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ABSTRACT

The problem examined in this study deals with the extent to which parental help in preparing for a science fair and parental support for the project affect students' attitudes toward the science fair. Fifty subjects were randomly selected from a group of 110 6th-grade students. There were 28 girls and 22 boys selected from the central-Virginia city school system. The survey instrument used had seven questions relating to students' attitudes toward the fair, three questions about students' perceptions of their parents attitude toward the fair (parental support), and six questions concerning how much their parents helped them complete their project (parental help). Although parental support and parental help correlated significantly, only the parental support questions related significantly to students' attitudes. The degree to which students liked their projects also related to their attitudes about the fair. The study suggests that the interest students feel for their projects as well as the amount of support parents show for the fair has a connection to students' feelings about their projects. (Author)

How Parental Support Affects Students' Attitudes Toward the Science Fair

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RUNNING HEAD: SCIENCE FAIR ATTITUDES

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Abstract

The problem examined in this study deals with the extent to which parental help in preparing for a science fair and parental support for the project affect students' attitudes toward the science fair. 50 subjects were randomly selected from a group of 110, 6th-grade students. There were 28 girls and 22 boys selected from the central-Virginia city school system. The survey instrument used had seven questions relating to students' attitudes toward the fair, three questions about students' perceptions of their parents attitude toward the fair (parental support) and six questions concerning how much their parents helped them complete their project (parental help). Although "parental support" and "parental help" correlated significantly ($r = .4494$, $p < .01$) only the parental support questions related significantly to students' attitudes (out of seven questions, one was $p < .10$, three were $p < .05$ and two were $p < .005$). The degree to which students liked their projects also related to their attitudes about the fair (out of six questions three were $p < .05$ and two were $p < .005$). The study suggests that the interest students feel for their

projects as well as the amount of support parents show for the fair has a connection to students' feelings about their projects. Possible future studies include looking at the concentration of effort on students' topic selection or possibly on educating parents about their effect on students' attitudes.

Chapter I

Some parents might say, "Only have as many children as you have Science Fair project ideas." This may be quite a cynical idea, especially to educators, but the fact is, science fairs require somewhat more of a team effort between parent and child than most any other category of project. In most science fair projects there are several main components that are labor and/or time intensive which include: picking a topic, researching the topic, obtaining materials for the experiment, performing an experiment, analyzing the data, writing a report and creating a poster display. This can be quite an overwhelming task for a student, especially the elementary or middle school student. Consider, for instance, examples from Tracy Kidder's book (1989). It describes Mrs. Zajac's classroom during a school year. The Science Fair is illustrated in one section of the book. Specifically, two paragraphs describe the contrasts between projects that had been done with and without parental help.

> There behind her homemade model of the solar system sat Arabella, smiling sweetly, looking chipper and healthy and confident, telling the

judges all the names of the planets, their approximate distances from the sun, the main characteristics of each. And there, in his electrician's uniform, moving from table to table and correcting mistaken notions of the various children who had done projects on electricity, was the explanation for the care behind Arabella's project and for the progress Arabella had made this year -- Arabella's father. (p.279)

Jorge, from her low math group, often looked exhausted. He had tried to do a science project, a model of a laser made out of colored paper, an electric light, and a cardboard box. Jorge had gotten the idea from a book. He'd followed all the instructions, he told Mrs. Zajac. "But it doesn't work," he said. Jorge had been heard to say a few days before, "I can't get too much help at home." An understatement....Jorge and his partners--two other boys who couldn't get much help from home either--sat behind their table and their inoperative cardboard box, looking glum. (p.277-8)

This, of course, is just anecdotal evidence but the preceding two paragraphs do raise questions concerning the frequency of these two situations. Do students without "help at home" have a different attitude toward the science fair? The goal of this project is to see if parents helping and supporting their children with their science projects and their children's attitude toward the science fair are related. If this is the case, then further research can be done to follow-up or to explore possible solutions for alleviating the effects of a lack of parental support.

The hypothesis of this study is that the students of parents who offer little or no help or support toward their projects will have a more negative attitude toward the Science Fair than students' parents who are supportive.

