

Analysis Report

This report is structured as follows.

Contents

Sample Characterization2

Independent-Samples T-Tests.....3

ANOVA Tests.....9

SAMPLE REPORT - Rafael Data Analysis Portfolio

Sample Characterization

The sample characterization based on the frequency distribution indicates various patterns in aquarium visitation and the perceived roles of aquariums (table below).

Category	Response Options	Frequency	Percent
Have Visited Aquarium	No	277	35.70%
	Yes, Once	181	23.30%
	Yes, More than Once	317	40.90%
Visited With: Family	No	240	30.90%
	Yes	535	68.90%
Visited With: Significant Other	No	479	61.70%
	Yes	296	38.10%
Visited With: Friends	No	516	66.50%
	Yes	259	33.40%
Visited With: Myself	No	699	90.10%
	Yes	76	9.80%
Age Group	18-29	350	45.10%
	30-45	305	39.30%
	46-60	87	11.20%
	61+	24	3.10%
	Prefer Not To Say	8	1.00%
Importance: Research	No	77	9.90%
	Yes	698	89.90%
Importance: Education	No	53	6.80%
	Yes	722	93.00%
Importance: Conservation	No	102	13.10%
	Yes	673	86.70%
Importance: Entertainment	No	184	23.70%
	Yes	591	76.20%
Importance: Outreach	No	240	30.90%
	Yes	535	68.90%
Importance: Inspiring Younger Generations	No	127	16.40%
	Yes	648	83.50%

Analysis of these categories reveals the following:

Have Visited Aquarium: Among the respondents, 35.70% reported not having visited an aquarium, whereas 23.30% have visited once, and 40.90% have visited more than once. This distribution suggests a higher inclination towards repeated visits among the sample.

Visited With: The data on companionship during visits shows a preference for visiting with family (68.90%) over visiting with a significant other (38.10%), friends (33.40%), or alone (9.80%). This indicates that aquarium visits are predominantly family-oriented activities.

Age Group: The age distribution of respondents who have visited aquariums shows a higher concentration in the 18-29 (45.10%) and 30-45 (39.30%) age groups, with a notable decrease in older age groups (11.20% for 46-60 and 3.10% for 61+). A small percentage (1.00%) preferred not to disclose their age.

Importance: Respondents attribute high importance to aquariums for education (93.00%) and conservation (86.70%), followed by entertainment (76.20%), outreach (68.90%), and inspiring younger generations (83.50%). A smaller proportion sees aquariums as important for research (89.90%).

These results technically present the respondents' patterns in visiting aquariums and their perceptions regarding the importance of aquariums across different dimensions. The data highlights a strong family presence in aquarium visits and emphasizes the educational, conservation, and inspirational roles of aquariums, with a lesser though still significant emphasis on entertainment and research.

Independent-Samples T-Tests

Independent-samples t-tests are statistical procedures used to compare the means of two independent groups on a particular measure of interest. This method is applied when you want to examine whether there exist significant differences between the groups' means. The test calculates the t-statistic, which represents the ratio of the departure of the estimated value of a parameter from its hypothesized value to its standard error. The p-value associated with the t-statistic indicates the probability of observing the data if the null hypothesis (that there is no difference between the groups) is true. A lower p-value suggests that it is less likely the observed differences occurred by chance, thus indicating significant differences between the groups.

In the context of assessing perceptions of aquarium visits, the independent-samples t-tests were conducted to evaluate differences in opinions based on who participants visited the aquarium with. The table below shows the results.

When analyzing the impact of visiting the aquarium with a significant other on the motivation to learn more about the oceans, the t-test revealed a significant difference between groups ($t(772) = -2.470$, $p = .014$). Those who visited with a significant other reported a higher mean ($M = 4.159$, $SD = 0.931$) in motivation levels compared to those who did not visit with a significant other ($M = 3.977$, $SD = 1.033$). This result suggests that visiting the aquarium with a significant other may enhance motivational outcomes related to learning about the oceans.

