

Darwin: Educators' Professional Development Program Evaluation

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New York area educators were invited to a professional development event at the American museum of Natural History on February 2, 2006, from 4:00 to 7:00 PM. The purpose of the evening was to acquaint teachers with the Museum's Darwin exhibition and to offer methods for using it to enhance classroom instruction. The event took place in the Hall of Reptiles and Amphibians and the exhibition in Gallery 3. Darwin is organized by the American Museum of Natural History, New York (www.amnh.org), in collaboration with the Museum of Science, Boston; The Field Museum, Chicago; the Royal Ontario Museum, Toronto, Canada; and the Natural History Museum, London, England.

The evening began with a talk by Darwin curator, Niles Eldredge, followed by remarks from AMNH Education staff and NYC Board of Education officials. Educators then visited the exhibition and attended demonstrations of activities designed to broaden the scope of the exhibition for students. Demonstration tables focused on journal writing, botany, insect observations and voyage of the Beagle. In addition, educators were given materials to use in the classroom, both as stand-alone activities and pre- and post-visit experiences.

Educators were treated to an appetizing array of food and beverages, served by elegantly clad wait staff. Time was available for socializing and networking with colleagues. The American Museum of Natural History gratefully acknowledges The Howard Phipps Foundation for its leadership support. Significant support for Darwin has also been provided by Chris and Sharon Davis, the Austin Hearst Foundation, Jack and Susan Rudin, and Rosalind P. Walter. Additional funding provided by the Carnegie Corporation of New York and Dr. Linda K. Jacobs.

Over 350 educators participated in the evening's events. Attendees were asked to fill out a form evaluating the professional development program. To thank them for participating in the evaluation, they were given 2 complimentary M+1 tickets to come back to the Museum on their own. Some 211 educators completed the evaluation. Results are summarized below in tables, followed by quotes in the educators' own words.

Table 1. What grade do you teach

	Frequency	Percent
Pre K - elem	49	23
MS	33	16
HS	95	45
Other/Various	34	16
Total	211	100

Almost half the attendees (45%) teach in high school, the level at which Darwin and evolution are more likely to be part of the science curriculum.

Table 2. School Type

	Frequency	Percent
Public	150	71
Private	13	6
Other	24	11
Total	187	89
Missing System	24	11
Total	211	100

Table 3. Subject area taught

	Frequency	Percent
Life science/biology	84	40
Social studies/humanities	15	7
Other	101	48
Total	200	95
Missing System	11	5
Total	211	100

Table 4. What was your main reason for coming this evening?

	Frequency	Percent
Professional development	23	10
Classroom preparation	62	28
See exhibition	41	18
Lecture/panel	4	2
Baruch	1	0
NYAPDP	5	2
Personal interest/interest in topic	65	29
Learn how to use AMNH	1	0
Recommended by friend/colleague	3	1
Networking/team building	10	4
Other	9	4
Total	224	100

Classroom preparation

To see how I can incorporate more social studies and science in my teaching. To learn about Darwin. (27)

I wanted to investigate teaching strategies for using [the] exhibit and teaching evolution with children. (8)

To enhance and enrich our theme on how to be a scientist and observer. (18)

To gain a better understanding of Darwin and the Evolution Theory so I can incorporate it into the curriculum.
(37)

Science, nature and religion. (40)

To collect ideas for possible ideas for exit projects. (116)

The New York State curriculum is based on evolution. (176)

To improve my ability to communicate more clearly about evolutionary theory. (209)

To see the exhibition

Studied the website [and] wanted to see it [Darwin exhibition] up close. [I] am a primatologist, behaviorist,
endocrinologist and evolutionary biologist. (130)

see the Darwin [exhibition]. (93)

I love to see the new exhibits. I used to teach bio[logy] and I might eventually teach it again. (173)

Personal Interest

Interest in Evolution-Creationism discussion. (179)

To improve my ability to communicate more clearly about evolutionary theory. (209)

How to use AMNH in teaching

Curious about teaching strategies for using the exhibit and for discussing evolution with children. (51)

Networking, team building

Wanted to hear ideas from educators, find out if and how Darwin's ideas are being used with young children. (28)

Team building; providing an evening to have my teachers talk and hang out with each other; about science and
ideas. (157)

Other

Learning about future museum programs. (93)

Ideas for the [New York] Hall of Science's Evolution Exhibit and workshops. (99)

Free (147)

Our facilities (Wildlife Conservation Society) have had much discussion on how to incorporate evolution into our
programs. (178)

Some 40% of the respondents teach life science and/or biology. Just 7% teach social studies or humanities, fields
that Darwin could make valuable contributions to curriculum.

