

Relationships between Gender, Age and Major of City College of San Francisco Students
and Belief in Human Evolution

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Abstract

The current study investigated what proportion of college students believe in human evolution. It was hypothesized that there would be no difference in belief between genders, while there would be a difference in belief between older and younger students, and also between physical/social science majors and humanities, business and vocational majors. Questionnaires were handed out to 171 ethnically diverse students in physical sciences, social sciences and humanities classes. The mean age of the sample was 26.03 years old ($SD= 9.07$). Chi-square analyses revealed no differences for either gender or age and belief in human evolution; however, there were differences between majors. Contrary to what was expected, a total of 88% of humanities majors believe in human evolution, compared to 84% of social science majors and 92% of physical science majors, and 63% of business/vocational majors and 62% of undecided students. Overall, 74.7% of students believe in human evolution.

Introduction

According to the National Academy of Sciences (2008), "Evolutionary biology has been and continues to be a cornerstone of modern science... More broadly, evolution is a core concept in biology that is based both in the study of past life forms and in the study of the relatedness and diversity of present-day organisms" (p. xi). Yet, a large proportion of the American public still do not accept that the vast diversity of life on earth is the result of evolution, and many "young earth creationists" believe that the earth is at most 10,000 years old. This directly contradicts the scientific evidence: for example, geologists and astronomers have repeatedly measured the age of the earth to be about 4.3 billion years old, and paleontologists and geneticists have accumulated an abundance of evidence to support the idea that life has been evolving on earth for most of this time. In this paper, the belief of City College of San Francisco (CCSF) students in human evolution will be investigated. Specifically, the study will attempt to identify whether there is a correlation between gender, age or major and belief in human evolution.

Nine Gallup polls from 1982 to 2008 consistently reported that 44-47% of the American public agree with the following statement: "God created human beings pretty much in their present form at one time within the last 10,000 years or so" (PollingReport.com, 2009). In 2009, another Gallup poll asked the question, "Do you, personally, believe in the theory of evolution, do you not believe in evolution, or don't you have an opinion either way?" Thirty nine percent of the respondents said that they believed in evolution, 25% did not believe in evolution, 36% had no opinion either way, and 1% did not answer (Gallup, 2009). The same poll revealed a strong correlation

between level of education and belief in evolution: 21% of those with high-school educations or less believed in evolution, versus 74% of those with postgraduate degrees (Gallup, 2009). The same poll also revealed that younger people were more likely to believe in evolution than older people: 49% of people aged 18 to 34 believed in evolution, versus 39% of people aged 35 to 54 and 31% of people 55 and older (Gallup, 2009). A Harris poll (2005) focused specifically on the question of human origins. When asked, “Do you believe apes and man have a common ancestry or not?”, 46% responded “Do”, 47% responded “Do Not”, while 7% responded “Unsure” (PollingReport.com, 2009).

Holden (2006) reported the results of several surveys of college students’ beliefs in evolution. For example, Provine began polling nonbiology majors taking his biology course in 1986, and has consistently found that about 70% of students believe in some sort of divine intervention in the creation of human beings (Holden, 2006). The same article mentions that Colbert polled the 150 students in his introductory biology class in the fall of 2007 to see whether they believed that “God created humans within the past 10,000 years”, 32% said they did (Holden, 2006). Holden also reported the results of pre- and post-course surveys of biology students at West Virginia University, Parkersberg in 2005. In response to the question “Do you accept that modern man and modern great apes had a common ancestor several million years ago?”, before the course 40% of a total of 206 students said “yes”, 23% said “maybe” and 37% said “no”. After the course 47% of the remaining 115 students said yes, 24% said maybe, and 29% said no (Holden, 2006).

