



Student Attitudes toward Adaptive Curriculum

The Isaac Middle School Pilot, Spring 2008

This report describes the attitudes of middle grade students after completing seven Adaptive Curriculum activity objects during the late spring of 2008. Among the findings of a survey completed by 389 middle-grade students was that a large majority of students indicated that the program helps them learn science, they find the activity objects easy to use, they feel their attitudes toward using computers in schools improved, they enjoyed the experience, they felt more are in charge of their own learning when using the activity objects, they are positively disposed to using the program in the future, and they feel their attitudes towards science have improved. Combining the 25 items into nine variables revealed that girls had higher means than the boys on each, but the differences were only significant for Science Learning.

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Introduction

An evaluation of Adaptive Curriculum was implemented with teachers and students from Isaac Middle School in the Isaac School District in Phoenix, AZ. The majority of students in the school are from families below the poverty line, as indicated by the high percentage of students (89.2%) receiving free lunches (76.7%) or subsidized lunches (12.5%). The school consists of grades sixth, seventh, and eighth, and over 90% of the school's students are of Hispanic origins.

Teachers implemented activity objects from the Adaptive Curriculum science library with their students. One sixth grade teacher, three seventh grade teachers, and two eighth grade teachers participated in the evaluation. Each teacher taught four classes of approximately 25 students each. Teachers chose activity objects that were directly related to their curriculum. Starting in late March, each teacher delivered a whole-class lesson with two activity objects, using a teacher computer and a projector. These two whole-class activity objects were completed in two weeks.

After the whole class presentations, a schedule was developed for usage of the school's laptop cart that consisted of 14 computers. Each teacher was scheduled to use the laptops in 6-day rotations. So, for instance, if a teacher used the laptops with their students on April 9th, they would not receive them again until April 17th. This was 6 school days later; weekend days (Saturday and Sunday) are not counted in the rotation.

Teachers implemented five activity objects using the laptop carts. All teachers started out with having two students on each computer, although in most classes one or two students could work independently on one or two computers, as there were fewer than 28 students per class. After students completed two activity objects, one of the teachers split her class in half and gave computers to one-half and an alternate assignment to the other half. Then, when half of the period was over, students switched tasks. The other teachers maintained the general two-students-to-a-computer arrangement.

The Survey

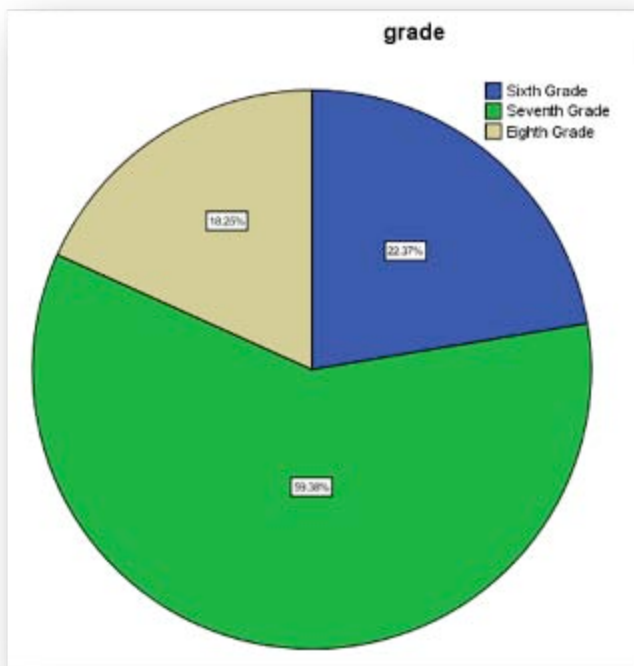
An attitude survey entitled, "What do you think about Adaptive Curriculum?" was created and teachers administered the survey to students at the conclusion of the project. An initial set of items were proposed and shared with the teachers, who gave suggestions for modification and inclusion of new items. When there was full agreement that the survey was a valid measurement of students' attitudes toward Adaptive Curriculum, the survey was finalized. The final survey contained 25 Likert items with responses on a five-point scale: strongly agree (5), agree (4), undecided (3), disagree (2), strongly disagree (1). There were nine hypothesized variables in the survey: Enjoyment, Science Learning, Usability, Motivation, Future Intent, and Science Attitude, Computer Attitudes, Computer Skills and Locus of Control. The complete survey can be found in Appendix 1.

