



# What Traits of Character do Exemplary Scientists Value?:

## Results from the Scientific Virtues Survey

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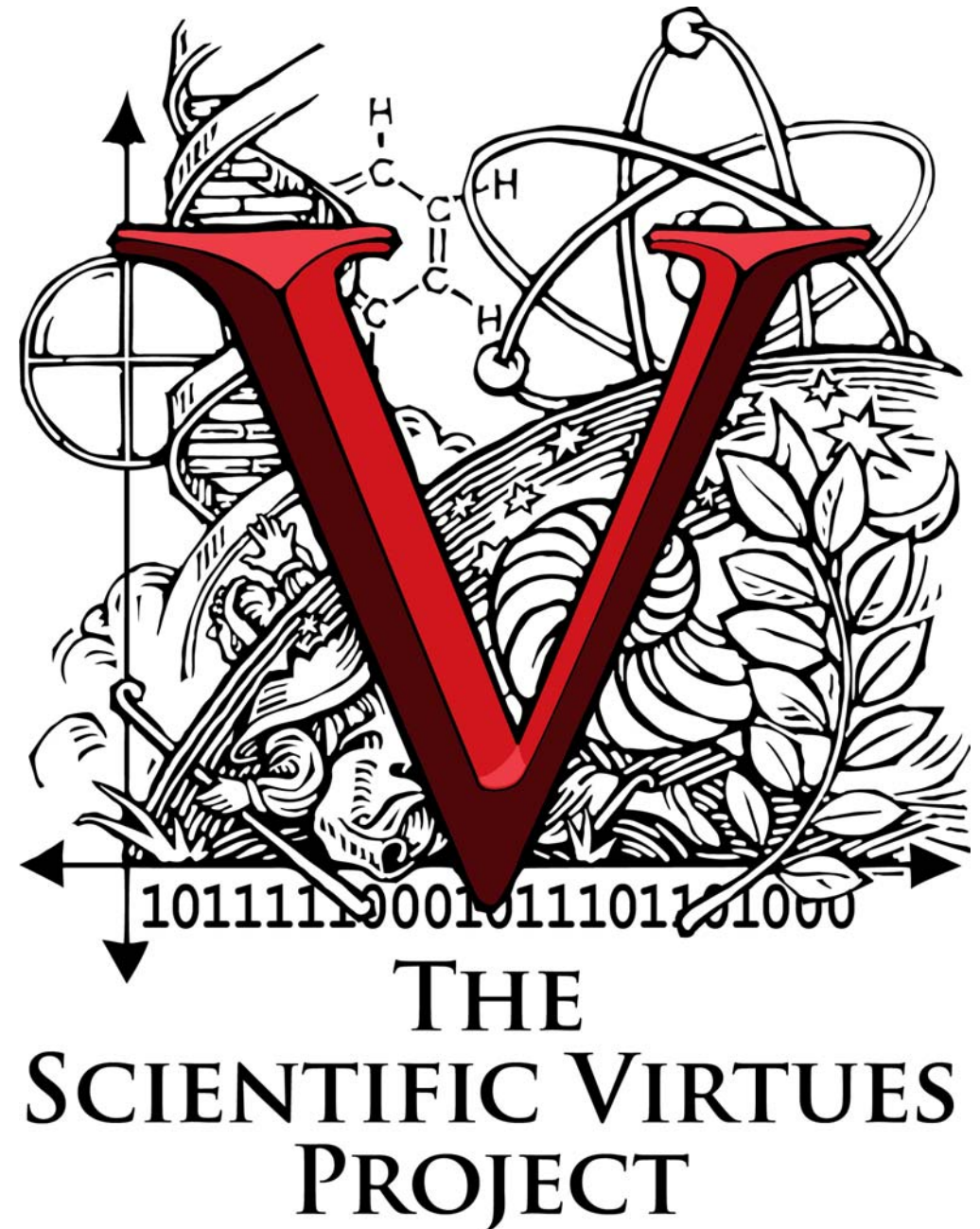
**Michigan State University**



