

Where are the women and minority amateur paleontologists?

A study of the development and characteristics of science hobbyists

Gail Jones, North Carolina State University
Thomas Andre, Iowa State University
Gina Childers, North Carolina State University
Elysa Corin, North Carolina State University



Hobbyists

Why do people engage in extensive and informal science learning?



Goal of the Study

This research study investigated science hobbyists

- The role the hobby played in their lives
- Factors that contributed to their motivation to pursue their hobby
- Relationship of the hobby to in and out-of-school experiences
- The role that hobbyists played as educators for formal and informal settings

Free Choice Learning

- Free choice learning is motivated by **personal interests** (Falk & Storksdieck, 2010; Falk, J., Heimlich, J., & Bronnenkant, K. (2008))
- Hobbyists spend considerable amounts of **time** engaging in their hobbies and in some cases the work that hobbyists do is of the depth of professional scientists
- Hobbyists are often highly **scientifically literate** (e.g., Falk & Dierking, 2010; Olmstead, 1993)

Hobbyists in Education



- Hobbyists are growing in number and their engagement with formal and informal education is considerable
- Storksdieck and Berendsen (2007) estimated that at least 10,000 amateur astronomers are involved in some level of education and public outreach

Related Research

- **identity theory** (Carlone & Johnson, 2007, Hazari, Sonnert, Sadler, Shanahan, 2010)
- **ecological perspectives** (relationships among physical and social environments and diversity of experiences) (Barron, 2006; Lee, 2008)
- **third spaces** (areas outside of home and work where non-school learning occurs (Gutierrez, 2008; Eisenhart and Edwards, 2004)
- **contextual model of informal learning** (informal learning includes the individual (including prior experiences and attitudes), the social context (social interactions with others), and the physical environment as essential components of informal learning (Storksdieck, 2005)

Methodology- Study 1- 107 Interviews – Birdwatchers & Amateur Astronomers

56 questions guided by motivational theories (Eccles, et al., 1983, 1984; 2005; Wiggins & Cambria, 2010), self-determination theory (Deci et al. 1991), and identity theory.

Explored hobby development, identity, achievement motivations (expectancies/values, attributions, autonomy)

“Who encouraged or discouraged your engagement with your hobby?”

“Do you ever participate in hobby-related events at a high school, college or university?”

“Were there any critical junctures or experiences that influenced your involvement in your hobby?”

Methodology- Study II

Survey – 3,000 Participants in all hobby areas

- 32 Amateur Paleontologists
- Inventors, Bee keepers, Model Builders, Gardeners...
- Participants were recruited through email lists, clubs, publications, organizations (science centers, universities...), websites



amateur paleontologists

Survey - 3,000 of these 32 were amateur paleontologists

Average age: 54.4 years ($SD = 12.9$)



Length of Participation

#	Answer		Response	%
1	1-2 years	<div></div>	2	6%
2	3-5 years	<div></div>	6	19%
3	6-10 years	<div></div>	3	9%
4	11-20 years	<div></div>	7	22%
5	21+ years	<div></div>	14	44%
	Total		32	100%

Age Hobby Began...

How old when you first participated in the hobby?

Average age: 31.3 years ($SD = 17.5$)

0-12 years = 7 (22%)

13-17 years = 2 (6%)

18-30 years = 5 (16%)

31-60 years = 17 (53%)

61+ years = 1 (3%)



66% Had been engaged in fossil collecting for 11- 21 years.

Gender & Ethnicity

Gender:

Male: 19 (59%)

Female: 13 (41%)

Ethnicity

Asian or Pacific Islander: 1 (3%)

Black, not of Hispanic origin: 0 (0%)

Hispanic: 0 (0%)

White, not of Hispanic origin: 30 (94%)

Other: 1 (3%)



Education Level of Hobbyists

- High School: 4 (13%)
- 2 Year College: 4 (13%)
- 4 Year College: 11 (34%)
- Masters: 9 (28%)
- Doctorate: 4 (13%)

