

# The Influence of Problem-based Learning on Drawing Ability

John Krenik, NBCT, MAE, Ph.D. (in progress)

Walden University Dissertation

<http://www.waldenu.edu>

---

# PROBLEM STATEMENT

- It is not known the extent of which PBL or SBL increases drawing ability for seventh grade students.
  - Negatively impacts short and long term drawing ability outcomes
  - No research studies to determine which teaching strategy results in increased drawing ability
-

# PURPOSE

The purpose of this study is to compare two different teaching strategies:

- Problem-based teaching
- Skill-based teaching

# RESEARCH QUESTION

- To what extent are there differences, if any, in scores on Clark's Drawing Abilities Test (CDAT) between seventh grade visual art students taught through PBL and those taught through SBL?
-

# HYPOTHESES

## Null Hypotheses

$H_01$  - There will be no significant differences on Clark's Drawing Abilities Post-Test scores in students that have been taught through PBL than those scores by students taught through SBL.

$H_02$  - There will be no statistically significant difference in Clark's Drawing Abilities assessment scores in the difference (pretest – posttest = difference) between students that have been taught through PBL and those taught through SBL.

# HYPOTHESES

## Alternative Hypotheses

$H_01$  - The scores on Clark's Drawing Abilities Post-Test will be higher in students that have been taught through PBL than those by students taught through SBL.

$H_A2$  - There will be statistically significant difference on Clark's Drawing Abilities assessment scores between the difference (pretest – posttest = difference) between students that have been taught through PBL and those taught through SBL.

# CONCEPTUAL FRAMEWORK

- PBL originates from a problem a student desires to solve.
- PBL used to study the “most effective training for future professionals who needed to access knowledge across the range of disciplines and in realistic settings” (Boud, 1985 as cited in Eilouti, 2007, p. 199).
- Students increased learning from independent studies and simulated ‘real life’ self-directed learning (Boud & Feletti, 1997; Delisle, 1997).

# WHY PBL?

- Purposively vague problems require critical thinking (DeYoung, Flanders, & Peterson, 2008), which PBL provides.
- PBL innovatively fosters teamwork, self-organization, information searching skills, and comprehension of knowledge (Burton, Horowitz, & Abeles, 1999; Kelly et al., 2009; Marti, Gil, & Julia, 2006).
- PBL is student driven learning, that teaches students to learn on their own (Cerezo, 2004; Delisle, 1997; Fiske, 2006; Tarnvik, 2007) and helps them learn more efficiently (Schmidt, Vermeulen, & van der Molen, 2009).
- Most impressive are lowest performing students who make the greatest improvements after an integrated PBL curricula (Fiske, 2006; Haney, Wang, Keil, & Zoffel, 2007; Vansant, 2011) as well as at-risk students (Cerezo, 2004).



# RESEARCHED STRATEGIES OF PROBLEM-BASED LEARNING

- student designed curriculum (Atkinson, 2008)
  - meaning-making (Walker, 2004)
  - self questioning (Wilson & Smetana, 2009)
  - mood boards (Garner & McDonagh-Philp, 2001)
  - teaching with your mouth shut (Finkel, 2000; Hardie, 2007)
  - Steiner & Montessori (Cox & Rowlands, 2000)
-

# ADDITIONAL RESEARCHED STRATEGIES OF PBL

- critical thinking (Green,2006; Lampert, 2006; Sloan, 2010)
- conditions used to solve a problem (Eisner, 1997)
- ill-structured problems (Maker, JO, & Muammar, 2008)
- problem-finding (Atkinson, 2008; Delisle, 1997; Rostan, 2005; Suwa, 2003)
- problem-solving (Kozbelt, 2008; Lampert, 2006; Leshnoff, 1995; Sloan, 2010)

# PBL AND VISUAL ART

Problem finding and problem solving

Critical thinking

Meaning making

Preparation for the workforce

---

# LACK OF RESEARCH ON TOPIC

- A study of this type has not been conducted with middle school students (Collard et al., 2009; Lam & Kember, 2004; Marshall, 2008)
- Negatively impacted visual art students because a higher quality of learning may be present (Beach, 2007; Boud, 1985; Cerezo, 2004; Eilouti, 2007; Smith, 2008)
- A possible cause of this problem is lack of research (Beach, 2007; Boud, 1985; Cerezo, 2004; Eilouti, 2007; Kozbelt, 2002; Kozbelt & Seeley, 2007; Lam & Keber, 2004; Smith, 2008)

# REVIEW OF LITERATURE

- Drawing ability and perception
  - Spatial visualization and drawing ability
  - Drawing development
  - PBL in art education
  - Technical SBL
  - Views of teaching drawing
-

