

THE EFFECTS OF VIEWING THE IMAX/OMNIMAX FILM
TROPICAL RAINFOREST
ON ATTITUDES AND KNOWLEDGE

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The Effect of Viewing the Imax/Omnimax film, *Tropical Rainforest* on Attitudes and Knowledge

INTRODUCTION

The Science Museum of Minnesota, located in St. Paul, Minnesota, which produced the Imax/Omnimax film, *Tropical Rainforest*, was interested in the effectiveness of the film, not only as entertainment, but also as an educational tool. The Science Museum of Minnesota was specifically interested in the question of whether or not the viewing of this film would have an effect on the viewers' attitudes toward and content knowledge of the worlds' tropical rain forests. Therefore, there was a need for the development of survey instruments that would measure changes in attitude and knowledge of the individuals that viewed the film at the Science Museum of Minnesota. The following paper discusses the development of the instruments and the administration of the research project.

The Imax/Omnimax film, *Tropical Rainforest*, was produced not only to inform and entertain, but also to confront the attitudes concerning the impact that the worlds' rain forests have on the earth. To be successful, the film needed to be imaginative, intriguing, and informative for it's audience. The question remained whether or not this Imax/Omnimax film on tropical rain forests was effective in changing the attitudes of a wide variety of viewers. This study was designed to answer these specific questions:

1. Does the viewing of the Imax/Omnimax film, *Tropical Rainforest*, contribute to a more positive attitude towards the rain forests of the world?
2. Does the viewing of the Imax/Omnimax film, *Tropical Rainforest*, contribute to a gain in the knowledge of the rain forests of the world?
3. Does age, gender, previous knowledge or number of previous visits to the Science Museum of Minnesota affect the attitude or knowledge changes that may take place as a result of viewing the Imax/Omnimax film, *Tropical Rainforest*?

INSTRUMENT DEVELOPMENT

This study began by evaluating the intentions of the producers of the film. What was the purpose of the film and what did the producers hope to accomplish, other than to entertain the audience? After reviewing the written proposals and committee minutes and statements, it was determined that five major concepts were emphasized in order to help people understand the situation that confronts the tropical rain forests of the world. The five major knowledge areas are; 1) very long periods of time (deep time) is important in the evolutionary processes which account for part of the biological diversity of the rain forests, 2) the difficulty and importance of scientific efforts to understand the tropical rain forests before they are destroyed, 3) the importance of the biological diversity of the rain forests, 4) the complex relationships that exist between organisms, and 5) the global impact of world-wide deforestation of the tropical rain forests. These content concepts were not the only purpose of this film, however, because the producers were also interested in the attitudes towards the tropical rain forests of the world. They intended to address the following attitudinal subgroups; 1) the importance of the tropical rain forests, 2) the importance of researching the rain forests, 3) the

importance of biological interdependence and biodiversity, and 4) the importance of human influences on tropical rain forests, for example logging.

The stated goals of the film producers included; 1) to capture the emotional drama of the issue of tropical rain forest deforestation in a "deep time" context, and 2) to create a context for the concerns of biologists at the loss of biodiversity.

INSTRUMENT DESCRIPTION

The design of a valid and reliable instrument to measure attitudes toward and knowledge of the tropical rain forests of the world was a major concern of the researchers involved in this study. Abdel-Gaid and her colleagues (1986) provided a guide of the processes involved in developing a Likert-like scale. According to Thomas R. Koballa (1989) attitude is a construct that must be measured indirectly, usually through self-report, and it is imperative that the instruments used to assess attitudes be both reliable (i.e. produce consistent results) and valid (i.e., measure what you want to measure). A Likert-like scale was used for the attitude measurement and a multiple choice and open-ended (short answer) format was used for the measurement of the content knowledge. The Likert-like scale consists of a series of attitude statements that are clearly either positive or negative. A wide range of scores is achieved by having respondents report the intensity of an attitude. This is accomplished by having them indicate their agreement with each statement on a 5-point scale. Two instruments were developed in order to measure the attitudes and content knowledge of a variety of viewers.

The knowledge and attitude items for these instruments were compiled by the researchers with the help of several science education assessment experts from the University of Minnesota, and area teachers from several different grade levels. All knowledge items were chosen to test for one of five major knowledge areas as defined by the film producers, which are listed above. The attitude statements were written to include the major attitude subgroups listed above.

One instrument is designed for grades one through six (referred to as the children instrument). This instrument consists of two parts; the first part measures the viewers knowledge of rain forests and the second part was designed to measure the viewers' attitude toward tropical rain forests. It should be noted that a 3-point Likert-like scale was used in the children instrument in the hope of simplifying the responses (see appendix). The second instrument is designed for grades seven through twelve, including all adults (referred to as the youth/adult instrument). This instrument also consisted of two parts; part one measures knowledge of the tropical rain forests, and part two measures attitudes toward tropical rain forests.

PILOT TESTING

After writing and editing the items for both instruments, a pilot test was conducted with students and general walk-in audience subjects. A Cronbach, coefficient alpha reliability test (Cronbach, 1970) was completed and was used to

eliminate items in order to develop the most reliable instrument possible. Some items were omitted and others were revised following the pilot testing procedure. All revisions were done with readability in mind. After eliminating certain items, the results of the reliability analysis for the children instrument resulted in an alpha value of 0.6225, with $n=37$. The children instrument contained twenty attitude items and five of these were eliminated to provide fifteen attitude items for the instrument used in the study. The multiple choice and open ended items were pilot tested as well, and a total of five multiple choice items were selected along with two open-ended (short answer) items. A combined class of third and fourth grade students were used to pilot test the instrument which will be used to measure grades one through six. The alpha value is lower than the normal suggested value, however, it is felt by this investigator that it is difficult to reach the normal acceptable alpha value of 0.8, which is found in the research literature, when sampling younger children, because of inherent problems with young children completing a self-report instrument.

The pilot instrument for the youth/adult subjects contained twenty-three attitudinal items and upon completion of the Cronbach alpha reliability test, six items were eliminated, resulting in seventeen attitudinal items to be used in the study. The results of the test, after the final selection of items was an alpha value of 0.8411, with $n=25$. Six multiple choice items were selected that reflected questions from each of the major content areas that were identified earlier in this paper. The multiple-choice and open-ended items, as well as the attitude items, describe above, were written by the independent researcher and reviewed and edited by various teachers, consultants, and science museum staff to help insure content validity. A sample of ninth grade students and adult walk-in subjects were used for the youth/adult instrument pilot test. After completion of the pilot test, the final versions of the two instruments were printed and the study was ready to begin. It should be noted that instrument reliability and valid data are not static, but change from sample to sample and from one administration to the next. Standard research procedures were used in the development of these instruments as regards to reliability and validity, with the hopes of having the best instrument possible.

Nine interviews were conducted in conjunction with the completion of the pre and post instruments. Each interview lasted approximately 15 minutes. Each selected subject was given the written instrument prior to viewing the film and then interviewed by the independent researcher. After viewing the film, each subject was given the second instrument and then immediately interviewed by the researcher. A sample of three subjects from each of the three audiences were interviewed. The protocol used for the interviews followed the instrument format. Only a few minor deviations from the written responses were obtained through the interview process. This reaffirmed that the instruments were, as a whole, measuring what the researchers thought they were measuring

METHODOLOGY

Three distinct audiences were evaluated including students in grades one through six, students in grades seven through twelve, and a general walk-in

audience consisting mostly of adults and a small number of students from grades seven through twelve. Students from fifteen St. Paul and Minneapolis, Minnesota area schools in grades one through twelve were selected by stratified random design for the study. The schools were selected from the Science Museum of Minnesota computer film reservation list provided by the museum. Approximately forty-five students from each of the twelve grades were sampled, which involved at least two different classes from each grade level.

The schools were contacted and asked if they would participate in the study, which involved having the students complete the first instrument the day prior to viewing the film and also a similar instrument the day following the viewing of the film. A consent and release form (see appendix) was given to each teacher to insure the confidentiality of all subjects. The pre and post instruments were delivered to the participating teachers prior to their scheduled viewing date. All instruments were completed in the classroom, under the supervision of the teacher, who was also available to answer any questions concerning the mechanics of the instruments. The teachers for grades one through three were instructed to read aloud the items of the instruments after modeling, to their students, the correct method of marking the instruments. A \$50.00 dollar gift certificate, which could be used at the museum gift shops, was offered to the participating schools.

The walk-in subjects were randomly chosen from the in-line audience at the museum theater and asked if they would like to participate in the study. A consent-release form was shown to each subject and a poster was provided for the completion of both the pre and the post instruments. The general walk-in audience filled out the youth/adult instrument prior to and immediately following the viewing of the film.

The Wilder Foundation of St. Paul, Minnesota was contracted by the Science Museum of Minnesota for consultation during the development, administration, and analysis of this research project. All instruments were collected and coded by the independent researcher and delivered to the Wilder Foundation for data entry and consultation. Statistical tests, using the P-STAT, Inc., version 2.14 (1972-1991 copyright) program, were completed to gain insight into the major research questions that were addressed by this study.

RESULTS

This study was designed to evaluate the effectiveness of the Imax/Omnimax film, *Tropical Rainforest* in changing viewer attitudes toward and knowledge of the tropical rain forests of the world. The main focus of the study was to look at the attitudes of the viewers before and after viewing the film, but also attempted to measure the change in knowledge as a result of viewing the film. There were three main audiences; children (grades one through six), youth (grades seven through twelve), and youth and adult walk-ins (grades seven and above). Comparisons between gender, age, previous knowledge of tropical rain forests, and number of previous museum visits will be analyzed below. The comparison results will be reported for each of the three audiences under the two main

categories of knowledge gained and change in attitude.

All multiple choice items were scored and analyzed individually, due to the small number of items. Six multiple choice items were used in the analysis of the youth-adult instruments, while five multiple choice items were analyzed in the children instrument. The multiple-choice items were analyzed using a Wilcoxon Matched-Pairs Test for testing for differences between pre knowledge scores and post knowledge scores. All open-ended knowledge questions were coded and analyzed by percent of responses. By completing the pre instrument shortly prior to seeing the film, and completing the post instrument as soon as possible after viewing the film, the only known treatment that the participants received was the Imax/Omnimax film, *Tropical Rainforest*.

The attitude statements were scored as a total attitude score and analyzed using a variety of nonparametric tests, which will be identified in the results below. The use of nonparametric statistical tests was justified because the distribution of the scores was not normal. This non-normality was partially anticipated by the researchers at the onset of this study due, in part, to the bias of the walk-in audience. The fact that the general walk-in audience subjects chose to view this film suggests that they had an interest or possible knowledge of tropical rain forests prior to viewing the film.

All results will be reported for children (grades 1 through 6), youth (grades 7 through 12), and adults (general walk-in audience) in that order for each of the categories and comparisons that were investigated in this study.

KNOWLEDGE GAINED

Children

A Wilcoxon Matched-Pairs Test was conducted on the scores to test for differences between pre and post knowledge scores. The pre knowledge scores are shown in figure 1 and Table 1, with a mean score of 3.848 and SD of .986. The post knowledge scores are shown in figure 2, with a mean score of 4.291 and SD of .8857. Overall, the knowledge scores improved significantly, with a z score of 6.52, with a $p < .0001$, $n = 278$ (see table 2). The distribution of scores showed 31.65% of the students improved their score by one item out of five, while 43.88% improved their score by one to four items out of five. 42.81% of the students' scores remained the same (see figure 3).

KNOWLEDGE

	N	Mean Score	SD	Possible range
Children				
Pre knowledge	283	3.848	.986	0 to 5
Post knowledge	283	4.291	.885	0 to 5
Youth				
Pre knowledge	259	3.261	1.375	0 to 6
Post knowledge	257	4.599	1.313	0 to 6
Adult				
Pre knowledge	352	4.599	1.313	0 to 6
Post knowledge	355	5.684	.684	0 to 6
ATTITUDE				
Children				
Pre attitude	257	25.677	3.515	0 to 30
Post attitude	257	26.253	3.122	0 to 30
Youth				
Pre attitude	247	48.576	8.1621	0 to 64
Post attitude	253	51.569	7.843	0 to 64
Adult				
Pre attitude	346	54.156	6.879	0 to 64
Post attitude	346	56.959	6.335	0 to 64

TABLE 1 - A summary of knowledge and attitude gain using a Wilcoxon Matched-Pairs Test. The table shows pre and post score information.

