Mediterranean Archaeology and Archaeometry, Vol. 16, No 4,(2016), pp. 519-524

10.5281/zenodo.220978

ANALYSING EDUCATION AS A VARIABLE IN "THE SKY IN OUR LIVES SURVEY"

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Received: 01/03/2016
Accepted: 10/03/2016
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ABSTRACT

"The Sky in Our Lives" is a survey that was created in 2006 by Dr. Jarita Holbrook and has been modified and improved since then to more accurately capture the relationship between people living today and the night sky (Holbrook, 2009). The survey is broken down into 5 parts: Part I "Demographic Information" deals with the demographic information of the respondents, Part II "The Sky in your life" section explores how people use the sky in their everyday life or have used the sky in the past, for example using the stars for night navigation. Part III with little modification, this section is the Noctcaelador Inventory developed by psychologist William E. Kelly (Kelly, 2004). This part of the survey tests a person's psychological attachment to the sky. Part IV "Astrology" this survey part is to test a person's belief in astrology. The final part which is Part V is to test a person's attitude towards astronomy. This section incorporates part of the Astronomy Attitude Survey developed by Michael Zeilik (Zeilik, 2002). The greater the educational attainment, the more positive the attitude towards astronomy & science (part V), the less a belief in astrology (part IV), and a higher psychological attachment to the night sky (part III).

KEYWORDS: Education, Astrology, Astronomy, Psycological Attachment, Sky, Survey, Correlation, Regression

1. INTRODUCTION

"The Sky in Our Lives" is a survey that was created in 2006 by Dr. Jarita Holbrook and has been modified and improved since then to more accurately capture the relationship between people living today and the night sky (Holbrook, 2009). When it comes to studying people and their relationship to the night sky, scholars tend to look backwards in time towards the beliefs and practices of ancient people rather than using living people. It is as if the expectation is that people living today have the knowledge of professionally trained astrophysicists, which isn't the case. The above mentioned survey has shown that this isn't the case because respondents' knowledge on astronomy varies greatly. With the results of the Sky in Our Lives survey real comparisons can be made between groups and across nations about their sky knowledge which is important for the field of cultural astronomy.

The survey is broken down into 5 parts: Part I "Demographic Information" this sectiction focuses on the demographic information of the respondents, such as age, gender, nationality etc. this study will focus on educational attainment in this part of the survey. Part II "The sky in your life" this section explores how people use the sky in their everyday life or have used the sky in the past for example using the stars for night navigation. Part III with little modification, this section is the Noctcaelador Inventory developed by psychologist William E. Kelly (Kelly, 2004). This part of the survey tests a person's psychological attachment to the sky. According to William E. Kelly in a study that he conducted it showed that college students who had more a positive attachment to the night sky had a slightly higher GPA in comparison to those that scored negatively on the attachment to the night sky. Part IV "Astrology" this survey section is to test respondents/ people's belief in astrology. The final part which is Part V is to test respondents/ people's attitudes towards astronomy and science. This section incorporates part of the Astronomy Attitude Survey developed by Michael Zeilik (Zeilik, 2002). 270 surveys were used in this study to determine the relation between education and the other sections of the Sky in Our Lives Survey. Therefore this study hypothesises that, the greater the educational, the more positive the attitude towards astronomy and science (part V), the less a belief in astrology (part IV), and a higher psychological attachment to the night sky (part III). The model of analysis that will be used is regression analysis, regression tests the correlation between two variables, and "education" will be the independent variable.

In William E. Kelly's article on academic orientation, academic achievement and noctcaelador, where he asks the question "Does interest in night sky watching correlate with student's approach to the academic environment?" the study found that 17.8% of college students view the night sky at least once a night, an average of 19.6% of the sample size confirmed that they had, had some sort of astronomy contact or owned night sky viewing equipment, and through planetariums and observatories (Kelly, Kelly, and Batey, 2006). The study conducted by William E. Kelly explored the relationship between academic orientation, academic achievement, and interest in night-sky watching (Noctcaelador), the study included 117 students, a regression analysis indicated that together the six academic orientation factors and GPA accounted for 13% of the variance in N1 (NOCTCAELADOR) scores. Hence as a result of these findings, the hypothesis mentioned above was developed.