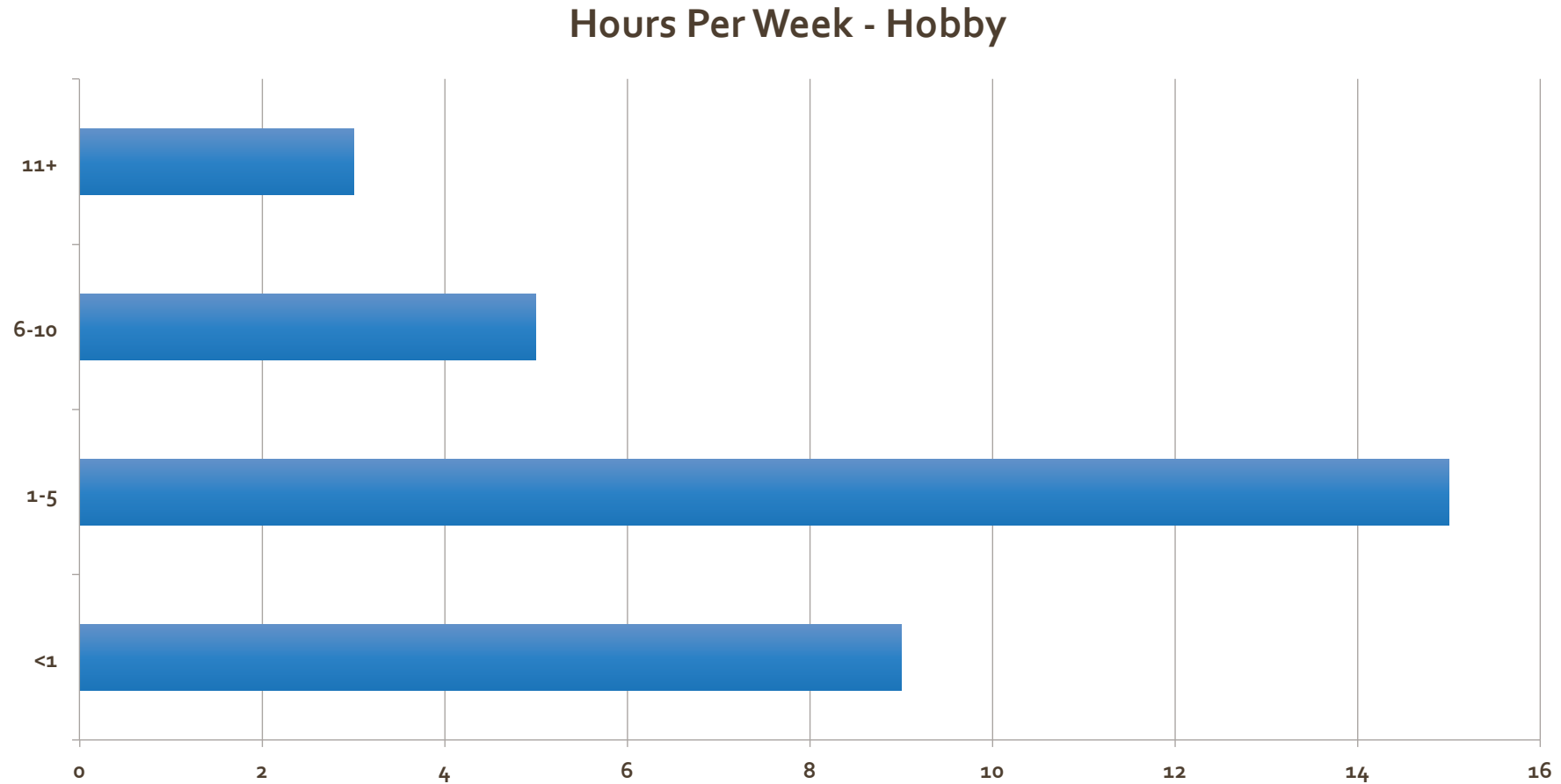
Are Amateur Paleontologists Scientists?

STEM Related Career?