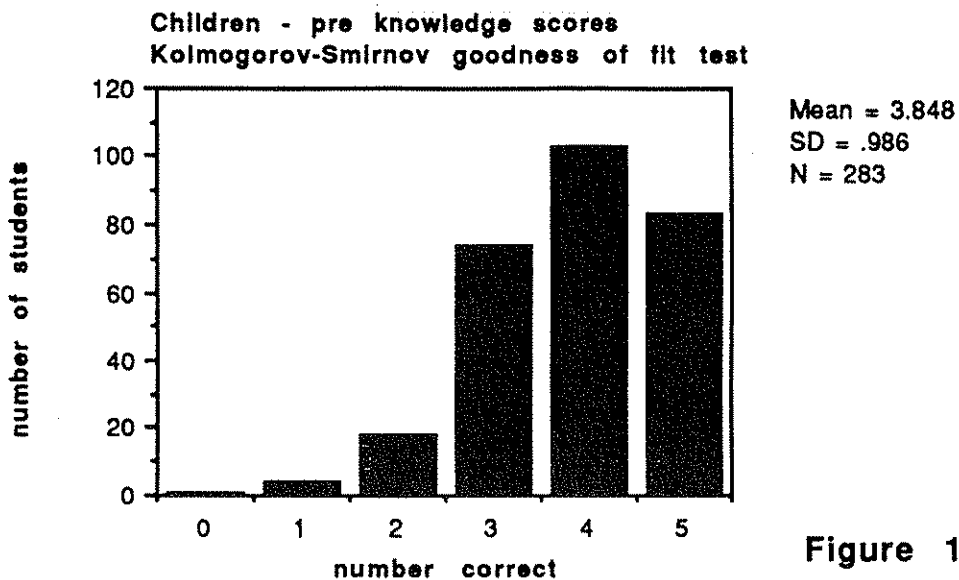


Figure 1

KNOWLEDGE

Audience	# cases increased	Mean Rank	# cases decreased	Mean Rank	# cases tied	Z value	2-tailed P value
Children	122	83.20	37	69.43	119	6.519	.0000
Youth	177	106.01	23	58.13	47	10.631	.0000
Adult	255	133.07	7	74.21	84	13.608	.0000

ATTITUDE

Children	108	91.33	65	79.81	62	3.544	.0004
Youth	146	114.41	69	94.44	14	5.577	.0000
Adult	223	155.38	61	95.40	49	10.406	.0000

TABLE 2 - A summary of Wilcoxon Matched-Pairs signed-rank test, testing for differences between pre knowledge and post knowledge and pre attitude and post attitude.

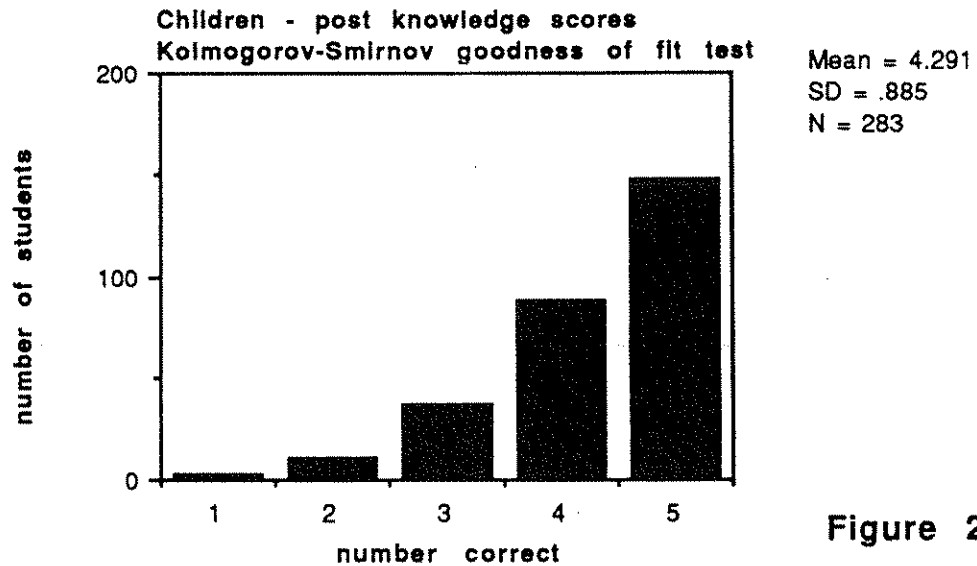


Figure 2

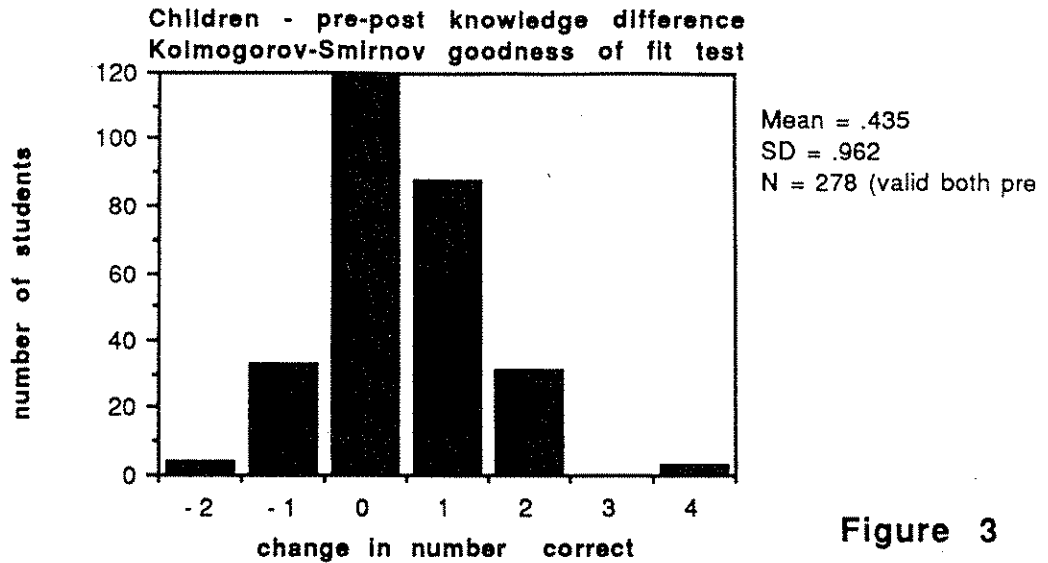


Figure 3

Youth

The youth pre knowledge scores were near normal (see figure 4), while the post knowledge scores were positively skewed (see figure 5). The Wilcoxon Matched-Paired Test showed that, overall, the knowledge scores improved significantly, with a z score of 10.63, $p < .0001$, ($n=247$) (see table 1). One hundred and seventy seven students improved their score by one to five items out of six. The distribution of scores showed 27.94% gained one item, 17.41% gained two items, 17.81 gained three items, 6.88% gained four items and 1.62% gained five items for a total of 71.66% of the subjects. 19.03% of the subjects had no gain and 9.3% of the subjects scored lower on the post-instrument (see figure 6 and table 2).

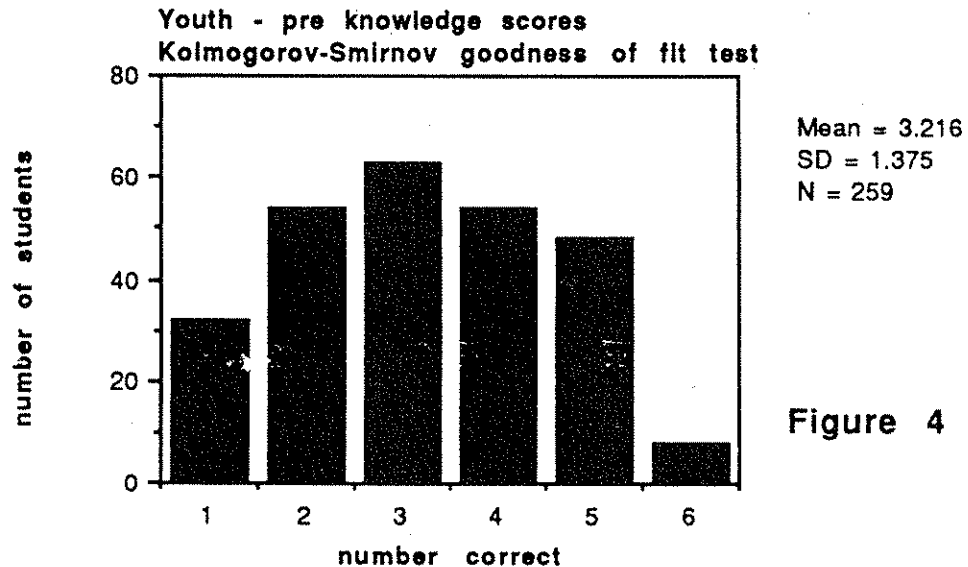


Figure 4

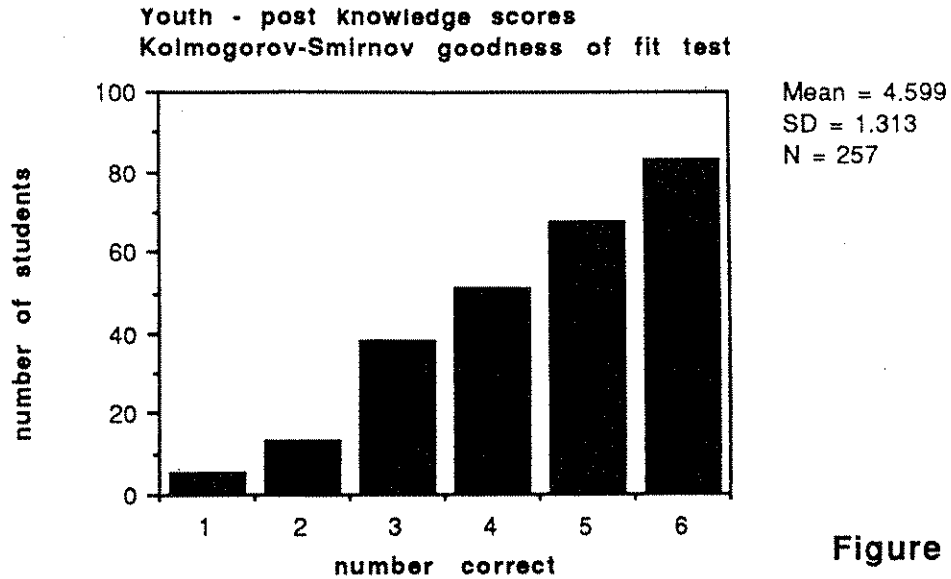


Figure 5

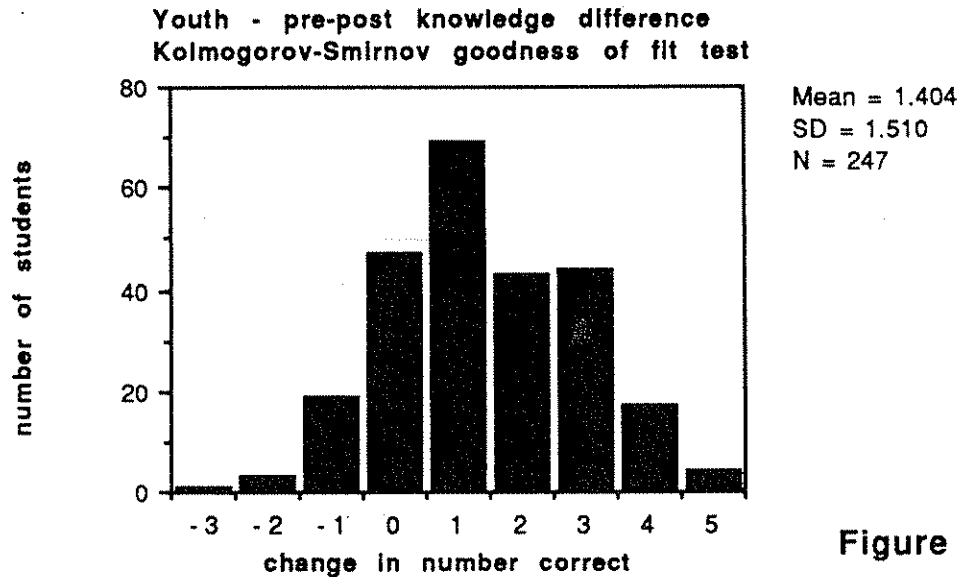


Figure 6

The adult pre knowledge scores were not of a normal distribution, (see figure 7). Figure 8 shows a positively skewed distribution of post knowledge scores for the adult population. Overall, the adult scores improved significantly, with a $z = 13.6$, $p < .0001$, ($n=346$) (see table 1). Two hundred and fifty five subjects improved their score by one to five items out of six (see table 2). The distribution of scores showed 32.37% gained one item, 25.14% gained two items, 12.72% gained three items, 3.18% gained four items, and 0.29% gained five items for a total of 73.7% of the subjects. 24.28% showed no gain and 2.02% scored lower, as shown in figure 9.

