



Biofuel Concept Learning Assessment of Middle School and Elementary School Youth through the Value of a Tree Lesson Plan

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Introduction

Biofuels are beginning to emerge as a prominent means of providing society with its energy needs. The development of the next generation of energy leaders is imperative for industry, government, and the civic sector. This project focuses around the effectiveness of using the Value of a Tree lesson plan to teach youth about the importance of energy sources. The activity was facilitated through a portion of presented material, followed by an outdoor hands-on activity. The students were first presented the material at Upham Woods Outdoor Learning Center, Wisconsin Dells. A follow-up lesson was conducted at their school; this lesson reinforces the goal that they will be able to connect these important ideas and skills to multiple places. Students completed a pre- and post knowledge based assessment to gain preliminary and concluding awareness. Evaluating the results of the assessments suggested potential changes to be made for the lesson to be more effective. The lesson needs to be altered for younger age groups with more engagement for the specific target groups.

Methods

- Paired t-test
The pre- and post scores were paired. After pairing, a two-tailed t-test and p-value was calculated using Excel software (Table 1).
- Item Discrimination
This test was used to determine the acceptability of a particular question. Based on the discrimination index, the level of acceptability was determined using a standard scale (Figure 3 & 4).
- Item Difficulty
This test was used to determine the degree of difficulty on a scale of 0 to 1. Items that are more difficult have a lower difficulty index.
- Histogram
The difference between the pre- and post assessment scores were calculated. Then the frequency at which those differences occurred was counted (Figure 1 & Figure 2).

Results and Conclusion

Based on the data collected it was found that there was no statistically significant evidence to support the conclusion that knowledge was gained after receiving the Value of a Tree lesson. However, based on our item discrimination test, we found that a large majority of the elementary school questions are usually considered unacceptable. Future modifications of the lesson plan and the assessment are necessary to increase the likelihood of knowledge gain. Possible areas of improvement include: creating more age appropriate items including vocabulary, concepts that they can relate to, and more active engagement. The lesson components should be more interactive for this age group by having tangible items, like wood chips and charcoal. The lesson should incorporate games and activities that require more physical and mental stimulation to ensure comprehension. Lastly, editing the assessment questions so that they are more acceptable for the younger audience would increase the reliability of collected data.

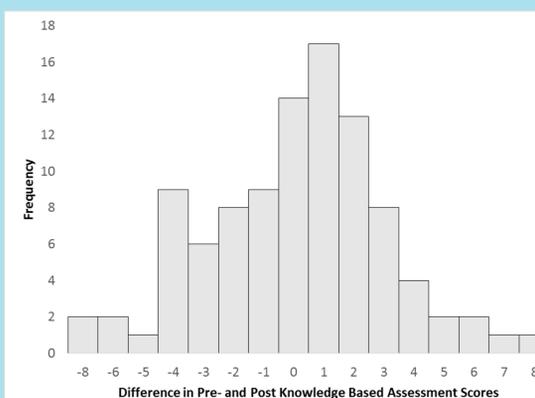


Figure 1: Frequency of the differences in pre- and post knowledge based assessment scores from a Middle School population.

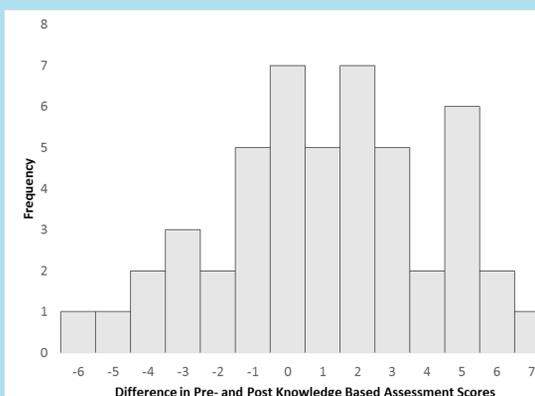


Figure 2: Frequency of the differences in pre- and post knowledge based assessment scores from an Elementary School population.

	Mean Difference	Standard Deviation	t-statistic	Degrees of Freedom	P-Value
Middle School	0.080808	3.0361	0.791702	99	0.430428
Elementary School	1.102	3.0771	0.015615	48	0.9876

Table 1: Statistical analysis of the Middle School and Elementary School pre- and post knowledge based assessments.

