Effects of a Historical Story on Student Understanding of NOS and Mendelian Genetics

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Introduction

- The nature of science (NOS) is an important part of scientific literacy (AAAS, 2009; Matthews, 1994; Lederman et al., 2014).
- History provides contextualized approach that allows for intertwining NOS and traditional science content (Clough, 2006).
- Stories represent a potential avenue for progress in using history in NOS research.
- Recent framework developed for historical stories in science education (Klassen, 2009).

Methods

- Study followed a quasi-experimental design with a nonequivalent control group.
- Undergraduate students from two sections of BIOS 1120 participated, one taught with minimal history and the other with historical stories.

Table 1. Elements of story structure from Klassen (2009).

Event Tokens	Agency- *Moral characters*
The Narrator	Purpose
Narrative Appetite	Role of the Reader- *Reader engagement, empathy*
Past Times	Effect of the Untold
Structure- *Beginning, middle, and end*	Irony

- Stories related to work of Gregor Mendel and H. B. D. Kettlewell, focused on creativity and imagination in science.
- Quantitative data collected using SUSSI and two-tier genetics instrument (Liang et al., 2008; Tsui & Treagust, 2010).
- Interview and SUSSI open response data also collected.

Results

- Quantitative results showed statistically significant improvements in NOS and Mendelian genetics understanding not seen in the non-intervention group.

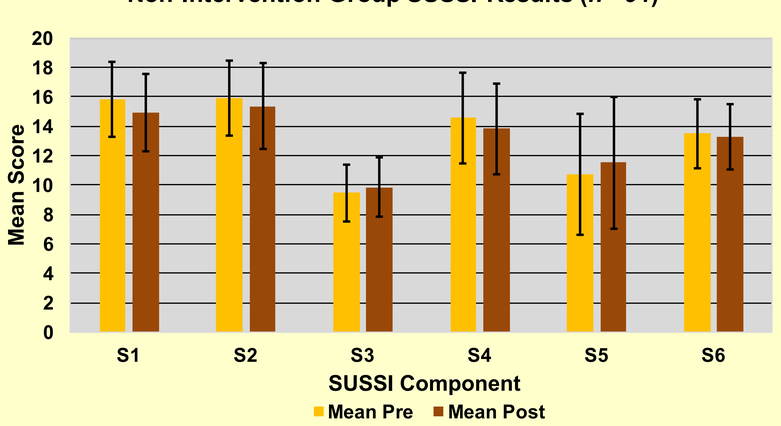
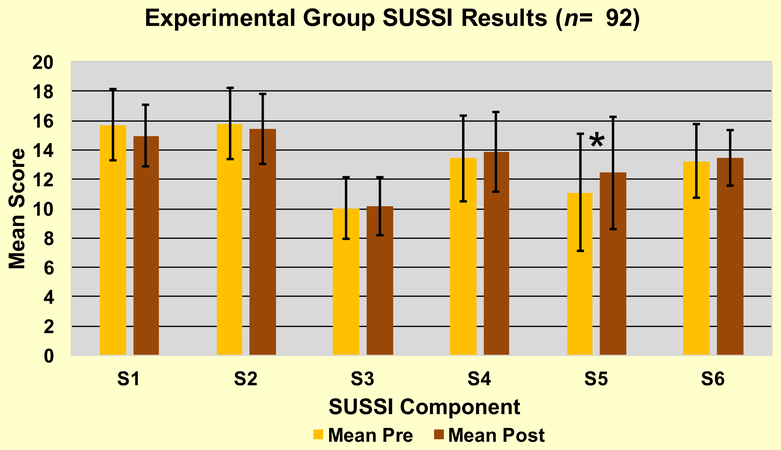


Figure 1. Mean SUSSI component scores before and after instruction for the non-intervention group.



*= Statistically significant increase (p<.001) pre- to post-instruction using Sidak's Correction for multiple comparisons

Figure 2. Mean SUSSI component scores before and after instruction for the experimental group.

Table 2. Number of participants that answered items correctly on the Two-tier Genetics Instrument (Tsui & Treagust, 2010)

	Non-Intervention Group		Experimental Group	
Item	# Correct Pre	# Correct Post	# Correct Pre	# Correct Post
1	61	68	70	74
2	56	62	61	64
3	26	30	27	23
4	10	12	20	15
5	9	15	20	23
6	41	48	29	57*
7	14	25*	22	28
8	56	57	52	67*
9	7	16	5	8*
10	15	12	18	38*
11	16	8	10	6
12	28	42*	24	32

*= Statistically significant difference pre- to post-instruction using McNemar's Test.

Conclusions

- Preliminary results from this study indicate that student participants from the experimental group made significant gains in their understanding of the role of imagination and creativity in science.
- Participants from the experimental group also outperformed the non-intervention group on genetics items related to Mendelian genetics.
- Student responses on the interviews and SUSSI open response items indicate that one reason for the difference is the historical stories used in the experimental group.

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