Yes: 19 (59%)

No: 13 (41%)

Hours Per Week Spent on Fossil Hobby



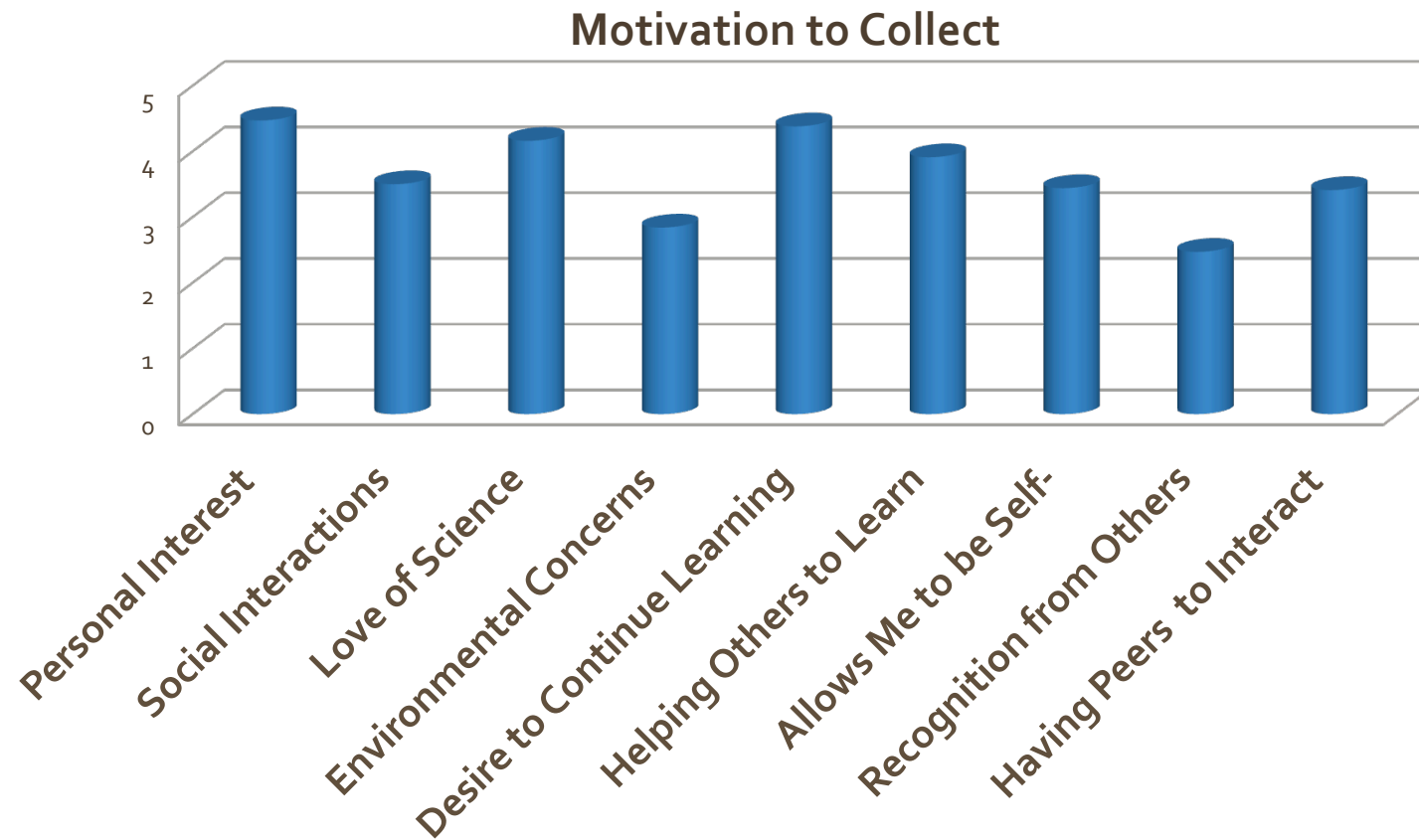
Club Activities

78% Participated in
Club Activities

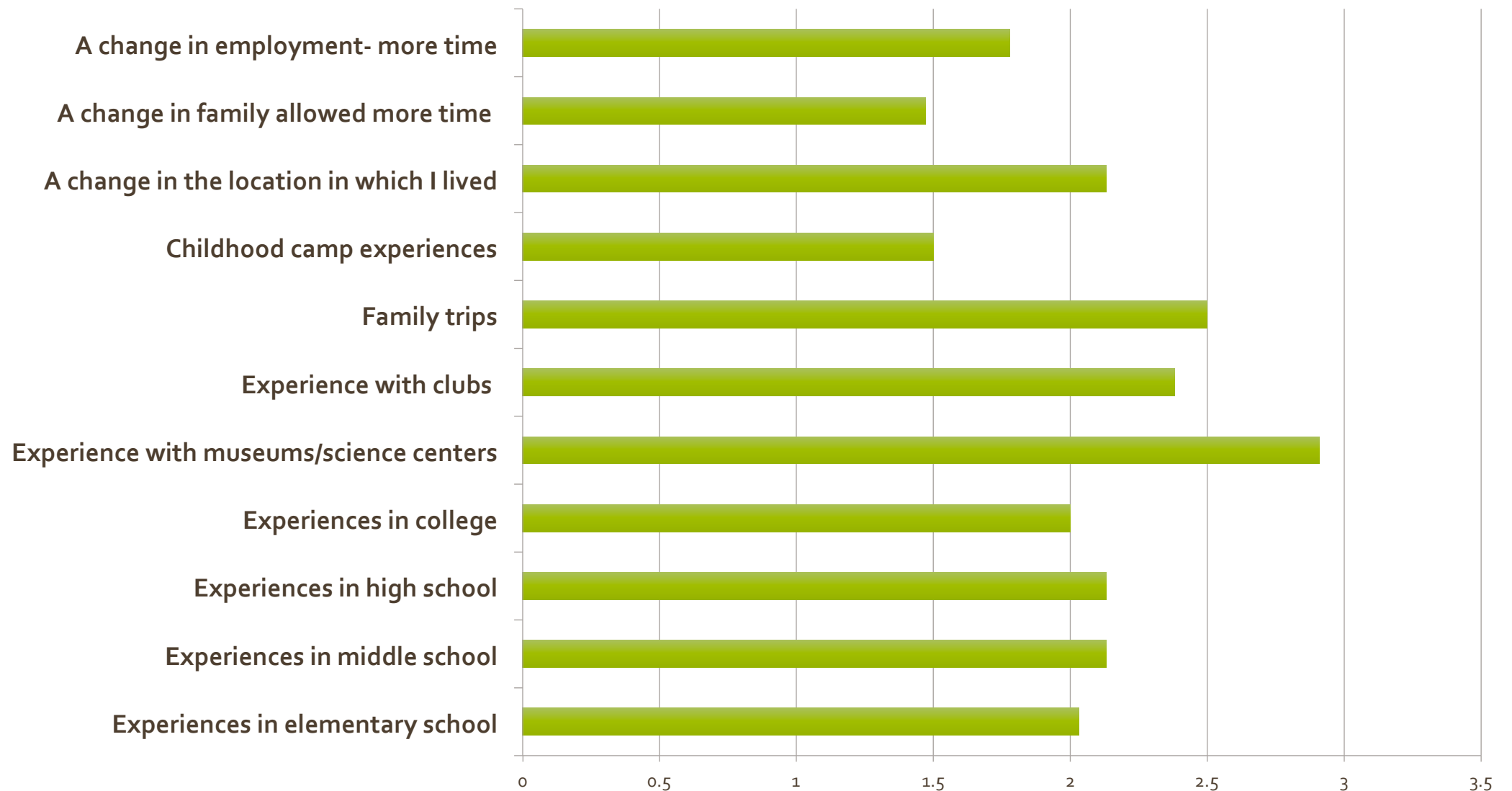
22% Did Not
Participate in a Club



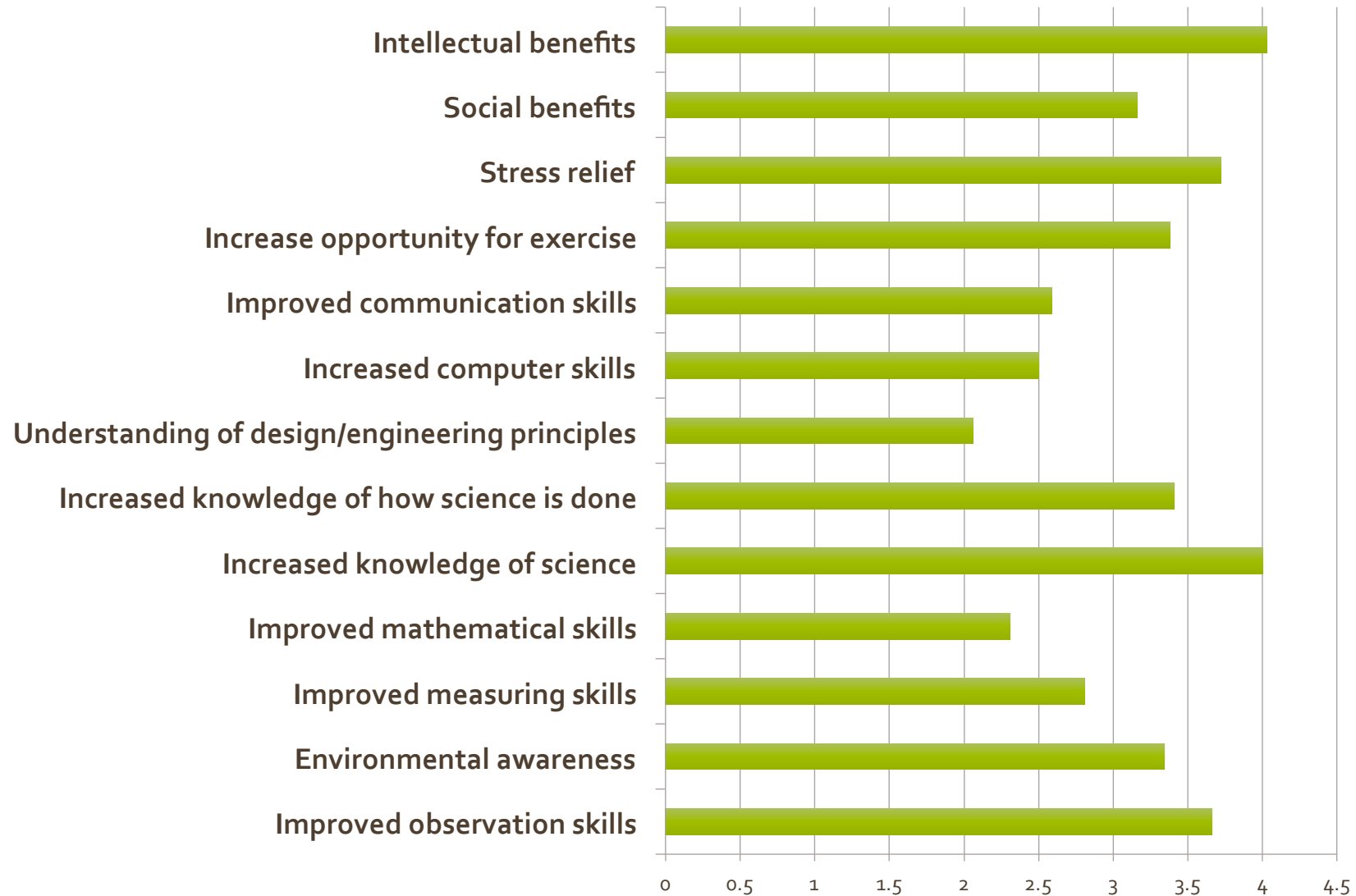
What Motivates You in Your Hobby?



Influences on Development of Hobby



Benefits of Being An Amateur Paleontologist



Citizen Scientists

19% Yes

81% No

- I have collaborated in research as a volunteer with the Two Medicine Dinosaur Center in Bynum, MT.
- I assist as a volunteer at the NC Museum of Natural Sciences in the paleo department. I have also donated specimens which have been used in research at the museum.
- I have donated specimens for research.
- Un of So Florida-- Straitography extinction studies in fossil shell pits
- Florida Fossil Vertebrate Program
- no formal program, but have made donations to museums

Study 1: Interviews

Participants

Amateur astronomers and birdwatchers

Contacts: science clubs, science centers,
and Internet listserves

107 volunteers

58 amateur astronomers

49 birdwatchers



Analyses

- Codes were developed from the existing literature related to motivation, self-efficacy, sociocultural career theory, social networking, as well as feminist, race, and identity theory.
- There were a total of 57 final codes that were used to code all interviews.
- Subcodes- demographic information, history of hobby involvement, factors that influenced initial and ongoing hobby engagement, degree of involvement and expertise in the hobby, interactions with others related to the hobby, prior and current experiences with formal and informal education, interest and confidence in science, and strategies for learning more about the hobby
- Four researchers -inter-rater reliability was 85%.