Table 5. Will you bring students to this exhibition?

	Frequency	Percent
Yes	137	65
No	52	25
Total	189	90
Missing System	22	10
Total	211	100

The majority of teachers said they would bring students (65%).

Table 6. Why will you recommend "Darwin" to other educators?

	Frequency	Percent
Science content	39	41
Exhibit quality	24	26
Introduce/reinforce curriculum	2	2
User friendly (hands-on, visually appealing)	25	27
Other	2	2
Innaccurate	1	1
Not interactive	1	1
Total	94	100

Reinforce curriculum

- Yes-Great opportunities about a subject not often touched upon by my demographic of students. (4)
- Yes-Because the exhibit is much more realistic than anything I can create in a classroom. (103)
- Yes-It perfectly enhances our evolution module. (133)
- Yes-We teach a quarter long class on Darwin and Evolution. (135)
- Yes-As part of an earth history unit. (159)

Learn about scientific inquiry

- Yes-I would, for them to see how curiosity/perseverance pays off. (27)

Other reasons to bring students

- Yes-There is a wealth of information. (19)
- Yes-It is interesting and thought provoking. (37)
- Yes-Excellent for exit project; a lot of resources. (56)
- Yes-Critical information regarding the relationship of self to all creatures and nature. (63)
- Yes-I believe they [children] need to know about evolution regardless of their religion. (64)

Yes-It is vital that they[children] be exposed to this and should be able to see and touch everything. (66)
 Yes-[The exhibition] has live specimens [and the] writing (explanations) so clear. (87)
 Yes-It is extremely well planned and well thought out and is appropriate for all ages and functioning levels. (143)

No

No-Logistics, but I will encourage them to come on their own. (84)

Students too young

No-Too young. There is too much reading. It will not hold their interest. It is meant for middle/high school-college. (23)

No-I think it isn't for 5th grade. I think it is too much small reading. (12)

No-Too above their heads; if I had an older grade I would. (31)

Students' poor behavior

No-My students don't listen very well. (21)

Unable to take field trips

No-It's way too hard to set up a trip. I will, however, send students on their own. (118)

No-I'd like to [but the] cost of transportation is too high. (161)

No-Too expensive. (93)

No-I don't do fieldtrips; however I will encourage students in my classes to visit on their own, as I always do, to better understand the importance of protecting biodiversity in NYC. (209)

Seven themes found in *Darwin* were outlined on the evaluation form; teachers were asked to check the ones they would teach to students they bring to the exhibition. The following 7 tables illustrate their response to each theme. "Checked" indicates that teachers would teach that theme.

Table 7. Darwin's greatest tools were his skills of observation and analysis.

		Frequency	Percent
	Checked	151	72
Missing	System	60	28
Total		211	100

Table 8. Scientific knowledge changes over time, as scientists test, refine, and add to what is already understood about the world.

		Frequency	Percent
	Checked	135	64
Missing	System	76	36
Total		211	100

Table 9. The evidence that Darwin collected during his 5-year voyage on the HMS Beagle led to his theory that species adapt to environments and change over time.

		Frequency	Percent
	Checked	110	52.1
Missing	System	101	48
Total		211	100

Table 10. Darwin developed his theory of natural selection after years of testing and analysis.

		Frequency	Percent
	Checked	116	55
Missing	System	95	45
Total		211	100

Table 11. All life, including humans, evolved from a common ancestor through the process of natural selection.

		Frequency	Percent
	Checked	126	60
Missing	System	85	40
Total		211	100

Table 12. Modern evidence supports and expands upon Darwin's theories.

		Frequency	Percent
	Checked	109	52
Missing	System	102	48
Total		211	100

Table 13. Modern biology and society in general benefit from our understanding of the process of natural selection.

		Frequency	Percent
Checked		111	53
Missing	System	100	47
Total		211	100

Table 14. Will you recommend "Darwin" to other educators?

		Frequency	Percent
Yes		194	92
No		3	1
Total		197	93
Missing	System	14	7
Total		211	100

Virtually all the educators said they would recommend Darwin to other educators. Their reasons follow.