THE  
SCIENTIFIC VIRTUES  
PROJECT

# The Scientific Character Virtues

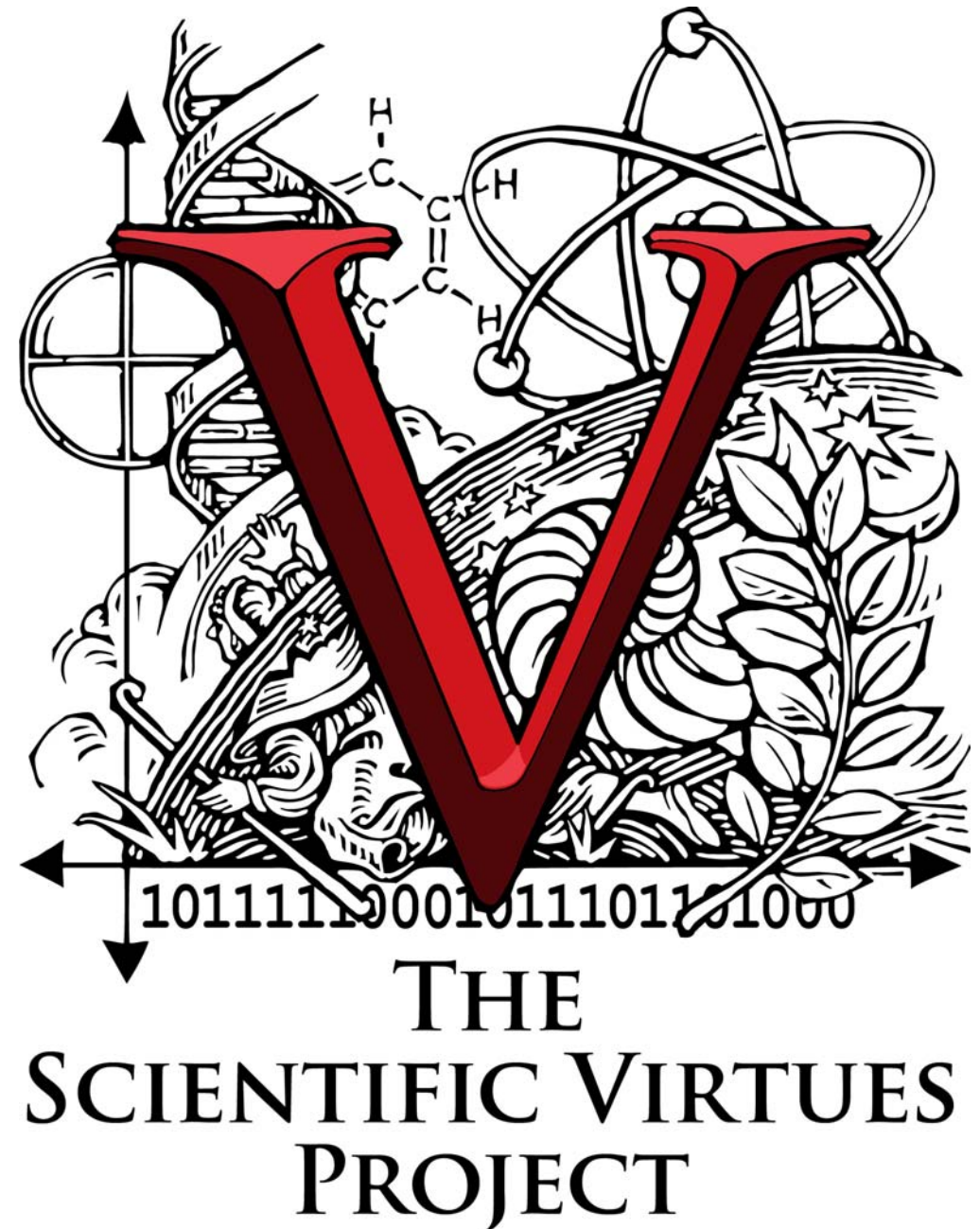
- Theoretical
  - Philosophical & historical account of the scientific disciplinary virtues
- Empirical
  - Formal study of scientists' ethical perceptions and stories
- Practical
  - Creation of SV-based science and RCR training curriculum





