

RESEARCH ARTICLE

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Teaching the tourists in Galápagos: what do Galápagos National Park guides know, think, and teach tourists about evolution?

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Abstract

Background: Evolution is everywhere in Galápagos, especially regarding the role the islands have played in the history of evolutionary thought. In turn, the Galápagos National Park guides are in a unique position as informal science educators, as they are the primary points-of-contact for the islands' ~ 200,000 tourists per year. Our goal was to assess the guides' knowledge and acceptance of the theory of evolution, in addition to learning more about their perceptions of the connection between the islands and evolution.

Methods: We surveyed 63 guides in three towns on three of the archipelago's populated islands. Surveys included items targeting the guides knowledge of evolution (via the Knowledge of Evolution Exam, or the KEE) and acceptance of the theory of evolution (via the Measure of Acceptance of the Theory of Evolution, or the MATE). Additional, novel items gauged the guides' perceptions of the islands, insofar as Galápagos is connected to evolution and the history of evolutionary thought.

Results: Although acceptance of evolution was high, knowledge was relatively low. However, the guides are proud of the islands' association with the history of evolutionary thought, and enjoy talking about evolution while giving tours. On open-ended responses, guides claimed to especially enjoy talking with tourists about geology and island culture, and a few voiced concerns about the conflict between evolution and religion. Finally, the overwhelming majority of the guides agreed or strongly agreed with the statement, "I would like to learn more about Galápagos and the history of evolutionary thought."

Conclusions: Galápagos guides display a disconnect between what is *felt* about evolution, and what is *known* about how evolution actually works. We can probably trace their fondness for, and acceptance of, evolution to the clear connection between evolution, tourism, and the guides' livelihoods. We can trace their lack of knowledge to their schooling, as prior work detected similarly low knowledge of evolution in the islands' schoolteachers. However, the guides are a receptive audience for professional development pertaining to our contemporary understanding of the mechanics of biological evolution. Improving guides' understanding of biological evolution could, in turn, inform the evolutionary understanding of thousands of tourists each year.

Keywords: Measure of Acceptance of the Theory of Evolution (MATE), Knowledge of Evolution Exam (KEE), Galápagos Islands, Galápagos National Park, Charles Darwin

Background

No place on Earth is more closely linked with Charles Darwin and the history of evolutionary thought than

Galápagos. Indeed, evolution is *everywhere* in Galápagos—in the names of businesses, on the names of boats, on the backs of t-shirts, on countless souvenirs, and on street names and displays honoring the archipelago's history and most famous visitor. Darwin is memorialized with statues, busts, and other tributes on virtually every inhabited island, and schools in Galápagos entertain

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tourists with shows about evolution and the role of the islands in Darwin's formulation of evolution by natural selection. Visitors to Galápagos—even if they ignore the islands' famous animals and their stunning evolutionary adaptations—cannot escape evolution (Fig. 1).

The fame of Galápagos has also, in recent decades, produced a flood of tourists. Although there are only about 25,000 legal residents of Galápagos (plus 1800 temporary residents and 5000 other people whose status is described as “irregular”), the islands host more than 180,000 tourists every year (Galápagos Conservancy 2017). These tourists, which produce an estimated 70%

of the archipelago's economy (Honey 2008), come to Galápagos for a myriad of reasons, ranging from photography and seeing the unafraid wildlife to ecotourism and hiking on volcanoes. Although learning about evolution may not be the primary motivation for most tourists' visits to Galápagos, visitors to Galápagos are likely to know something about the islands' links with Darwin and evolution. Moreover, and regardless of why they came to the islands, tourists in Galápagos hear about evolution from Galápagos National Park (GNP) guides, who must accompany tourists when they visit almost every part of GNP.



Fig. 1 Presence of Charles Darwin in Galápagos. Main: Statue of Darwin erected to commemorate the landing site of the *Beagle*, Cerro Tijeretas, San Cristóbal, Galápagos. Top to bottom: bust of Darwin, souvenir t-shirt, and local dive shop all located in Puerto Baquerizo Moreno, San Cristóbal, Galápagos

In an earlier study, we documented what biology teachers in Galápagos know, think, and teach their students about evolution. These teachers are proud of their islands' links with evolution, love the idea of evolution, and are confident that they understand evolution. However, the teachers' confidence about their knowledge of evolution is not accompanied by a clear knowledge of evolution or an acceptance of key evolutionary principles, such as the age of the Earth (Cotner et al. 2016).

