievement and post-test attitudes [r=.055, n=67, p=.652] was observed.

Table 2: Pearson Product-Moment Correlations Between Measures of Achievement, Interest and Attitude

| **Measures** | **1** | **2** | **3** | **4** | **5** |
|---|---|---|---|---|---|
| Post Achievement (1) | 1.00 | | | | |
| Pretest Interest (2) | .286* | 1.00 | | | |
| Pretest Attitude (3) | .342** | .649** | 1.00 | | |
| Posttest Interest (4) | -.056 | .614** | .349** | 1.00 | |
| Posttest Attitude (5) | .252* | .633** | .699** | .707** | 1.00 |

**Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the .05 level (2-tailed)

## Discussion

Chevron has successfully partnered with HISD for nearly 20 years. Chevron's partnership and support resulted in the development of the New Century Energy game. The game was designed to create a learning environment that allowed students to work together to solve problems that were aligned to their learning levels and to science instructional content. The National Science Foundation (2008) maintains that strategies, such as computer games, enhance the effectiveness of the educational experience for students (National Science Foundation, 2008). Surveys were administered to participating students to capture their perceptions concerning whether the game increased their interest and attitudes about science. Positive outcomes were expressed by students who completed the survey based on a pre- and post-test model of analysis. There was evidence that students increased exposure to activities related to science during school and outside of school following the game. There was also evidence that students increased their aspirations to pursue careers in science as adults and to seek careers involving energy. In contrast, students did not express that the game was beneficial in helping them learn difficult concepts. Further, assessment results did not reflect increased learning of science concepts tested after participation in the game.

There are several possible explanations for these results. One explanation is that, while the game may have increased students' interests and attitudes in science, the concepts covered in the game could have been too complex to master for some students. Other explanations for study outcomes are that the assessment was not a valid measure of academic achievement or that comparing online and paper assessments results may compromise reliability (Way, 2006). Considering all of these factors, the research provides promising evidence for using computer games to improve student learning in science.

With Chevron's support, recommendations are to continue game development in similar student populations to identify strategies that promote academic success, particularly among economically-disadvantaged students and students who may be academically challenged in science. Norm-referenced test data should be reviewed, when it becomes available, to determine whether academic achievement benefits are apparent. Also, monitoring students' perceptions over time will support the long-term impact of the NCE game experience and the sustainability of interests and attitudes over time.

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For additional information contact the HISD Department of Research and Accountability at 713-556-6700 or e-mail Research@Houstonisd.org.

## APPENDIX A: PRE- AND POST-TEST INTEREST SURVEY RESULTS

| **Pre-test Results of NCE Students, Fall 2010** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **In the past 12 months, how often have you engaged in the following activities:** | **Very Often (4)** | | **Regularly (3)** | | **Sometimes (2)** | | **Never or hardly ever (1)** | | **N** |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | |
| 1. Read books or magazines about science outside of school. | 4 | 4.5 | 15 | 17.0 | 30 | 34.1 | 39 | 44.3 | **88** |
| 2. Watched news on TV that involved science concepts. | 4 | 4.5 | 23 | 26.1 | 48 | 54.5 | 13 | 14.8 | **88** |
| 3. Talked about science to parents or family members. | 4 | 11.4 | 10 | 11.4 | 2 | 55.7 | 1 | 28.4 | **88** |
| 4. Participated in after-school science activities. | 4 | 4.5 | 9 | 10.2 | 21 | 23.9 | 54 | 61.4 | **88** |
| 5. Visited websites about science. | 4 | 4.5 | 19 | 21.6 | 41 | 46.6 | 24 | 27.3 | **88** |
| 6. Attended science study groups. | 4 | 4.5 | 10 | 11.4 | 15 | 17.0 | 59 | 67.0 | **88** |
| 7. Talked to my friends about science. | 7 | 8.0 | 12 | 13.6 | 37 | 42.0 | 32 | 36.4 | **88** |
| 8. Participated in science competitions. | 8 | 9.2 | 12 | 13.8 | 23 | 26.4 | 44 | 50.6 | **87** |
| 9. Talked to my teacher about science. | 15 | 17.0 | 21 | 23.9 | 36 | 40.9 | 16 | 18.2 | **88** |
| 10. Had fun when learning science. | 24 | 27.6 | 33 | 37.9 | 22 | 25.3 | 8 | 9.2 | **87** |