Barnes, Keilholtz and Alberstadt (2008) reported a survey of 591 college students, 43.6% of whom were from a community college in Ohio, 15.2% from a state college in Michigan, and 40.7% from a liberal arts college in Maryland. The responses from the three schools were pooled. Forty five point five percent of respondents believed that “natural evolution” is the explanation for the origin of all living things, while 9.9% favored “guided evolution” and 43.2% favored “creation”. However, when asked about the evolution of human beings, only 36.2% favored “natural evolution”, while 21% favored “evolution guided by supernatural power”, and 41.6% believed in “creation without descent from another species” (Barnes, Keilholtz and Alberstadt, 2008).

Lastly, Sikkink (2009) reported a survey of students’ beliefs in evolution at Western State College, Colorado. From the 348 “usable surveys” obtained, only the responses from students who had declared one of six majors were recorded. The following percentages of students agreed with the statement “I believe in evolution”:

Anthropology 96%, Biology 86%, Recreation 86%, Psychology 66%, Exercise and Sport Science 65%, Business 61% (Sikkink, 2009).

Taken together, these results appear to indicate that the proportion of American college students who believe in evolution roughly reflects that of the American population as a whole: Sikkink’s results are a striking exception, but this might be a reflection of the fact that no humanities majors were selected. In addition, the responses of students in the 2008 survey reported by Barnes, Keilholtz and Alberstadt demonstrate that people are less likely to believe in the evolution of human beings by natural selection than they are to believe in the evolution of other forms of life.

The current study combines aspects of several of the previous studies, in that it aims to investigate what proportion of students at CCSF accept the idea of human evolution, and in particular to investigate whether there is any correlation between major and belief in human evolution. In addition, this study will investigate whether there is any correlation between gender or age and belief in human evolution. Belief in human evolution in particular rather than evolution overall is being investigated because, following Barnes, Keilholtz and Alberstadt, some of those who apparently accept the theory of evolution make an exception in the case of human beings, and therefore do not fully accept the theory of evolution. In other words, it is assumed that students who accept the idea of human evolution fully accept the idea of evolution.

It is hypothesized that there will be no correlation between gender and belief in human evolution, and that there will be a correlation between age and belief in human evolution (younger people are more likely to believe in human evolution than older people.) It is further hypothesized that students who are majoring in the physical sciences and social sciences will be more likely to believe in the theory of evolution than students who are majoring in humanities and business or a vocation.

Independent Variable: Gender

Null Hypothesis H_0 : In the population of CCSF students, there will be no statistically significant difference in the distributions of belief in evolution between males and females. (Belief in evolution is independent of gender.)

Research Hypothesis H_1 : In the population of CCSF students, there will be a statistically significant difference in the distributions of belief in evolution between males and females. (Belief in evolution is related to gender.)

Independent variable: Age

Null Hypothesis H_0 : In the population of CCSF students, there will be no statistically significant difference in the distributions of belief in evolution between students less than 21 years old and students who are 21 or older. (Belief in evolution is independent of age.)

Research Hypothesis H_1 : In the population of CCSF students, there will be a statistically significant difference in the distributions of belief in evolution between students less than 21 years old and students who are 21 or older. (Belief in evolution is related to age.)

Independent variable: Major

Null Hypothesis H_0 : In the population of CCSF students, there will be no statistically significant difference in the distributions of belief in evolution among students who are physical science majors, social science majors, humanities majors, business/vocational majors, or undecided. (Belief in evolution is independent of major.)

Research Hypothesis H_1 : In the population of CCSF students, there will be a statistically significant difference in the distributions of belief in evolution among students who are physical science majors, social science majors, humanities majors, business/vocational majors, or undecided. (Belief in evolution is related to major.)

Method

The variables are operationally defined as follows: Gender is divided into two categories: “Male” and “Female”. Age is divided into two categories: “Less than 21 years old” and “21 years or older”. Major is divided into five categories: “Humanities”, “Social Sciences”, “Physical Sciences”, “Business and Vocational”, and “Undecided”.

“Humanities” comprises English, Languages, Art, Photography, Film-making, etc.

“Social sciences” comprises Psychology, Sociology, History, Anthropology etc.