Science content for curriculum

Yes-A lot of good collections on the work of Darwin. Great ideas to implement in the classroom. (14)

Yes-It's child friendly, visually and, with the proper preparation in the classroom, we think the children would understand it. (15)

Yes-It added much to my own knowledge of Darwin and his theories. (23)

Yes-Because it can cross all disciplines. (33)

Yes-Excellent exhibit provokes curiosity, tell a story and teaches. (68)

Yes- Darwin represents the epitome of scientific thinking. (73)

Yes-The message transcends biology; it has universal appeal. (106)

Yes- Because it opens up your eye, mind and thought to develop ideas. (119)

Yes-It as so well thought out and through; it was a wealth of information. (173)

Yes-[It] focuses on process of science as well as scientific content. (174)

Yes- The detail is excellent. Flexible for many topics. (186)

Yes-Excellent demonstration of how one man's curiosity about life revolutionized our understanding of it. (209)

Exhibition quality

Yes-Excellent layout & student friendly (134)

Yes-Amazing because they have such accessible, well-written displays. (100)

No

As a former high school science teacher, I find it difficult to determine how to engage student with the typical "writing on the wall" seen in most museums. I appreciate the few interactives but evolution themes rarely

take on a timely inquiry-based approach within the Darwin exhibit. (210)
 No-It is based on false information. (198)

The following 4 tables illustrate educators' use of the demonstration tables. Insect observations was the most well-utilized: 63% tried it, compared to about half the educators at each of the other 3 demonstrations.

Table 15. Insect observations

		Frequency	Percent
Checked		132	63
Missing	System	79	37
Total		211	100

Table 16. Botany

		Frequency	Percent
Checked		99	47
Missing	System	112	53
Total		211	100

Table 17. Journals

		Frequency	Percent
Valid	Checked	107	51
Missing	System	104	49
Total		211	100

Table 18. Voyage of the Beagle

		Frequency	Percent
Valid	Checked	104	49
Missing	System	107	51
Total		211	100

Table 19. Will you use any of the resources you received in your teaching?

		Frequency	Percent
	Yes	156	74
	No	15	7
	Total	171	81
Missing	System	40	19
Total		211	100

Educators were asked which aspects of the exhibition were most personally satisfying for them. The following 8 tables illustrate their selections. "Checked" indicates that the item was selected.

Fossils and animal models, stories of Darwin's life, videos and Darwin's notebooks and journals were the most satisfying to educators. The interactive computers, transcriptions of Darwin's papers and the Explainers were the least satisfying parts of the exhibition for educators. It should be noted that educators did not have a great deal of time to spend in the exhibition, which would impact on how much they were able to see and experience.

Table 20. Fossils and animal models

		Frequency	Percent
	Checked	121	57
Missing	System	90	43
Total		211	100

Table 21. Stories of Darwin's life

		Frequency	Percent
	Checked	120	57
Missing	System	91	43
Total		211	100

Table 22. The videos

		Frequency	Percent
	Checked	117	55
Missing	System	94	45
Total		211	100

Table 23. Darwin's notebooks and journals

		Frequency	Percent
Checked		103	49
Missing	System	108	51
Total		211	100

Table 24. The interactive computers

		Frequency	Percent
Checked		71	34
Missing	System	140	66
Total		211	100

Table 25. Transcriptions of Darwin's papers

		Frequency	Percent
Valid	Checked	75	36
Missing	System	136	64
Total		211	100

Table 26. The Explainers

		Frequency	Percent
Valid	Checked	56	27
Missing	System	155	73
Total		211	100

Table 27. Did you use your hand lens/magnifier?

		Frequency	Percent
	Yes	64	30
	No	135	64
	Total	199	94
Missing	System	12	6
Total		211	100

Table 28. What was your favorite part of the evening?

	Frequency	Percent
Exhibition	117	58
Live animals	25	12
Demonstrations	10	5
Lecture, speakers	18	9
Explainers	8	4
Food	8	4
Networking	9	4
Other	8	4
Total	203	100

Eldredge lecture, background on Darwin, demonstrations

I liked the introduction to the exhibit by the paleontologists; great overview and background on Darwin; I loved the demonstration/work tables. (78)

Dr. Eldridge's lecture and history of Darwin; the incredible diversity of the different ways of approaching Darwin's contributions. (143)

Really, the whole package but probably the best was the introduction by Niles Eldridge. (190)

Aspects of the exhibition

Seeing the evidence (animals, plants) Darwin saw and reading from his own documents and sketches. (68)

The table where he [Darwin] decided to get married and raise a family. (118)

Specific examples of animals which demonstrate evolution. (129)

Learning the background leading up to the Theory of Evolution. (150)

Darwin's notebooks and journals. (161)

Comparative skeletons (183)

The event encouraged multiple ways of exploring. I enjoyed the diversity. (184)

