An Investigation of the Effect of Project-based Learning on Students' Self-regulation and Self-Efficacy Perception in Face-to-Face, Hybrid and Online Learning Environments

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BACKGROUND

Project-Based Learning:

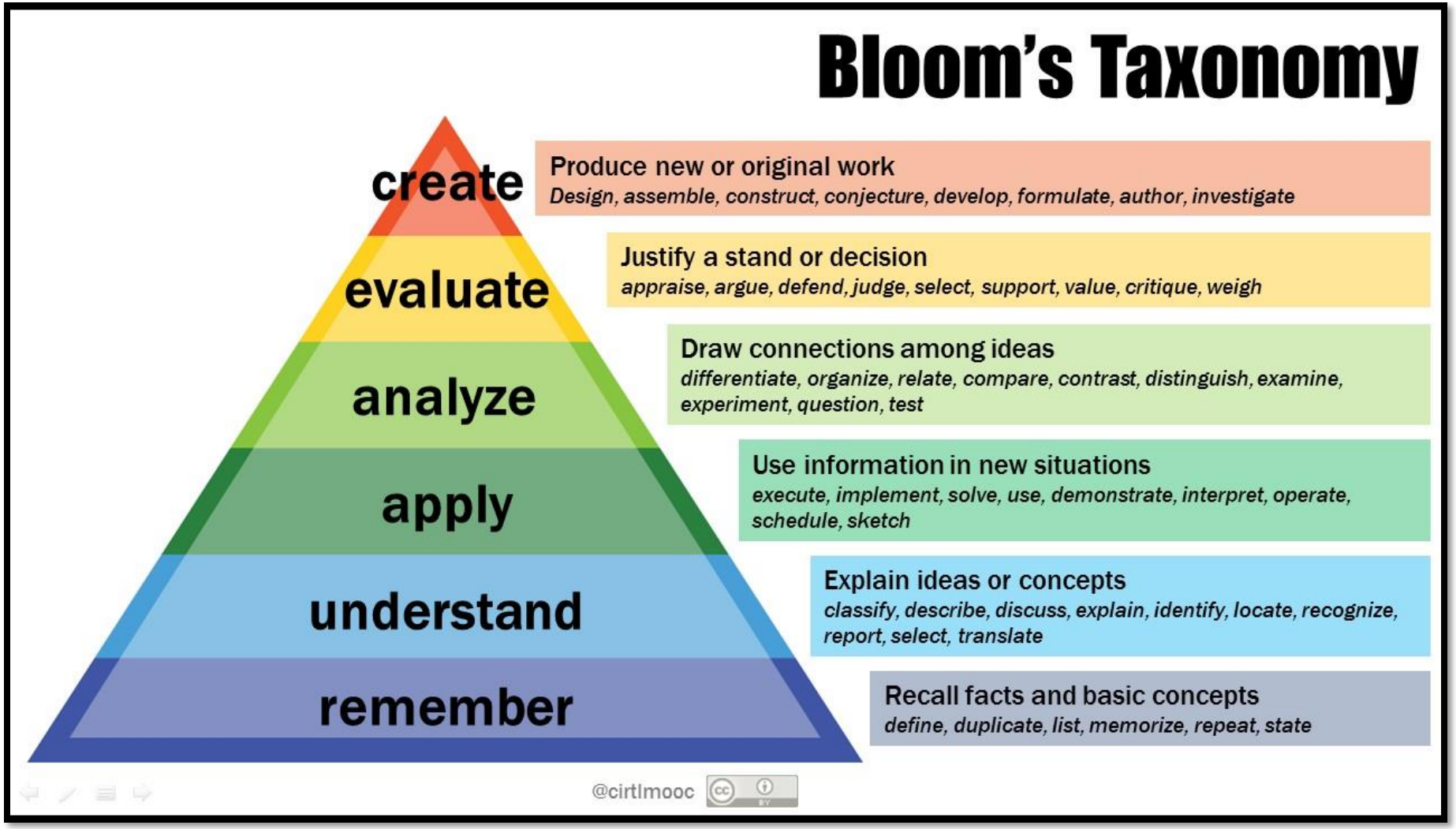
- **Days are gone when students were expected to passive receiver at their desks while teachers lectured endlessly, expecting them to soak up the information being thrown at them.**