Participant Demographics

Table 1. Demographic Characteristics of Participants

	Age (Mode)	Gender	Ethnicity	Education	Years in Hobby
Astronomers	57% (51-70 yrs of age)	79% male	88% Caucasian	71% (masters or bachelors degree)	77% (10 or more years)
Birdwatchers	63% (51-70 yrs of age)	53% male	98% Caucasian	71% (masters or bachelors degree)	67% (10 or more years)

Influences on Hobby Development

Table 2. Frequency of Reported Influences on Hobby Involvement

Influences	Astronomers	Birders	All (Percent)
Event	39	31	70 (65%)
Family Member	30	25	55 (50%)
Friend	12	7	19 (17%)
School	25	11	36 (33%)
Mentor	15	11	26 (23%)
Museums/Sci Centers	12	2	14 (12%)
Resources	41	26	67 (62%)
Club/Org	17	16	33 (30%)

Note. Individual participants could name more than one influence. Percentages indicate the number of participants out of all participants that named that influence.

Results

Participants were asked if there was a person or event that influenced their involvement in their hobby

Astronomers reported being highly influenced by events such as the Sputnik or Apollo space travel.

"watching Cosmos with Carl Sagan on TV when I was a young kid... that had a big impact."



Initial Involvement

Initial Involvement	Astronomers	Birders	All (Percent)
Childhood	36	23	59 (55%)
Middle School	14	3	17 (16%)
High School	3	1	4 (4%)
College	1	3	4 (4%)
Adult	8	16	24 (20%)

75% reported getting involved in their hobby by the end of high school

over 50% reported that their interest began in childhood

Educating Hobbyists

Table 4. Sources of Continuing Education for Hobby

Source	Astronomers	Birders	All (Percent)
Reading	45	40	85 (79%)
Media	10	11	21 (20%)
Internet	44	33	77 (72%)
Friends	6	5	11 (10%)
Family	6	10	16 (15%)
Club Members	13	5	18 (17%)
Experts/Mentor	25	22	47 (44%)
Formal Education	23	5	28 (26%)
Informal Education	23	13	36 (34%)

Discussion

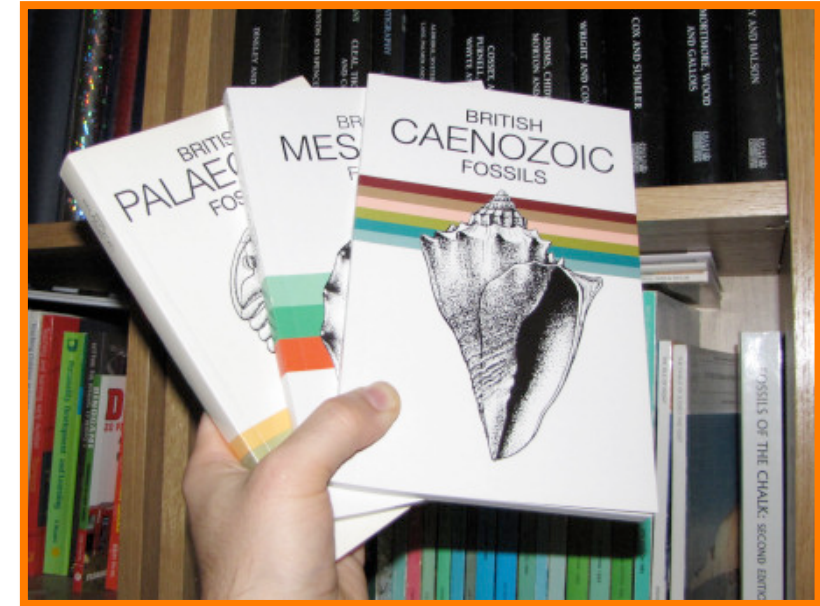
- Strong interest for sharing their hobby with others
- Outreach to:
 - teachers and schools (34%).
 - 46 % to elementary and middle schools
 - science centers and museums (27%)
 - workshops (16%)
 - clubs (22%)



Hobbyists: Learners

71% attended events related to their hobbies as a way to learn more.

93% noted that they were more informed about science issues as a result of their hobby



Discussion and Implications

- The number of hobbyists continue to grow dramatically and the roles that these individuals play as educators is significant.
- Clearly there is a role for educating these highly motivated adults to serve as effective mentors and instructors.
- The participants are highly interested in serving in the role of science educators and we need to partner with these individuals to prepare the next generation of scientists and citizens and to nurture their interests.
- Furthermore, by understanding more about hobbyists at a variety of levels we can gain insight into what it means to be a lifelong learner and an informed citizen of science.

Questions?



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