# The Scientific Character Virtues

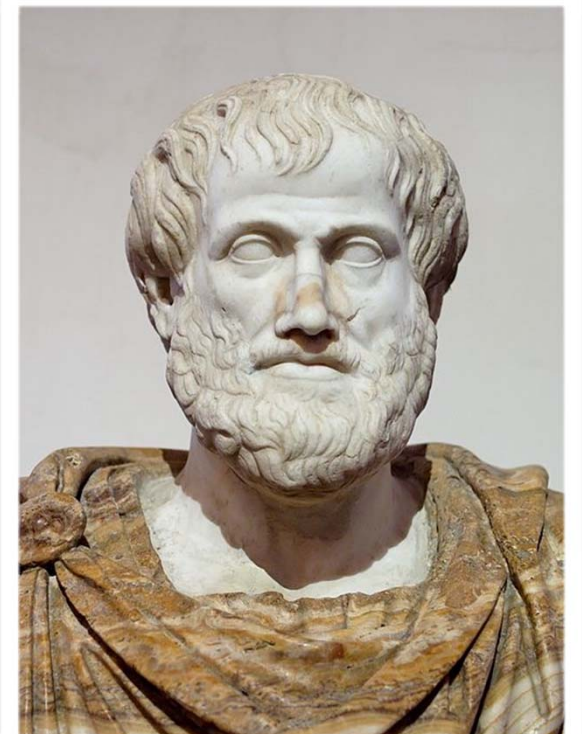
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# Aristotle's Virtue Theory



- The Virtue Mindset: “[A] settled disposition of the mind that determines our choice of actions and emotions...”
- Human Telos: Purpose in relation to human nature
- Human Virtues
  - Classical “Cardinal” virtues
    - Prudence, Justice, Temperance, Courage
- Moderation distinguishes virtue from vice
- Increases human flourishing



# Vocational Virtue Theory



- Vocational (e.g. Scientific) Mindset
- Vocational Telos: Purpose in relation to nature of vocation
  - E.g. Goal of science: To discover empirical truths of nature.
- Vocational Virtues
  - Scientific, engineering, medical, etc.
  - Characteristic virtues of the vocation
- Vocational vice results from imbalance
- Increases vocational flourishing
  - E.g. Scientific flourishing
  - Component of human flourishing





# The Scientific Character

From Philosophy of Science  
to Philosophy of the Scientist







# The Scientific Character Virtues

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# What Possible Scientific Virtues?

- Philosophical theory & historical background
- Informal interviews
- Open ended questions
- Pilot survey narrowed list to 25 possible virtues

How important are the following traits as descriptive of the character of the *exemplary* scientist?

	Irrelevant ----- Essential											Not Sure	Term too vague
Attentiveness	0	1	2	3	4	5	6	7	8	9	10	NS	V
Cleanliness	0	1	2	3	4	5	6	7	8	9	10	NS	V
Communal	0	1	2	3	4	5	6	7	8	9	10	NS	V
Cooperative	0	1	2	3	4	5	6	7	8	9	10	NS	V
Creativity	0	1	2	3	4	5	6	7	8	9	10	NS	V

# Endorsement of Scientific Virtues by Exemplary Scientists



Scientific Virtues	Mean
Honesty	9.5
Curiosity	9.2
Attentiveness or observant	8.7
Objectivity	8.5
Humility to evidence	8.5
Perseverance or patience	8.4
Skepticism	7.9
Meticulousness	7.5
Courage	7.1
Collaborative	6.4