BACKGROUND

Project-Based Learning:

In todays' classroom, students are expected to:

- **Collaborate**
- **Think critically**
- **Work together to develop innovative projects**
- **Work together to develop answers to complex questions**
- **Prepare for 21st century workplace**



Bloom's Taxonomy was created in 1956 under the leadership of educational psychologist Benjamin **Bloom** in order to promote higher forms of thinking in education, such as analyzing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts (rote learning)

BACKGROUND

Project-Based Learning:

- **To support this mission, many instructors have begun to take part in a practice known as Project-Based Learning (PBL).**
- **PBL allows instructor to expose students to a wide variety of 21st Century skills, and allows students to interact with curriculum in a way that is engaging, authentic, and fun!**
- **Making a shift from traditional forms of learning to PBL can be challenging and PBL can require a lot of prep work on the part of the teacher.**

BACKGROUND

What is Project-Based Learning (PBL)?

- **PBL is a teaching strategy that focuses on student-directed investigation (Blumenfeld et al., 1991; English & Kitsantas, 2013).**
- **Through this strategy, students engage in projects by:**
  - **Articulating questions for investigation**
  - **Designing plans**
  - **Collecting and analyzing information**
  - **Creating a product of their understanding (Blumenfeld et al., 1991)**

BACKGROUND

Project-Based Learning (PBL):

- **Through students' inquiry and experience with the project under study, they are expected to:**
  - **Identify information needed**
  - **Locate resources**
  - **Integrate the collected resources into coherent projects**

BACKGROUND

Project-Based Learning?

- **Project-based learning is considered as an important learning approach that may support students' self-regulated learning through:**
  - **Setting goals**
  - **Selecting learning tasks and strategies**
  - **Monitoring progress toward goals (English & Kitsantas, 2013)**

BACKGROUND

Self-regulation:

- Empirical evidence indicates that encouraging students to utilize self-regulation activities may lead to improving their academic performance (Butler & Winne, 1995; Carver & Scheier, 2001; Schunk, 1996).
- Researchers found that students' self-regulated learning skills is closely linked to their self-efficacy (Pintrich, 2004; Seifert, 2004)
- Many studies found that students' self-efficacy has a profound impact on their academic achievements (Ferla, Valcke, & Schuyten, 2008).

OBJECTIVES

<u>This study investigated:</u>

The effect of project-based learning (PBL) on pre-service teachers' self-regulation and self-efficacy skills in face-to-face, hybrid and online learning environments.

THEORETICAL FRAMEWORK

Metacognition Skills

- **It is what we know about our cognitive processes and how we use these processes in order to learn and remember (Ormrod & Davis, 2004).**

THEORETICAL FRAMEWORK

Metacognition Skills

1. **DECLARATIVE KNOWLEDGE**
2. **PROCEDURAL KNOWLEDGE**
3. **CONDITIONAL KNOWLEDGE**
4. **PLANNING**
5. **INFORMATION MANAGEMENT STRATEGIES**
6. **COMPREHENSION MONITORING**
7. **DEBUGGING STRATEGIES**
8. **EVALUATION**

THEORETICAL FRAMEWORK

Metacognition Skills

- **Students' self-regulated skills toward their learning goals should have a direct impact on subsequent achievement (Boekaerts & Corno, 2005)**

THEORETICAL FRAMEWORK

Preferred learning styles

- **According to Gardner multiple intelligences theory (2011), students have different preferred learning styles and they have different approaches or ways of learning.**
- **Students' preferred learning styles was defined in the literature as the way individuals seek to extract, process, and memorize information (Brown, Stothers, Thorp, & Ingram, 2006).**

THEORETICAL FRAMEWORK

Preferred learning styles

The educational literature identified the types of learning styles as:

- **Visual learners**
- **Auditory learners**
- **Kinesthetic learners**
- **Tactile/kinesthetic learners**

METHODS

- This study employed within-subject design
- Participants: 66 pre-service teachers
- 54 undergraduates, 12 graduates enrolled in a technology integration course

METHODS

- **This study examined the effect of project-based instruction on pre-service teachers' self-regulation and self-efficacy skills in face-to-face, hybrid and online learning environment.**

The three dependent variables:

- **Students' self-regulation skills**
- **Self-efficacy skills**
- **Learning styles and**
- **Independent variable: class activities using project-based teaching**

METHODS

- The projects used in this experiment were designed to teach pre-service technology integration strategies in three different learning settings: Face-to-face, hybrid and online.