AMNH staff and explainers

[Dr. Aquino] Adriana from AMNH giving us a mini-lecture on chromosomes. (100)

The superb and friendly explainers. (116)

Using the Museum for teaching

Thinking of ways to connect the museum to my teaching. (32)

Darwin and the theory of evolution

The experience [of] seeing the progress of an idea (evolution). (59)

The focus on Darwin at this time in history is great. And the focus on Darwin as a curious man who did wonderful things is a great way to present him. We can relate and be like him. (15)

Live animals

Looking at the different species and the live animals. (1)

Networking

Interacting with other educators and the explainers. (30)

Special event just for teachers. (130)

Table 29. What is one new thing you learned here this evening?

	Frequency	Percent
About Darwin's life and work	90	54
About scientific topics	38	23
About specific animals	10	6
How to use AMNH for teaching	2	1
How to use journaling	4	2
How to use microscopy	2	1
Geology	3	2
Other	17	10
Total	166	100

Not sure that I did learn anything new, but it was a good event. My only critique was of the format that left us all standing listening to opening remarks that stretched on instead of letting us enter the exhibit right away. (51)

Darwin's life and work

He married his 1st cousin. He was an unpaid member of the expedition (HMS Beagle). He waited many years before publishing his theory. (15)

He [Darwin] only used a magnifying glass and a microscope for most of his discoveries. (64)

Darwin was also a man; a husband and father. (73)

That Darwin's study contains no microscope. (97)

The conflicts that haunted Darwin. (103)

The Wedgewood connection. (122)

That Darwin's Grandfather was the first to study Natural Selection. (135)

Darwin's Grandfather was so fat they had to cut out a hole in the table. (136)

That Darwin waited 20 years to publish his theories. (137)

That Darwin had collected the finches before noticing [their] importance. (138)

Darwin was born the same year as Abraham Lincoln. (152)

I loved reading about the big questions that Darwin was thinking about based on his notes. I also liked to think about and then discuss with my colleague theories about how the tortoises got to the Galapagos Islands.

(157)

I learned how much Darwin struggled to get his work published. (162)

I learned that Darwin studied much more than we teach in class! (167)
About Darwin's kids. (169)
Mockingbirds inspired ideas rather than finches. (173)
Darwin saw connections between fossils and living creatures that led him toward his great theory. (184)
Dolphins have leg bones! (186)
He [Darwin] discovered organisms never seen before. (60)
That Darwin was such a recluse and so concerned about controversy. (209)

Scientific topics

The meaning of Natural Selection. (1)
I picked up a really useful and friendly explanation of what a theory is. (8)
That Darwin's theory is the foundation of many sciences. (19)
How similar humans are to animals. (26)
How similar living organisms really are to each other and how important the theory is to all scientific research.
(37)
Embryos look the same as human [but] different when mature. (56)
Bone similarities. (80)
Goosebumps are a human vestigial structure. (85)
The role of flowers in evolutionary study. (105)
That most species share common traits; we have more in common than we think. (133)
Human/animal expressions of emotion. (151)
That snakes had hind legs. (170)
That Darwin studied plants extensively and that these studies also furthered his evolutionary ideas or supported
his theory. (178)

How to use Museum for teaching

That I can use the museum as a fun and learning experience for students who may never have the opportunity to
experience scientific information in a normal classroom. (69)
Different ways to do journaling and ways to teach life cycles of insects. (14)
How interesting all creatures are-there is a great way to teach students about inquiry-through this museum. (32)

Miscellaneous

Boys wore dresses until age 4! (59)
I learned how well and exhibition can be planned, laid out, and appreciated by educators and lay people alike.
(143)
Science is so relevant and connected to our lives. (204)

Table 30. Would you like to receive information about an institute on "Science and Society" on June 29 and 30?

		Frequency	Percent
	Yes	152	72
	No	32	15
	Total	184	87
Missing	System	27	13
Total		211	100

The high rate of participation in this evaluation, including the educators' thoughtful, handwritten comments on the program and activities, will provide planners with valuable insights for the development of future professional development opportunities, starting with the summer institute, "Science and Society."

NB: Chi square tests were performed to see if there were significant differences based on grade level and subject taught between teachers' responses to questions about reasons for coming, intention to bring students, themes that will be taught, demonstrations explored, and resource usability. Significance variation exists between high school teachers' and others' responses to some of the questions, and between life science/biology and other teachers' responses to some questions. It is important to keep in mind when reviewing this data that half the teachers attending were high school level. The crosstabulation results are attached below.