	Who did you visit the aquarium with? Family				t	p	Who did you visit the aquarium with? Significant Other				t	p
	No		Yes				No		Yes			
	M	SD	M	SD			M	SD	M	SD		
I think aquariums are a good tool for educating people about marine conservation.	4.573	0.806	4.570	0.836	0.049	0.961	4.544	0.872	4.615	0.746	-1.161	0.246
The animals at the Georgia Aquarium are ambassador animals and help people understand and learn more about the natural world.	4.368	0.969	4.460	0.888	-1.289	0.198	4.395	0.932	4.490	0.883	-1.398	0.162
At the aquarium, I was provided actionable information about conserving the oceans	4.192	1.007	4.226	0.956	-0.446	0.656	4.178	0.999	4.277	0.923	-1.382	0.167
Going to the aquarium has motivated me to learn more about the oceans	4.021	0.989	4.058	1.003	-0.476	0.634	3.977	1.033	4.159	0.931	-2.470	0.014
Following my visit to the aquarium, I will make lifestyle choices that will support the environment and conservation efforts	4.046	1.014	4.064	0.971	-0.229	0.819	4.010	0.977	4.135	0.993	-1.715	0.087

Making lifestyle choices that support the environment following the visit to the aquarium was higher for those visiting with significant others vs those that not ($p < 0.10$).

The next table shows the results for two other company categories.

	Who did you visit the aquarium with? Friends				t	p	Who did you visit the aquarium with? Myself				t	p
	No		Yes				No		Yes			
	M	SD	M	SD			M	SD	M	SD		
I think aquariums are a good tool for educating people about marine conservation.	4.563	0.847	4.587	0.785	-0.377	0.706	4.582	0.812	4.474	0.945	1.082	0.280
The animals at the Georgia Aquarium are ambassador animals and help people understand and learn more about the natural world.	4.437	0.924	4.421	0.896	0.230	0.818	4.446	0.898	4.303	1.046	1.295	0.196
At the aquarium, I was provided actionable information about conserving the oceans	4.217	0.960	4.212	0.995	0.069	0.945	4.241	0.940	3.987	1.205	2.169	0.030
Going to the aquarium has motivated me to learn more about the oceans	4.058	1.006	4.023	0.984	0.461	0.645	4.062	0.978	3.908	1.168	1.275	0.203
Following my visit to the aquarium, I will make lifestyle choices that will support the environment and conservation efforts	4.082	0.989	4.012	0.974	0.933	0.351	4.070	0.967	3.947	1.130	1.034	0.302

Significant differences were observed in the provision of actionable information about conserving the oceans when comparing those who visited the aquarium alone versus those who did not. Participants who visited alone reported a lower mean ($M = 3.987$, $SD = 1.205$) compared to those who visited with others ($M = 4.241$, $SD = 0.940$), with a t -value of 2.169 and a p -value of .030. This indicates that solitary visits might be associated with a slightly reduced perception of receiving actionable conservation information.

These significant findings highlight the nuanced ways in which the social context of aquarium visits can impact visitors' educational and motivational outcomes.

The following two tables present results for T-tests conducted to examine the differences between different importance categories.

	I think aquariums, such as the Georgia Aquarium, are important for: Research				t	p	I think aquariums, such as the Georgia Aquarium, are important for: Education				t	p	I think aquariums, such as the Georgia Aquarium, are important for: Conservation				t	p
	No		Yes				No		Yes				No		Yes			
	M	SD	M	SD			M	SD	M	SD			M	SD	M	SD		
I think aquariums are a good tool for educating people about marine conservation.	4.342	0.946	4.596	0.809	-2.252	0.027	4.077	1.186	4.607	0.783	-3.172	0.002	4.267	0.968	4.617	0.793	-3.455	0.001
The animals at the Georgia Aquarium are ambassador animals and help people understand and learn more about the natural world.	4.145	1.042	4.463	0.894	-2.894	0.004	4.077	1.218	4.457	0.884	-2.910	0.004	4.010	1.153	4.495	0.856	-5.049	0.000
At the aquarium, I was provided actionable information about conserving the oceans	4.066	0.929	4.232	0.975	-1.419	0.156	3.827	1.248	4.244	0.943	-2.360	0.022	3.891	1.038	4.264	0.952	-3.632	0.000
Going to the aquarium has motivated me to learn more about the oceans	3.724	1.001	4.082	0.992	-2.984	0.003	3.788	1.126	4.065	0.987	-1.933	0.054	3.752	1.108	4.091	0.974	-3.193	0.001
Following my visit to the aquarium, I will make lifestyle choices that will support the environment and conservation efforts	3.789	1.011	4.087	0.977	-2.515	0.012	3.692	1.229	4.084	0.960	-2.252	0.028	3.703	1.073	4.111	0.959	-3.926	0.000