The participants were students in three different sections:

- Two undergraduate sections
- One graduate section

METHODS

Students reported that their preferred learning style:

- **7-Lectures/Discussions**
- **2-Books/Related Written Material**
- **4-Video/Movies/Media**
- **25-Hands-on activities**
- **26-Mixed method**

METHODS

Participants:

Students reported that their age as the following:

- **44- age between 18-21**
- **10-age 22-25**
- **6-age between 26-30 years**
- **2-age between 31-40 years**
- **3-age 41or over**

INSTRUMENTATION

Instruments

- **Self-efficacy survey based on (Pajares & Urdan , 2006)**
  - **Cronbach’s alpha (internal consistency): .92**
- **Metacognitive Awareness Inventory (MAI)**
  - **Cronbach's alpha (internal consistency): .83**
- **Demographic survey**

MATERIALS

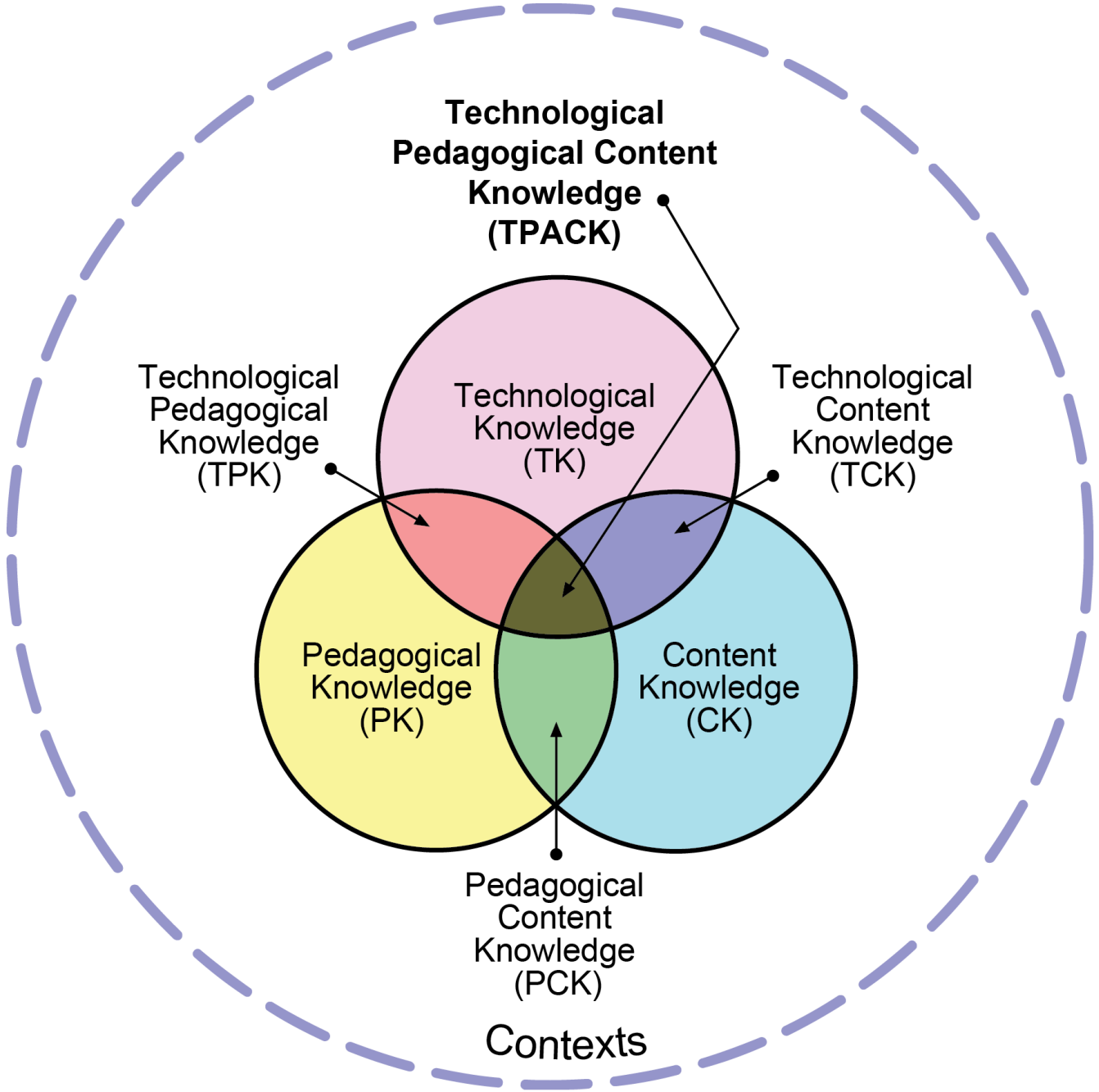
- Students read the chapter or online materials before class (at home)
- Students watched video or screencast before class (at home)
- Q & A in the first five minutes of the class
- The majority of the class time for project-based activities

