“Affective Teaching” to Learn Science: What is the Relationship between Practice and Achievement?

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Teaching, Learning, and Technology

ABSTRACT

Considering that the No Child Left Behind law now requires science assessment, a new area for educational research has surfaced. This presentation will share the results of a pilot study that begins to build tools and insights related to this new area of educational research. The study included 11th grade students in Delaware public high schools. The finding from the study will help future research by providing a valid and reliable tool that can be used with continuous efforts for assessing effective instruction in high school science classrooms. Findings from this study will also serve as a source of information for the development of other similar tool (s) in the field of science and/or other content areas.

The motivation to learn science (MLS) Inventory was designed to measure the relationship between student motivation to learn science and teacher use of affective teaching techniques. The validated tool will serve as part of a broader study on the relationship between mode of instruction (affective vs. non-affective) and student motivation to learn science.

INTRODUCTION

It can be argued that good science teaching requires prioritizing the affective domain, especially in building up pupils’ confidence in learning science. Although some research has been done in the area of the affective domain, it is limited and often focuses on the perception of science. Research related to the intellectual domain is dominated by work in the area of the cognitive domain. As a result, curricula are created to meet academic needs, not necessarily the “emotional needs of developing adolescents” (Hurd, 1997, p.73). The early work done by Bloom (Bloom et al., 1956) and Krathwohl (Krathwohl et al., 1964) served as foundations for much of the work done in both the cognitive and affective domains.

Even though much has been learned from Bloom’s and Krathwohl’s work, there is a need to better understand the direct impact of affective teaching on students’ motivation to learn science. Learning more about the relationship between affective teaching techniques and student motivation is important when determining how educators, especially those in schools that are failing to meet Adequate Yearly Progress (AYP), could alter their strategies to help students experience academic achievement. Understanding how affective teaching practices influence student motivation to learn science will add critical insight to the foundation of knowledge created by Bloom, Krathwohl and others.

As a result of this pilot study a new tool and insight related to this area of educational research will be available for other future investigations. Future studies will now have a tool to gather more comprehensive data, in hopes of further understanding the relationship between affective teaching practices, student motivation, and academic achievement. In efforts to better understand student motivation to learn, we must examine teaching practices that focus on the affective domain.

METHODOLOGY

Research Design
Non-experimental descriptive design with a convenience sample of science students from two high schools.

Participants
11th grade students (n = 138) in science classrooms from Delaware public schools in New Castle County.

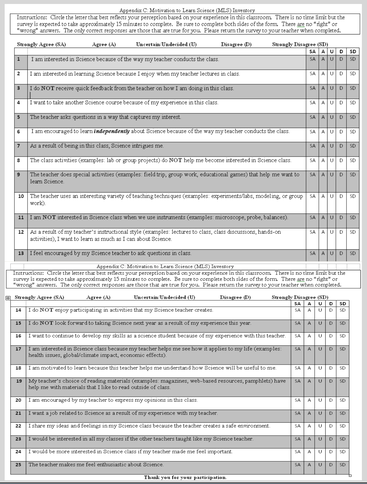
Instrument
Motivation to Learn Science (MLS) Inventory – researcher created, 25 item survey grounded in the original model of the affective domain (Krathwohl et al, 1964). The tool is composed of twenty five questions, which represent four subscales: (1) Receiving, (2) Responding, (3) Valuing, and (4) Organization. The subscales are based on four of the five categories of the Taxonomy of Affective Behavior.

Response category values for the survey ranged from Strongly Agree with a value of 5 to Strongly Disagree with a value of 1 on a Likert Scale.

Procedures
Students completed 25 item MLS Inventory.

Analysis
Reliability was determined using Cronbach’s Alpha (Cronbach, 1951), a measure of a scale’s minimal internal consistency. Cronbach’s Alpha was calculated for the total instrument as well as for each of the four constructs, both in the total population (Table 1) and for each of the two schools (Tables 2 and 3) that completed the study. After reviewing Alpha values and graphing MLS percent scores, two questions were removed for the validated instrument.

Research Questions:
Is the MLS Inventory a valid instrument for measuring student motivation to learn Science?
Is the MLS Inventory a reliable instrument for measuring student motivation to learn Science?



Appendix C: Motivation to Learn Science (MLS) Inventory

Instructions: Circle the letter that best reflects your perception based on your experience in this classroom. There is no time limit but the survey is expected to take approximately 15 minutes to complete. Be sure to complete both sides of the form. There are no “right” or “wrong” answers. The only correct responses are those that are true for you. Please return the survey to your teacher when completed.

Strongly Agree (SA) Agree (A) Uncertain/Undecided (U) Disagree (D) Strongly Disagree (SD)

		SA	A	U	D	SD
1	I am interested in Science because of the way my teacher conducts the class	SA	A	U	D	SD
2	I am interested in learning Science because I enjoy when my teacher lectures in class	SA	A	U	D	SD
3	I do **NOT** receive quick feedback from the teacher on how I am doing in this class	SA	A	U	D	SD
4	I want to take another Science course because of my experience in this class	SA	A	U	D	SD
5	The teacher asks questions in a way that captures my interest	SA	A	U	D	SD
6	I am encouraged to learn ***independently*** about Science because of the way my teacher conducts the class	SA	A	U	D	SD
7	As a result of being in this class, Science intrigues me	SA	A	U	D	SD
8	The class activities (examples: lab or group projects) do **NOT** help me become interested in Science class	SA	A	U	D	SD
9	The teacher does special activities (examples: field trip, group work, educational games) that help me want to learn Science	SA	A	U	D	SD
10	The teacher uses an interesting variety of teaching techniques (examples: experiments/labs, modeling, or group work)	SA	A	U	D	SD
11	I am **NOT** interested in Science class when we use instruments (examples: microscope, probe, balances).	SA	A	U	D	SD
12	As a result of my teacher’s instructional style (examples: lectures to class, class discussions, hands-on activities), I want to learn as much as I can about Science	SA	A	U	D	SD
13	I feel encouraged by my Science teacher to ask questions in class	SA	A	U	D	SD

Appendix C: Motivation to Learn Science (MLS) Inventory

Instructions: Circle the letter that best reflects your perception based on your experience in this classroom. There is no time limit but the survey is expected to take approximately 15 minutes to complete. Be sure to complete both sides of the form. There are no “right” or “wrong” answers. The only correct responses are those that are true for you. Please return the survey to your teacher when completed.