Surveys were completed by 389 students in sixth, seventh, and eighth grades. After the survey was administered, the data were entered into Microsoft Excel files and then analyzed with the use of SPSS 7.0 software.

Who are the Students?

This report will describe the students who completed the attitude survey and their responses. To facilitate communication, the student respondents will be referred to as “students” for the remainder of the report and the report refers only to students who answered questions on the survey. Grade level data for all 389 students was indicated on the surveys of all students. As the table and figure below indicate, the most students were in the seventh grade (59.4 %), then sixth grade (22.4%), and finally eighth grade (18.3%).

| | | grade | | | |
|-------|---------------|-----------|---------|---------------|--------------------|
| | | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Sixth Grade | 87 | 22.4 | 22.4 | 22.4 |
| | Seventh Grade | 231 | 59.4 | 59.4 | 81.7 |
| | Eighth Grade | 71 | 18.3 | 18.3 | 100.0 |
| | Total | 389 | 100.0 | 100.0 | |



For gender, 42.9% of the students indicated they were male, 52.2% of the students indicated they were female; 4.9 % of the respondents or 19 students did not answer the gender question. This is shown in the table below.

gender

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---------|--------|-----------|---------|---------------|--------------------|
| Valid | Boy | 167 | 42.9 | 45.1 | 45.1 |
| | Girl | 203 | 52.2 | 54.9 | 100.0 |
| | Total | 370 | 95.1 | 100.0 | |
| Missing | System | 19 | 4.9 | | |
| Total | | 389 | 100.0 | | |

Student Attitudes

The range on all the individual items was four, reflecting a minimum of 1 and a maximum of 5. None of the item means were lower than three on the five-point Likert scale, where three is undecided. The mean values of the questions ranged between 3.23 and 4.25.

The larger the mean, the more positive students were in response to the item. The item with the highest mean (4.25) was “I would rather do Adaptive Curriculum activities than read a textbook.” For this item, 55.4% of the students strongly agreed, 27.7% agreed, 7.6% indicated they were undecided, 5.7% disagreed, and 3.7% strongly disagreed. The item with the second highest mean (4.17) was “I enjoyed doing the Adaptive Curriculum activities.” For this item, 40.1% of the students strongly agreed, 45.2% agreed, 8.2% indicated they were undecided, 4.1% disagreed, and 2.3% strongly disagreed.

The third and fourth highest means were the same (4.15). In the third position was the item “Adaptive Curriculum activities helped me to learn science.” This item had the highest percentage of strongly agreed and agreed responses (86.6%) of any item in survey. The fourth highest item was “I hope my teacher next year uses Adaptive Curriculum.” Finally, the fifth highest mean (4.06) was for the item “I was excited to get the computers to start working on Adaptive Curriculum activities.”

Although all the means were about three, two items had the combined percentages of students agreeing or strongly agreeing below a majority. For the item “I would be sad if I never did Adaptive Curriculum activities again,” the largest category of responses was in the undecided category (31.3%), 18.0% strongly agreed, 23% agreed, 19.1% disagreed, and 8.6% strongly disagreed. For the item “I would rather do Adaptive Curriculum activities than hands-on science activities,” the largest category of responses was again in the undecided category (29.2%), 22.1% strongly agreed, 22.4% agreed, 17.2% disagreed, and 9.1% strongly disagreed.

The number of valid responses (N), mean, standard deviation (SD), and percentage of students who either strongly agreed or agreed (% SA or A) are indicated in the table below. To facilitate interpretation, the results are listed in ascending means, that is, the lowest means are first and the highest means are last.