“Physical sciences” comprises Physics, Geology, Astronomy, Chemistry, Biology, Zoology, Computer science etc. “Business and Vocational” comprises Business, Finance, Nursing, Criminal Justice, Legal Studies etc. “Undecided” means that the student has not yet decided on a major. Majors will be assigned to the appropriate categories after the survey is complete.

Lastly, belief in evolution is defined by agreement with the following statement: “Human beings and chimpanzees evolved from a common ancestor that lived in Africa several million years ago.”

Questionnaires (see Table 6 in Appendix) were handed out to students in a Psychology 5 class, an English 1A class, a Biology 11 class, a Music 21 class, a Music 41 class, an Interdisciplinary Studies 45 class, and an Anthropology 2 class, on three different days from 11/02/09 to 11/10/09, at the CCSF Ocean campus. Responses from the Music 21 class and Music 41 class, two consecutive classes taught by the same teacher, were pooled. The responses were tallied and then analyzed using the chi-square test of independence.

The sample consisted of 171 ethnically diverse students. Nine of the 171 completed questionnaires were excluded because the student checked both the "agree" and "disagree" boxes, left both blank, or the response was illegible. Ninety one (56.2%) of the 162 remaining usable responses were from female students and 71 (43.8%) were from male students. The mean age of the sample was 26.03 years old with a standard deviation of 9.07 years. The range was from 17 to 64 years old (see Table 2 in Appendix).

Results

A chi-square analysis (see Table 3 in Appendix) was performed comparing belief in evolution between male students and female students. We concluded that there was no statistically significant difference in the distributions of belief in evolution between males and females, $\chi^2 (1, n = 162) = 0.12, p > .05$.

A chi-square analysis (see Table 4 in Appendix) was performed comparing belief in evolution between students under the age of 21 and students aged 21 or older. We concluded that there was no statistically significant difference in the distributions of belief in evolution between students under the age of 21 and students aged 21 or older, $\chi^2 (1, n = 162) = 3.25, p > .05$.

A chi-square analysis (see Table 5 in Appendix) was performed comparing belief in evolution among students majoring in Humanities, Social Sciences, Physical Sciences, Business/Vocational, or Undecided. We concluded that there was a statistically significant difference in the distributions of belief in evolution among students who are physical science majors, social science majors, humanities majors, business/vocational majors, or undecided, $\chi^2 (4, n = 162) = 12.72, p < .05$.
 $V = 0.28, df^* = 1$. This is a small effect size.

Discussion

This study demonstrates that there is no relationship between either gender and belief in the theory of evolution or age and belief in the theory of evolution among CCSF students; however, there is a relationship between a student's major and whether or not he or she believes in the theory of evolution.

With regard to gender, the similarity in distribution between males and females

was striking. Of the 71 males, 54 (76%) agreed that human beings and chimpanzees evolved from a common ancestor in Africa, and 17 (24%) disagreed, while of the 91 females, 67 (74%) agreed and 24 (26%) disagreed (Fig. 1.) This was as predicted.

With regard to age, it was predicted that more younger students would agree that human beings and chimpanzees evolved from a common ancestor in Africa than older students. In fact, a smaller proportion of students who were under the age of 21 (27 out of 42 = 64%) agreed than those who were 21 or older (94 out of 120 = 78%) (Fig. 2.) This was the opposite of what was predicted, and apparently contradicts the result of the 2009 Gallup poll mentioned above. However, the Gallup definition of “young” was people aged 18 to 34, whereas the average age of this sample of CCSF students was only 26.03, which is probably close to the average age of the "young" people in the Gallup poll, and in fact 143/162 (88.3%) of the CCSF students were aged 17 to 34 (see Table 2). Of the 19 students who were aged 35 or older, 13 (68.4%) agreed, which was slightly lower than the total average number of students who agreed with the statement (74.7%, see below).