2. ANALYSIS

Statistical analysis will be used to test the above mentioned hypothesis including correlations and regression. Multivariate Data Analysis refers to statistical techniques used to analyse data that arises from more than one variable (Berger, 1985: 68). Given the data from the Sky in Our Lives, I have noticed that due to the nature of the survey there were multiple questions which all form part of the important variables I seek to analyse, therefore multivariate analysis will be used in this study.

As mentioned above another statistical analysis that was used in the study, which will be at the core of the study is correlations. Correlation measures the relationship between two variables and in the case of this study I will be measuring the relationship between education and attitudes towards astronomy, astrology, and psychological attachment to the night sky. When comparing the correlation between two items, one item is called the "dependent" item and the other the "independent" item. The goal is to see if a change in the independent item will result in a change in the dependent item. The correlation coefficient can range between ±1.0. A coefficient of +1.0, a "perfect positive correlation," means that changes in the independent item will result in an identical change in the dependent item (e.g., a change in the level of education attained by a respondent will result in an identical change in the aforementioned sections). A coefficient of -1.0, a "perfect negative correlation," means that changes in the independent item will result in an identical change in the dependent item, but the change will be in the opposite direction. A coefficient of zero means there is no relationship between the two items and that a change in the independent item

will have no effect in the dependent item (Rice, 1995). A low correlation coefficient (e.g., less than ±0.10) suggests that the relationship between two items is weak or non-existent. A high correlation coefficient (i.e., closer to plus or minus one) indicates that the dependent variable (e.g., the attitudes towards astronomy and belief in astrology) will usually change when the independent variable (e.g., Level of Education attainment by a respondent) changes.

Correlation analysis is also valuable in gauging the relationship between two dependents. Often, one dependent "leads" or predicts the level of another dependent. For example, in case of this study correlation coefficient of attitudes towards astronomy versus beliefs in astrology shows a strong negative relationship. This means that a positive attitude towards astronomy will predict a negative attitude towards astrology.

In modern society education is used as a parameter to measure the intellectual capacity of individuals, thus education is often categorized as shown in the table below. Using the level of education as the independent variable, the hypothesis states that a change in level of education will have a positive change in how the respondents answer the questions on the survey. For the purpose of this study, education was coded as per the table below

Level of Education	Coding
Primary	1
Secondary	2
College	3
Graduated from College	4
Attended Grad School	5
Masters	6
PhD	7

In statistics, regression analysis is a statistical process for estimating the relationships among variables. It includes many techniques for showing and analyzing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. More specifically, regression analysis helps one understand how the typical value of the dependent variable (e.g. The Zodiac is part of the night sky responses) changes when any one of the independent variables (e.g. Level of Education) is varied, while the other independent variables are held fixed. Most commonly, regression analysis estimates the conditional expectation of the dependent variable given the independent variables that is, the average value of the dependent variable when the independent variables are fixed. Less commonly, the focus is on a quartile, or other location parameter of the conditional distribution of the dependent variable given the independent variables. In all cases, the estimation target is a function of the independent variables called the regression function. In regression analysis, it is of utmost importance to characterize the variation of the dependent variable around the regression functions, which can be described by a probability distribution.

Regression analysis is widely used for prediction; it is also used to understand which among the independent variables are related to the dependent variable, and to explore the forms of these relationships. In restricted circumstances, regression analysis can be used to infer causal relationships between the independent and dependent variables. However this can lead to illusions or false relationships, so caution is advisable; i.e., correlation does not imply causation.

Linear regression is the next step after correlation. It is used when we want to predict the value of a variable based on the value of another variable. The variable we want to predict is called the dependent variable (e.g. The Zodiac is part of the night sky). The variable we are using to predict the other variable's value is called the independent variable (e.g. Level of Education).