Given the omnipresence of evolution in Galápagos, and the importance of GNP guides to tourists' impressions of evolution and Darwin, these guides are potentially an important source of information about evolution—for tens of thousands of people annually, from around the globe. We wondered how GNP guides might influence tourists' perceptions of evolution during their visits. Specifically, what do GNP guides know, think, and teach tourists about evolution?

Methods

In August, 2015, we surveyed GNP guides living and working on the three most populated islands in the Galápagos archipelago: Santa Cruz, San Cristóbal, and Isabela. The guides' knowledge of evolution was measured using the Knowledge of Evolution Exam (KEE; Moore et al. 2011; Moore and Cotner 2009; Rissler et al. 2014), a 10-item, multiple-choice quiz that reveals common misconceptions about, and knowledge of, evolution by targeting basic evolutionary understanding. The guides' acceptance of evolution was assessed with the Measure of Acceptance of the Theory of Evolution (MATE; Rutledge and Warden 1999), a 20-item quiz that focuses on key tenets of evolutionary theory. The survey also included several novel, Likert-scale response items to address the perception and knowledge of evolution as it applies locally to Galápagos (e.g., "Galápagos is closely connected to the history of evolutionary thought."). A few questions specifically addressed Charles Darwin's connection to the islands. Finally, an open-ended survey item asked the guides to comment on what they most enjoyed discussing with tourists.

The survey was created in English and translated to Spanish. To mitigate problems with the translation of the surveys to a new population (e.g., see Asghar et al. 2007), we had several native Spanish-speaking residents of Galápagos and elsewhere (including one professional translator) inspect the exam to ensure its accuracy and clarity. The full survey is available as Additional file 1.

Guides were approached in typical gathering places (e.g., cafes and city parks) outside of the Galápagos National Park, in three towns (Puerto Ayora on Isla Santa Cruz, Puerto Villamil on Isabela, and Puerto Baquerizo Moreno on San Cristóbal); guides were identifiable by

their official Galápagos National Park badges. At least one member of the project team met with each guide to explain (and answer questions about) the survey, and stayed with each guide until she or he completed the survey. Guides who completed the survey were given \$20. There was no time limit for guides to take the survey, and all the guides knew that they could omit any item(s) on the surveys. All of the guides completed the surveys independently of other guides. The survey, consent statement, and procedures were exempt from full review by the University of Minnesota's IRB.

Results

Respondent demographics

Of the 63 GNP guides who took the survey, 35% were based on Santa Cruz, 27% were based on San Cristóbal, and 38% were based on Isabela. Approximately 87% of the guides were male. The average age of the guides was 41 ± 8.6 years old (range = 25–58 years old) and their average amount of time spent as a GNP guide was 13.3 ± 9.5 years (range = 4–34 years).

Approximately 73% of the guides were Level 1 guides, 20% were Level 2 guides, and 7% were Level 3 guides (see discussion of guide levels in Moore and Cotner 2013). Education levels and sources of evolution education differed among respondents. Guides must have a high-school diploma, but only Level III guides are required to have a university degree. Approximately half (i.e., 53%) of the guides had attended college, 34% had graduated from college, and 13% had taken post-graduate courses. Of the 63 respondents, 19% reported learning about evolution in school (college or undergraduate schooling), 25% reported learning about evolution in school and while training to be a guide, 44% reported learning about evolution only while training to be a guide, and 11% reported learning about evolution from other sources (e.g., "personal observations" and "reading"). All 63 respondents were fluent in Spanish and English, with 14 also being fluent in another language (e.g., German, Italian, French, or Swedish).

Guides took an average of 37 min to take the survey. No guide expressed any reservations before, during, or after taking the survey. Also, no guide requested assistance with the language or wording of the survey.