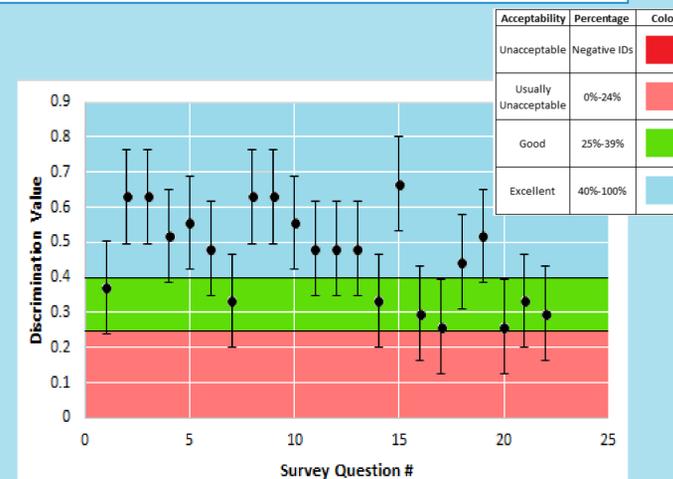


Figure 3: An Item Discrimination plot showing the quality of the Middle School assessment questions.

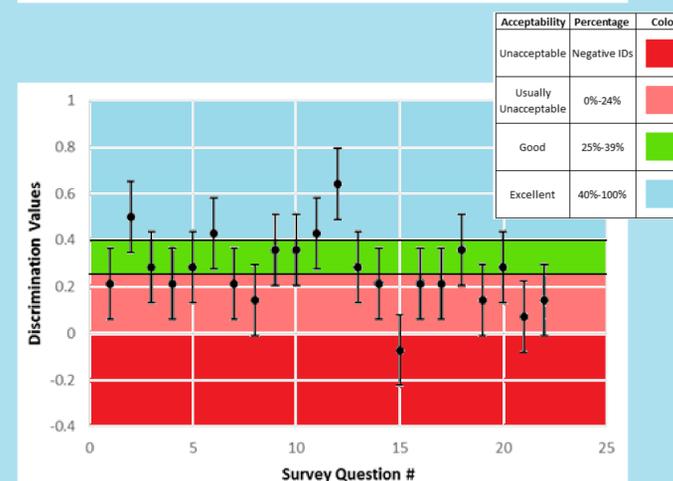
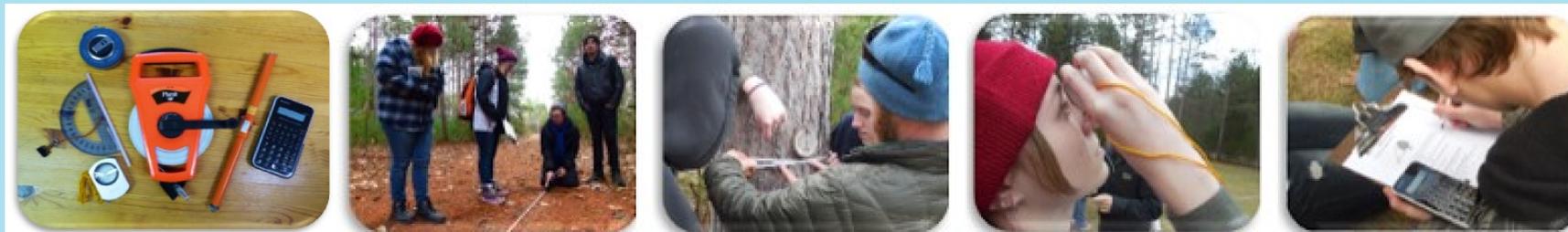


Figure 4: An Item Discrimination plot showing the quality of the Elementary School assessment questions.

References

James W. Pellegrino, Louis V. DiBello, Susan R. Goldman, A Framework for Conceptualizing and Evaluating the Validity of Instructionally Relevant Assessments, *Educational Psychologist*, 2016, 51, 1, 59.



Value of a Tree (VOAT) Lesson Facilitation