Chapter II

Literature Review

The science fair has been a tradition since 1928 where the first one was held by the Institute of the

City of New York (Speece, 1978). Since then it has become a requirement of many science curricula throughout the country. It is a popular forum for students to learn about and practice scientific endeavors. The purposes and objectives of the science fair are clear as to the importance of having this event and why it has become such a widespread science activity.

Isaac Asimov cites America's status as being the "most technologically advanced" and for this status to be maintained educators must foster a love of science in children.

> This is what youngsters should learn--how to think scientifically, how to reason logically, how to make observations, how to gather and organize them, how to perform experiments and draw conclusions, how to make an intelligent guess in advance as to what those conclusions might be, and see them supported or rejected or left undetermined. And they must learn the joy and pleasure of doing all this for the sake of learning and not for awards; just as a game of football can be exciting even if you don't win.

(Fredericks & Asimov, 1990)

Asimov believes that the science fair is a way to have children learn these concepts. He is not alone in this philosophy. Others such as Riggins (1985) also state an, "understanding of scientific thinking and the scientific method" as a main goal of science fairs. Other reasons for science fairs include: Following through on a commitment, developing written, oral and organizational skills, improving research and library skills, finding that his/her project provides another avenue for communicating with parents (Riggins, 1985), and building self-confidence (North Carolina State Board of Education, 1988).

But are these goals actually possible without parental support? Research on students' attitudes toward the science fair as related to their parents supportiveness is virtually non-existent. There is, however, a good deal of evidence stating that parental support of academics is essential for the student's achievement and attitude toward school.

There is some literature on parental influence on science attitudes. Ormerod and Duckworth's 1975 review of research found that attitudes of parents toward science has a significant influence on pupil's interest in science. They also state that relatives with a career in science play a strong role in students attitude toward science.

Some math attitude studies can be revealing as well. Tocci and Engelhard (1991) found that certain parental behaviors appear to be related to student attitudes toward mathematics. These behaviors were: The parents' ability to do math, parents' encouragement for their children to do math and parents' reaction toward math. Basically, if parents liked math, could do it well and reacted positively toward their children's math achievement, then their children had a more positive attitude toward math. Indeed, Keith et al. (1992) support the generalization of this study with the finding that parental aspirations or expectations for their children had an effect on overall achievement.

Parents do have an important role in their children's achievement and attitude about school. Becher (1984) found in her review of studies on the topic that there are several things that parents do that contribute to achievement. These things include:

high academic expectations, responsiveness to their children, the perceptions of themselves as teachers, using advanced styles of language and thought, being strong models of learning, and reinforcing school. She found that training parents to do these things actually improved their children's school achievement.

Parents can also affect achievement by their actual help at home. Becher's review (1984) also noted that children whose parents read to them regularly before they started Kindergarten had greater reading ability as well as a more positive attitude about reading. Searles, Lewis and Morrow (1982) found that parental home tutoring increased their child's achievement in reading/language arts and math in first graders. This is also supported by two papers concerning the difference between Asian parents and American parents. Many acknowledge the academic superiority of Asian (Chi ese and Japanese) over American students. Gordon (1987) and Smith (1989) cited the constant tutoring that Asian parents give to their children and the great personal investment that Asian mothers have in their children's success in school as reasons for the difference in overall academic achievement. Keith et al. (1992) also relates to this with their finding that parents who are involved in their child's education have children who complete their homework and this, in turn, increases their achievement.

Finally, Snodgrass in her 1991 review of previous research and Wilson-Wesley (1984) emphasize the importance of parents working together with the schools in a student-teacher-parent team. Both papers acknowledge the positive aspects of parental influence. They also warn against transferring all of the responsibility for their children's development to the schools and encourage parents to be involved in every step of their children's education.

Clearly, parents play an important role in their children's academic achievement and attitude toward school and specific school subjects. The science fair, because of its complexity and amount of work, calls for parents to be supportive both attitudinally and physically. If the parents are not there for a child with a positive attitude and a helping hand it seems that their children will become negative and discouraged about the fair. This study attempts to explore whether this is true or not. Is parents' support of the science fair related to how their children *feel* about the science fair?