| **Post-test Results of NCE Students, Spring 2011** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **In the past 12 months, how often have you engaged in the following activities:** | **Very Often (4)** | | **Regularly (3)** | | **Sometimes (2)** | | **Never or hardly ever (1)** | | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **N** |
| 1. Read books or magazines about science outside of school. | 4 | 4.5 | 13 | 14.8 | 71 | 80.7 | 0 | 0.0 | **88** |
| 2. Watched news on TV that involved science concepts. | 4 | 11.5 | 18 | 20.7 | 59 | 67.8 | 0 | 0.0 | **87** |
| 3. Talked about science to parents or family members. | 7 | 8.0 | 10 | 11.5 | 70 | 80.5 | 0 | 0.0 | **87** |
| 4. Participated in after-school science activities. | 2 | 2.3 | 14 | 15.9 | 72 | 81.8 | 0 | 0.0 | **88** |
| 5. Visited websites about science. | 9 | 10.3 | 20 | 23.0 | 58 | 66.7 | 0 | 0.0 | **87** |
| 6. Attended science study groups. | 5 | 5.7 | 8 | 9.1 | 75 | 85.2 | 0 | 0.0 | **88** |
| 7. Talked to my friends about science. | 7 | 8.0 | 10 | 11.4 | 71 | 80.7 | 0 | 0.0 | **88** |
| 8. Participated in science competitions. | 4 | 4.5 | 9 | 10.2 | 75 | 85.2 | 0 | 0.0 | **88** |
| 9. Talked to my teacher about science. | 15 | 17.0 | 25 | 28.4 | 48 | 54.5 | 0 | 0.0 | **88** |
| 10. Had fun when learning science. | 23 | 26.1 | 23 | 26.1 | 42 | 47.7 | 0 | 0.0 | **88** |

## APPENDIX B: PRE- AND POST-TEST ATTITUDE SURVEY RESULTS

| Pre-test Results of NCE Students, Fall 2010 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Rate your interest in the following since participating in the New Science Energy Game** | **Strongly Agree (4)** | | **Agree (3)** | | **Disagree (2)** | | **Strongly Disagree (1)** | | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **Total** |
| 11. I am interested in learning more science. | 24 | 27.3 | 53 | 60.2 | 9 | 10.2 | 2 | 2.3 | 88 |
| 12. Science will help me become successful. | 36 | 40.9 | 40 | 45.5 | 9 | 10.2 | 2 | 3.4 | 88 |
| 13. I like studying science. | 10 | 11.5 | 44 | 50.6 | 24 | 27.6 | 9 | 10.3 | 87 |
| 14. A science energy game will help me learn difficult science theories that I may not understand without seeing it in the game. | 29 | 33.0 | 47 | 53.4 | 10 | 11.4 | 2 | 2.3 | 88 |
| 15. Studying science is worthwhile because it will improve my career opportunities. | 40 | 45.5 | 34 | 38.6 | 8 | 9.1 | 6 | 6.8 | 88 |
| 16. Making an effort to study science is worth it because it will help me get into college. | 37 | 42.0 | 41 | 46.6 | 8 | 9.1 | 2 | 2.3 | 88 |
| 17. I study science because I know it is useful to me. | 20 | 22.7 | 45 | 51.1 | 19 | 21.6 | 4 | 4.5 | 88 |
| 18. I would like to have a career involving science. | 15 | 17.0 | 28 | 31.8 | 31 | 35.2 | 14 | 15.9 | 88 |
| 19. I want to study science after high school. | 11 | 12.5 | 23 | 26.1 | 38 | 43.2 | 16 | 18.2 | 88 |
| 20. I would like to have a career involving energy (oil, wind, solar, nuclear, biomass, natural gas). | 2 | 2.3 | 17 | 19.8 | 47 | 54.7 | 20 | 23.3 | 86 |
| 21. I would like to work on science projects as an adult | 10 | 11.4 | 25 | 28.4 | 37 | 42.0 | 16 | 18.2 | 88 |

| Post-test Results of NCE Students, Spring 2011 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Rate your interest in the following since participating in the New Science Energy Game** | **Strongly Agree (4)** | | **Agree (3)** | | **Disagree (2)** | | **Strongly Disagree (1)** | | |
| | **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** | **Total** |
| 11. I am interested in learning more science. | 24 | 27.3 | 23 | 26.1 | 41 | 46.6 | 0 | 0.0 | 88 |
| 12. Science will help me become successful. | 33 | 37.9 | 26 | 29.9 | 28 | 32.2 | 0 | 0.0 | 87 |
| 13. I like studying science. | 17 | 19.5 | 17 | 19.5 | 53 | 60.9 | 0 | 0.0 | 87 |
| 14. A science energy game will help me learn difficult science theories that I may not understand without seeing it in the game. | 33 | 37.5 | 25 | 28.4 | 30 | 34.1 | 0 | 0.0 | 88 |
| 15. Studying science is worthwhile because it will improve my career opportunities. | 35 | 40.2 | 25 | 28.7 | 27 | 31.0 | 0 | 0.0 | 87 |
| 16. Making an effort to study science is worth it because it will help me get into college. | 40 | 45.5 | 24 | 27.3 | 24 | 27.3 | 0 | 0.0 | 88 |
| 17. I study science because I know it is useful to me. | 33 | 38.4 | 24 | 27.9 | 29 | 33.7 | 0 | 0.0 | 86 |
| 18. I would like to have a career involving science. | 23 | 26.7 | 19 | 22.1 | 44 | 51.2 | 0 | 0.0 | 86 |
| 19. I want to study science after high school. | 19 | 21.6 | 22 | 25.0 | 47 | 53.4 | 0 | 0.0 | 88 |
| 20. I would like to have a career involving energy (oil, wind, solar, nuclear, biomass, natural gas). | 9 | 10.3 | 14 | 16.1 | 64 | 73.6 | 0 | 0.0 | 87 |
| 21. I would like to work on science projects as an adult. | 9 | 10.2 | 22 | 25.0 | 57 | 64.8 | 0 | 0.0 | 88 |