Table 1 (Correlation R table)

Correlation Coefficient (r)	Descriptive label
0	no correlation
0.0 to 0.2	very weak/ negligible
0.2 to 0.4	weak / low
0.4 to 0.7	Moderate
0.7 to 0.9	strong/high
0.9 to 1.0	very strong/very high
1+	perfect correlation +

The table above shows the correlation values for R that can be calculated and how such values should be described.

3. ASTROLOGY REGRESSION ANALYSIS

Table 2 correlation and regression analysis of the Astrology questions

EDUCATION INDEPENDENT VARIABLE		
DEPENDENT VARIABLES	R-VALUE	CORRELATION
Zodiac	0.159	very weak +
Personality	0.20	very weak +
Romance	0.070	very weak +
Horoscope	0.225	weak +
Birth Chart	0.092	very weak +
Effect	0.129	weak +
Scientific	0.262	very weak +
Astrology vs Astronomy	0.188	very weak +
Gods	0.303	weak +

The table above shows a correlation and regression analysis of the Astrology questions. The hypothesis was the greater the educational attainment, the less belief in astrology. In fact there is a positive correlation however it is important to note that it is weak to very weak. Three unambiguous questions in the Astrology section were examined. The first was "is the zodiac part of the night sky?" (Fig.1).

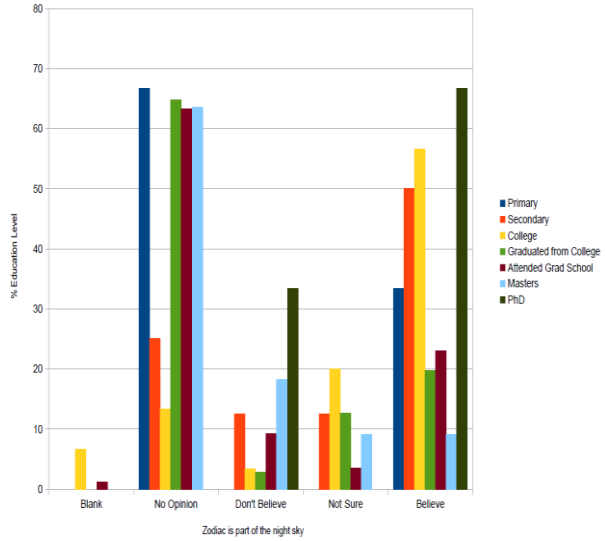

Figure 1. Opinions concerning the Zodiac

The expected response was yes, because the Zodiac is part of the night sky. The R value is 0.159 which mean that there was a positive but very weak correlation, raising concerns about its statistical significance. The next question was "Astrology has been scientifically proven?" (Fig.2).