1. Crosstab: Scientific knowledge changes over time, as scientists test, refine, and add to what is already understood about the world. & What grade do you teach.

There is a significant difference between grade taught and teaching the theme that scientific knowledge changes over time, $\chi^2 (3, N=211) = 13.427, p < .05$.

The biggest difference in percents is with teachers that teach High School (51.1%) stating they will teach the theme.

2. . Crosstab: All life, including humans, evolved from a common ancestor through the process of natural selection. & What grade do you teach.

There is a significant difference between grade taught and teaching the theme that all life, including humans, evolved from a common ancestor through the process of natural selection, $\chi^2 (3, N=211) = 9.084, p < .05$.

The biggest difference in percents is with teachers that teach High School (50.0%) stating they will teach the theme.

3. Crosstab: Modern evidence supports and expands upon Darwin's theories. & What grade do you teach.

There is a significant difference between grade taught and teaching the theme that modern evidence supports and expands upon Darwin's theories, $\chi^2 (3, N=211) = 11.277, p < .05$.

The biggest difference in percents is with teachers that teach High School (54.1%) stating they will teach the theme.

4. Crosstab: Modern biology and society in general benefit from our understanding of the process of natural selection. & What grade do you teach.

There is a significant difference between grade taught and teaching the theme that Modern biology and society in general benefit from our understanding of the process of natural selection, $\chi^2 (3, N=211) = 10.419, p < .05$.

The biggest difference in percents is with teachers that teach High School (51.4%) stating they will teach the theme.

5. Crosstab: Insect observations. & What grade do you teach.

There is a significant difference between grade taught and exploring the insect observations, $\chi^2 (3, N=211) = 11.152, p < .05$.

The biggest difference in percents is with teachers that teach High School (43.9%) stating they observed insect observations.

6. Crosstab: Will you use any of the resources you received in your teaching. & What grade do you teach.

There is a significant difference between grade taught and using the resources received in your teaching, $\chi^2 (3, N=171) = 12.780, p < .05$.

The biggest difference in percents is with teachers that teach High School (46.2%) and that teach Pre K and elementary school (25.6%) stating they would use the resources received in your teaching.

7. Crosstab: Scientific knowledge changes over time, as scientists test, refine, and add to what is already understood about the world. & Subject taught.

There is a significant difference between subject taught and teaching the theme that scientific knowledge changes over time, $\chi^2 (2, N=200) = 7.474, p < .05$.

The biggest difference in percents is with life science/biology taught (48.9%) and other subjects taught (45.0%).

8. . Crosstab: All life, including humans, evolved from a common ancestor through the process of natural selection. & Subject taught.

There is a significant difference between subject taught and teaching the theme that all life, including humans, evolved from a common ancestor through the process of natural selection, $\chi^2 (2, N=200) = 15.771, p < .01$.

The biggest difference in percents is with life science/biology taught (52.9%) and other subjects taught (39.7%).

9. Crosstab: Modern evidence supports and expands upon Darwin's theories. & Subject taught.

There is a significant difference between subject taught and teaching the theme that modern evidence supports and expands upon Darwin's theories, $\chi^2 (2, N=200) = 10.947, p < .05$.

The biggest difference in percents is with life science/biology taught (52.8%) and other subjects taught (40.6%).

10. Crosstab: Modern biology and society in general benefit from our understanding of the process of natural selection. & Subject taught.

There is a significant difference between grade taught and teaching the theme that modern biology and society in general benefit from our understanding of the process of natural selection, $\chi^2 (2, N=200) = 13.382, p < .01$.

The biggest difference in percents is with life science/biology taught (53.8%) and other subjects taught (41.5%).

11. Crosstab: Journals & Subject taught.

There is a significant difference between subject taught and exploring journals, $\chi^2 (2, N=200) = 7.343, p < .05$.

The biggest difference in percents is with life science/biology taught (35.6%) and other subjects taught (52.5%).

12. Crosstab: Will you use any of the resources you received in your teaching. & Subject taught.

There is a significant difference between subject taught and using the resources received in your teaching, $\chi^2 (2, N=161) = 6.329, p < .05$.

The biggest difference in percents is with other subjects taught (78.6%).

13. Crosstab: What was your main reason for coming this evening. & Subject taught.

There is a significant difference between subject taught and main reason for coming this evening, $\chi^2 (30, N=193) = 49.454, p < .05$.

Classroom preparation (57.4%) and personal interest/interest in topic (44.4%) were reported as the largest reason for high school teachers for coming this evening.