| Item | N | Mean | SD | % SA or A |
|---|-----|------|-------|-----------|
| I would be sad if I never did Adaptive Curriculum activities again. | 383 | 3.23 | 1.199 | 41.0 |
| I would rather do Adaptive Curriculum activities than hands-on science activities. | 384 | 3.31 | 1.246 | 44.5 |
| I like science more because of Adaptive Curriculum. | 387 | 3.56 | 1.114 | 53.5 |
| I was able to figure out how to do the Adaptive Curriculum activities on my own. | 388 | 3.67 | 1.123 | 64.9 |
| My brain could concentrate on Adaptive Curriculum activities better than on other schoolwork. | 387 | 3.71 | 1.071 | 62.0 |
| I understand science better because of Adaptive Curriculum. | 386 | 3.72 | 1.027 | 87.0 |
| My computer skills improved as a result of Adaptive Curriculum. | 384 | 3.73 | 1.005 | 66.4 |
| Adaptive Curriculum helped me develop a greater appreciation for science. | 386 | 3.78 | .049 | 68.1 |
| When I was doing Adaptive Curriculum, I felt like I was in charge of my learning. | 386 | 3.80 | .050 | 67.6 |
| Doing Adaptive Curriculum activities have helped me to see the importance of computers in education. | 384 | 3.85 | .050 | 73.2 |
| I liked doing Adaptive Curriculum activities more than other schoolwork. | 387 | 3.86 | .056 | 66.1 |
| I felt motivated to complete the Adaptive Curriculum activities. | 386 | 3.91 | .047 | 73.1 |
| Doing Adaptive Curriculum activities helped me to see the value in using computers to learn. | 388 | 3.94 | .050 | 74.2 |
| The Adaptive Curriculum activities made science more enjoyable. | 381 | 3.99 | .049 | 77.4 |
| I would like to use Adaptive Curriculum in the future. | 387 | 3.99 | .052 | 73.9 |
| The level of difficulty of the Adaptive Curriculum activities was right for students in my grade. | 383 | 4.00 | 0.45 | 77.8 |
| Because I did Adaptive Curriculum, I feel more comfortable with using computers. | 385 | 4.00 | .052 | 75.8 |
| Adaptive Curriculum activities would help me do better on a science test. | 386 | 4.01 | .047 | 76.2 |
| If school principals tried Adaptive Curriculum activities, they would want more computers for their students. | 385 | 4.03 | .046 | 72.7 |
| The Adaptive Curriculum activities were easy to follow. | 385 | 4.04 | .050 | 79.6 |
| I was excited to get the computers to start working on Adaptive Curriculum activities. | 384 | 4.06 | .047 | 77.9 |
| I hope my teacher next year uses Adaptive Curriculum. | 388 | 4.15 | .052 | 81.4 |
| Adaptive Curriculum activities helped me to learn science. | 389 | 4.15 | .041 | 86.6 |
| I enjoyed doing the Adaptive Curriculum activities. | 389 | 4.17 | .046 | 85.3 |
| I would rather do Adaptive Curriculum activities than read a textbook. | 383 | 4.25 | .054 | 83.0 |

Explorations of Differences by Grade Level and Gender

Student attitudes toward Adaptive Curriculum are grouped in nine different variables. These are Enjoyment, Science Learning, Usability, Motivation, Future Intent, and Science Attitude, Computer Attitudes, Computer Skills and Locus of Control. Thus, the 25 questions were classified based on these variables, and the reliabilities expressed as Cronbach's alpha are presented in the following table. These variables were created by taking the averages of

individual items. Because this is an exploratory study, all of the reliabilities were judged to be sufficiently high to explore differences by gender and grade level.

| Variable | Items | Reliability | Mean | SD |
|---|--------------|-------------|--------|--------|
| Enjoyment | 1, 8, 17, 21 | 0.611 | 3.9090 | .73573 |
| Science Learning | 2, 9, 18 | 0.730 | 3.9626 | .74773 |
| Usability | 3, 10, 19 | 0.586 | 3.9136 | .73211 |
| Motivation | 4, 11, 20 | 0.612 | 3.8962 | .73047 |
| Future Intent | 5, 12, 22 | 0.714 | 3.7895 | .86605 |
| Attitude Towards Science | 6, 13, 23 | 0.788 | 3.7766 | .84893 |
| Attitude Towards Computers in Education | 7, 14, 24 | 0.700 | 3.9389 | .75317 |
| Computer skills | 16, 25 | 0.650 | 3.8642 | .86744 |
| Locus of Control | 15 | n/a | 3.7979 | .97533 |

To see how the variables correlated with each other, Pearson’s correlation coefficient analyses were conducted. These are shown in the table below.