Chapter III

Study design

Sample

50 subjects were randomly selected from a group of 110 sixth grade students for this study. There were 28 girls and 22 boys selected, ages 11 and 12. The sample was taken from a central-Virginia city school system. The intellectual ability of the students ranged from borderline Educably Mentally Retarded to Gifted. 46% of the students were from a low-socioeconomic background as was determined by the free and reduced lunch enrollment. There was also an appreciable segment of students from middle to upper-middle class backgrounds. Racially, 47% of the students were considered white, 52% were considered African-American and 1% were other races or ethnicities. These statistics indicated a racially, intellectually and economically diverse population.

Measurement Instrument

No previously designed instruments were found that would be appropriate for this study, consequently the instrument was designed by the researcher with the help of professors and doctoral candidates who were experienced in working with attitude surveys. The survey had two parts (See Appendix A). The first 10-question section asked seven questions about how students felt about the science fair. These 10 questions also included three questions concerning the degree to which they felt their parents were available for help and how much the students felt their parents encouraged the them to do the science fair project (parental support). The answers to the first ten questions were answered using a five-point Likert scale from "Strongly Agree" to "Strongly Disagree".

The second part consisted of seven questions to determine the amount of help given by their parents on specific parts . the project (see Appendix A). The students could answer "a lot", "some" or "none". The last question asked whether their parents would be attending the fair with the possible answers of "yes" or "no".

Design

The survey was given the day before the science fair so that prizes given or not given to the students on the day of the fair would not influence students attitudes about the project. It was given to all students so that half of the students were not unoccupied, creating management problems. Fifty surveys were then selected to be analyzed using a random number chart (Rand, 1955). The regular science teacher administered the tests. Names were requested on the survey for possible interviews at a later date. Scoring remained objective, however, because of the Likert scales.

After randomly selecting the surveys, the first part of the surveys were scored. The answers to the first ten questions were scored using a five point scale with the most "positive" answers being fives while the most "negative" answers were ones. The second part concerning specific types of parental help given was graded as "a lot" receiving two points, "some" receiving one point and "none" receiving zero points. The last question about whether or not parents would attend the fair was intended to be graded on a two (yes) or zero (no) point basis.

The data was first evaluated in straightforward ways. Each question was evaluated for its mean, median, mode, standard deviation, skewness etc. General trends to each answer for the first ten questions were ascertained with graphs depicting frequencies of each of the five points of the scale. Graphs of the amount of help students received were also made (see figure 1).

Questions 4, 5 and 8 of the first part of the survey were all related to perceived parental encouragement and support for the science fair. These three scores from 1 to 5 were averaged together to create a "parental support score." The last questions about specific parental help given on the project were also averaged together. This made up the "parental help score". These two groups were correlated together to see if there was a general relation between the two types of questions about parental support.

The way the data were analyzed was through the use of correlations and analyses of variance (ANOVAs) between many of the questions. First, the relation between parental support (questions 4, 5, and 8) and the students opinions about their science projects (questions 1, 2, 3, 6, 7, 9, 10) was evaluated. Specifically, two relationships were examined. Questions 2 and 3, which were considered "achievement motivation" questions and their connection between parental support questions were explored. The association between parental encouragement and whether the students found the fair to be worthwhile (questions 1, 6 and 7) was examined. Because the students perceptions about the science fair might have been driven by how much they liked their topics, the relationship between how much the student liked his or her topic and other attitude questions were also determined.

Analysis

In selecting from all the surveys, five of them were thrown out because they were incomplete. The last question of the survey asking if the student's parents would be attending the science fair had to be omitted because 20 out of 50 questions were either: a) not answered b) answered as "I don't know" or c) answered incorrectly (This is known because pictures were taken of everyone who was at the fair and compared to the names on the surveys).

The raw data was first looked at for averages of responses for each individual question. Each of the questions were scored so that positive answers received higher numbers. For example "When I need help, my parents try to help me" was scored a "5" if the response was strongly agree as this was considered a very positive answer. Furthermore, negatively stated questions were considered very positive and scored "5" if they strongly disagreed with the statement, e.g., question 10: I don't think I've learned that much from participating in the science fair, was scored "5" if they marked "strongly disagree".

The basic statistics of each questions responses were calculated, i.e., mean, median, standard deviation, skewness, etc., in order to understand general trends in the raw data.