# TEACHING STRATEGIES RESEARCHED

- Student designed curriculum
  - Meaning-making
  - Self questioning
  - Mood boards
  - Teaching with your mouth shut
  - Steiner & Montessori methods
  - Critical thinking
  - Conditions used to solve a problem
  - Ill-structured problems
  - Problem-finding & problem-solving
-

# PBL ART CURRICULUM

- Begin with and **decide on problem** to solve
  - Students **decide what they need** to solve the problem
  - Provide students with a variety of methods to solve the problem (**variety of media, art styles, and cultures**)
  - Students **begin solving** the problem
  - Curriculum is **successful if student solves problem** with little assistance
-

# SIGNIFICANCE OF THE STUDY

- Both problem-based learning and skill-based learning may increase drawing ability of students.
- This study intends to determine which teaching strategy increases artistic outcomes for 7<sup>th</sup> grade students.
- A study of this type has not been conducted with middle school students.
- Teachers are in disagreement about teaching through problem-based learning or skill-based learning (Marshall, 2008).
- This creates a research gap in art education (Lam & Kember, 2004).



# QUASI-EXPERIMENTAL DESIGN

- Quasi-experimental nonequivalent nonrandom external control group design with a pretest-posttest
- NR O<sub>1</sub>XO<sub>2</sub> NR O<sub>1</sub> O<sub>2</sub>
- The effect size was calculated from G\*Power 3.1.2.
- Effect size = 0.40, sample size of 20 is needed for each group to yield a power of 0.85 or 85% to achieve significant results. (Faul, Erdfelder, Buchner, & Lang, 2009).

# WHY QUANTITATIVE METHOD

- Drawing is a basic method of communication
  - Art talent is normally distributed
  - Few national standardized drawing tests
  - State visual art tests are multiple choice
  - CDAT measures drawing ability via problem solving & technical skill
  - CDAT is reliable, validated, & has been used in many studies
-

## OTHER METHODS WOULD NOT WORK AS WELL

- Equivalent Materials Design
  - Randomized Materials Design
  - Equivalent Time Samples Design
  - Counterbalanced Design
  - Institutional Cycle Design
  - One-Shot Case Study
-

# VARIABLES (DEPENDENT)

- The **dependent variable** is Clark's Drawing Abilities Test (CDAT) (Clark, 1984).
- **dependent covariates from CDAT:**
  - sensory qualities
  - formal qualities
  - expressive properties
  - technical properties

# VARIABLES (INDEPENDENT)

- The **independent variable** is teaching style.
- And the **independent covariates** are:
  - problem-based learning
  - skill-based learning

# DATA ANALYSIS

- *t* test and an ANOVA repeated measures, within-between interactions with power set at 0.85, using a sample of 40.
- **Two-Way ANOVA** to find interactions from the main effect of each covariate (Green & Salkind, 2008).
- ***t* test** to find both mean differences and relationships between variables (Green & Salkind, 2008).

# BASELINE DESCRIPTIVE AND DEMOGRAPHIC CHARACTERISTICS

Table A1

*Number of Students in Each of the Two Different Teaching Styles*

---

	PBL		SBL	
Groups	A	12	A	16
	B	14	B	14
			C	11
			D	14 *
Totals		26		55

---

*Note.* PBL = PBL; SBL = Skills-Based Learning; \* = Group D excluded from posttest data collection as students did not complete CDAT due to students being taken out of class for assemblies.

# RAW SCORES BY GROUP

- Table A2
- *Pretest and Posttest Raw Scores by Group*

---

- Teaching Styles

---

Test type	PBL (n = 25)	SD	SBL (n = 39)	SD
Pretest Mean	5.460	1.7555	5.6026	1.80343
Posttest Mean	5.280	1.7385	5.8846	2.09467

---

- *Note.* PBL = PBL; SBL = Skills-Based Learning; SD = standard deviation.



# FREQUENCIES AND PERCENTAGES

Table A3

*Frequencies and Percentages for Nominal Data*

---

Variable	<i>n</i>	%
Instruction type		
Problem-based	25	31
Skill-based	56	69

---

# CONTINUOUS DATA

Table A4

*Means and Standard Deviations for Continuous Data*

Variable	<i>n</i>	<i>M</i>	<i>SD</i>
CDAT pretest	81	5.63	1.74
CDAT posttest	64	5.65	1.97
Teacher grade pretest	55	3.58	0.57
Teacher grade posttest	63	3.73	0.51

# T TEST RESULTS

Table A5

*Results for Independent Sample t Test for CDAT Pretest Scores by Instruction Type*