RESEARCH QUESTIONS

1. Is PBL an effective teaching strategy for improving pre-service' self-regulation skills?
2. Does PBL effect pre-service' self-regulation differently in face-to-face, hybrid and online learning environment?
3. Is PBL an effective teaching strategy for improving pre-service' self-efficacy to integrate technology in teaching?
4. Does PBL effect pre-service' self-efficacy differently in face-to-face, hybrid and online learning environment?
5. Does PBL effect pre-service differently based on their learning style preferences?

PROCEDURE

- At the beginning of the semester students in all sections completed demographic, self-efficacy and the Metacognitive Awareness Inventory (MAI) surveys.
- Students used the project-based method to learn 10 topics in 10 consecutive weeks.
- At the end of the semester, students completed again self-efficacy and the Metacognitive Awareness Inventory (MAI) surveys.


Technological Pedagogical Content Knowledge (TPACK)
Technological Pedagogical Knowledge (TPK)
Technological Knowledge (TK)
Technological Content Knowledge (TCK)
Pedagogical Knowledge (PK)
Content Knowledge (CK)
Pedagogical Content Knowledge (PCK)
Contexts

Universal Design for Learning Guidelines

I. Provide Multiple Means of **Representation**

1: Provide options for perception

1.1 Offer ways of customizing the display of information

1.2 Offer alternatives for auditory information

1.3 Offer alternatives for visual information

2: Provide options for language, mathematical expressions, and symbols

2.1 Clarify vocabulary and symbols

2.2 Clarify syntax and structure

2.3 Support decoding of text, mathematical notation, and symbols

2.4 Promote understanding across languages

2.5 Illustrate through multiple media

3: Provide options for comprehension

3.1 Activate or supply background knowledge

3.2. Highlight patterns, critical features, big ideas, and relationships

3.3 Guide information processing, visualization, and manipulation

3.4 Maximize transfer and generalization

Resourceful, knowledgeable learners

II. Provide Multiple Means of **Action and Expression**

4: Provide options for physical action

4.1 Vary the methods for response and navigation

4.2 Optimize access to tools and assistive technologies

5: Provide options for expression and communication

5.1 Use multiple media for communication

5.2 Use multiple tools for construction and composition

5.3 Build fluencies with graduated levels of support for practice and performance

6: Provide options for executive functions

6.1 Guide appropriate goal-setting

6.2 Support planning and strategy development

6.3 Facilitate managing information and resources

6.4 Enhance capacity for monitoring progress

Strategic, goal-directed learners

III. Provide Multiple Means of **Engagement**

7: Provide options for recruiting interest

7.1 Optimize individual choice and autonomy

7.2 Optimize relevance, value, and authenticity

7.3 Minimize threats and distractions

8: Provide options for sustaining effort and persistence

8.1 Heighten salience of goals and objectives

8.2 Vary demands and resources to optimize challenge

8.3 Foster collaboration and community

8.4 Increase mastery-oriented feedback

9: Provide options for self-regulation

9.1 Promote expectations and beliefs that optimize motivation

9.2 Facilitate personal coping skills and strategies

9.3 Develop self-assessment and reflection

Purposeful, motivated learners

RESULTS

1. Is PBL an effective teaching strategy for improving pre-service' self-regulation skills?

<u>One-sample t-test:</u>

- **Pre-service teachers who engaged in project-based leaning strategy in all leaning environments (face-to-face, hybrid and online) reported higher metacognitive skills scores (M =45.56, SD = 5.61) compared to their scores before the PBL activities, t(60) = 63.37, p = .000.**