Correlations were calculated for questions 4, 5, and 8 and the last six questions to see if the responses of parental support and physical parental help were similar. To find the relation between parental support and attitude about the science project questions, ANOVA tests for regression analyses were made between the combined scores for questions 4, 5, and 8 and each of the rest of the first 10 questions. Because of the extremely skewed data of questions 4, 5, and 8 (see Figure 1) the data had to be first divided into two groups (those who averaged from 1.0 to 3.9 and from 3.91 to 5.0) before the ANOVA was calculated. Without grouping this way the results were insignificant. Then analyses of variance were made for the last six questions and questions 1, 2, 3, 6, 7, 9, 10. This was to see if there was any relation between the "parental helping" questions and attitude questions. An ANOVA test was also done with question 10 and the rest of the first 10 questions (except for 4, 5, and 8) to find if there was any connection between interest in their own project topic and other attitude questions about the science fair.

In the analysis of results, the groups answers will be discussed in general, and outcomes will be pulled together to relate them to the hypothesis.

Chapter IV

Analysis of Results

The general statistics of the survey responses revealed several interesting results. Of the first 10 questions, (See table 1) the one that drew the *most negative* results was number 3, which stated: I am only participating in the science fair because I have to.

Insert Figure 1 about here

More students stated that they agreed (which was considered a negative attitude response) and it therefore garnered the lowest mean score. The *most positive* attitude question was question 2 which stated, "I would be very happy about winning a prize in the science fair." The mean of 4.16 showed that many people agreed with this statement. The parental support questions, 4,5 and 8, (see Table 4.1) also had very high means (means = 4.220, 4.100, 4.320 respectively) with the three lowest standard deviations of the first 10 questions(S.D.s = 1.016, 1.111 and

0.891 respectively). The histograms with their clumps of positive responses, provide the clear visual support for this (see Figure 1). Finally, in looking at parental help questions (concerning how much their parents helped the students with each step of their project), parents in this study helped the least in picking out a topic and the most in getting materials for the project according to their children.

Insert Table 1 about here

The parental support and encouragement questions (4, 5, and 8) were correlated with the last 6 questions about specific parental help and a significant relationship was found: $r = 0.4494$, $p < .01$. This suggested a possible association between perception of parental support and help.

The parental help scores (11 to 16) were averaged together for each survey and were compared with the attitude questions. (See Table 2) Analyses of variance tests did not show any significant effects except for question 7 concerning whether the science project helped students relate to scientists' work [$F(2,47) = 4.01$, $p < .03$] These tests indicated that the parental help students received did not significantly relate to students, attitudes.

The averages of parental support were then analyzed separately with the rest of the first ten questions (1,2,3,6,7,9,10). (See Table 3) A moderate relation to parental support was found for question 9 [$F(2,47) = 3.43$, $p < .10$]. This suggests weaker associations between the amount of parental encouragement and how much the students liked their science project, though question 10 which also dealt with the degree to which the student liked their own science project was not significant with parental support.

The achievement motivation questions (2 and 3) were each separately found to relate significantly with parental support at $p < .05$ at $F(1,48) - 5.26$ and $F(1,48) = 5.64$ respectively. Tne implication for question 2 is that parental support is related to how much the students would like to succeed with their projects. Question 3 suggests that students are more likely to have a desire to be in the science fair when their parents are supportive.

Extremely high relationships ($p < .005$) were found with questions 6 and 7 with $F(1,48) = 11.89$ and $F(1,48) = 10.75$ respectively. Question 6 and 7 strongly indicates that parental support is associated with the extent to which the students the students feel their projects are worthwhile. Question 1, which also dealt with how worthwhile the students perceived the project to be, had a weaker but interesting relation to parental support as well [$F(1,48) = 2.12$].

Insert Table 2 About Here

Insert Table 3 About Here

Finally, the relationship between question 10 (how interesting the students thought their science project was) and the rest of the attitude questions was calculated by ANOVA tests (See table 4). It seems that all but one of these comparisons were significant.

Insert Table 4 About Here

Follow up Scheffe procedures were done for these ANOVAs. Significant differences were found for the following.

Q 2	Groups	2 & 4	with 1
Q 3	"	3 & 4	with 1
Q 9	"	4	with 1

In general the mean for group 4 was always visibly different from the mean for group 1 in each question indicating that the different groups tended to answer the same way in each question.