The third hypothesis of this study was that students who are majoring in the physical sciences or social sciences will be more likely to believe in the theory of evolution than students who are majoring in the humanities. However, it appeared that the difference in the distribution was actually between business/vocational majors / undecided students and the rest of the student population, rather than between humanities majors and the physical and social science majors. Twenty two out of twenty five (88%) of humanities majors actually agreed that human beings and chimpanzees evolved from a common ancestor in Africa, compared to 38/45 (84%) of social science majors and 11/12 (92%) of physical science majors. On the other hand only 32/51 (63%) of business /

vocational majors and 18/29 (62%) of undecided students agreed with the statement (Fig 3.)

Overall, these results indicate that there might be a relationship between belief in evolution and whether students are business/vocational or non- business/vocational majors, although much depends on how “vocational” and “non-vocational” are defined. Another survey comparing business/vocational majors and science majors might reveal a clearer relationship between major and belief in evolution. On the other hand, this is not evidence of a cause and effect relationship: it could be that students who do not believe in evolution tend to avoid majoring in fields in which they feel that their beliefs will be challenged.

A surprising result was the high overall proportion (74.7%) of CCSF students surveyed who believe in evolution. This is much higher than the national average, and indeed is at the same level (74%) as people with postgraduate degrees (Gallup 2009). Furthermore, these CCSF students believe in human evolution (and therefore “fully” believe in evolution,) and include business and vocational majors. It would be interesting to take another sample of CCSF students from a similarly broad range of classes and majors to see whether these results are replicated. As for why such a high proportion of CCSF students believe in evolution, it could be that students who attend CCSF bring this belief with them, or perhaps they come to believe in evolution while they are students at CCSF. It would therefore also be interesting to do a repeated measures study, initially of CCSF freshmen before they have taken any courses, and once again when the same students are ready to graduate or transfer.

Finally, comparing the results of this study with those of Sikkink and also those of

Barnes, Keilholtz and Alberstadt, it seems that there might be a relationship between students' belief in evolution and the state where they attend college. It could be that students who attend colleges in a "liberal" area like the Bay Area, either because they are born here or because they choose to study here, are also more likely to believe in evolution. It would therefore be interesting to do some comparative surveys of students who are attending colleges in states that are perceived as being relatively "liberal" and states that are perceived as being relatively "conservative".

In conclusion, the most striking result of this study was the relatively high proportion of CCSF students who believe in evolution, especially in view of the fact that the survey question was framed in terms of human evolution. Our research demonstrated a relationship between belief in evolution and CCSF student major, but further study is required to determine exactly which majors are related to belief in evolution. It would be interesting to continue this study not only at CCSF but also at some of the elite universities in the United States, with a focus on business, finance and law majors: these are the people who will be the future leaders of this country, and will have considerable influence on the future education policies of the United States, and thus on the teaching of evolution at American high schools and universities.