Analysis of KEE scores

The 63 guides in our study had an average KEE score of 44% (Table 1). Although two-thirds of the guides accurately identified the definition of natural selection, only 25% correctly identified the definition of evolution, and only slightly more than one-third of the guides knew that mutation is the ultimate source of genetic variation. Moreover, only 29% of respondents identified the

Table 1 Guides' understanding of evolutionary principles, as measured by the Knowledge of Evolution Exam (KEE)

Percent that responded correctly on KEE items		
KEE item #	Understanding of evolutionary principles	Guides
1	Can identify the several lines of evidence that support the theory of evolution	50.82
2	Can identify the occurrence of evolution by natural selection in an altered environment	30.16
3	Understand that fitness is measured by reproductive success	40.03
4	Can isolate steps leading to adaptation	38.10
5	Can select the correct definition of natural selection	66.67
6	Realize that genetic evidence suggests common ancestry for all organisms	63.93
7	Understand that natural selection is not a random process	31.15
8	Can identify the definition of evolution	25.40
9	Understand that mutation is the ultimate source of genetic variation	37.01
10	Realize that natural selection is simply one mechanism that results in evolutionary change	29.03
	Average KEE score (%)	44.0

Sample sizes for each item vary from 61 to 63, as several guides omitted an item or two from the survey

correct relationship between evolution and natural selection (Table 1). In fact, attention to which wrong answers are chosen can be illuminating. When asked “How might a biologist explain why a species of birds has evolved a larger beak size?” many (38%) guides chose the need-based argument (i.e., “the ancestors of this bird species encountered a tree with larger than average sized seeds. They needed to develop larger beaks in order to eat the larger seeds, and over time, they adapted to meet this need.”) This answer is consistent with similar explanations we’ve heard from guides over the years, and consistent with that given by 55% of the islands’ biology teachers (Cotner et al. 2016).

ANOVA tests were used to determine if demographic indicators could explain differences in KEE scores. There were no significant differences in average KEE scores with respect to age groups ($df = 6$, $F = 1.213$, $p = 0.334$), level of education ($df = 2$, $F = 0.887$, $p = 0.417$), number of sources from which a guide’s knowledge of evolution was obtained ($df = 2$, $F = 0.181$, $p = 0.835$), guide level ($df = 2$, $F = 0.307$, $p = 0.737$), or years of work experience ($df = 6$, $F = 0.375$, $p = 0.889$). A t test showed that KEE scores did not significantly differ between males and females ($p = 0.638$). The only difference in KEE scores that was statistically significant was that between respondents from Santa Cruz (with an average of 48% correct) and Isabela (34% correct; $p < 0.05$). Average KEE scores obtained by respondents from Santa Cruz and Isabela did not differ significantly from respondents from San Cristóbal (42% correct).

Analysis of MATE scores

Respondents who did not answer an item on the MATE, or who indicated two responses for an item on the

MATE, could not be scored due to the unidimensional format of the MATE and the formula used to obtain an aggregate score. Consequently, we obtained only 44 scores on the MATE from the 63 guides in our sample. The average MATE score for these 44 guides was 81% (Table 2). Using criteria set forth by Rutledge and Warden (Rutledge and Warden 1999), these guides have a “high acceptance” of the theory of evolution.

ANOVA tests showed that there were no significant differences in MATE scores with respect to age group ($df = 6$, $F = 0.897$, $p = 0.523$), level of education ($df = 2$, $F = 0.764$, $p = 0.473$), number of sources from which a guide’s knowledge of evolution was obtained ($df = 2$, $F = 0.453$, $p = 0.639$), guide level ($df = 2$, $F = 0.08$, $p = 0.924$), years of work experience ($df = 6$, $F = 2.232$, $p = 0.0782$), or island ($df = 2$, $F = 0.203$, $p = 0.817$). A t test showed that MATE scores did not differ significantly between males and females ($p = 0.242$).

Analysis of evolution-in-Galápagos items

We used several novel multiple-choice items to determine the guides’ knowledge of local aspects of the history of evolutionary thought (Table 3). All of the guides in the survey could identify *On the Origin of Species* as the book in which Darwin described his theory of evolution by natural selection, and more than 85% of the guides knew when Darwin was in Galápagos (i.e., 1835), and that Darwin visited four islands during the *Beagle*’s stopover in Galápagos (Table 3). Over half (57%) correctly selected mockingbirds (albeit often in combination with finches) as the birds that most impressed Darwin during his visit to the islands. In contrast, not one of the teachers surveyed earlier (Cotner et al. 2016) selected mockingbirds

Table 2 Average responses to individual items on the Measure of Acceptance of the Theory of Evolution (MATE)