These results suggest several interesting relationships. There is a strong association ($p < .002$ and $p < .004$ respectively) between liking one's own project topic and how "happy" the students would be to win a prize as well as how much they *wanted* to participate in the science.

There is also significance in the relationships between question 10 and 6, 7 and 9 at $p < .03$, $p < .02$ and $p < .02$ respectively. This means that interest in one's topic is also related to: 1. students' perception of the worthwhileness of their projects, 2. to what degree the students believe the science fair teaches them about the experiences of a scientist, and 3. how pleased the students are concerning the outcomes of their projects.

Chapter V

Conclusion/Discussion

The hypothesis of this study is generally supported by the data. Several interesting questions are also stimulated by the data. There does seem to be some relationship between parental support of the science fair and students' attitudes toward it. The association between parental help and student attitude, however, is unclear.

There does not seem to be any general association between physical parental help in completing the project and students' attitudes. There is, however, one attitude question that does relate significantly. This question asks whether the student feels the science project helped him or her to understand what it is like to be a scientist. One possible explanation could be that the direct parental interaction and communication about the project that might very well be associated with "parental help" could make the scientific process more understandable and meaningful to the student. This, in turn, might yield a more significant association between parental help scores and relating to a scientist's experiences. Overall, however, parental help in completing the project is not related to a positive attitude about the science fair.

Truly significant associations, however, are found between parental support and students' attitudes. Parental support, as measured by this instrument, means that students know that their parents are available for help, that their parents think the science fair is important and that they feel their parents encourage them to work on the project. In other words, the three survey questions, 4, 5 and 8, are assessing students perceptions of their parents attitudes about the project. The data support a relationship between students who perceive their parents as more supportive and these pupils' positive attitude toward the science fair. It implies parents who conveyed their support for the science fair have students who think of the science fair in a more positive way.

Further study might ask whether there can be some sort of "intervention" program for students whose parents might not encourage science or school in general. Would extra information about the science fair sent home (or relayed in some way) to the parent(s) help to increase their supportiveness of the fair? Could a specific school or science program incite interest in the science project. Would this approach be feasible?

Another question that is examined in the analysis is the association between how interesting students find their project topic and their attitude about the project in general. Though this is not a question in the hypothesis it seems an appropriate question to ask and it has generated significant results as well. There seems to be a strong connection between these two constructs. These results make a great deal of intuitive sense and provoke questions for further study. These findings also suggest a competing explanation for students' attitudes and need to be dealt with before conclusions are drawn.

Since a substantial percentage of 6th-graders gave negative responses for the "project interest" question, a few questions could be asked, such as: If these students had thought their project topics were engaging, would they have liked doing the project more? Could there be an intervention plan for "topic choosing" to make sure that everyone enjoys their topic?

The study also raises some other general questions. For instance: What effect do awards have on students' attitudes about the project? What effect does the presentation of the science projects to peers have on students attitudes? Does this form of peer teaching have any impact on students' perception of the "worthwhileness" of the project? In this study, the students are required to present their projects after the fair and their instructor feels that this might effect their attitudes. Another area that could be explored is the effect of teachers on students' attitudes. Do different teachers have different affects on attitudes. If so, why are these differences present. In general, this study raises many important questions.

Recommendations about the areas of the study that should be improved upon in further studies, have to do with the sample and the measurement instrument. Considering the ease of entering the data into a computer program, all 110 students should be surveyed instead of just 50. The survey instrument might also be more extensive by asking a few questions about each construct in order to achieve internal validity.

There is also one aspect of the study would have been done differently. Students' names should not be requested on the survey instrument. This anonymity might have also improved its validity.

Finally, the important question that this study generates is: why does only parental *support* and not parental *help* seem to be related to a positive attitude. One possible interpretation might be that students are aware of what parents expect from them and what their parents think is important. The students then project these attitudes onto their own schoolwork, the science fair in this case. It might also be the case that these students would rather do their own work and not have their parents do it for them. This would account for the high mean for the survey question concerning the extent to which parents helped the students get materials for the project. This is most likely the only part of the science project that the students are not able to do themselves. Though there is a significant correlation between students whose parents are supportive and those who help students, it appears that parental help alone is not enough for attitudes to be affected.