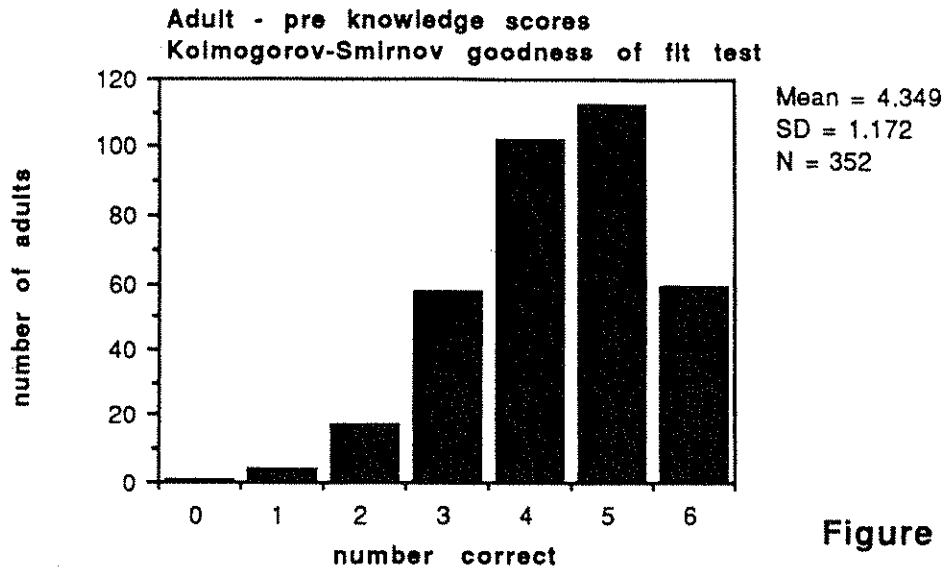


Figure 7

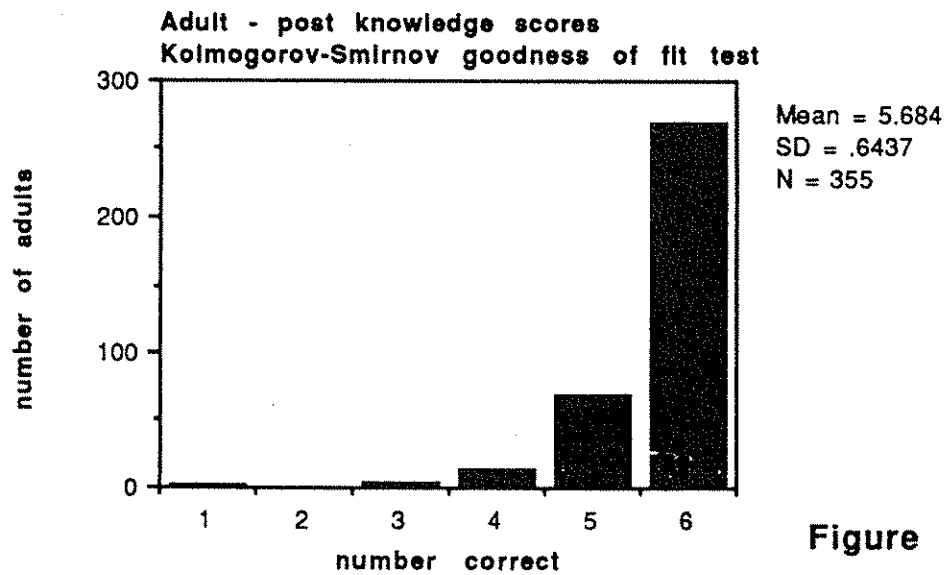


Figure 8

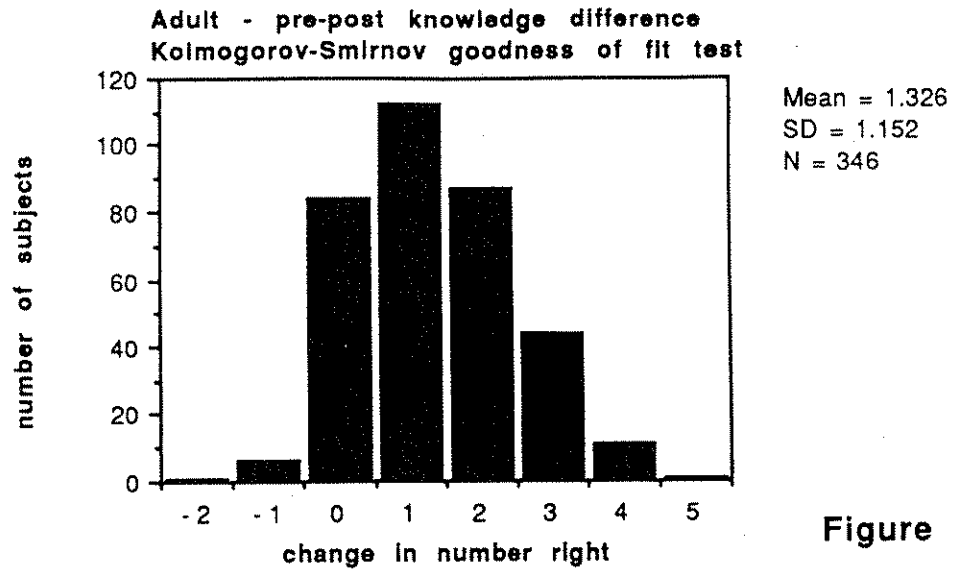


Figure 9

ATTITUDE CHANGES

Children

The following scores were analyzed using a Wilcoxon Matched-Pairs Test for testing for differences between **pre and post attitude scores**.

Overall, the children attitude scores rose significantly, with a z score = 3.54, $p < .0004$, $n = 235$ (see table 2). The attitude score of sixty two students (26.4%) remained the same, while one hundred and eight (45.97%) of the students improved their attitude scores from one to nine points. A total of 27.66% sixty five students (27.66%) showed a decrease in attitude. (See figures 10, 11 and 12.)

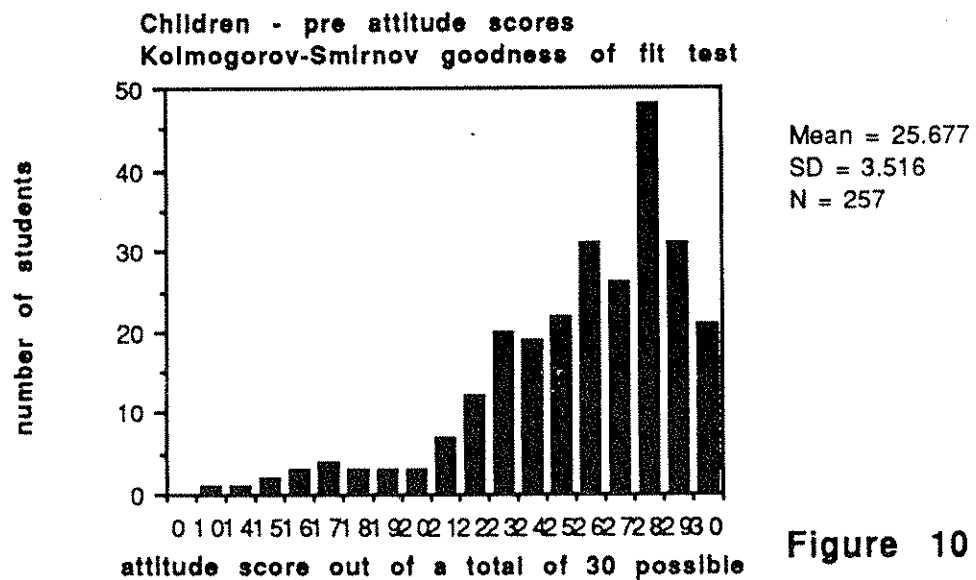


Figure 10

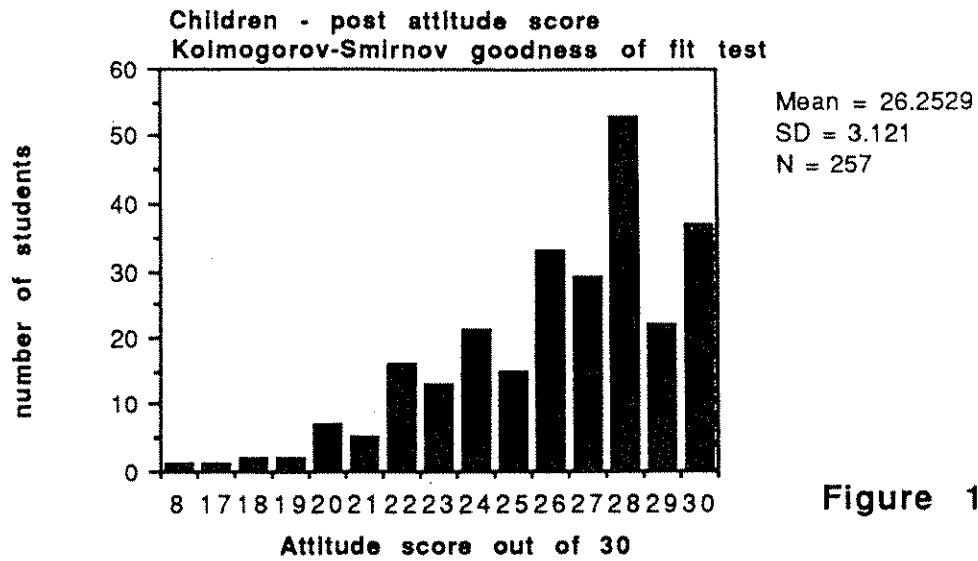


Figure 11

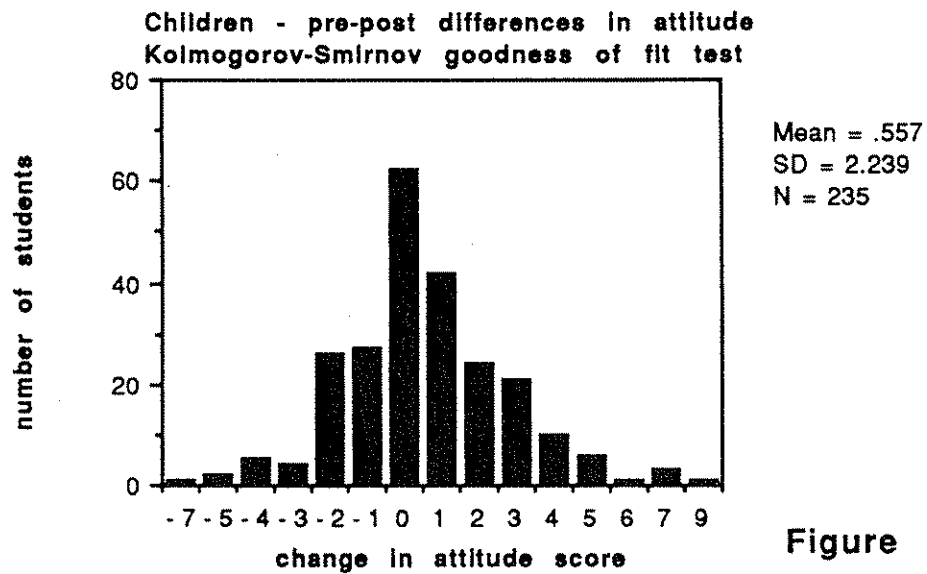


Figure 12

Youth

Overall, the youths attitude scores increased significantly, with a z score = 5.75, $p < .0001$ ($n=229$) (see table 2). Fourteen students showed no change in attitude, while 63.76% (146) of the students improved their attitude scores from one to 27 points. A total of 30.13% (69) students showed a decrease in attitude (see figures 13, 14, and 15).