Strongly Agree (SA) Agree (A) Uncertain/Undecided (U) Disagree (D) Strongly Disagree (SD)

		SA	A	U	D	SD
14	I do **NOT** enjoy participating in activities that my Science teacher creates	SA	A	U	D	SD
15	I do **NOT** look forward to taking Science next year as a result of my experience this year	SA	A	U	D	SD
16	I want to continue to develop my skills as a science student because of my experience with this teacher	SA	A	U	D	SD
17	I am interested in Science class because my teacher helps me see how it applies to my life (examples: health issues, global climate impact, economic effects)	SA	A	U	D	SD
18	I am motivated to learn because this teacher helps me understand how Science will be useful to me	SA	A	U	D	SD
19	My teacher’s choice of reading materials (examples: magazines, web-based resources, pamphlets) have help me with materials that I like to read outside of class	SA	A	U	D	SD
20	I am encouraged by my teacher to express my opinions in this class	SA	A	U	D	SD
21	I want a job related to Science as a result of my experience with my teacher	SA	A	U	D	SD
22	I share my ideas and feelings in my Science class because the teacher creates a safe environment	SA	A	U	D	SD
23	I would be interested in all my classes if the other teachers taught like my Science teacher	SA	A	U	D	SD
24	I would be more interested in Science class if my teacher made me feel important	SA	A	U	D	SD
25	The teacher makes me feel enthusiastic about Science	SA	A	U	D	SD

Thank you for your participation.

RESULTS

Reliability Results

Table 1 - MLS Inventory

# of Questions	Deleted Question	Chronbach Alpha MLS Inventory	Chronbach Alpha Responding	Chronbach Alpha Receiving	Chronbach Alpha Organization	Chronbach Alpha Valuing
25	-	.865	.707	.555	.536	.354
24	15 – Org	.882	.707	.555	.786	.354
23	3 – Rec	.897	.707	.719	.786	.354
22	8 - Res	.908	.825	.719	.786	.354

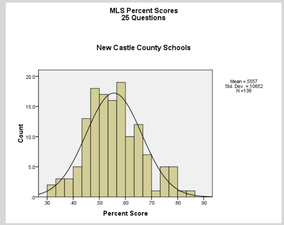
Table 2 - Wilmington Charter High School

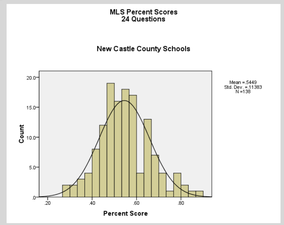
# of Questions	Deleted Question	Chronbach Alpha MLS Inventory	Chronbach Alpha Responding	Chronbach Alpha Receiving	Chronbach Alpha Organization	Chronbach Alpha Valuing
25	-	.850 (97)	.730 (103)	.535 (100)	.544 (101)	.109 (101)
24	15 – Org	.872 (98)	.730 (103)	.535 (100)	.810 (102)	.109 (101)
23	3 – Rec	.889 (98)	.730 (103)	.710 (101)	.810 (102)	.109 (101)
22	8 – Res	.899 (98)	.837 (103)	.710 (101)	.810 (102)	.109 (101)

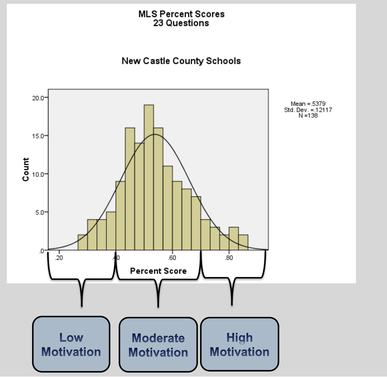
Table 3 - Concord High School

# of Questions	Deleted Question	Chronbach Alpha MLS Inventory	Chronbach Alpha Responding	Chronbach Alpha Receiving	Chronbach Alpha Organization	Chronbach Alpha Valuing
25	-	.842 (30)	.563 (33)	.212 (33)	.450 (34)	.595 (35)
24	15 – Org	.847 (30)	.563 (33)	.212 (33)	.624 (34)	.595 (35)
23	3 – Rec	.863 (30)	.563 (33)	.414 (33)	.624 (34)	.595 (35)
22	8 – Res	.870 (31)	.638 (34)	.414 (33)	.624 (34)	.595 (35)

MLS Inventory Scores







CONCLUSIONS & FUTURE RESEARCH

- Valid and reliable tool
  - The MLS Inventory, as a comprehensive instrument, was found to be a valid and reliable instrument for measuring student motivation to learn science.
  - Three of the four subscales were found to be reliable.
- Model for Inventory development in other content areas to develop similar tools.
- Further development and research for subscales validity and reliability.
- Relationship between use of affective teaching techniques and motivation to learn science.
- Replication of study in Kent and Sussex Counties
  - Initial intentions were to conduct the study in all three counties of Delaware. Future studies in the remaining two counties are necessary to ensure reliability with students from throughout the state.

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