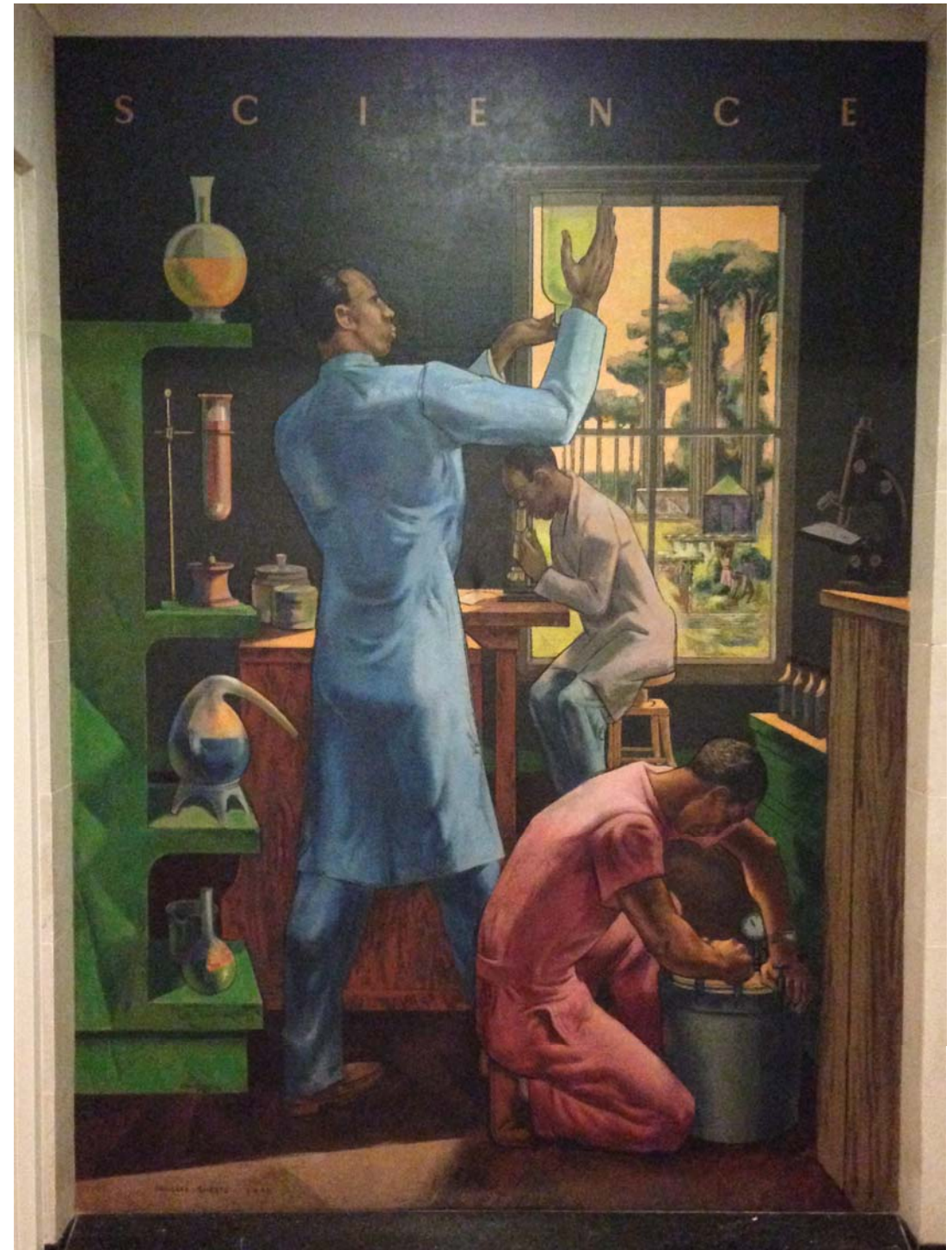
N = 605

(Pennock & Miller – preliminary data analysis)



In judging whether to take on some prospective graduate student or post-doc, do you look primarily at their academic record or do you also try to judge what scientific character traits that they have, positive or negative, in making your decision?

12% - Academic record  
88% - Character traits



Do you think that exemplary  
scientific values and virtues  
– the kinds of traits on our  
list – can be learned?