One-sample t-test

Table 1: Results of One-sample t-test and Descriptive Statistics for Students' Metacognitive Scores Before and after the project-based teaching strategy

Outcome	M	SD	n	95% CI for Mean Difference	t	df
Students' Metacognitive Before	42.47	7.29	66	11.53, 41.22	47.328	65
Students' Metacognitive After	45.56	5.61	61	-0.08, 0.02	63.379*	60

* $p < .000$.

RESULTS

2. Does PBL effect pre-service' self-regulation differently in face-to-face, hybrid and online learning environment?

Analysis of variance One-way ANOVA:

- **The analysis of variance showed that the effect of PBL strategy on students' metacognitive skills in three different learning environments: face-to-face, hybrid and online was nonsignificant, F (2,58) = .378, p = .687.**

One-way ANOVA

Table 2: Results of analysis of variance for Students' Metacognitive Scores in three different learning environments: face-to-face, hybrid and online

Metacognitive Scores	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	24.327	2	12.163	.378	.687
Within Groups	1866.722	58	32.185		
Total	1891.049	60			

RESULTS

3. Is PBL an effective teaching strategy for improving pre-service' self-efficacy to integrate technology in teaching?

<u>One-sample t-test:</u>

- **Pre-service teachers who engaged in project-based leaning strategy in all leaning environments (face-to-face, hybrid and online) reported higher self-efficacy scores (M =869.51, SD = 115.47) compared to their scores before the PBL activities, t(60) = 58.81, p = .000.**

One-sample t-test

Table 3: Results of One-sample t-test and Descriptive Statistics for Students' self-efficacy scores Before and after the project-based teaching strategy

Outcome	M	SD	n	95% CI for Mean Difference	t	df
Self-Efficacy Before	544.55	178.36	66	500.70	24.80	65
Self-Efficacy After	869.51	115.47	61	839.93	58.81*	60

* $p < .000$.

RESULTS

4. Does PBL effect pre-service' self-efficacy differently in face-to-face, hybrid and online learning environment?

Analysis of variance One-way ANOVA:

- **The analysis of variance showed that the effect of PBL strategy on students' self-efficacy in three different learning environments: face-to-face, hybrid and online was nonsignificant, $F(2,58) = .163$, $p = .850$.**

Correlation Coefficient

Table 4: Results of analysis of variance for Students' self-efficacy Scores in three different learning environments: face-to-face, hybrid and online

Self-efficacy Scores	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4478.02	2	2239.01	.163	.850
Within Groups	795607.22	58	13717.37		
Total	800085.25	60			

RESULTS

5. Does PBL effect pre-service differently based on their learning style preferences?

Analysis of variance One-way ANOVA:

- **The analysis of variance showed that the effect of PBL strategy on students' learning styles in all learning environments was nonsignificant, F (4,54) = .391, p = .814.**

Correlation Coefficient

Table 5: Results of analysis of variance for Students' metacognitive Scores with preferred learning styles

Self-efficacy Scores	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	51.98	4	12.996	.391	.814
Within Groups	1796.67	54	33.272		
Total	1848.64	58			

CONCLUSIONS

- **The use of the PBL teaching strategy does improve pre-service teachers' self-regulation skills in a technology integration course.**
- **Results suggest that students engaged in the PBL viewed their learning activities as more personal curiosity to discover new tools to use in teaching and offered them internal motivation.**
- **Students' self-efficacy perception was significantly improved after engaging in PBL strategy.**
- **PBL activities do improve pre-service teachers' self-regulated skills equally in three different learning environments: face-to-face, hybrid and online.**
- **Finally, the results showed that the PBL activities improves pre-service teachers self-regulated skills, regardless to their learning preferences.**
- **Student's work example: https://sites.google.com/site/darissab5/**

Questions 

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