| | Enjoyment | Sci Learning | Usability | Motiv | Future Intent | Att Sci | Att Comp | Comp Skills | Locus Cont |
|---------------|-----------|--------------|-----------|--------|---------------|---------|----------|-------------|------------|
| Enjoyment | 1 | .606** | .523** | .667** | .629** | .639** | .563** | .555** | .427** |
| Sci Learning | .606** | 1 | .559** | .706** | .708** | .756** | .674** | .655** | .459** |
| Usability | .523** | .559** | 1 | .584** | .542** | .542** | .574** | .475** | .421** |
| Motivation | .667** | .706** | .584** | 1 | .684** | .673** | .650** | .621** | .469** |
| Future Intent | .629** | .708** | .542** | .684** | 1 | .701** | .677** | .607** | .422** |
| Att Sci | .639** | .756** | .542** | .673** | .701** | 1 | .711** | .599** | .461** |
| Att Comp | .563** | .674** | .574** | .650** | .677** | .711** | 1 | .629** | .484** |
| Comp Skills | .555** | .655** | .475** | .621** | .607** | .599** | .629** | 1 | .442** |
| Locus Cont | .427** | .459** | .421** | .469** | .422** | .461** | .484** | .442** | 1 |

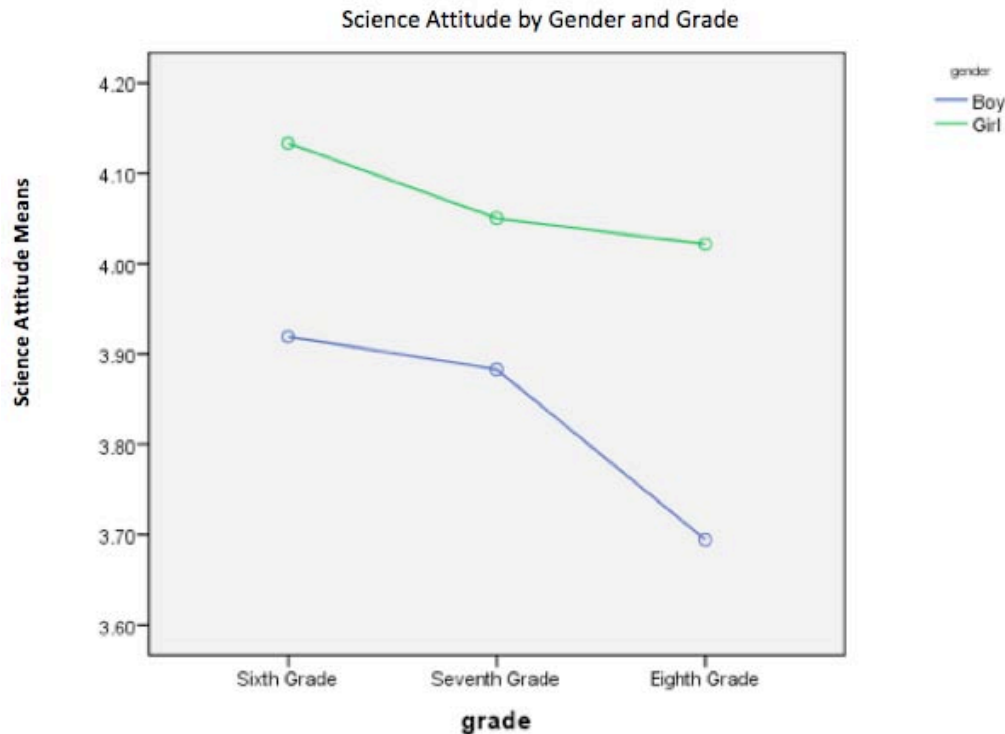
The table has double asterisks by correlations that are statistically significant and examining the table reveals that all the correlations are significant. Using the convention that correlations greater than 0.7 are strong positive associations, the strong positives have been labeled in blue. Science Learning has strong positive correlations with Motivation (0.706), Future Intent (0.708), and Attitude towards Science (0.756). Attitude toward Science has strong positive correlations with Future Intent (0.701) and Attitudes towards Computers (0.711).

To determine if there were differences on the above variables by gender, grade level, and the interaction of grade level and gender two-way ANOVA tests were conducted. In the table below, for each variable, the means for male and female students are presented along with the level of statistical significance. Levels that are statistically significant at the less than 0.05 are labeled with an asterisk. Likewise, means for grade 6, 7, and 8 are presented along with the level of statistical significance. None of the interactions of grade level by gender were significant, so these are not included in the table.