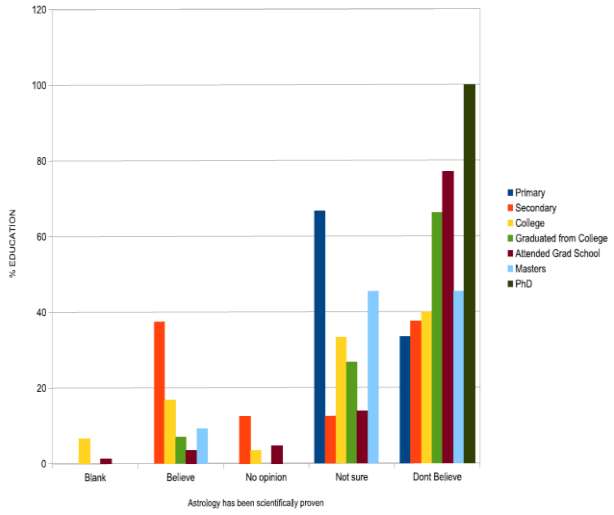

Figure 2. Opinions concerning astrology and science

In this question highly formally educated respondents, were expected to respond No because astrology has not been scientifically proven, a strong positive correlation was expected in this question as per the hypothesis. The R value for this question was 0.262 which is a very weak positive correlation. There is a common mistake that that people tend to make and that is distinguishing between astrology and astronomy (Fig.3). As hypothesized above, highly formally educated respondents are expected to know the difference between astrology and astronomy as the two are not the same. However the R value in this question again showed a very weak correlation of 0.188. Having analyzed these questions and looked at the study's hypothesis, these were alarming results thus the graphs below clearly show that highly educated respondents have less belief in astrology as compared to less educated ones.

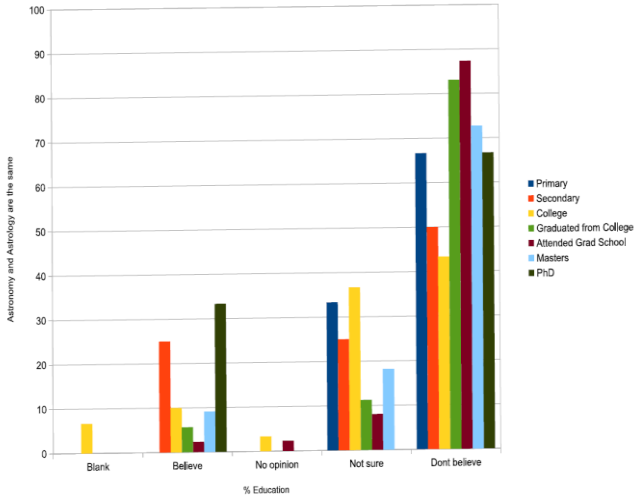

Figure 3. Opinions concerning astronomy and astrology

4. NOCTCAELADOR REGRESSION ANALYSIS

Table 3 regression analysis for the noctcaelador section

DEPENDENT VARIABLES	R-VALUE	CORRELATION	%+	%-
Emotion	0.070	very weak +	7%	93%
Mesmerize	0.073	very weak +	7.3%	92.7%
Looking	0.031	very weak +	3.1%	96.9%
Outside	0.070	very weak +	7%	93%
Time	0.062	very weak +	6.2%	93.8%
Pleasure	0.009	very weak +	0.9%	99.1%
Pleases	0.159	very weak +	15.9%	84.1%
Connected	0.021	very weak +	2.1%	97.9%
Fond	0.116	very weak +	11.6%	88.4%
Adore	0.131	very weak +	13.1%	86.9%

The table above show the regression analysis for the noctcaelador section. According to William E. Kelly's article on academic orientation, academic achievement and noctcaelador, where he asks the question "Does interest in night sky watching correlate with student's approach to the academic environment"? the study found out that 17.8% of college students view the night sky at least once a night, an average of 19.6% of the sample size confirmed that they had, had some sort of astronomy contact or owned night sky viewing equipment, or had been to observatories (Kelly, Kelly, and Batey, 2006). Also William E. Kelly explored the relationship between academic orientation, academic achievement, and interest in night-sky watching (noctcaelador), the study included 117 students a regression analysis indicated that together the six academic orientation factors and GPA accounted for 13% of the variance in N1 scores. From this Kelly (Kelly, 2004), hypothesised that the higher the level of education, the more attachment to the night sky. The above table shows the hypothesis to be true, albeit weakly.

Table 4 regression correlation analysis for the astronomy attitude section

INDEPENDENT VARIABLES EDUCATION				
DEPENDENT VARIABLES	**R VALUE**	**CORRELATION**	**%+**	**%-**
Trouble Understanding	0.047	+weak	4.7%	*95.3%*
Easy	0.040	+ weak	4%	*96%*
Relevance	0.087	+weak	8.7%	91.3%
Discipline	0.043	+weak	4.3%	95.7%
No Idea	0.017	+weak	1.7%	98.3%
Like	0.067	+weak	6.7%	93.3%
Not Useful	0.017	+weak	1.7%	98.3%
Thinking	0.099	+weak	9.9%	90.1%
Technical	0.072	+weak	7.2%	92.8%
Difficult	0.0176	+weak	1.76%	98.24%
Enjoy	0.087	+weak	8.7%	91.3%
Collection Fact	0.079	+weak	7.9%	92.1%
Complicated	0.091	+weak	9.1%	90.9%
Learning Ability	0.064	+weak	6.4%	93.6%
Worthless	0.148	+weak	14.8%	85.2%
Scared	0.107	+weak	10.7%	89.3%