	I think aquariums, such as the Georgia Aquarium, are important for: Entertainment				t	p	I think aquariums, such as the Georgia Aquarium, are important for: Outreach				t	p	I think aquariums, such as the Georgia Aquarium, are important for: Inspiring younger generations				t	p
	No		Yes				No		Yes				No		Yes			
	M	SD	M	SD			M	SD	M	SD			M	SD	M	SD		
I think aquariums are a good tool for educating people about marine conservation.	4.530	0.894	4.584	0.804	-0.768	0.443	4.444	0.924	4.628	0.773	-2.696	0.007	4.341	1.037	4.616	0.772	-2.824	0.005
The animals at the Georgia Aquarium are ambassador animals and help people understand and learn more about the natural world.	4.317	1.004	4.467	0.882	-1.944	0.052	4.222	1.015	4.525	0.850	-4.034	0.000	4.087	1.193	4.498	0.834	-3.696	0.000
At the aquarium, I was provided actionable information about conserving the oceans	4.126	1.120	4.244	0.920	-1.296	0.196	3.987	1.039	4.318	0.922	-4.424	0.000	3.889	1.133	4.279	0.924	-4.173	0.000
Going to the aquarium has motivated me to learn more about the oceans	3.967	1.037	4.071	0.986	-1.230	0.219	3.770	1.085	4.170	0.932	-4.945	0.000	3.595	1.126	4.134	0.948	-5.039	0.000
Following my visit to the aquarium, I will make lifestyle choices that will support the environment and conservation efforts	4.077	0.986	4.052	0.984	0.289	0.773	3.833	1.019	4.159	0.952	-4.310	0.000	3.698	1.060	4.128	0.954	-4.542	0.000

For individuals who view aquariums as important for research, significant differences were observed in their beliefs about aquariums as educational tools ($t(773) = -2.252, p = .027$), with those agreeing showing a higher mean ($M = 4.596, SD = 0.809$) compared to those disagreeing ($M = 4.342, SD = 0.946$). Similarly, significant differences were found in perceptions of aquariums as ambassadors for learning about the natural world ($t(773) = -2.894, p = .004$), where agreement was associated with higher mean scores ($M = 4.463, SD = 0.894$) compared to disagreement ($M = 4.145, SD = 1.042$).

In the category emphasizing the importance of education, a significant difference was identified in perceptions of aquariums as educational tools ($t(773) = -3.172, p = .002$), with those valuing aquariums for education showing higher agreement ($M = 4.607, SD = 0.783$) than those who did not ($M = 4.077, SD = 1.186$). This trend was mirrored in the conservation category, where significant differences were noted across all statements, with those valuing conservation reporting higher agreement on the educational ($t(773) = -3.455, p = .001$) and ambassadorial roles ($t(773) = -5.049, p < .001$) of aquariums, as well as on providing actionable information ($t(773) = -3.632, p < .001$), motivating learning about oceans ($t(773) = -3.193, p = .001$), and influencing lifestyle choices ($t(773) = -3.926, p < .001$).

For those who view aquariums as important for entertainment, significant differences emerged in perceptions of aquariums facilitating education about marine conservation among those who disagreed ($M = 4.530, SD = 0.894$) and those who agreed ($M = 4.584, SD = 0.804$), though not reaching traditional levels of significance. However, perceptions significantly differed for those valuing aquariums for outreach, with significant findings in understanding the natural world ($t(773) = -4.034, p < .001$), providing actionable conservation information ($t(773) = -4.424, p < .001$), motivating learning ($t(773) = -4.945, p < .001$), and influencing lifestyle choices ($t(773) = -4.310, p < .001$).

Lastly, significant differences were observed for those emphasizing the importance of inspiring younger generations, with higher agreement scores on the educational role of aquariums ($t(773) = -2.824, p = .005$), ambassadorial role ($t(773) = -3.696, p < .001$), providing actionable information ($t(773) = -4.173, p < .001$), motivating learning ($t(773) = -5.039, p < .001$), and influencing lifestyle choices ($t(773) = -4.542, p < .001$) compared to those who did not value this aspect as highly.

These findings underscore the significant impact of perceptions regarding the importance of aquariums across various dimensions on visitors' attitudes and beliefs about their educational and conservation roles.

ANOVA Tests

A one-way ANOVA (Analysis of Variance) is a statistical test used to compare the means of three or more independent groups to see if at least one group mean is significantly different from the others. This test is based on the assumption that the populations from which the samples are drawn have the same variance. The F statistic, derived from the ANOVA, compares the variance between the groups to the variance within the groups. A significant F value ($p < 0.10$) suggests that there are significant differences in group means. Post hoc tests are conducted following a significant ANOVA to pinpoint exactly which means are different. Tamhane's T2 tests were used since the variances were unequal for the cases with significant ANOVA results (according to Levene's tests). The table below shows comparing groups with different history of visiting the aquarium.