| Variables | Male | Female | Sig. | Grade 6 | Grade 7 | Grade 8 | Sig. |
|---|------|--------|--------|---------|---------|---------|--------|
| Enjoyment | 3.88 | 3.94 | 0.083 | 3.87 | 3.93 | 3.90 | 0.216 |
| Science Learning | 3.84 | 4.06 | 0.009* | 3.99 | 3.99 | 3.85 | 0.388 |
| Usability | 3.86 | 3.96 | 0.329 | 3.90 | 3.93 | 3.91 | 0.991 |
| Motivation | 3.87 | 3.93 | 0.582 | 3.94 | 3.94 | 3.74 | 0.141 |
| Future Intent | 3.72 | 3.86 | 0.094 | 4.02 | 3.82 | 3.45 | 0.001* |
| Attitude Towards Science | 3.76 | 3.80 | 0.410 | 3.90 | 3.81 | 3.56 | 0.053 |
| Attitude Towards Computers in Education | 3.86 | 4.01 | 0.128 | 3.97 | 3.97 | 3.82 | 0.287 |
| Computer skills | 3.79 | 3.91 | 0.757 | 3.98 | 3.84 | 3.77 | 0.310 |
| Locus of Control | 3.76 | 3.81 | 0.372 | 3.76 | 3.79 | 3.81 | 0.899 |

There was a statistically significant main effect for grade level ($F(2, 355)=7.32, p<.001$). Post-Hoc comparisons using the Tukey Honestly Significant Differences (HSD) test indicated that the mean (M) score for the sixth grade samples ($M=4.02, SD=.83$) was significantly different from the eighth grades samples ($M=3.46, SD=1.08$). The Tukey HSD test also indicated that the mean score for the seventh grade samples ($M=3.82, SD=.78$) was significantly different from the eighth grades samples ($M=3.46, SD=1.08$). In addition, the seventh grade samples ($M=3.82, SD=.78$) did not differ significantly from the sixth grade samples ($M=4.02, SD=.83$).

There was also a statistically significant main effect for gender ($F(1, 359)=6.99, p<.01$) and the variable Science Learning, with girls having higher means than boys for all grade levels, as shown in the graph below. There was no significant interaction by grade level and gender.



Discussion

As mentioned previously, all of the means for each individual item were 3.23 or greater. Because three represents undecided, any mean above three can be interpreted to some extent as positive. The larger the mean, the more positive students were. So, one plausible conclusion is that in general, students had positive attitudes towards Adaptive Curriculum.

The item with the highest mean (4.25) was “I would rather do Adaptive Curriculum activities than read a textbook.” Textbook based instruction has and continues to dominate US classrooms, and students overwhelmingly prefer Adaptive Curriculum over reading textbooks. When asked specifically about Adaptive Curriculum versus other school activities (“I liked doing Adaptive Curriculum activities more than other schoolwork”), the mean (3.86) indicated general agreement, but it wasn’t as high as the textbook item. One conclusion here is that the students had less preference for textbooks than other things they associate with the term “schoolwork.” When asked about hands-on science (“I would rather do Adaptive Curriculum activities than hands-on science activities.”), the mean of 3.31 shows that students have a high regard for activity-based science.

The item with the second highest mean (4.17) was “I enjoyed doing the Adaptive Curriculum activities.” Coupled with the third highest item by mean (4.15) “I hope my teacher next year uses Adaptive Curriculum,” it becomes clear that there is a strong liking of the program and that students hope to continue with it.

Of course, enjoying something and wanting to do something is important, but only if it is a good thing to do and demonstrates solid educational value. This survey does not directly address student learning; it does, however, address students’ perceptions of their science learning. The

fourth largest mean (4.15), and the largest percentage of strongly agreed and agreed responses (86.6%) was the item “Adaptive Curriculum activities helped me to learn science.” Clearly, students see value in the program for helping them learn science.

The examination of the individual items gives a student perspective of Adaptive Curriculum. Grouping the items into nine variables gives a stronger sense of student perspectives. From this perspective, the following aspects of the program are suggested: The vast majority of students that experience the activity objects of Adaptive Curriculum feel the program helps them learn science, they find the activity objects easy to use, they feel their attitudes toward using computers in schools improved, they enjoyed the experience, they felt more in charge of their own learning when using the activity objects, they are positively disposed to using the program in the future, and they feel their attitudes towards science have improved.