MATE item	Average response (out of 5)
Organisms existing today are the result of evolutionary processes that have occurred over millions of years*	4.48
The theory of evolution cannot be tested scientifically	3.69
Modern humans are a product of evolutionary processes that have occurred over millions of years*	4.19
The theory of evolution is based on speculation and not valid scientific observation and testing	4.12
Most scientists accept evolutionary theory as a valid scientific theory*	4.44
The available data are unclear as to whether evolution actually occurs	3.48
The age of the earth is < 20,000 years	4.53
There is a significant body of data that supports evolutionary theory*	4.04
Organisms exist today in essentially the same form in which they always have	4.18
Evolution is not a scientifically valid theory	4.06
The age of the earth is at least 4 billion years*	4.01
Current evolutionary theory is the result of sound scientific research and methodology*	4.20
Evolutionary theory generates testable predictions with respect to the characteristics of life*	3.89
The theory of evolution cannot be correct since it disagrees with Biblical account of creation	3.89
Humans exist today in essentially the same form in which they always have	4.15
Evolutionary theory is supported by factual historical and laboratory data*	3.74
Much of the scientific community doubts if evolution occurs	3.82
The theory of evolution brings meaning to the diverse characteristics and behaviors observed in living forms*	4.30
With few exceptions, organisms on earth came into existence at about the same time	3.45
Evolution is a scientifically valid theory*	4.34
Average MATE score (%)	81.54

To account for positively and negatively phrased items, scales were reversed so that responses indicating high acceptance of evolutionary theory are assigned a score of 5 and those indicating low acceptance receive a score of 1. Asterisks indicate positively phrased answers, where a score of 5 is "Strongly Agree" and 1 is "Strongly Disagree." All others were transposed for calculating average responses. Sample sizes for each item vary from 60 to 63

Table 3 Percent of correct responses to Darwin-in-Galápagos survey items

Percent of GNP guides that responded correctly to Darwin-in-Galápagos survey items		
Darwin item #	Knowledge of Darwin revealed	Guides
1	Can identify when (roughly) Charles Darwin visited the islands	85.7
2	Can identify why Darwin visited the islands	91.8
3	Are aware that mockingbirds—not finches—were the birds that most impressed Charles Darwin	39.7
4	Know that Darwin visited four islands during the <i>Beagle's</i> stopover in the archipelago	86.7
5	Can identify <i>On the Origin of Species</i> as the book Darwin wrote, describing his theory of evolution	100.0

Sample sizes for each item vary from 60 to 63

for this question; instead, 100% selected finches, a group that is not even mentioned in *The Origin*.

Similarly, most guides are confident that they understand evolution, with 89% "agree[ing]" or "strongly agree[ing]" that "I am confident in my understanding of evolution." Approximately 83% of the guides also said that they enjoy talking about evolution, 97% indicated that they realize that Galápagos is closely connected to the history of evolutionary thought, 86% enjoy talking about this connection, and 89% are proud of this connection. Furthermore, with high confidence in their knowledge of evolution and their stated enjoyment of evolution, 97% of

respondents indicated that they would like to know more about evolution (Table 4).

Analysis of open-ended items

Fifty-five guides (87% of the total) answered the question, "What is your favorite thing to talk about when giving a tour?" Most answers were single-word responses (e.g., "geology") or short phrases (e.g., "island culture"), but some were several-sentence responses. We assigned categories to responses that were echoed by two or more individuals. For example, two individuals mentioned something about the

Table 4 Guide perceptions of discussing evolution in Galápagos

Survey item	% in agreement with the statement
I am confident in my understanding of evolution	89
Galapagos is closely connected to the history of evolutionary thought	97
I am proud of the connection between Galapagos and evolutionary thought	89
I enjoy talking about evolution	83
I enjoy talking about Galapagos and the history of evolutionary thought	86
I would like to know more about Galapagos and the history of evolutionary thought	97

The percent of guides who responded either “agree” or “agree strongly” with items related to discussing evolution in Galápagos. Sample sizes for each item vary from 61 to 63

perceived conflict between evolution and religion, and 18 guides listed some version of “geology” (including “the origin of the islands”) as among their favorite things to discuss (Table 5). One guide couched the discussion of evolution in the island’s religious culture: “It is important to treat the evolutionary issue with great caution due to the religious beliefs of our community, that on many occasions brought much controversy.”