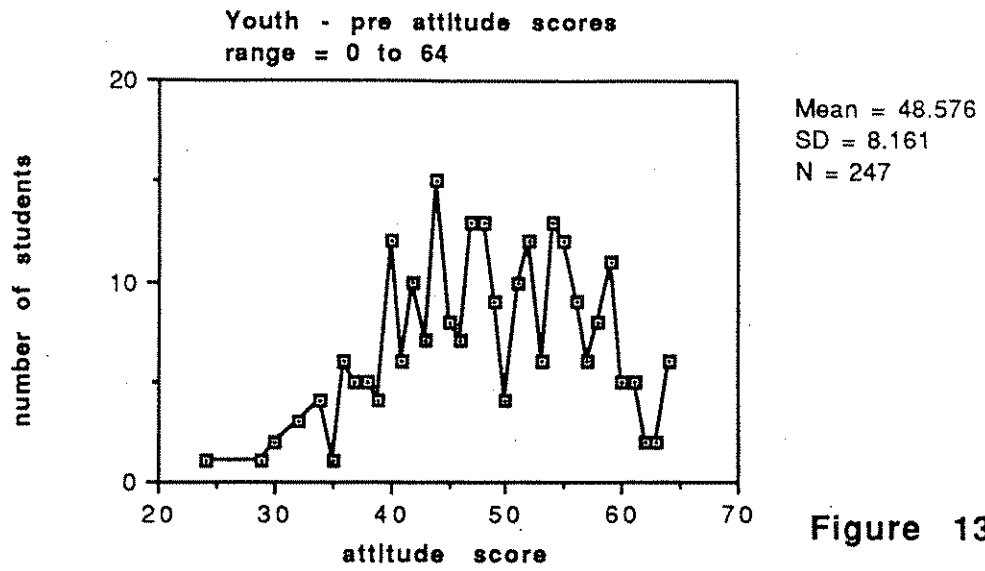


Figure 13

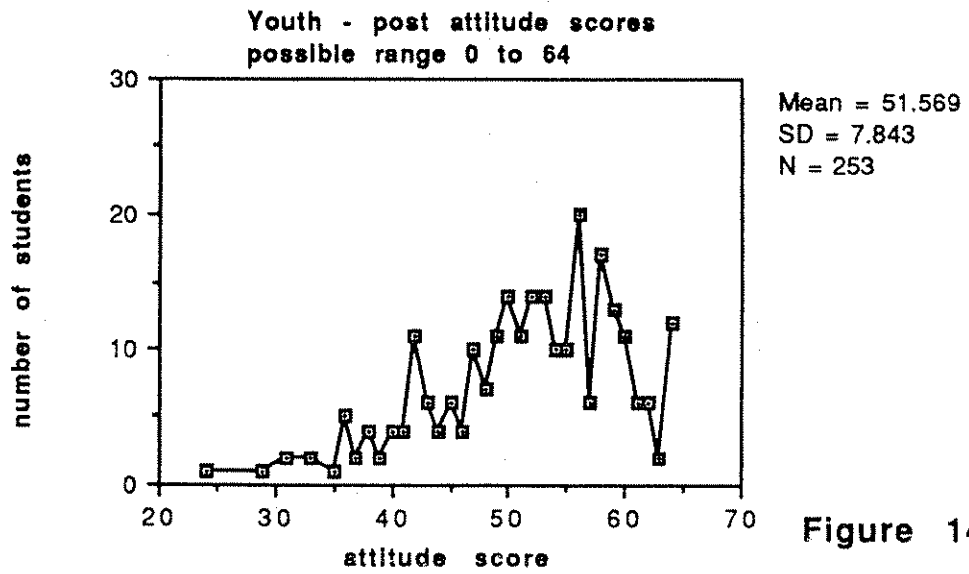


Figure 14

Youth - difference between pre and post attitude scores

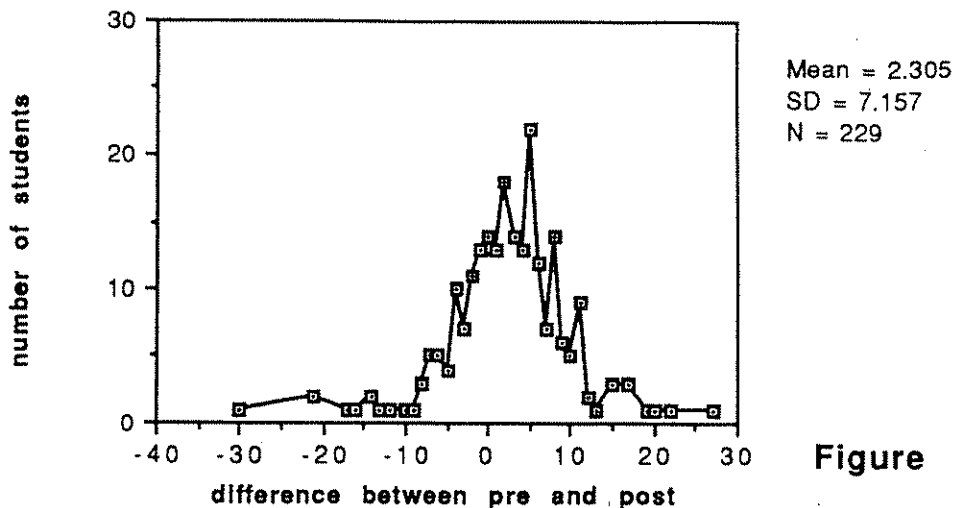


Figure 15

Adult

Overall, the adults (general audience) attitude scores increased significantly, with a z score = 10.40, $p < .00001$, ($n=333$) (see table 2). About fifteen percent of the subjects (49) showed no change in attitude, while 66.97% (223) showed improved attitude scores from 1 to 16 points. A total of 18.321% (61) subjects showed a decrease in attitude (see figures 16, 17, and 18).

Adult - pre attitude scores
Kolmogorov-Smirnov goodness of fit test

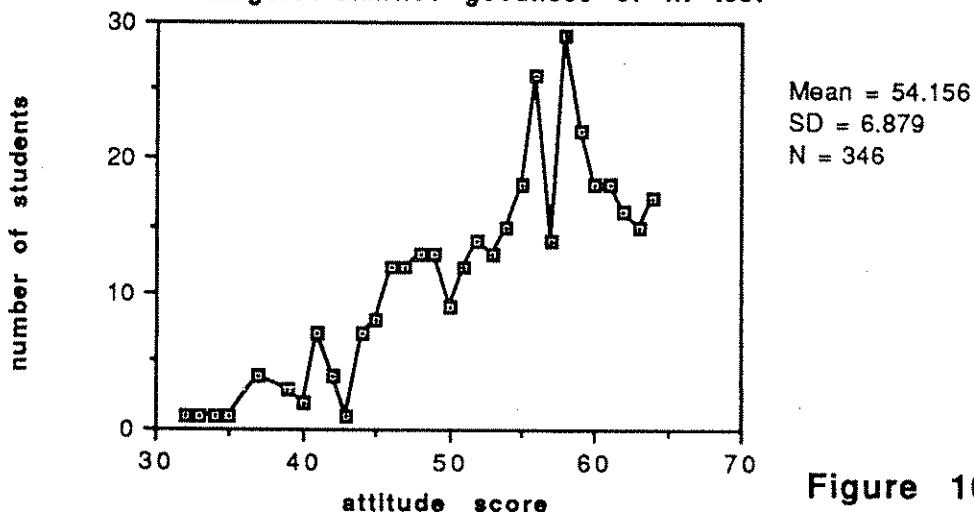


Figure 16

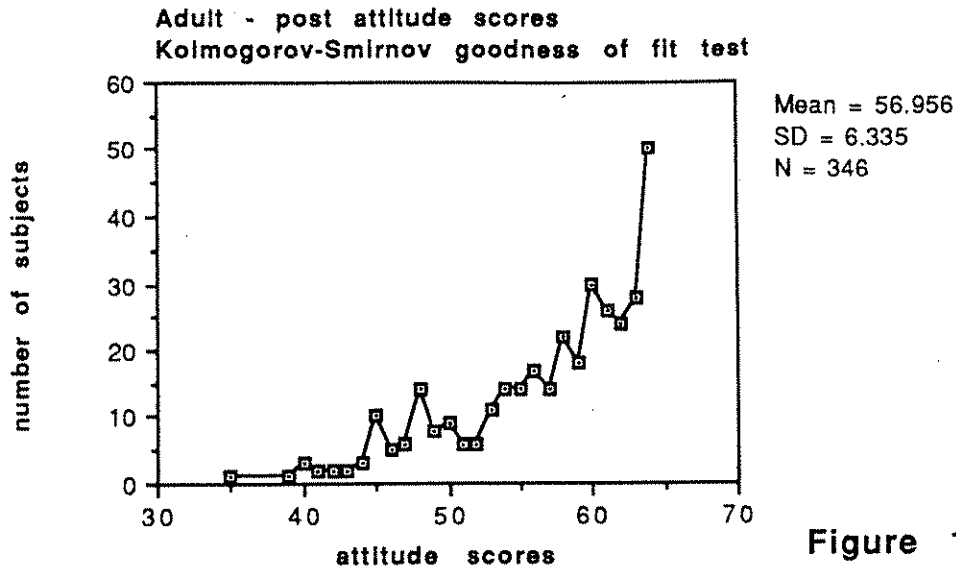


Figure 17

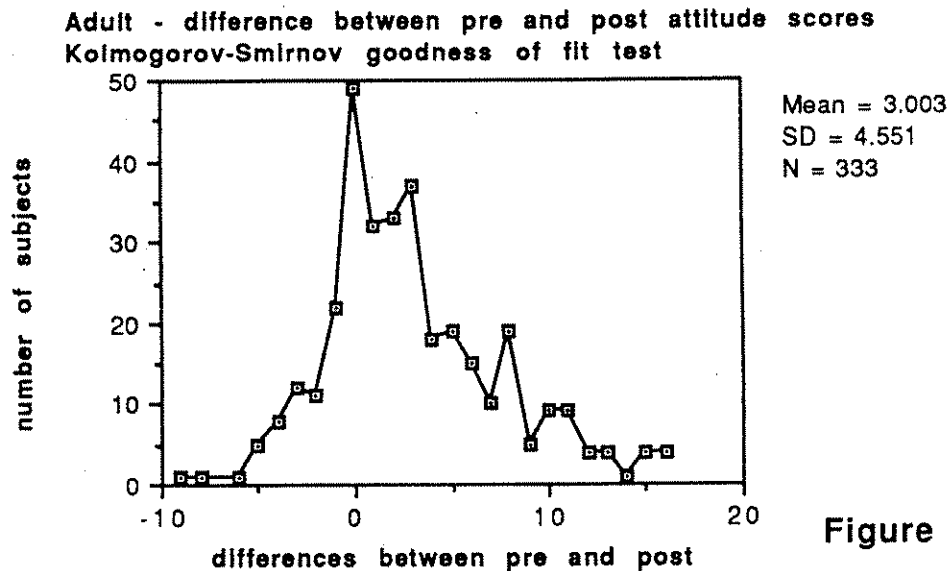


Figure 18

EFFECT OF PRIOR VISITS ON PRE-POST KNOWLEDGE SCORES

Children

The subjects were asked to indicate the number of prior visits that they had made to the Science Museum of Minnesota in the last year. A Kruskal-Wallis Test for testing for differences by number of visits on total pre-post knowledge scores was completed, and the results are reported here (see table 3). As one might expect, the subjects who indicated that they have visited the museum more than five times scored significantly higher on the pre-test for knowledge. A chi square of 14.578, $p < .005$ ($n=279$) was obtained. On the post test knowledge scores, the students with 1-4 visits and more than 5 visits scored higher on the post knowledge test than the subjects who indicated that they had never been to the museum before, with a chi square of 30.98, $p < .00001$ ($n=281$). Interestingly, the

improvement on knowledge scores showed that the subjects who visited 1–4 times and more than 5 times were similar, but significantly higher than those who had never visited the museum prior to seeing the film, with a chi-square of 7.03, $p < .05$.