5. ASTRONOMY ATTITUDE REGRESSION ANALYSIS

The table below shows the regression correlation analysis for the astronomy attitude section, as we can see again above the correlation is a weak correlation, in this section three questions were deeply analysed and these questions were "Do you have trouble understating astronomy"? , the correlation was a weak correlation this also applied for the other questions which were "Is astronomy complicated"? and "Is it easy to learn astronomy"? For these questions highly educated individuals were expected to respond positively, however there a weak correlation between education and attitude towards astronomy.

6. CONCLUSION

In modern society education is not only seen as A means to acquire status as there is a perception that has been created that formal education means consciousness in "education", this means that formal education is a tool that is used as knowledge, meaning by being formally educated one is expected to have acquired knowledge in all fields of education. It is important to distinguish between the different types of education: Formal education means institutionalised education, and social education means traditional education that is acquired from the society. Social education might differ from society to society. The "education" that this paper focused on is "formal education" which is institutionalised education. Formal education has many disciplines i.e. science, law, education, arts, finance and other fields. Science as a field within formal education has different disciplines, from physics, biology, medical, chemistry, statistics, maths and many more. An article published by the US National Science Foundation confirmed that a study of more than 2 200 randomly sampled American adults suggest that a quarter of Americans do not know that the earth goes around the sun (Sylvia McLain: 2014) this reaffirms the notion that formal education does not mean knowledge in all fields, the level of education of the respondents on the above mentioned study was estimated to be secondary and above. The same study was conducted in Europe and the results were worse as only 66% of the respondents knew that the earth went around the sun (Sylvia McLain: 2014). The majority of the people interviewed by the Smithsonian online quiz were formally educated individuals (Sylvia McLain: 2014).

Therefor having stated the above, this study found a weak correlation in the variables that were tested, It is of utmost importance to note that the data set that was used wasn't proportionally distributed because there were more people Attending College and Those with Primary education hence that had an influence on the weak correlation; however the distribution graphs (figure 1, 2 and 3) show the distribution per level of education and the respondents' responses to the questions asked. Thus referring back to the hypothesis which is, the greater the educational attainment, the more positive the attitude towards astronomy & science (part V), the less a belief in astrology (part IV), and a higher psychological attachment to the night sky (part III). Therefor having analysed the results found by this study, the hypothesis is proven to be correct on a 95% con-

fidence interval. This study is consistent with other studies of similar nature, i.e. Noctlaedor William Kelly (Kelly, 2004). Where he found this question to be correct "Does interest in night sky watching correlate with student's approach to the academic environment"? The study is also consistent with Sugarman and Impey's (Impey, 2012). However it is important to note that Impey says "One of the common assumptions about astrology is that students who know or who understand more science are less likely to subscribe to the principles of astrology, or be susceptible to the other forms of pseudoscience, presumably because they have learned critical thinking skills and the scientific method along with their factual knowledge" (Hannah Sugarman, Chris Impey, Sanlyn Buxner, Jessie Antonellis. 2011) Each of them found that there was less belief in astrology from undergraduate students.

ACKNOWLEDGEMENTS

Special thank you to everyone who took the survey, data cleaners Sinako Tshawekazi Mguglwa, Angelica Mnkomombini, Kanya Bizo and Nontokozo Natasha Moyo. Another Special thank you goes to Dr Holbrook my supervisor for the support and encouragement.

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