Appendix

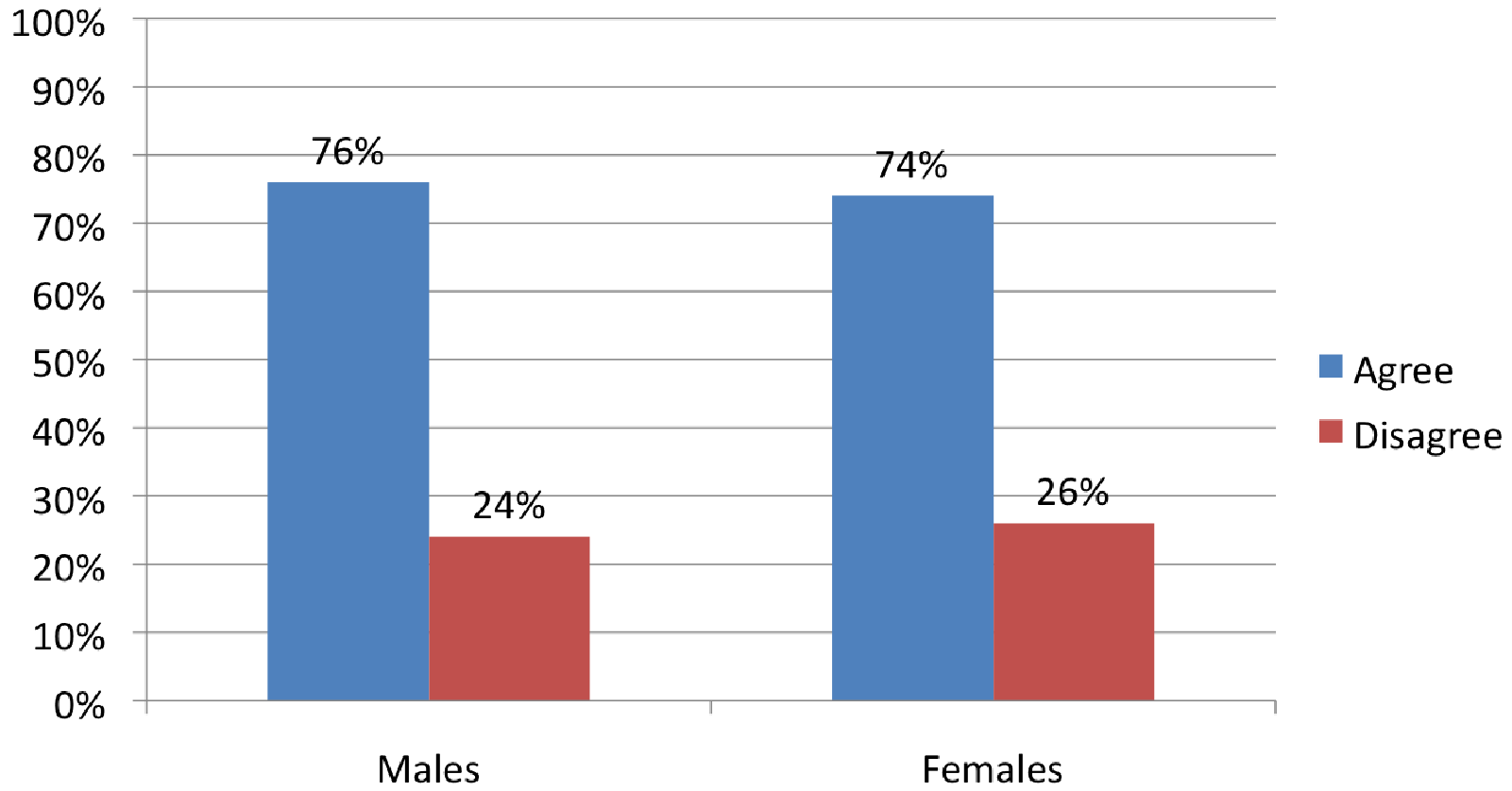


Figure 1. Belief in Human Evolution by Gender

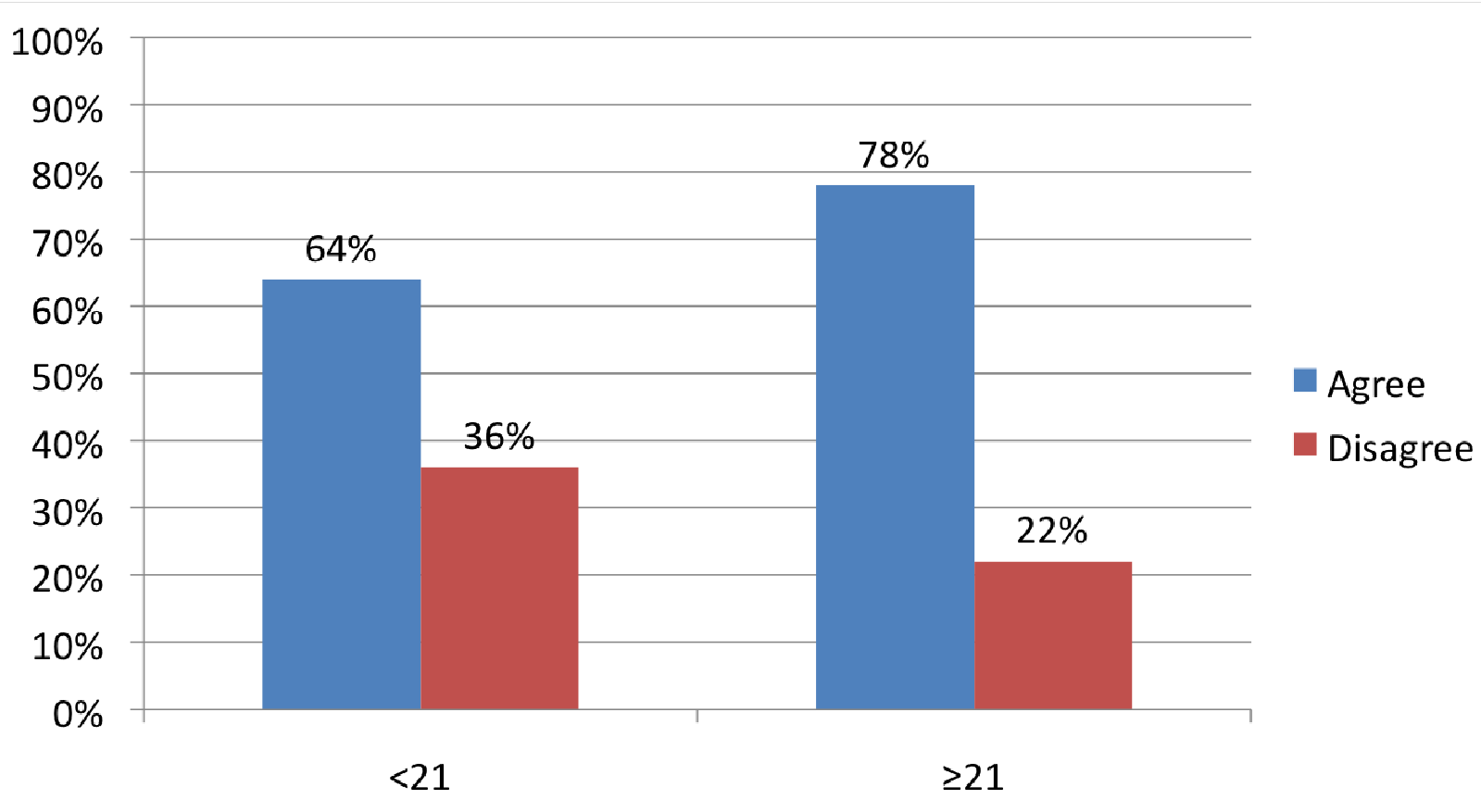


Figure 2. Belief in Human Evolution by Age

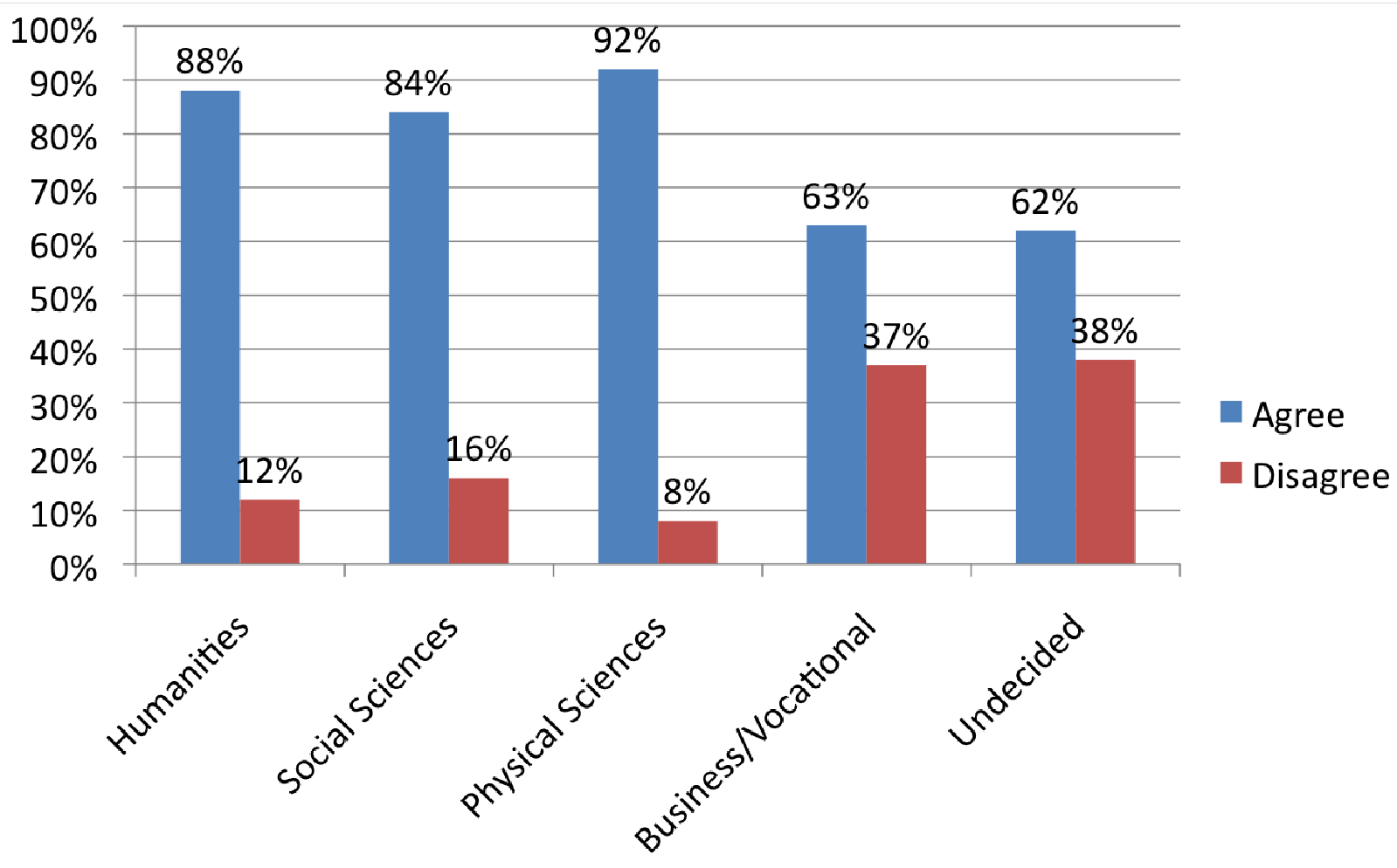


Figure 3. Belief in Human Evolution by Major

Table 1

Questionnaire Results by Major and Category

Major	Category	Agree	Disagree
Accounting	Business / vocational		1
Administration of justice	Business / vocational	1	1
Aerospace engineering	Physical science	1	
Anthropology / Ethnic studies	Social science	7	
Architecture	Humanities	3	
Art	Humanities	1	
Art history	Humanities	1	1
Asian American studies / Anthropology	Social science	1	
Biochemistry	Physical science	1	
Biology	Physical science	2	
Broadcast journalism	Business / vocational	1	
Broadcasting	Business / vocational	1	
Business	Business / vocational	2	1
Chemistry	Physical science	1	
Child development	Social science	2	1
Cinema	Humanities	1	
Communication	Business / vocational		1
Communicative disorders	Social science		1
Criminal justice	Business / vocational	3	4
Dance	Humanities	1	
Early childhood development	Social science	1	
Economics	Business / vocational		1
Electronics	Physical science	1	
Engineering	Physical science		1
English (creative writing)	Humanities	1	
Environmental science	Physical science	1	
Environmental studies	Physical science	1	
Film production	Business / vocational	1	
Financial management	Business / vocational	1	
Fine art	Humanities	1	
Fine arts	Humanities	1	
Geography	Physical science	2	
Graphic design	Humanities	1	
Health education	Business / vocational	1	
History	Social science	2	
Horticulture	Business / vocational		1
Human development	Social science	1	
IDST / English	Humanities	1	
Industrial design	Business / vocational	1	