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APPENDIX A
Science Fair Survey, scoring system included

1. I don't think I've learned that much from participating in the science fair.
(SA) (A) (N) (D) (SD)
1 2 3 4 5

2. I would be very happy about winning a prize in the science fair.
(SA) (A) (N) (D) (SD)
5 4 3 2 1

3. I am only participating in the fair because I have to.
(SA) (A) (N) (D) (SD)
1 2 3 4 5

4. My parent(s) encourage me to work on my science fair project.
(SA) (A) (N) (D) (SD)
5 4 3 2 1

5. When I need help with my science fair project, my parent(s) try to help me.
(SA) (A) (N) (D) (SD)
5 4 3 2 1

6. The science project was worth all of the time and effort I put into it.
(SA) (A) (N) (D) (SD)
5 4 3 2 1

7. I think that the science fair helped me to see what it is like to be a scientist.
(SA) (A) (N) (D) (SD)
5 4 3 2 1

8. My parent(s) don't think that the science fair is important.
(SA) (A) (N) (D) (SD)
1 2 3 4 5

9. I am happy about how my project turned out.
(SA) (A) (N) (D) (SD)
5 4 3 2 1

10. I don't think that my science fair project topic was very interesting.
(SA) (A) (N) (D) (SD)
1 2 3 4 5

My parent(s) helped me...

		2	1	0
11)	pick a topic	a lot	some	none
12)	do research	a lot	some	none
13)	write the paper	a lot	some	none
14)	get materials for the project	a lot	some	none
15)	make the presentation board	a lot	some	none
16)	create the display	a lot	some	none

17) Are your parents coming to the science fair? *(omitted from analysis)*   2 Yes or 0 No

Means and Standard Deviations for the Raw Data for Each Instrument Question

Q.#	Mean	Stan. Dev.
1	3.640	1.191
2	4.160H	1.184
3	2.840L	1.267
4	4.220	1.016
5	4.100	1.111
6	3.580	1.090
7	3.120	1.136
8	4.320	0.891
9	3.620	1.260
10	3.460	1.297
	parental help	
11	0.420L	0.609
12	0.800	0.756
13	0.620	0.667
14	1.180H	0.748
15	0.660	0.688
16	0.740	0.694

shaded areas = parental support questions. H = highest mean of group, L = lowest mean of group.

(parental support questions not inc d for H & L)

Table 1

ANOVAs of Questions 11-16 with Attitude Questions

ANOVA w/ Q#	F-ratio	F-prob.
1	.2875	.7514
2	.0380	.9628
3	.7468	.4794
6	1.1168	.3359
7	4.0036	.0248**
9	1.2774	.2883
10	.2809	.7546

Significance: ** < .05

Table 2

ANOVAs of Questions 4, 5 and 8 with Attitude Questions

ANOVA w/ Q. #	F-ratio.	F-prob.
1	2.1211	.1518
2	5.2597	.0263**
3	5.6353	.0217**
6	11.8868	.0012***
7	10.7647	.0019***
9	3.4257	.0703*
10	.9785	.3275

Significance * < .10 ** < .05, *** < .005

Table 3

ANOVAs of Question 10 with other Attitude Questions

ANOVA w/ Q#	F-ratio	F-prob.
1	1.6752	.1854
2	6.0716	.0014***
3	5.2214	.0035***
6	3.3597	.0266**
7	3.6597	.0190**
9	3.7376	.0174**

Significance ** < .05 *** < .005

Table 4

Figure 1

Question 1

```
Count     Midpoint   One symbol equals approximately
                     1.0 occurrences

    3        1.00 I***
    8        2.00 I********
    5        3.00 I*****
   22        4.00 I**********************
   12        5.00 I************
                  +----+----+----+----+----+----+
                  0    5    10   15   20   25   30

                     Mean = 3.640, SD = 1.191
```

Question 2

```
Count     Midpoint

    4        1.00 I****
    1        2.00 I*
    4        3.00 I****
   15        4.00 I***************
   26        5.00 I**************************
                  +----+----+----+----+----+----+
                  0    5    10   15   20   25   30

                     Mean = 4.160, SD = 1.184
```

Question 3

```
Count     Midpoint

   11        1.00 I***********
    8        2.00 I********
   12        3.00 I************
   16        4.00 I****************
    3        5.00 I***
                  +----+----+----+----+----+
                  0    5    10   15   20   25

                     Mean = 2.840, SD = 1.267
```

Figure 1 contd.