	Have you visited the Georgia Aquarium before?						F	p
	No		Yes, Once		Yes, More than Once			
	M	SD	M	SD	M	SD		
I think aquariums are a good tool for educating people about marine conservation.	4.570 _a	0.847	4.564 _a	0.832	4.576 _a	0.807	0.013	0.987
The animals at the Georgia Aquarium are ambassador animals and help people understand and learn more about the natural world.	4.408 _a	0.934	4.414 _a	0.954	4.462 _a	0.874	0.299	0.741
At the aquarium, I was provided actionable information about conserving the oceans	4.245 _a	0.923	4.166 _a	1.057	4.218 _a	0.963	0.370	0.691
Going to the aquarium has motivated me to learn more about the oceans	3.957 _a	1.010	4.133 _a	1.019	4.076 _a	0.973	1.937	0.145
Following my visit to the aquarium, I will make lifestyle choices that will support the environment and conservation efforts	4.054 _a	0.944	4.061 _a	1.055	4.060 _a	0.979	0.004	0.996

Note: Values in the same row and subtable not sharing the same subscript are significantly different at $p < .10$ in the post-hoc test. Cells with no subscript are not included in the test. Tests assume equal variances or unequal variances depending on the result of Levene's tests.¹

The ANOVA test conducted to evaluate differences based on previous visits to the Georgia Aquarium across three groups (No, Yes, Once, Yes, More than Once) for several statements showed no significant differences in perceptions regarding the aquarium's role in education, conservation efforts, motivation to learn about the oceans, or influencing

lifestyle choices towards environmental support. All p-values exceeded the threshold for significance, with values such as $p = 0.987$ for education about marine conservation, indicating no substantial variance in opinions based on visitation history.

A second test was executed for different age groups and results are shown below.

SAMPLE REPORT - Rafael Data Analysis Portfolio

	Which range does your age fall into?										F	p
	18-29		30-45		46-60		61+		Prefer Not To Say			
	M	SD	M	SD	M	SD	M	SD	M	SD		
I think aquariums are a good tool for educating people about marine conservation.	4.663 _a	0.643	4.507 _a	0.912	4.540 _a	0.925	4.292 _a	1.367	4.125 _a	0.991	2.868	0.022
The animals at the Georgia Aquarium are ambassador animals and help people understand and learn more about the natural world.	4.509 _a	0.748	4.345 _a	1.009	4.517 _a	0.938	4.250 _a	1.422	3.875 _a	1.246	2.483	0.043
At the aquarium, I was provided actionable information about conserving the oceans	4.277 _a	0.905	4.141 _a	1.039	4.310 _a	0.880	3.875 _a	1.296	4.250 _a	0.707	1.748	0.138
Going to the aquarium has motivated me to learn more about the oceans	4.171 _a	0.914	3.941 _b	1.055	4.000 _{a,b}	0.940	3.750 _{a,b}	1.327	3.875 _{a,b}	1.356	2.885	0.022
Following my visit to the aquarium, I will make lifestyle choices that will support the environment and conservation efforts	4.149 _a	0.883	4.007 _a	1.053	3.966 _a	0.994	3.667 _a	1.341	4.125 _a	0.835	2.111	0.078

Note: Values in the same row and subtable not sharing the same subscript are significantly different at $p < .10$ in the two-sided test of equality for column means. Cells with no subscript are not included in the test. Tests assume equal variances.¹

The following results were found:

Education about Marine Conservation: There was a significant effect of age on perceptions of aquariums as educational tools ($F(4, 771) = 2.868, p = 0.022$). Post hoc comparisons were not able to reveal between which pairs of age groups the differences lie ($p > 0.10$).

Ambassador Animals: Significant differences were also observed in opinions on whether the animals at the Georgia Aquarium serve as ambassadors for learning ($F(4, 771) = 2.483, p = 0.043$), with younger participants (18-29, $M = 4.509, SD = 0.748$) generally viewing them more favorably than older ones. But again, the post-hoc comparisons were not able to see differences between pairs of groups.

Motivation to Learn about the Oceans: Age influenced motivation to learn about the oceans ($F(4, 771) = 2.885, p = 0.022$), where the 18-29 age group ($M = 4.171, SD = 0.914$) showed higher motivation compared to the 30-45 age group ($M = 3.941, SD = 1.055$). This was confirmed by Tamhane's post hoc test ($p = 0.031$).

Lifestyle Choices for Environment: There was a trend towards significance in how different age groups intend to make lifestyle choices supporting the environment after visiting the aquarium ($F(4, 771) = 2.111, p = 0.078$), suggesting some variation in commitment to environmental conservation across age groups, albeit not strongly significant.