94% - Yes

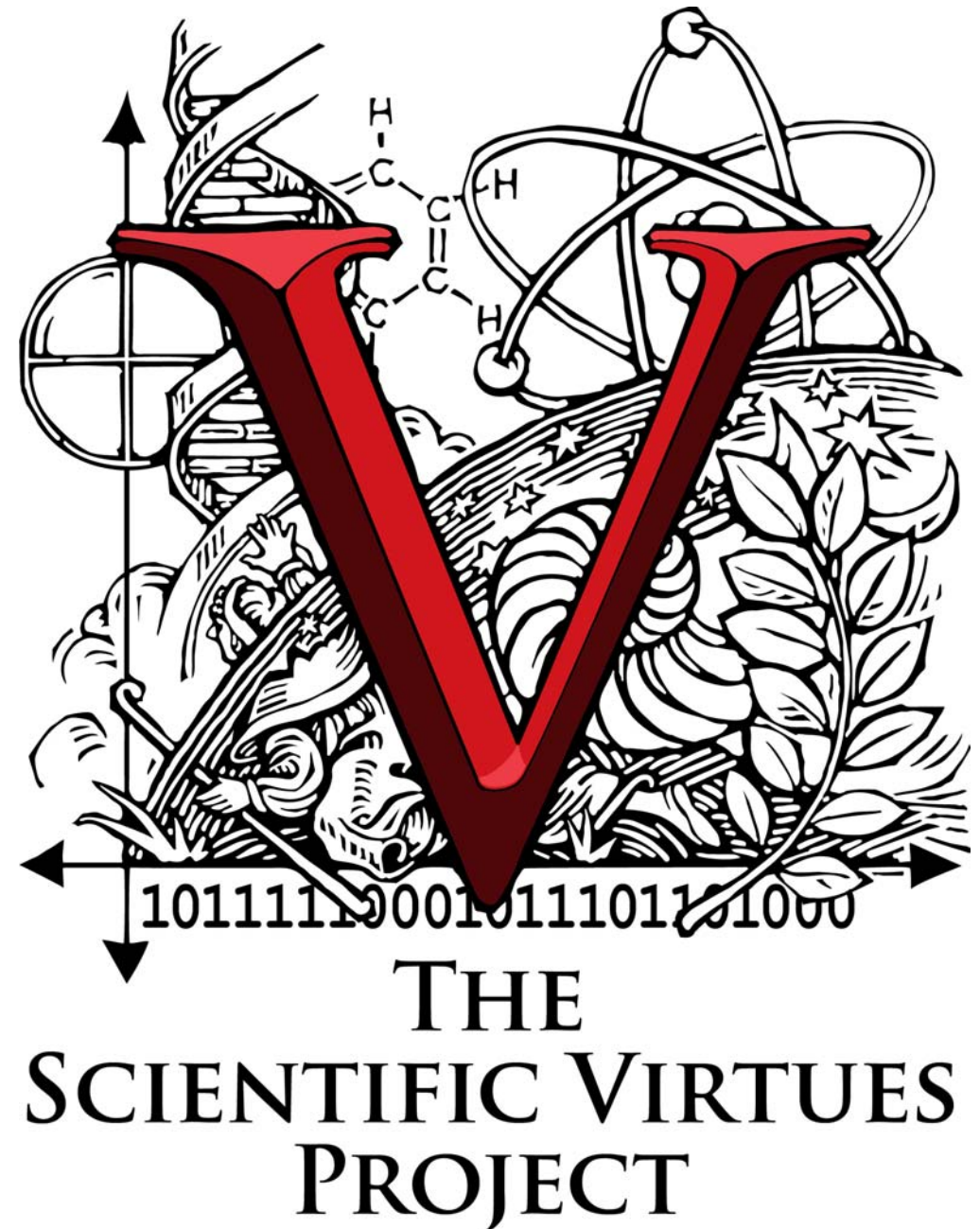


The Reign of Science - Karl Konrad Huber