KNOWLEDGE

Children	Number	Chi-square	Significance	# ties	range
Pre knowledge	279	14.518	.0007	5	0 to 5
Post knowledge	281	37.560	.000	5	0 to 5
Improvement of scores	274	7.937	.0189	6	-5 to 5
Youth					
Pre knowledge	259	7.424	.0244	6	0 to 6
Post knowledge	257	3.361	.1863	6	0 to 6
Improvement of scores	247	2.188	.335	8	0 to 6
Adult					
Pre knowledge	352	6.029	.0491	6	0 to 6
Post knowledge	355	9.141	.0104	4	0 to 6
Improvement of scores	346	0.6526	.7216	6	-6 to 6

TABLE 3 - Summary of Kruskal-Wallis Test for testing for differences by number of visits on total pre/post knowledge scores and improvement on knowledge scores. Kruskal-Wallis 1-way anova.

Youth

A Kruskal-Wallis Test for testing differences by number of visits on the total pre-test knowledge scores was conducted and there were no significant differences shown between the number of prior visits and the pre, post or improvement on knowledge scores (see table 3).

Adult

A Kruskal-Wallis Test for testing differences by the number of visits on total pre-test knowledge scores was conducted and there were significant differences between the subjects who had visited the museum more than five times and the subjects who had never visited the museum before in total pre-test knowledge scores. The reported values of the difference was a chi-square of 6.029, with a significance of .0491. However, no statistically significant differences were found between number of visits and the post-test knowledge scores. No significant differences were found on the improvement on knowledge scores between subjects with different numbers of prior museum visits (see table 3).

EFFECT OF PRIOR VISITS ON PRE-POST ATTITUDE SCORES

Children

A Kruskal-Wallis Test for testing for differences by number of visits on total pre-post attitude scores was completed with the following results: (see table 4). The students who visited the museum more than five times prior to viewing the film had significantly higher pre-test attitude scores than either of the other two

groups (no visits and 1–4 prior visits). When testing for differences on improvement on attitude scores, there were no significant differences, but those with a less positive attitude improved their ranking more than the students with more than five visits (see table 4).

ATTITUDE

Children	Number	Chi-square	Significance	# of ties	Possible range
Pre attitude	254	9.713	.0078	16	0 to 30
Post attitude	254	5.628	.0606	13	0 to 30
Improvement of scores	232	1.428	.4897	12	-5 to 5
Youth					
Pre attitude	243	6.245	.0440	32	0 to 64
Post attitude	253	4.047	.1322	31	0 to 64
Improvement of scores	229	1.480	.4770	25	-64 to 64
Adult					
Pre attitude	346	1.534	.4645	26	0 to 64
Post attitude	346	0.2449	.8847	25	0 to 64
Improvement of scores	333	1.977	.3722	21	-64 to 64

TABLE 4 - Summary of Kruskal-Wallis Test for testing for differences by number of visits on total pre/post attitude scores and improvement on attitude scores. Kruskal-Wallis 1 way anova (corrected for ties).

Youth

A significant difference in pre-test attitude scores was found between the groups who had never visited the museum before and those who had visited the museum 1–4 times and more than 5 times. A chi-square of 6.23, $p < .05$ ($n=243$) was calculated. However, the post-test and improvement on attitude scores showed no significant differences (see table 4).

Adult

A Kruskal-Wallis Test for testing for differences by number of visits indicated no statistically significant differences between the adult general audience on the pre-attitude scores, post-attitude scores, and improvement on attitude scores (see table 4).

EFFECT OF PREVIOUS KNOWLEDGE OF RAIN FORESTS ON KNOWLEDGE SCORES

Children

The children's instrument contained a question concerning how much previous knowledge of rain forests the participant had prior to viewing the film. There

were three possible responses, none, a little, and a lot. A Kruskal-Wallis Test for testing differences by previous knowledge on total pre-knowledge scores indicated that all three groups were at virtually the same level, with no significant differences between the three groups (see table 5). However, the subjects that indicated they had discussed the rain forest previously had significantly higher post knowledge scores, with a chi-square of 10.081, with a $p < .0065$, with $n=279$. When a test for improvement on knowledge scores, it was shown that both groups that had previously discussed the rain forest improved their scores significantly with a chi-square of 8.815, with a $p < 0.05$, with $n=273$ (See table 5 and 6).

KNOWLEDGE

Children	Number	Chi-square	Significance	# ties	Possible range
Pre knowledge	278	.350	.8393	5	0 to 5
Post knowledge	279	12.133	.0023	5	0 to 5
Improvement dist.	273	9.961	.0069	6	-5 to 5
Youth					
Pre knowledge	259	5.528	.0631	6	0 to 6
Post knowledge	257	10.545	.0051	6	0 to 6
Improvement dist.	247	1.250	.5354	8	-6 to 6
Adults					
Pre knowledge	348	9.370	.0092	6	0 to 6
Post knowledge	352	2.650	.2658	4	0 to 6
Improvement dist.	343	7.538	.0231	6	-6 to 6

TABLE 5 - Summary of Kruskal-Wallis Test for testing differences by previous knowledge on total pre/post knowledge and improvement on knowledge scores.

Youth

The youth and adult survey instruments also contained a question concerning how much previous knowledge of rain forests the participant had prior to viewing the film. The three choices were none, a little, and a lot. A Kruskal-Wallis Test for testing differences by previous knowledge on total pre-knowledge scores, post-knowledge scores, and improvement on knowledge scores showed no significant differences between the three groups (see tables 5 and 6).

Adult

The same Kruskal-Wallis Test was run on the adult surveys and the results indicated that for the pre-knowledge scores, there was a significant difference in total knowledge scores between people who had discussed rain forests compared to the people who had not previously discussed the rain forests. A chi-square value of 9.370, with a $p < 0.05$, with $n=348$ was calculated. On the post knowledge scores, the individuals who had no previous knowledge of the rain forests showed no significant difference in knowledge scores compared to those who had previous knowledge of rain forests. In terms of improvement on knowledge scores, the people who had some previous knowledge of rain forests faired significantly better, with a chi-square value of 7.538, with $p < 0.05$ and $n=343$ (see tables 5 and 6).

EFFECT OF PREVIOUS KNOWLEDGE ON PRE-POST ATTITUDE SCORES

Children

The Kruskal-Wallis Test for testing differences by previous knowledge on total pre attitude scores showed a significantly higher attitude towards rain forests for those individuals who had discussed rain forests previously, especially those who had discussed rain forests a lot. A chi-square value of 6.717, with $p < 0.05$, with $n=252$ was calculated. A similar test was run on the post attitude scores, and no significant differences were calculated (see table 6). When the test for testing differences by previous knowledge on improvement on attitude scores was conducted, no significant differences were found among the individuals.

ATTITUDE

Children	Number	Chi-square	Significance	# ties	possible range
Pre attitude	252	6.807	.0332	16	0 to 30
Post attitude	253	4.238	.1202	13	0 to 30
Improvement of scores	231	4.405	.1106	12	-30 to 30
Youth					
Pre attitude	243	31.176	.0000	32	0 to 64
Post attitude	253	29.221	.0000	31	0 to 64
Improvement of scores	229	5.451	.0655	25	-64 to 64
Adult					
Pre attitude	343	25.764	.0000	26	0 to 64
Post attitude	342	19.125	.0001	25	0 to 64
Improvement of scores	330	2.4759	.2900	21	-64 to 64

TABLE 6 - Summary of Kruskal-Wallis Test for testing differences by previous knowledge on total pre/post attitude scores and improvement on attitude scores. Kruskal-Wallis 1 way anova (corrected for ties).

Youth

The Kruskal-Wallis Test for testing differences by previous knowledge on total pre and post attitude scores showed significant differences between the people who had no previous knowledge and those who reported that they had a little or a lot of previous knowledge. For the pre attitude scores, a chi-square value of 31.125, with a $p < 0.0001$, $n=243$ was found, and for the post attitude scores, a chi-square value of 29.158, with a $p < 0.0001$, $n=253$ was calculated. When testing differences on improvement of attitude scores was completed, no significant differences were found among the individuals who had none, a little or a lot of previous knowledge.

Adult

The Kruskal-Wallis Test for testing differences by previous knowledge on total pre and post attitude scores showed significant differences between the individuals who had no previous knowledge and those who reported that they had a little or a lot of previous knowledge. For the pre attitude scores, a chi-square value of 25.698, with a $p < 0.0001$, $n=343$ was obtained, and for the post attitude scores, a chi-square value of 19.012, with a $p < .0001$, $n=342$ was calculated. However, when testing for differences on improvement of attitude scores, no significant differences were found among the three categories of individuals (see table 6).

EFFECT OF GENDER ON PRE-POST KNOWLEDGE SCORES

Children

A Mann-Whitney test for testing differences by gender on total pre knowledge scores indicated that girls had significantly lower scores than the boys, with a Mann-Whitney U test showing a Z score of 2.220, with a 2-tailed $p < 0.05$, $n=282$. The same trend was seen with the post knowledge scores, with the girls scoring significantly lower, with a Z score of 2.221, with a 2-tailed $p = < 0.05$, $n=285$. When the test was conducted for testing differences by gender in terms of improvement on knowledge scores, no significant differences were found, which indicates that both the boys and the girls improved at about the same rate (see table 7).

KNOWLEDGE

Children	Number	Mean Rank	Z score	2-tail P	possible range
Pre knowledge	F-130	151.49	2.220	.0264	0 to 5
	M-153	130.83			
Post knowledge	F-131	132.29	2.221	.0263	0 to 5
	M-154	152.11			
Knowledge improvement	F-126	137.21	.458	.6467	-5 to 5
	M-152	141.39			
Youth					
Pre knowledge	F-130	113.50	3.454	.0006	0 to 6
	M-127	144.87			
Post knowledge	F-129	122.92	1.255	.2096	0 to 6
	M-127	134.17			
Knowledge improvement	F-125	128.17	1.064	.2873	-6 to 6
	M-121	118.69			
Adult					
Pre knowledge	F-192	174.12	.1326	.8945	0 to 6
	M-154	172.73			
Post knowledge	F-194	179.40	1.224	.2211	0 to 6
	M-155	169.49			
Knowledge improvement	F-188	1721.35	.184	.8542	-6 to 6
	M-152	169.45			

TABLE 7 -Summary of Mann-Whitney Test for testing differences by gender on total pre/post knowledge scores and improvement on knowledge scores. Mann-Whitney U test, corrected for ties.

Youth

A Mann-Whitney U test for testing differences by gender on total pre knowledge scores indicated that the girls scored significantly lower than the boys with a Z score of 3.454, with a $p < 0.05$, $n=257$. On the post knowledge scores, no significant differences between the males and females was indicated. The females improved more on the post than the males. When testing for difference by gender in terms of improvement on knowledge scores, no significant differences appeared. Both the male and female populations are similar in their changes in scores from pre to post. The females did appear to improve some compared to the males, but the change was not one which would be considered significant (see table 7).

Adult

The Mann-Whitney U test revealed no significant differences between males and females in the adult population in any of the pre, post, or improvement on knowledge scores (see table 7).

EFFECT OF GENDER ON PRE-POST ATTITUDE SCORES

Children

The Mann-Whitney Test for testing differences by gender on total pre attitude, post attitude and improvement on attitude scores indicated no significant differences between the males and females (see table 8).

ATTITUDE

Children	Number	Mean Rank	Z value	2-tailed P value	Possible range
Pre attitude	F-117	128.65	0.696	.9446	0 to 30
	M-148	129.29			
Post attitude	F-122	129.29	0.103	.9183	0 to 30
	M-135	128.55			
Attitude improvement	F-110	119.50	0.323	.7467	-30 to 30
	M-125	116.68			
Youth					
Pre attitude	F-120	124.94	0.874	.3822	0 to 64
	M-121	117.10			
Post attitude	F-128	132.16	1.372	.1701	0 to 64
	M-123	119.59			
Attitude improvement	F-114	116.90	.670	.5028	-64 to 64
	M-113	111.07			
Adult					
Pre attitude	F-190	175.79	1.118	.2635	0 to 64
	M-150	163.80			
Post attitude	F-190	179.37	1.878	.0604	0 to 64
	M-150	159.26			
Attitude improvement	F-182	168.29	.9237	.3557	-64 to 64
	M-145	158.61			

TABLE 8 -Summary of Mann-Whitney Test for testing differences by gender on total pre/post attitude scores and improvement on attitude scores. Mann-Whitney U test.