Interior design	Business / vocational		1
International relations	Social science	2	
International studies	Social science	1	
Journalism	Business / vocational	1	
Kinesiology	Business / vocational	1	2
Legal studies	Business / vocational	1	
Liberal studies	Humanities	1	
Life skills	Business / vocational	1	
Music	Humanities	4	2
Native studies	Social science		1
Natural medicine	Business / vocational	1	
Nursing	Business / vocational	3	4
Nursing / Personal trainer	Business / vocational	1	
Nutrition	Business / vocational	1	
Personal enrichment	Business / vocational	1	
Photography	Humanities	1	
Physical education	Business / vocational	1	
Physical therapy	Business / vocational	1	
Political science / Anthropology	Social science	1	
Political science	Social science	1	
Premed	Physical science	1	
Psychology	Social science	13	2
Psychology / Criminal justice	Social science	1	
Radio broadcast	Business / vocational		1
Religion	Humanities	1	
Social science	Social science		1
Social work	Business / vocational	1	1
Sociology	Social science	4	
Sociology / Theater arts	Social science		1
Sociology / Marketing	Social science	1	
Sound engineering	Business / vocational	1	
Spanish	Humanities	1	
Sports medicine	Business / vocational	1	
Teaching	Business / vocational	1	
Technical theater	Business / vocational	1	
Theater	Humanities	2	
Traditional Chinese medicine	Business / vocational	1	
Travel	Business / vocational	1	
Undecided	Undecided	18	11

Table 2

Sample Total, Mean Age and Standard Deviation

Age	f	Age	f	Age	f	Age	f	Age	f	Age	f
70	0	60	0	50	1	40	1	30	3	20	15
69	0	59	0	49	0	39	1	29	2	19	20
68	0	58	0	48	0	38	1	28	5	18	6
67	0	57	1	47	0	37	1	27	4	17	1
66	0	56	1	46	1	36	0	26	6		
65	0	55	0	45	2	35	2	25	10		
64	1	54	0	44	2	34	4	24	8		
63	0	53	0	43	0	33	4	23	7		
62	2	52	0	42	1	32	3	22	16		
61	0	51	0	41	1	31	5	21	24		

$$\Sigma X = 4,217$$

$$M = \Sigma X / n = 4217 / 162 = 26.03$$

$$SS = \Sigma X^2 - (\Sigma X)^2 / n = 123,009 - (4,217)^2 / 162 = 123,009 - 109,772.15 = 13,236.85$$

$$s = \sqrt{(SS / n-1)} = \sqrt{(13,236.85 / 161)} = \sqrt{82.22} = 9.07$$

Table 3

Chi-square analysis comparing belief in evolution between male students and female students

Gender	Agree	Disagree	Total
Male	54	17	71
Female	67	24	91
Total	121	41	n = 162

Table 4

Chi-square analysis comparing belief in evolution between students under the age of 21 and students aged 21 or older

Age	Agree	Disagree	Total
<21	27	15	42
≥21	94	26	120
Total	121	41	n = 162

Table 5

Chi-square analysis comparing belief in evolution among students majoring in

Humanities, Social Sciences, Physical Sciences, Business/Vocational, or Undecided

Major	Agree	Disagree	Total
Humanities	22	3	25
Social Sciences	38	7	45
Physical Sciences	11	1	12
Business/Vocational	32	19	51
Undecided	18	11	29
Total	121	41	n = 162

Table 6

Questionnaire

a) Please answer the following three questions about yourself:

i) Gender (circle one): Male Female

ii) Age:_____

iii) Major (if undecided, please write “undecided”):_____

b) Please indicate whether you agree or disagree with the following statement by checking the appropriate box: “Human beings and chimpanzees evolved from a common ancestor that lived in Africa several million years ago.”

Agree	Disagree

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