Question 4

```
Count    Midpoint

   2        1.00 I**
   1        2.00 I*
   6        3.00 I******
  16        4.00 I****************
  25        5.00 I*************************
                 +----+----+----+----+----+----+
                 0    5    10   15   20   25   30

                   Mean = 4.220, SD = 1.016
```

Question 5

```
Count    Midpoint

   2        1.00 I**
   3        2.00 I***
   7        3.00 I*******
  14        4.00 I**************
  24        5.00 I************************
                 +----+----+----+----+----+----+
                 0    5    10   15   20   25   30

                   Mean = 4.100, SD = 1.111
```

Question 6

```
Count    Midpoint

   4        1.00 I****
   3        2.00 I***
  11        3.00 I***********
  24        4.00 I************************
   8        5.00 I********
                 +----+----+----+----+----+----+
                 0    5    10   15   20   25   30

                   Mean = 3.580, SD = 1.090
```

Figure 1 contd.

Question 7

```
Count    Midpoint

   5        1.00 I*****
   9        2.00 I*********
  16        3.00 I****************
  15        4.00 I***************
   5        5.00 I*****
                 +----+----+----+----+----+
                 0    5    10   15   20   25
```

Mean = 3.120, SD = 1.136

Question 8

```
Count    Midpoint

   0        1.00 I
   1        2.00 I*
  11        3.00 I***********
   9        4.00 I*********
  29        5.00 I*****************************
                 +----+----+----+----+----+----+----+
                 0    5    10   15   20   25   30   35
```

Figure 1 contd.

Mean = 4.320, SD = 0.891

Question 9

```
Count    Midpoint

   5        1.00 I*****
   4        2.00 I****
  10        3.00 I**********
  17        4.00 I*****************
  14        5.00 I**************
                 +----+----+----+----+----+
                 0    5    10   15   20   25
```

Mean = 3.620, SD = 1.260

Figure 1 contd.

Question 10

```
Count     Midpoint

    7         0.00 I*******
    3         1.00 I***
   11         2.00 I***********
   18         3.00 I****************
   11         4.00 I***********
                   +----+----+----+----+----+
                   0    5    10   15   20   25

                     Mean = 3.460, SD = 1.297
```

Question 11

```
Count     Midpoint

   32         0.00 I********************************
   15         1.00 I***************
    3         2.00 I***
                   +----+----+----+----+----+----+----+
                   0    5    10   15   20   25   30   35

                     Mean = 0.420, SD = 0.609
```

Question 12

```
Count     Midpoint

   20         0.00 I********************
   20         1.00 I********************
   10         2.00 I**********
                   +----+----+----+----+----+----+
                   0    5    10   15   20   25   30
```

Figure 1 contd.

```
                     Mean = 0.800, SD = 0.756
```

Figure 1 contd.

```
Question 13

Count     Midpoint

   24         0.00 I************************
   21         1.00 I*********************
    5         2.00 I*****
                   +----+----+----+----+----+----+
                   0    5   10   15   20   25   30

                     Mean = 0.620, SD = 0.667
```

```
Question 14

Count     Midpoint

   10         0.00 I**********
   21         1.00 I*********************
   19         2.00 I*******************
                   +----+----+----+----+----+----+
                   0    5   10   15   20   25   30

                     Mean = 1.180, SD = 0.748
```

```
Question 15

Count     Midpoint

   23         0.00 I***********************
   21         1.00 I*********************
    6         2.00 I******
                   +----+----+----+----+----+----+
                   0    5   10   15   20   25   30

                     Mean = 0.660, SD = 0.688
```

Figure 1 contd.

Question 16

```
Count     Midpoint

   20         0.00 I********************
   23         1.00 I***********************
    7         2.00 I*******
                   +----+----+----+----+----+----+
                   0    5    10   15   20   25   30

                      Mean = 0.740, SD = 0.694
```