Table 5 Categorization of guides’ free responses by general topic

Characterization of guides’ free responses		
Topic	Number of respondents	Example responses
Evolution, in general	10	“I explain about the species that have evolved”
Evolution, adaptive radiation	4	“I like to talk about the arrival and establishment of organisms on the island”
Evolution, natural selection or adaptation	6	“The adaptation of species;” “Natural selection”
Evolution, history of Charles Darwin	4	“The true story of how Charles Darwin was inspired to collect evidence of the differences between species that he collected”
Evolution and religion	2	“Concept of evolution as a product of CREATION”
Endemic or unique fauna	3	“I like to talk about the docility of the animals, their behavior, and their beauty that is unique in the world”
Biodiversity/fauna and flora	8	“To interpret the marvelous fauna and flora of Galapagos”
Conservation/human impacts	4	“The impacts of humans on the environment in Galapagos”
Geology	18	“I always enjoy talking about the origin of volcanoes;” “I like to talk about geology”
Human history/island culture	15	“The first colonists on Isabela;” “Island culture”
Marine biology or oceanography	4	“The marine world”
Animal behavior	3	“Animal behavior”
Specific organisms	15	Various responses including references to tortoises, sea lions, blue-footed boobies, finches, mammals, birds, and iguanas
Miscellaneous	2	“I like to talk about everything but evolution; I believe in adaptations of species to survive their environment”

Fifty-six guides responded, and 98 items were categorized

Discussion

There are limitations associated with our study. First, the MATE and KEE have, to our knowledge, not been validated for use in Latin America. Second, we surveyed a non-random sample of guides, based simply on those we encountered (and who were wearing their guide badges) in a handful of public areas. Thus, we are reluctant to draw too many comparisons between our population of GNP guides and other populations that have taken the MATE, the KEE, or a combination of the two. However, we can make note of trends in our findings, comment on factors that may contribute to these trends, and consider whether these findings can help us understand how GNP guides might influence tourists’ perceptions of evolution during their visits.

There are approximately 320 registered GNP guides in Galápagos (Moore and Cotner 2013). However, many of these guides do not work regularly as guides in the archipelago; many operate tour boats, work on the mainland, or manage other businesses in the islands. Our sample of 63 individuals, then, represents at least 20% of the guides currently (in 2015) working in Galápagos. Our sample of guides differs from the source population of guides in that the surveyed guides were predominantly (73%) Level I guides (as opposed to ~ 50% throughout the archipelago) and 34% were college graduates (compared to 20% throughout the archipelago; Moore and Cotner 2013).

We did not detect differences in knowledge or perceptions of evolution as a function of age, gender, level of education, or years working as a guide. As an exception, there were significant differences on the KEE between guides on the main island of Santa Cruz (48% KEE average), and the more remote western island of Isabela (34% KEE average). We are not sure why there were significant differences in KEE scores between Santa Cruz and Isabela, especially since guides on Isabela are not necessarily *from* Isabela. However, to the extent that the guides surveyed by island disproportionately represent resident guides (primarily giving day-tours), Isabela's isolation may affect guides' access to training and therefore impact a guide's overall knowledge of evolution.

In general, GNP guides are confident that they understand evolution, but their KEE scores averaged only 44%. Although this score is higher than that of Galápagos teachers (Cotner et al. 2016), it is less than the average score reported elsewhere (i.e., 53% for first-year students at the University of Minnesota; see Moore et al. 2011). These results indicate that GNP guides' confidence about their knowledge of evolution is, like that of Galápagos teachers, uncoupled from their actual knowledge about evolution. This is at least partly because the only school-based instruction about evolution received by most guides comes from Galápagos' biology teachers (indeed, < 20% of the GNP guides in our sample who attended college reported learning about evolution in college). The poor understanding of evolution by biology teachers in Galápagos is passed to students who become GNP guides, and is only partially remedied by the subsequent evolution-related training that some individuals receive from GNP when they are certified as guides.

The uncoupling of GNP guides' confidence about evolution from their knowledge of evolution may also be partly due to the prominent religiosity in the islands. Although Galápagos lacks creation museums and commercial young-Earth organizations (e.g., Answers in Genesis), Seventh-Day Adventism—that is, a religion that rejects evolution while promoting a “young Earth”—is prominent in Galápagos. Indeed, until recently, tourists walking along Charles Darwin Avenue in Puerto Ayora were greeted by a large billboard proclaiming Genesis 1:1 (“In the beginning...”), sponsored by the island's Seventh-Day Adventist church and school (Cotner 2011). The failure to teach and learn about evolution is often linked to religiosity (e.g., see Rissler et al. 2014), but in Galápagos, this lack of knowledge about evolution is not linked to an outright rejection of evolution.