When the 25 items were parsed into nine variables and correlations between the variables are explored, it is interesting to examine the strong positive associations. Motivation had only one strong positive association and that was with Science Learning. Students who reported the most Science Learning were also the ones that were most motivated to do the activity objects. Future Intent was highly correlated with Science Learning and Science Attitude. Students who were most excited about using Adaptive Curriculum in the future were the ones who reported the most Science Learning and the biggest improvements in Science Attitude. Perhaps most interesting is that Enjoyment was not highly correlated with anything. While of course learning experiences should be enjoyable, these correlations suggest that the slogan to get students motivated to learn science might be changed from “science is fun” to “science is interesting.”

When differences in the variables were explored by gender and grade-level, the main finding is that for most of the variables gender or grade-level did not result in statistically significant differences. While girls had higher means than boys for all nine of the variables, the only statistically significant differences were for Science Learning. A plausible conclusion from the data is that the vast majority of students agreed or strongly agreed that Adaptive Curriculum helped them to learn science, but girls ranked Adaptive Curriculum significantly higher than boys for helping them learn science.

The analysis of grade level differences on the nine variables revealed a trend in five of the nine variables with means being highest in sixth grade, second highest in seventh grade, and lowest in eighth grade. This was true for the variables Science Learning, Future Intent, Science Attitude, Computers Attitude, and Computer Skills. It is important to note, however, that the only differences that are statistically significant are those in the variable Future Intent. While generally students were positive about using Adaptive Curriculum in the future, for these variables the most positive attitudes were found in the younger students. For the four variables that didn't have this trend, none of the differences were statistically significant but just as points of comparisons, the patterns were as follows: Motivation: Grade 6=Grade 7>Grade 8, Enjoyment and Usability: Grade 7>Grade 8>Grade 6, and Locus of Control: Grade 8>Grade 7>Grade 6.

To reiterate, students, no matter what grade they were in, generally had very positive attitudes towards Adaptive Curriculum. The only significant differences in grade levels were for the variable Future Intent, where students in sixth grade and seventh grade had more excitement than students in eighth grade.

Appendix 1

What do you think about ADAPTIVE CURRICULUM?

Your Name _____ Teacher's Name _____

Please circle your grade

6 7 8

Are you a

Boy Girl

SD = Strongly Disagree D = Disagree U = Undecided A = Agree SA = Strongly Agree

1. I enjoyed doing the Adaptive Curriculum activities. SD D U A SA
2. Adaptive Curriculum activities helped me to learn science. SD D U A SA
3. The Adaptive Curriculum activities were easy to follow. SD D U A SA
4. I felt motivated to complete the Adaptive Curriculum activities. SD D U A SA
5. I would like to use Adaptive Curriculum in the future. SD D U A SA
6. I like science more because of Adaptive Curriculum. SD D U A SA
7. Doing Adaptive Curriculum activities helped me to see more value in using computers to learn. SD D U A SA
8. I liked doing Adaptive Curriculum activities more than other schoolwork. SD D U A SA
9. I understand science better because of Adaptive Curriculum. SD D U A SA
10. I was able to figure out how to do the Adaptive Curriculum activities on my own. SD D U A SA
11. My brain could concentrate on Adaptive Curriculum activities better than on other schoolwork. SD D U A SA
12. I hope my teacher next year uses Adaptive Curriculum. SD D U A SA

13. Adaptive Curriculum helped me develop a greater appreciation for science. SD D U A SA
14. Doing Adaptive Curriculum activities have helped me to see the importance of computers in education. SD D U A SA
15. When I was doing Adaptive Curriculum, I felt like I was in charge of my learning. SD D U A SA
16. My computer skills improved as a result of Adaptive Curriculum. SD D U A SA
17. I would rather do Adaptive Curriculum activities than read a textbook. SD D U A SA
18. Adaptive Curriculum activities would help me do better on a science test. SD D U A SA
19. The level of difficulty of the Adaptive Curriculum activities was right for students in my grade. SD D U A SA
20. I was excited to get the computers so I could start working on Adaptive Curriculum activities. SD D U A SA
21. I would rather do Adaptive Curriculum activities than hands-on science activities. SD D U A SA
22. I would be sad if I never did Adaptive Curriculum activities again. SD D U A SA
23. The Adaptive Curriculum activities made science more enjoyable. SD D U A SA
24. If school principals tried Adaptive Curriculum activities, they would want more computers for their students. SD D U A SA
25. Because I did Adaptive Curriculum, I feel more comfortable with using computers. SD D U A SA

The End. Thank you for sharing your thoughts.