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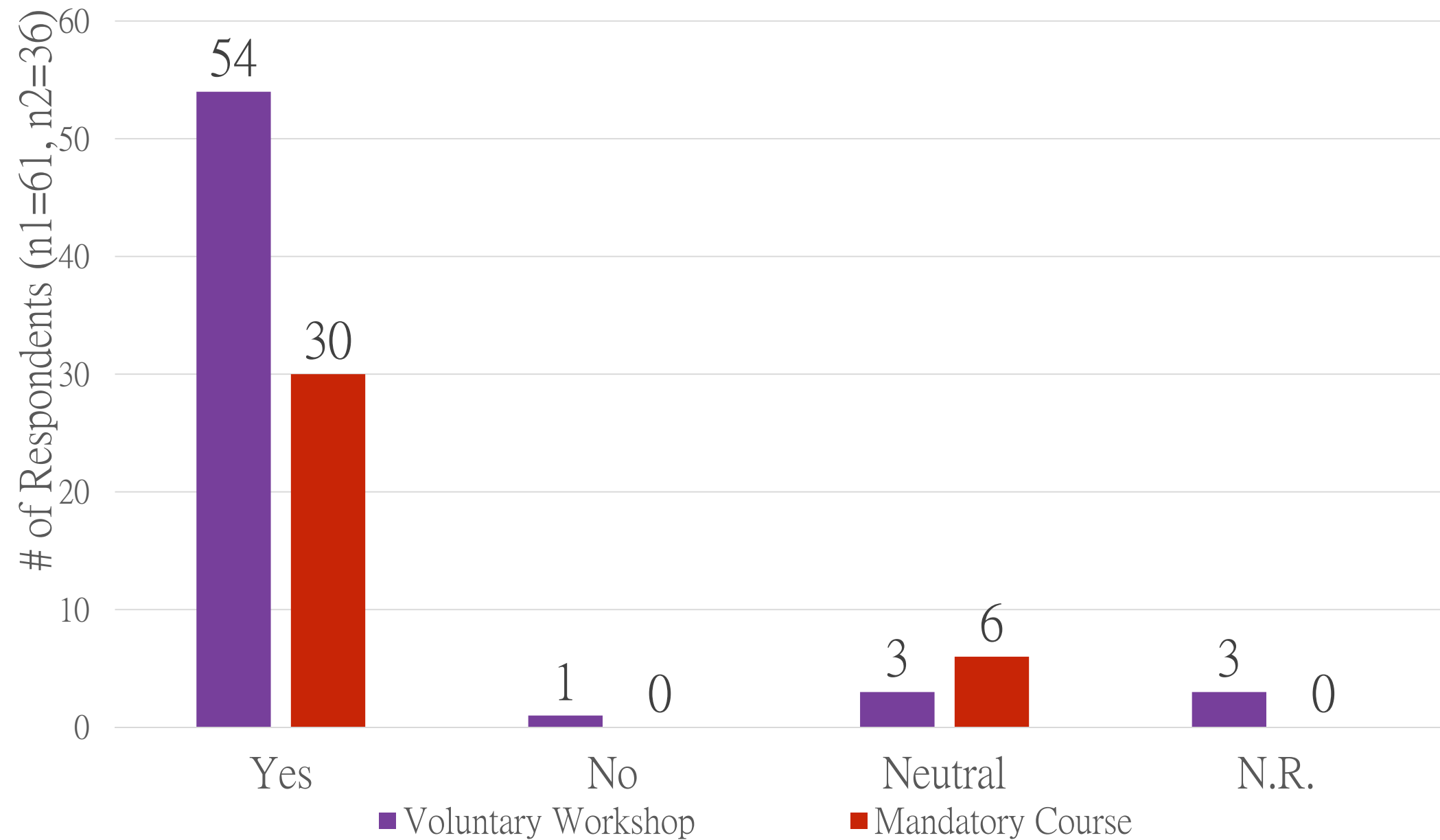