Although GNP guides' knowledge of evolution exceeds that of teachers by 22%, the guides' *acceptance* of evolution exceeds that of teachers by 56%. That is, GNP guides are far more accepting of evolution than are the islands'

biology teachers. GNP guides may also be more accepting of evolution than, for example, biology teachers in countries such as Spain and Portugal (Clément 2015), and they are certainly more accepting of evolution than are the Ecuadorans, on average, on the mainland: a recent PEW study reported that only 50% of Ecuadorans agree that humans and other living things evolved over time, as opposed to having been created in their present form (Bell and Sahgal 2014), whereas 94% of guides agree that “Modern humans are a product of evolutionary processes that have occurred over millions of years.” Nevertheless, many guides still express misgivings about accepting evolution, despite its direct linkage to the tourism on which their livelihoods depend.

GNP guides know much more than teachers about the local connections between Galápagos, Darwin, and evolution (e.g., guides are more likely than teachers to know when Darwin was in Galápagos and how many islands Darwin visited; see Table 3). This local knowledge is presumably important for the guides' abilities to educate and entertain tourists, and it is likely more useful than are the guides' knowledge and acceptance of evolution. Furthermore, these connections between Darwin and the history of evolutionary thought are evident throughout the islands and may be absorbed daily and informally, for example simply by walking past one of several statues of Darwin or dining in The Mockingbird Café. However, the *science* of evolution is more likely a topic that is restricted to formal educational settings and discussed in short, infrequent installments.

More than 40% of the GNP guides reported learning about evolution only from the GNP training program, and not from their college courses. Two-thirds of the GNP guides learned about evolution from the GNP training programs, and only 11% of the guides reported learning about evolution from sources such as books and personal observations. These data, combined with the guides' low KEE scores, suggest that Ecuador's biology courses and GNP's training about evolution are inadequate for mastering core concepts about evolution. This conclusion is also consistent with Galápagos teachers' (who attended college, but not the GNP's training program) poor knowledge of evolution.

Further work should clarify whether tourists planning to visit Galápagos place high relative importance on learning about evolution. If learning about evolution is not a primary motivation for visiting the islands, then the guides' relatively low KEE scores may not be important. If tourists visit Galápagos to learn about Darwin's voyage and the role the islands have played in the history of evolutionary thought, they will encounter apt tutors in the GNP guides. However, if individuals travel to Galápagos to learn about evolution itself—for example, how

evolution involves many mechanisms, one of which is natural selection, and how populations undergo adaptive radiation—then they may be disappointed or misinformed. Interestingly, at Grand Canyon National Park in the United States—another iconic, science-linked site—a similar conflict exists between explanations of Earth's age based on science and those based on religion. Most guides argue that Earth is approximately 4.5 million years old and that Grand Canyon formed over millions of years, but a growing number of other guides claim that Grand Canyon formed over the course of 1 year, 4300 years ago (Moore 2016).

On a positive note, teaching the *content* of evolution is easier than changing an individual's *acceptance* of evolution (Alters et al. 2002; Nehm et al. 2009; Nehm and Schonfeld 2007). The guides we surveyed have relatively high levels of evolution acceptance, and more than 90% of these guides want to learn more about evolution. In combination, these findings suggest that a targeted program by GNP or other organization (e.g., Galápagos Conservancy) could help remedy the problems we report about the guides' poor understanding of evolution.

Additional file

Additional file 1. The full survey completed by guides in summer 2015.

Abbreviations

GNP: Galápagos National Park; KEE: Knowledge of Evolution Exam; MATE: Measure of the Acceptance of the Theory of Evolution.

Authors' contributions

All authors contributed to the experimental design, survey administration, and/or drafting of the manuscript. All authors read and approved the final manuscript.

Acknowledgements

We thank Ricardo Andres, Victor Mendia, and José Garcia for their help with administering the survey.

Competing interests

The authors declare that they have no competing interests.

Availability of data

We are happy to share our data in whatever form the editors prefer.

Consent for publication

Not applicable.

Ethics approval and consent to participate

The University of Minnesota IRB judged this work as exempt from full review. All guides signed consent forms prior to completing the survey.

Funding

Not applicable.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Received: 19 June 2017 Accepted: 15 September 2017

Published online: 15 October 2017

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