Youth

The Mann-Whitney Test for testing differences by gender on total pre attitude, post attitude and improvement on attitude scores indicated no significant differences between the males and females in grades seven through twelve. Both males and females appear to have improved their attitudes at about equal rates (see table 8).

Adult

The Mann-Whitney Test for testing differences by gender on total pre attitude, post attitude, and improvement on attitude scores indicated no significant differences between the males and females in the adult population. Both males and females appear to have scored at about equal rates (see table 8).

OPEN-ENDED QUESTIONS

Children Open-ended Question #7

There was one open-ended knowledge question on the Children instrument. Question number seven was asked on the pre and post instrument. The responses to the open ended questions were coded by the independent researcher (see appendix F), and the top three responses are reported here (see table 9).

Pre-Instrument

Question #7 - What are some reasons why we should **not** cut down all of the tropical rain forests? (n=291)

- Code 1 = The plants and animals will have no place to exist (extinction).
192 respondents = 66 % of subjects
- Code 3 = Because we will lose oxygen production for the earth.
111 respondents = 38.2% of subjects
- Code 2 = The plants and animals depend on the trees for survival.
56 respondents = 19.2 % of subjects

Post-Instrument

Question # 7 - What are some reasons why we should not cut down all of the tropical rain forests. (n=291).

- Code 1 = The plants and animals will have no place to exist/extinction.
185 responses = 63.6% of subjects
- Code 3 = Because we will lose oxygen production for the earth.
111 responses = 38.1% of subjects
- Code 2 = The plants and animals depend on the trees for survival.
41 responses = 14.1% of subjects

CHILDREN PRE INSTRUMENT			POST INSTRUMENT		
Code	number respondents	percent respondents	Code	number respondents	percent respondents
1	192	66	1	185	63.6
3	111	38.2	3	111	38.1
2	56	19.2	2	41	14.1

TABLE 9 - Summary of children question #7 pre and post.

Youth Open-ended Questions #7 AND #8

There were two open-ended questions on the youth instrument, questions number seven and eight were asked on the pre and post instrument. The responses to the open ended questions were coded by the independent researcher (see appendix F), and the top three responses are reported here (see table 10).

Pre-Instrument

Question #7 - What are some important reasons for studying the plants and animals of the tropical rain forests?

- Code 2 = To find uses for plants and animals/how we can benefit from the rain forests.
179 responses = 65.7% of subjects

Code 6 = To gain knowledge about new exotic species/evolution/for the fun of it, and to not destroy the rain forest.

144 responses = 53% of subjects

Code 1 = To understand the ecosystem (balance) of rain forests.

114 respondents = 41.9% of subjects

Question #8 - If the tropical rainforests continue to be destroyed at the present rate, what would be some important consequences for the earth?

Code 1 = Atmosphere may heat up (global warming). Affect global weather.

211 respondents = 77.5% of subjects

Code 2 = Inability for earth to balance gases.

99 respondents = 36.4% of subjects

Code 11 = Loss of oxygen.

96 respondents = 35.3% of subjects

Post-Instrument

Question #7 - What are some important reasons for studying the plants and animals of the tropical rain forests?

Code 2 = To find uses for plants and animals/how can we benefit from the rain forests.

190 respondents = 69.8% of subjects

Code 6 = To gain knowledge about new exotic species/evolution/for the fun of it, without destroying it.

161 respondents = 59.2% of subjects

Code 1 = To understand the ecosystem (balance) of rain forests.

112 respondents = 41.2% of subjects

Question #8 - If the tropical rain forests continue to be destroyed at the present rate, what would be some important consequences for the earth?

Code 3 = Loss of species (extinction)

205 respondents = 75.4% of subjects

Code 1 = Atmosphere may heat up (global warming). Affect global weather.

100 respondents = 36.8% of subjects

Code 11 = Loss of oxygen.

90 respondents = 33.1% of subjects

Adult Open-ended Questions #7 AND #8

There were two open-ended questions on the adult instrument, question number seven and eight were asked on the pre and post instrument. The responses to the open ended questions were coded by the independent researcher (see appendix G), and the top three responses are reported (see table 10).

Pre-Instrument

Question #7 - What are some important reasons for studying the plants and animals of the tropical rain forests?

Code 2 = To find uses for plants and animals/how we can benefit from the rain forests.

320 respondents = 88.2%

Code 1 = To understand the ecosystem (balance) of rain forests.

157 respondents = 43.3%

Code 4 = To find new pharmaceuticals (medicines).

143 respondents = 39.4%

Question #8 - If the tropical rain forests continue to be destroyed at the present rate, what would be some important consequences for the earth?

Code 1 = Atmosphere may heat up (global warming).

349 respondents = 96.1%

Code 3 = Loss of species (extinction).

169 respondents = 46.6%

Code 11 = Loss of oxygen.

121 = 33.3%

Post-Instrument

Question #7 - What are some important reasons for studying the plants and animals of the tropical rain forests?

Code 2 = To find uses for plants and animals/how we can benefit from the rain forest.

321 respondents = 88.4%

Code 6 = To gain knowledge about new exotic species/ how to save the rain forests.

179 respondents = 49.3%

Code 4 = To find new pharmaceuticals (medicines).

175 respondents = 48.2%

Question #8 - If the tropical rain forests continue to be destroyed at the present rate, what would be some important consequences for the earth?

Code 3 = Loss of species (extinction).

285 respondents = 78.5%

Code 1 = Atmosphere may heat up (global warming). Affect global weather.

237 respondents = 65.3%

Code 2 = Inability for earth to balance gases.

82 respondents = 22.6%

Code 4 = Loss of medicinal plants/animals.

82 respondents = 22.6%

QUESTION # 7**YOUTH****PRE INSTRUMENT****POST INSTRUMENT**

Code	number respondents	percent respondents	Code	number respondents	percent respondents
2	179	65.7	2	190	69.8
6	144	53.0	6	161	59.2
1	114	41.9	1	112	41.2

QUESTION #8**YOUTH****PRE INSTRUMENT****POST INSTRUMENT**

Code	number respondents	percent respondents	Code	number respondents	percent respondents
1	211	77.5	3	205	75.4
2	99	36.4	1	100	36.8
11	96	35.3	11	90	33.1

QUESTION #7**ADULT****PRE INSTRUMENT****POST INSTRUMENT**

Code	number respondents	percent respondents	Code	number respondents	percent respondents
2	296	81.6	2	321	88.4
1	157	43.3	6	179	49.3
4	143	39.4	4	175	48.2

QUESTION #8**ADULT****PRE INSTRUMENT****POST INSTRUMENT**

Code	number respondents	percent respondents	Code	number respondents	percent respondents
1	349	96.1	3	285	78.5
3	169	46.6	1	237	65.3
11	121	33.3	2	164	45.2

TABLE 10 - Summary of question #7 and #8 for youth and adult instruments comparing pre and post answers.

POST INSTRUMENT ONLY QUESTIONS

The open-ended question "What did you learn from this film?" was asked on each of the post instruments only. This was question #8 on the children instrument and question #9 on the youth/adult instrument. The responses were coded (see Appendix F and G), and the top three codes, based on number of respondents, are reported here (see Table 11 for a summary).

Children Post-Instrument Question # 8 - What did you learn in this film?

Code 1 = There are many plants and animals in the tropical rain forests that depend on each other.
89 responses = 30.6 % of subjects.

Code 9 = tropical rain forests should be saved, many undiscovered species.
 75 responses = 25.8% of subjects.
 Code 6 = Man is cutting down the tropical rain forests, which is making it
 worse.
 33 responses = 11.3% of subjects.

**Youth Post-Instrument Question #9 - What did you learn from the film,
*Tropical Rainforest?***

Code 1 = Reaffirm general sense of tremendous diversity and balance
 of the rain forests, and that all things are recycled within.
 267 respondents = 99.7% of subjects
 Code 12 = There are many valuable uses of the rain forest and its products,
 70% of medicines come from the rain forests.
 53 respondents = 19.% of subjects
 Code 5 = Destruction if fast (50 years none will be left)
 50 respondents = 18.4% of subjects

**Adult Post-Instrument Question #9 - What did you learn from the film,
*Tropical Rainforest?***

Code 1 = Reaffirm general sense of tremendous diversity and balance of the
 rain forests, and that all things are recycled within.
 363 respondents = 100% of subjects
 Code 12 = There are many valuable uses of the rain forest and its products,
 70% of medicines come from the rain forests.
 83 respondents = 22.9.% of subjects
 Code 5 = Destruction if fast (50 years none will be left)
 564 respondents = 17.6% of subjects

Code	# Respondents	% Respondents
CHILDREN(#8)		
1	89	30.6
9	75	25.8
6	33	11.3
YOUTH(#9)		
1	267	99.7
12	53	19
5	50	18.4
ADULT(#9)		
1	363	100
12	83	22.9
5	64	17.6

TABLE 11 - Summary of Post Children question #8 and Post Youth/Adult question #9 (What did I learn in this film?)

POST-INSTRUMENT ONLY OPEN ENDED QUESTIONS

The following question "What did you like/dislike about the film?" was asked in the post instruments only. This was question #18 in the children instrument and question #20 in the youth/adult instrument (see table 12 for a summary).

Children Post-Instrument Question #18 - What did you like/dislike about the film?

Liked

Code 7 = I liked the wildlife, insects and plants.

80 responses = 27.5% of subjects.

Code 21 = I liked the motion of the film, it seemed so real.

49 responses = 16.8% of subjects.

Code 4 = Film is very informative.

34 responses = 11.7% of subjects.

Disliked

Code 58 = I did not like seeing the trees cut down.

45 responses = 15.5% of subjects.

Code 53 = Film was too jerky, it made me dizzy.

10 responses = 3.4% of subjects.

Code 59 = The insects were gross.

10 responses = 3.4% of subjects.

Youth Post-Instrument Question #20 - What did you like or dislike about the film?

Liked

Code 7 = I liked the wildlife, insects and plants.

43 responses = 15.8%

Code 13 = Spectacular scenery.

33 respondents = 12.1%

Code 3 = Everything about it.

30 responses = 11%

Disliked

Code 58 = I did not like seeing the trees cut down.

22 responses = 8.1%

Code 65 = Nothing.

13 responses = 4.8%

Code 53 = Too jerky, made me dizzy/monkey scene was fragmented.

11 responses = 4.0%

Adult Post-Instrument Question # 20 - What did you like or dislike about the film?

Liked

Code 4 = Very informative (great synopsis of rain forests) Very interesting, because I learned a lot.

64 respondents = 17.6%

Code 1 = Beautiful and colorful.
 52 respondents = 14.3%
 Code 3 = Everything about it.
 40 responses = 11%

Disliked

Code 50 = Failed to talk about forces threatening the rain forests.
 21 responses = 5.8% .
 Code 74 = Too short.
 16 responses = 4.4%
 Code 68= Not enough action, as in other Omni films.
 11 responses = 3.0%

LIKED

Code	# Respondents	% Respondents
CHILDREN (#18)		
7	80	27.5
21	49	16.8
4	34	11.7
YOUTH(#20)		
7	43	15.8
13	33	12.1
3	30	11
ADULT(#20)		
4	64	17.6
1	52	14.3
3	40	11

42.9

DISLIKED

Code	# Respondents	% Respondents
CHILDREN (#18)		
58	45	15.5
53	10	3.4
59	10	3.4
YOUTH(#20)		
58	22	8.1
65	13	4.8
53	11	4
ADULT(#20)		
50	21	5.8
74	16	4.4
68	11	3

13.2

TABLE 12 - Summary of Post Children question #18 and Post Youth/Adult question #20 (What did you like or dislike about the film?)