# Responsible Conduct of Research

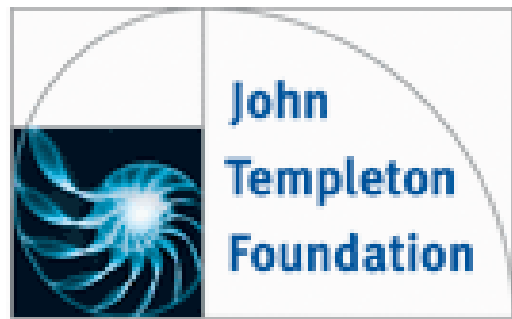
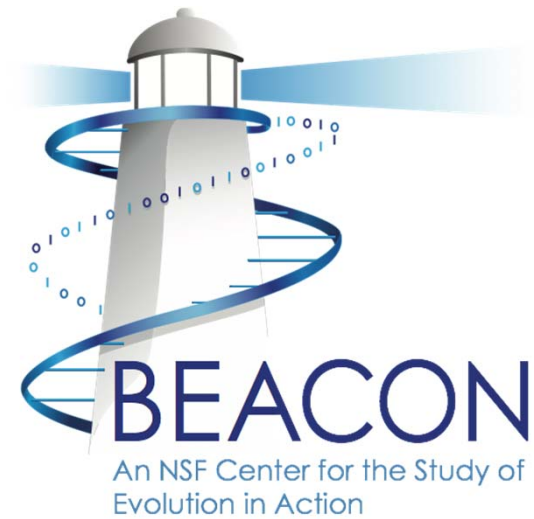
Traditional vs. Virtue-based Approach

## Appreciation of the Scientific Virtues can contribute to the development of RCR.



	Voluntary BEACON Workshops			Mandatory Course Curriculum		
# of Participants	88			40 (31*)		
# of Survey Respondents	43			36 (30*)		
Response Rate	48.9%			90.0% (96.8%*)		
QUESTION	Agree	Neutral	Disagree	Agree	Neutral	Disagree
...I enjoyed the Workshop	93.0%	4.7%	2.3%	83.3%	16.7%	0%
...effective conversation starters	95.3%	2.3%	2.3%	94.4%	5.6%	0%
...an open exchange of ideas	88.4%	9.3%	2.3%	86.1%	8.3%	0%
...help my prof. development	65.1%	30.2%	4.7%	44.4%	38.9%	13.9%
...I have thought about the topics	60.5%	25.6%	14.0%	63.3%*	13.3%*	23.3%*
...I have discussed the topics	48.8%	27.9%	23.3%	50.0%	22.2%	27.8%
... a change in my views	30.2%	27.9%	41.9%	26.7%*	33.3%*	40.0%*





# Acknowledgments

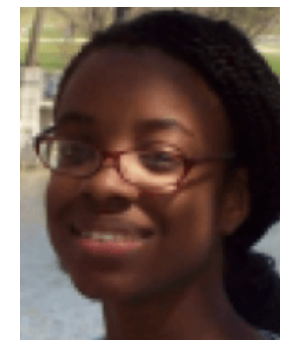
- Jon Miller
- Michael O' Rourke



- **Chet McLeskey**
- **Eric Berling**



- |                 |                   |
|-----------------|-------------------|
| • Karen Meagher | • Ike Iyioke      |
| • Tony Givhan   | • Anna Malvisi    |
| • Wendy Johnson | • Lori Hale       |
| • Zachary Piso  | • Brittany Tucker |





# Publications

Pennock, RT. *An Instinct for Truth: Curiosity and the Moral Character of Science*. (2019) The MIT Press.

McLeskey, C, Berling, C, O' Rourke, M, Pennock, RT (2019) "The Evolution of the Scientific Virtues Toolbox Approach to Responsible Conduct of Research Training." In Banzahf, W. (ed.) *Evolution in Action: Past, Present, and Future*. New York: Springer Publishing

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Pennock, RT, O' Rourke, M. (2017) "Developing a Scientific Virtue-Based Approach to Science Ethics Training." *Science & Engineering Ethics* 23(1), 243-262

Pennock, RT (2015) "Fostering a Culture of Scientific Integrity: Legalistic vs. Scientific Virtue-Based Approaches." *Professional Ethics Report* 28(2):1-3

Pennock RT (2002) "Research Funding and the Virtue of Scientific Objectivity" *Academic Integrity* V:2, 3-6.