---

Variable	Problem-based		Skill-based		<i>t</i>	<i>df</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
CDAT pretest	5.46	1.76	5.71	1.74	-0.59	79	.560

---

# RESULTS: ONE-WITHIN ONE-BETWEEN ANOVA

Table A6

*Results for One-Within One-Between ANOVA for CDAT Scores by Time and Instruction Type*

Source	SS	df	MS	F	p	Partial $\eta^2$	
Within subjects effects							
Time		0.08	1	0.08	0.07	.789	.00
Time*							
Instruction		1.63	1	1.63	1.48	.229	.02
Error		68.17	62	1.10			
Between subjects effects							
Instruction		4.25	1	4.25	0.72	.401	.01
Error		368.65	62	5.95			

# SOURCES OF INTERNAL VALIDITY

- History
  - Maturation interactions and testing
  - Instrumentation
  - Regression
  - Homogeneity of Regression
  - Selection-maturation
-

# Sources of External Validity

- Interaction of testing & X: unlikely, a person's attitudes are unlikely to change
- Interaction of selection & X: unlikely, lack of freedom to sample widely a randomized grouping
- Reactive arrangements: unlikely, less chance to react difference in teaching method & geographic distance
- Consistent with research designs of visual art education

# STATISTICAL ANALYSIS AND OTHER FINDINGS

- 0.18 decrease on PBL mean scores on the CDAT posttest
- 0.282 increase in SBL CDAT mean scores.
- PBL teacher reported student-testing burnout
- PBL students took the posttest at the end of the term as well as State-mandated high stakes testing
- PBL students' felt like it was their last days of school and students blew off the posttest.
- PBL teacher reported group had a larger than normal amount of special needs students and other issues that the students were dealing with.
- It was unnecessary to conduct Post-hoc analysis since the findings were inconclusive.

# SUMMARY OF RESULTS

- both the experimental and control group were relatively equivalent in baseline data
- There was a decrease in CDAT scores in the experimental PBL group
- whereas the control group increased in CDAT scores
- further statistical tests were not conducted because the CDAT scores were inconclusive



# INTERPRETATION OF FINDINGS

- This study adds to new knowledge in the sense that there are very few similar empirical studies in art education engaging middle school student as subjects
- The findings do not confirm or disconfirm knowledge in the discipline; however, the findings do extend knowledge in the discipline of visual art education.
- I did not locate in the literature an art education study comparing PBL with SBL
- This study adds to the literature on teaching styles which is of interest to art teachers and administrators
- Results were inconclusive due to resentful demoralization as a reactivity threat to construct validity.

# LIMITATIONS

- Validity and reliability: gap in research produces this problem and need for study
- Models may inaccurately determine drawing ability of visual art students comparing PBL & SB
- Limited research & tested criteria has been conducted on PBL/SBL & drawing
- Any study on the topic will add to research
- Results cannot be generalized
- Limited to seventh grade visual art
- Demographic limitations

# RECOMMENDATIONS

- Pretests/posttests should be carried out at the beginning rather than end of school year
- scoring CDAT differently may not only enrich results, it might cancel out the over testing mode because the four sections on CDAT would only be taken once, not twice.
- different scores for each separate test would result in 5 scores, 4 of which representing for each of the four CDAT tasks with a 5th overall mean score
- Having both the experimental and control groups then take one or two sections different from those in the pretest can serve as a posttest, effectively giving the appearance of a different test which may hold the interest and attention of 7<sup>th</sup> grade students.
- Other options include complementing or replacing CDAT with GEFT/CEFT, or NEAP, or teacher assessments.
- Students could draw themselves with their friends in a schoolyard with the school in the background and a dog in the foreground

# POSITIVE SOCIAL CHANGE

- This study will promote positive social change by providing insight into ways in which teaching strategies benefit student learning for 7<sup>th</sup> grade visual art students.
- The outcomes of this study may have positive effects on increasing drawing ability outcomes.
- Potential long-term changes in learners, faculty, institutions, policy, and the visual art education profession.
- The results of this study will add to the body of research which is presently lacking on this topic

# CONCLUSION

- Results were inconclusive due to resentful demoralization as a reactivity threat to construct validity
  - This study demonstrates the need for further research in comparative teaching styles using drawing tests and further validating them
  - Findings guard against having students taking pretest and posttests during high stakes testing
  - Study will add to research, inform practice
-

# CONTACT

John Krenik

Walden University

[John.krenik@waldenu.edu](mailto:John.krenik@waldenu.edu)

[www.johnkrenik.com](http://www.johnkrenik.com)

[wcbath@msn.com](mailto:wcbath@msn.com)

---