POST-INSTRUMENT STATEMENTS

Two opinion statements were posed to each participant after viewing the film *Tropical Rainforest*. They are both found only on the post instrument, and therefore no pre-post comparisons are made. The statements are "I enjoyed the film" and "I would tell my friends to see this film". The statements are #16 and #17 on the children instrument and #18 and #19 on the youth/adult instrument. Figures 19 and 20 show the percentages of respondents who indicated strongly agree or agree.

Children

Post-Instrument Statement #16 - I would tell my friends to see this film.

245 respondents strongly agree = 84.2%
35 respondents uncertain = 12%
10 respondents strongly disagree = 3.4%

Post-Instrument Statement #17 - I enjoyed the film *Tropical Rainforest*.

269 respondents strongly agree = 92.4%
15 respondents uncertain = 5.2%
4 respondents strongly disagree = 1.4%

Youth

Post-Instrument statement #18 - I enjoyed the film.

160 respondents strongly agree = 58.8%
84 respondents agree = 30.9%
15 respondents undecided = 5.5%
12 respondents disagree = 4.4%

Post-Instrument statement #19 - I would recommend the film to a friend.

140 respondents strongly agree = 51.5%
79 respondents agree = 29%
37 respondents undecided = 13.6%
11 respondents disagree = 4%

Adult

Post-Instrument statement #18 - I enjoyed the film, *Tropical Rainforest*.

265 respondents strongly agree = 73%
91 respondents agree = 25.1%
3 respondents uncertain = 0.8%
2 respondents disagree = 0.6%

Post-Instrument statement #19 - I would recommend the film to a friend.

260 respondents strongly agree = 71.6%
89 respondents agree = 24.5%
10 respondents undecided = 2.8%
2 respondents disagree = 0.6%

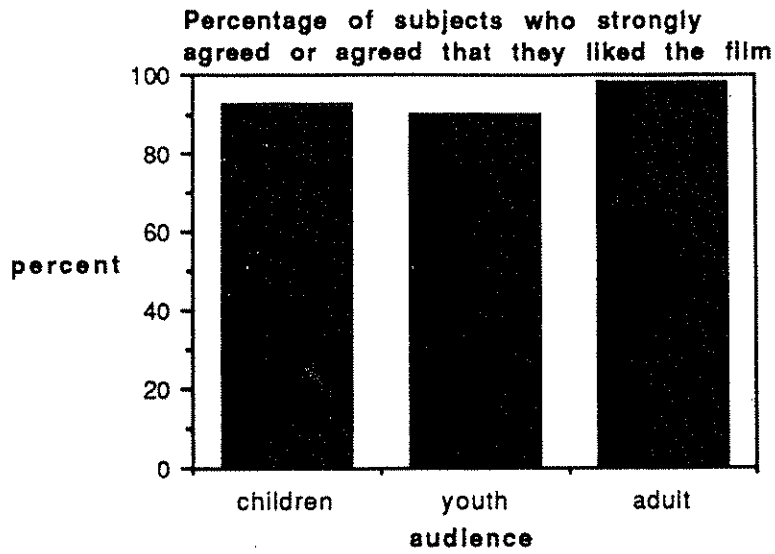


FIGURE 19

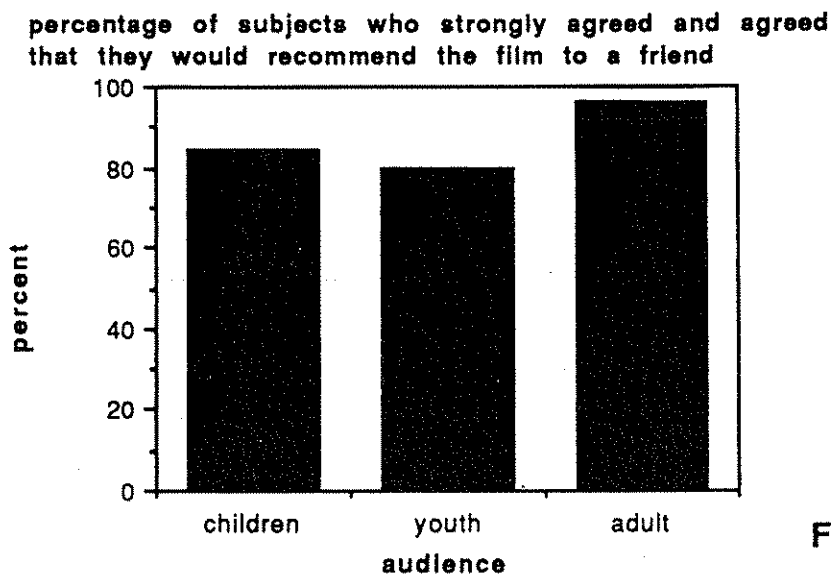


Figure 20

CONCLUSION AND DISCUSSION

The Science Museum of Minnesota conducted this study to answer the questions of whether or not the Imax/Omnimax film *Tropical Rainforest* contributes to a more positive attitude towards, and an increase in knowledge about, the tropical rain forests of the world. The results of this study indicates that there are statistically significant increases in knowledge gained, as well as an increase in positive attitudes towards the tropical rain forests. All three specific audiences (school children grades 1-6, school children grades 7-12, and adult general

audience) tended to increase, overall. These results are encouraging to the Science Museum, as they reaffirm the important role that the Imax/Omnimax films play in education.

It is felt that the Omnifilm exhibit at the Science Museum plays a vital role in educating as well as entertaining the public. This research project, funded by the National Science Foundation, was the first attempt, by the Science Museum of Minnesota, to quantify the effectiveness of Imax/Omnimax films as an educational tool. The informal learning that takes place during a museum visit has been the focus of increased research, as science museums take a closer look at the importance of quality learning experiences outside of the traditional former educational classroom setting. Both the affective (attitudes) and cognitive (knowledge) domains were addressed by the survey instruments used. It has long been known that the affective domain in science education is indeed important, and the ability of the Science Museum to positively affect attitudes through their exhibits is an important contribution to the education of the public.

The measurement of attitudes and content knowledge is difficult at best. It is encouraging that statistically significant increases in knowledge gained and positive attitudes toward the tropical rain forests were indicated by this study. However, the indicated effectiveness of this Omnimax film is limited to the parameters of the survey instruments used, and the inherent difficulties involved with measuring attitudes. Joseph Laforgia (1988) indicates that the importance of the affective domain in education has been established, but that the measurement of attitudes is difficult, and that "it is with instrument development that researchers must be particularly cautious if they are to convince educators that attitudes can be measured." Standard research procedures were used to develop valid and reliable instruments (Cronbach, 1970, Krynowsky, 1988, and Thompson and Shrigley, 1986) for use in this study.

There are many unanswered questions that remain to be researched. For example, could the effectiveness of this film be enhanced if Science Museum curriculum materials were used in the formal classroom in conjunction with the viewing of the film? What curriculum development would be most useful to the classroom teacher and at what age group would the most benefit arise? Is the Minnesota audience that was sampled representative of audiences world wide? Are the Imax/Ominimax films as effective to the general public that are not regular museum visitors? Should science museums expand their role in providing more informal educational experiences such as the Imax/Omnimax films? Can new and better methods of measuring viewers responses to films be developed?

Copies of this report are available upon request. Any questions regarding the evaluation of this Imax/Omnimax film in other locations may be directed to Kathleen Lundgren, Public Programs Division, 30 East 10th Street, St. Paul, Minnesota, 55101.

STUDENT QUESTIONNAIRE
"Tropical Rainforest" An Omnitheater Film

Last Name _____ First Name _____

School _____ Grade _____

1. Age _____
2. Sex: Girl _____ Boy _____
3. How many times have you been to the science museum before?
1) none _____ 2) 1-4 times _____ 3) more than 4 times _____
4. Have you read about or talked about the tropical rainforests before today?
1) yes (a little) _____ 2) yes (a lot) _____ 3) no _____

PLEASE CHOOSE THE BEST ANSWER AND CIRCLE THE NUMBER

1. When a tree dies in the tropical rainforest, what happens to it?
1. it is wasted 2. I am not sure 3. nature uses it again

2. Most of the plants and animals in the tropical rainforest depend on which of the following for survival?
1. insects 2. birds 3. trees

3. The different kinds of plants and animals in the tropical rainforest are
1. few 2. many

4. What makes a tropical rainforest such a good place for plants and animals to live?
1. the seasons change a lot
2. there is only a warm season
3. there is a warm and a cold season

5. When did the tropical rainforest begin to grow?
1. after Columbus discovered America
2. the same time humans began living
3. long before the dinosaurs began living

6. The big variety of plants and animals in the tropical rainforest is possible because of
1) very good soil
2) humans planting different plants
3) very long periods of time

7. What are some reasons why we should NOT cut down all of the tropical rainforests
a. _____
b. _____

STUDENT QUESTIONNAIRE
"Tropical Rainforest" An Omnitheater Film

Last Name _____ First Name _____

School _____ Grade _____

Do you know where the Rainforest Station is at the Science Museum? Yes _____ No _____

PART ONE: Now that you have seen the film "Tropical Rainforest," please choose the best answer and circle the number.

1. When a tree dies in the tropical rainforest, what happens to it?
1) it is wasted 2) I'm not sure 3) nature uses it again

2. Most of the plants and animals in the tropical rainforest depend on which of the following for survival?
1) insects 2) trees 3) birds

3. The different kinds of plants and animals in the tropical rainforest are
1) few 2) many

4. What makes a tropical rainforest such a good place for plants and animals to live?
1) the seasons change all the time
2) there is only a warm season
3) there is a warm and a cold season

5. When did the tropical rainforest begin to grow?
1) long before the dinosaurs began living.
2) after Columbus discovered America
3) when humans began living

6. Which of the following is needed in order for the tropical rainforests to have many different kinds of plants and animals?
1) very good soil
2) very long periods of time
3) humans to plant new plants

7. What are some reasons why we should NOT cut down all of the tropical rainforests.
1) _____
2) _____
3) _____

8. What did you learn in this film?
1) _____
2) _____
3) _____

"TROPICAL RAINFOREST" QUESTIONNAIRE

Last Name _____ First Name _____

School (if applicable) _____ Grade _____

1. Age: 11-20___ 21-30___ 31-40___ 41-50___ Over 51___
2. Gender: Female___ Male___
3. Are you a science museum member? Yes___ No___
4. How many times have you seen an Omnifilm at the Science Museum before today?
1) none___ 2) 1-4 times___ 3) more than 4 times___
5. How much have you heard or talked about the tropical rainforest before today?
1) none___ 2) a little___ 3) a lot___

PART ONE: Please answer each question to the best of your ability. Choose the best answer and circle the number.

1. When a tree dies in the tropical rainforest, the nutrients and energy contained in the tree are
1) wasted and lost forever 2) used one more time 3) used over and over
2. Most plant and animal species in the tropical rainforest rely on which one of the following for their survival?
1) trees 2) animals 3) changing seasons
3. How many years ago did the tropical rainforest of today begin to develop?
1) 400 years 2) 4000 years 3) 4 million years 4) 400 million years
4. Which appeared most recently in the tropical rainforest?
1) dinosaurs 2) humans 3) insects 4) birds
5. You can tell that a rainforest is diverse since it has
1) only a few kinds of plants and animals.
2) many different kinds of plants and animals.
3) many individuals of a few kinds of plants and animals.
6. The wide variety of plant and animal types found in the tropical rainforest is possible because of
1) extremely good soil
2) plants and animals depending on themselves
3) humans planting new crops
4) evolution over a very long time
7. What are some important reasons for studying the plants and animals of the tropical rainforests.
1) _____
2) _____
3) _____
8. If the tropical rainforests continue to be destroyed at the present rate, what would be some important consequences for the earth?
1) _____
2) _____
3) _____

"TROPICAL RAINFOREST" QUESTIONNAIRE

Last Name _____ First Name _____

School (if applicable) _____ Grade _____

Do you know where the Rainforest Station is at the Science Museum? yes ___ no ___

PART ONE: Please answer each question to the best of your ability. Choose the best answer and circle the number.

1. When a tree dies in the tropical rainforest, the nutrients and energy contained in the tree are
 - 1) wasted and lost forever
 - 2) used one more time
 - 3) used over and over

2. Most plant and animal species in the tropical rainforest rely on which one of the following for their survival?
 - 1) insects
 - 2) trees
 - 3) changing seasons

3. How many years ago did the tropical rainforest of today begin to develop?
 - 1) 400 years
 - 2) 4000 years
 - 3) 4 million years
 - 4) 400 million years

4. Which appeared most recently in the tropical rainforest?
 - 1) dinosaurs
 - 2) humans
 - 3) insects
 - 4) birds

5. You can tell that a rainforest is diverse since it has
 - 1) only a few kinds of plants and animals.
 - 2) many different kinds of plants and animals.
 - 3) many individuals of a few kinds of plants and animals.

6. The wide variety of plants and animals found in the tropical rainforests is possible because of
 - 1) extremely good soil
 - 2) plants and animals depending on themselves
 - 3) humans planting new crops
 - 4) evolution over a long period of time

7. What are some important reasons for studying the plants and animals of the tropical rainforests.
 - 1) _____
 - 2) _____
 - 3) _____

8. If the tropical rainforests continue to be destroyed at the present rate, what would be some important consequences for the earth?
 - 1) _____
 - 2) _____
 - 3) _____

9. What did you learn from the film, "Tropical Rainforest"?
 - 1) _____
 - 2) _____
 - 3) _____



The Science Museum of Minnesota

THIRTY EAST TENTH STREET, SAINT PAUL, MINNESOTA 55101 TEL. (612) 221-9488
FAX (612) 221-4777

“Tropical Rainforest” Omnifilm Evaluation Consent Form

You are invited to participate in a research study of attitudes towards and knowledge of the tropical rainforests in connection with the viewing of the film, “Tropical Rainforest” being shown at the Science Museum of Minnesota. You have been randomly selected as a possible participant. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

This study is being conducted by the Science Museum of Minnesota using an independent researcher, in conjunction with the Wilder Foundation.

PURPOSE OF STUDY

The purpose of this study is to find out if there are any changes in the knowledge of or attitudes towards tropical rainforests after viewing the 3M-Wm L. McKnight Omnitheater film, “Tropical Rainforest.”

PROCEDURES

If you agree to be in this study, we ask that you complete two survey forms, one before seeing the film and one after seeing the film. Each survey form will take approximately ten minutes to complete.

Your decision to participate is strictly voluntary, and you are free to withdraw at any time.

The researchers conducting this study are Mark A. Minger and Kathleen A. Lundgren. You may ask any questions you have now. If you have questions later, you may contact them at the Science Museum of Minnesota. Phone: (612) 221-9410.

CONFIDENTIALITY

The records of this study will be kept private. In any report that might be published, we will not include any information that will make it possible to identify you, the subject. Research records will be kept locked and only the researchers will have access to the records.

CHILDREN INSTRUMENT

CODED RESPONSES FOR QUESTION #7

Question #7 - What are some reasons why we should not cut down all of the tropical rain forests?

CODE	RESPONSE
01/05	The plants and animals will have no place to exist/extinction..
02	The plants and animals depend on trees for survival.
03/06	We will lose oxygen production for the earth.
04/29	Tropical rain forests will disappear/very few left.
07	Rain forest plants are valuable for making medicines.
08	The rain forests are a pretty/nice place.
09	Rain forests helps protect the ozone layer.
10	It hurts the earth.
11	It causes soil erosion and makes new deserts.
12	Trees give us ice.
13	The trees will be ill forever when we cut too many down.
14	We need paper.
15	The trees absorb carbon dioxide.(CO2)
16/28	We do not need so much paper and wood (recycle).
17/20	We will lose an interesting place, lose a place to study.
18	because it takes a long time to grow back.
19/21	Rain forests provide food and wood.
22	Save it so others can see it.
23	To help cut down on pollution.
24	(Unable to make sense out of the response)
25/31	Because it's fun and I like it. It is good for climbing.
26	It gives us water.
27	It makes new trees.
30	Has different seasons.

CODED RESPONSES FOR QUESTION #8

Question #8 - What did you learn in this film?

CODE	RESPONSE
01/22	There are many plants and animals in the tropical rain forests that depend on each other.
02	That there are high water falls in the rain forests.

03 Scientists (researchers) help to save the rain forests.
04/11 Rain forests have been here a long time. Before Dinosaurs.
05 Different plants and animals do different things.
06/20 Man is cutting down the rain forests and making it worse.
Man does not care and it is turning into a desert.
09 Rain forests should be saved and some are still undiscovered.
10 Rain forest destruction is rapid.
12 Rain forest organisms are recycled in the forest.
13 Organisms go extinct with killing of the forests.
14/38 I learned a lot about the rain forests.
15 Many different sizes of leaves - some very big.
16 What it will look like after we cut it all down.
17 The rain forests is nice/cool/precious/important and pretty.
18 I learned about bugs, trees and other plants and animals.
19 Trees are very big and it takes 100 years to grow.
21 Very humid, it rains up not down.
23 One tree is cut down every 4 minutes.
24 We need laws to help save the forests.
25 The area of forests is small (7%).
26 (Response does not make sense - it is not readable)
27 Valuable medicines available and other important products.
28 Frogs lived before monkees.
29/35 Not much/nothing new.
30 Trees are cut down, but grow back.
31/37 It rains every day/lots of rain.
32 Trees and plants make oxygen.
34 Most of the species in the world are in the rain forests.
36 Rain forests only have one season.

YOUTH/ADULT INSTRUMENT

CODED RESPONSES FOR QUESTION #7

Question #7 - What are some important reasons for studying the plants and animals of the tropical rain forests?

CODE	RESPONSE
01	To understand the ecosystem (balance) of rain forests.
02/03/21	To find uses for plants and animals/how we can benefit from the rain forests.
04	To find new pharmaceuticals (medicines).
05	To learn about the planet.
06/26/13/22	To gain knowledge about new exotic species/evolution/for the fun of it, without destroying it.
07/23	To learn the limits of removal of rain forests.
08/10	Learn about the conservation of species/how to save the rain forests
09	Learn about weather and climate.
11	Study soils and the erosion problems.
12	It is a good view into the past (how organisms have evolved).
14	To explore a new region.
15/36	Able to see nature at its' best. To experience the rain forests.
16	It is a spiritual place.
17	To learn about carbon dioxide cycle.
18	When the trees are gone, no more oxygen.
19	To evaluate the impact of changes in atmosphere and environment.
20	It is a unique place, the organisms only live there.
24	To get clean air.
25	To show importance of diversity.
27	Ozone depletion.
28	(Response does not make sense/unreadable)
29/35	I do not know/I do not understand.
30	To maintain the beauty.
31	Lots of reasons.
33	To make new jobs.
34	It's a waste of tax money.
37	To learn to recycle more.
38	Because it is fun.

CODED RESPONSES FOR QUESTION #8

Question #8 - If the tropical rain forests continue to be destroyed at the present rate, what would be some important consequences for the earth?

CODE	RESPONSE
01/05	Atmosphere may heat up (global warming). Affect global weather.
02	Inability for earth to balance gases.
03	Loss of species (extinction).
04	Loss of medicinal plants/animals.
06/16	Rain forests turn to desert. The loss of fertile soil.
07/23	Loss of beauty of rain forest.
08	Loss of research knowledge (unknown species).
09/12	Ozone depletion/larger hole in ozone layer (greenhouse).
10	No consequences.
11	Loss of Oxygen.
13	More pollution.
14	Destruction of ecosystem and large human population.
15	People will die sooner.
17	Rain forests will be gone by the time I'm 60.
18	Loss of habitats for many species.
19	Loss of carbon dioxide in the atmosphere.
20	Loss of natural resources/increase in prices, more recycling.
21/25	Loss of moisture on earth.
22	Loss of food.
24	(Unable to make sense out of the response - unreadable)
26	I'm not sure.
27	Increased flooding.
28	Loss of energy.
29	Increase in waste.
30	To learn to work together with others to solve problems.
31	In order to find alternatives to wood.

CODED RESPONSES FOR QUESTION #9

Question #9 - What did you learn from the film, *Tropical Rainforest*?

CODE	RESPONSE
01/18	Reaffirm general sense of tremendous diversity and balance of the rain forests, and that all things are recycled within.
02	So much happens at the tops of the trees.
03	If no action is taken, the earth is in serious trouble.
04	The rain forests are a delicate balance of plants and animals, constantly being recycled.
05	Destruction is fast (50 years none will be left).

06 Location of the rain forests.
 07 The amount of land that make up the rain forests (7%).
 08 The large number of species in the rain forests and that all
 things grow fast.
 09 That the rain forests should be saved.
 10 Forests contain many species that I would like to study some
 day.
 11 That 90% of all species live in the rain forest.
 12/14/23/25 There are many valuable uses of the rain forest and its
 products (medicines).(70% of medicines come from forests).
 13 400 million year time span in development of todays' rain
 forests.
 15 Survival of trees is paramount importance for rain forests
 survival.
 16 It is important to learn how to use the rain forests wisely.
 17 The rain forests are so beautiful.
 19 That there still are areas untouched by humans.
 20/24 Man has only been there last 100 years destroying it, man must
 learn to be responsible.
 21 The desert effect of cutting down the trees.
 22 No seasons, other than the daily cycles.
 26 Made me ask some questions.
 27 Loss of potential knowledge about the biology of the rain forests.
 28 Humans are stupid.
 29 Some humans care/study to save the forests (research
 techniques of interesting).
 30 Evolutionary processes.
 31 (Unable to make sense out of the response - unreadable)
 32 Not much I did not already know.
 33 A lot.
 34 I do not know.
 35 Theory of evolution is wrong/unproven.
 36 How annoying a voice can be.

CHILDREN, YOUTH, AND ADULT INSTRUMENT

CODED RESPONSES FOR QUESTIONS #18 AND #20

Question #18 on children and question # 20 on youth and adult instruments- What did you like or dislike about the film?

CODE RESPONSE - LIKE

01/11	Beautiful and colorful.
02	Seeing species I have not seen before.
03	Everything about it.
04/19/22	Very informative (great synopsis of rain forest). Very interesting. Because I learned a lot.
05	Background music and sound.
06	Enhanced what I thought about rain forests.
07	I liked the wildlife and insects and trees.
08/09	Exciting to see all the diverse species.
10	Not "hitting us over the head" with the message.
12	Excellent narrators (explained clearly).
13	Spectacular photography.
14	Opened my mind, made me aware of forests importance.
15	Showing consequences of cutting down the trees.
17	I liked the researchers.
18	I liked the water falls.
20/32	Fun/cool/the excused absence from school was great.
21	Enjoyed the motion of the film, seemed very real.
23	The beginning.
24	Peaceful.
25	(Response does not make sense/unreadable)
26	Good way of showing length of time taken for development of rain forest.
27	Intense sound and big screen.
29	Butterfly emerging from cocoon.
30	The theater building was nice.
31	I liked the news clips.

CODE RESPONSE - DISLIKE

50	Failed to talk about forces threatening the rain forests.
51	More facts needed on oxygen, carbon dioxide cycles and other pertinent facts would have been nice.
52	What are the replacement capabilities of the rain forests.
53	Too jerky, made me dizzy/monkey scene was fragmented.
54	Strongly sided toward non-commercial use of rain forest, there should be a balance.
55	Should have showed us how to help save the rain forests.

56 Did not show native peoples, their knowledge of the forests and
the effects on them.
57 Did not like the big screen.
58 Did not like seeing the forests being cut down.
59 The bugs were gross.
60 I did not like my dreams.
61 It gave me a stiff neck/did not like where I sat.
62 I am scared of heights.
63 I did not like the darkness in the theater.
64 It was long and boring.
65 Nothing.
66 The narrator, you need more than one.
67 Too repetitious.
68 Not enough action, as in other OMNI films.
69 Not enough animals shown, or aquatic species.
70 Hard to catch CNN facts, too much noise during the facts.
71 Out of focus sometimes.
72 Chain saw too loud.
73 Are we hypocritical! We destroy our forests in the U.S.
74 Too short.
75 Did not like an interruption due to a page in the theater, noisy
kids and picture taking was annoying.
76 No mention of God, the creator.
77 Better music.
78 Did not like the advertisements for First Bank.
79 Disagree with time line.
80 Highly political questionnaire.
81 It was sad.
82 Did not like the snakes.
83 Kind of scary.