UNIVERSITY of MARYLAND
SCHOOL OF NURSING

Optimizing Student Learning Using Cognitive Load Principles

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Introduction

- Facilitating learning
  - Instructional design and instructional design (ID) strategies
- Ineffective instructional designs can hinder learning
- The Cognitive Load Theory
  - Complements established learning theories
  - Assists in evaluation of instructional design strategies on student learning

(Braungart & Braungart, 2008; Chen et al., 2014; Hessler & Henderson, 2013; Sweller et al., 1998)

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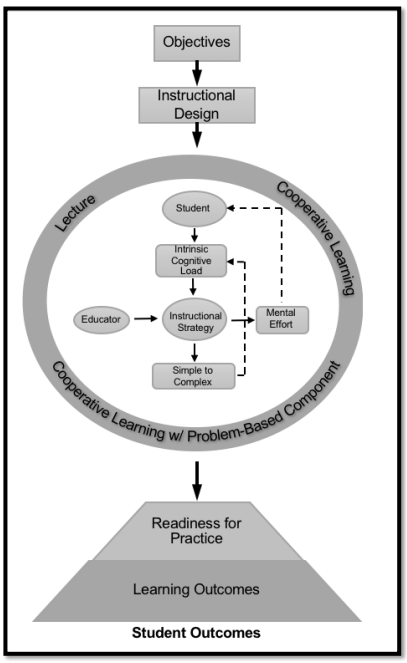
Cognitive Load Theory

- John Sweller and colleagues (1980s)
- Principles considering human cognition
- Goals:
  - Optimize learning
  - Decrease cognitive load
- Three Types
  - Intrinsic load
  - Extraneous load
  - Germane load

(Leppink et al., 2013; Sweller et al., 2019)



Conceptual Framework

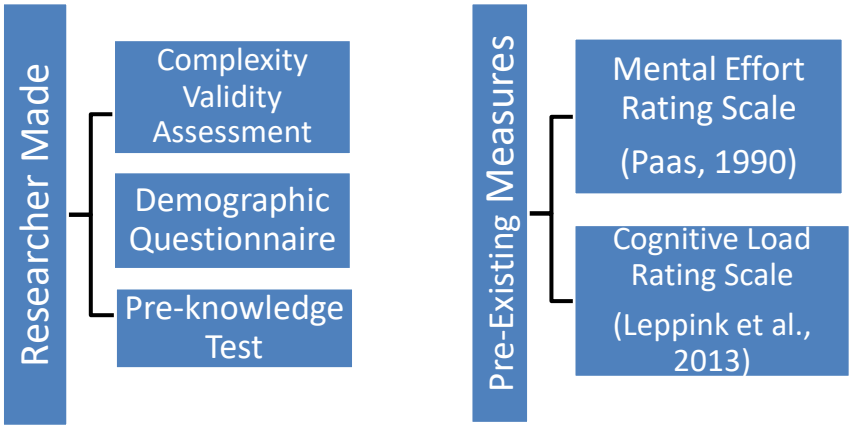
Purpose

Examine how instructional design strategies, influenced by the principles of the cognitive load theory, affect the cognitive load (including mental effort) of pre-licensure baccalaureate nursing students in the United States.

Methods

- Two-within Repeated-Measures Design
  - Within Levels
    1. Complexity
       a) Simple
       b) Complex
    2. Instructional Strategy
       a) Cooperative Learning
       b) Cooperative Learning with Problem-Based Component
- Outcomes
  - Intrinsic Cognitive Load and Mental Effort
- Covariate
  - Prior-Knowledge

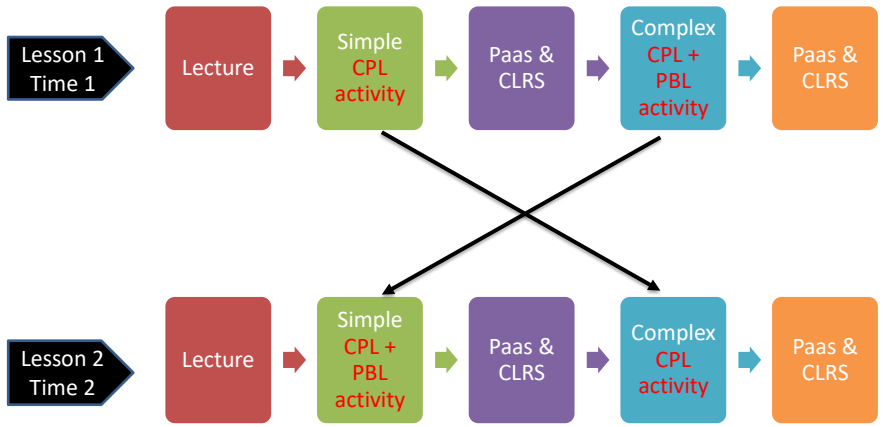
Instruments



Setting and Sample

- Setting
  - School of Nursing-Northeast United States
  - Synchronous online classroom
- Sample
  - Convenience
- Inclusion Criteria
  - Students enrolled in designated Foundations course at study site
  - Students 18 years of age or older
- Exclusion Criteria
  - Students with prior experience as a nurse (LPN or nurse in another country)
  - Students repeating designated nursing course
  - Students previously enrolled in a nursing program (LPN, diploma, ADN, BSN, or graduate entry-level program)

Repeated-Measures Intervention



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Activity Prompts: Lesson 1

Simple Activity CPL	Complex Activity CPL + PBL
1. List 2 reasons why it is important to increase or maintain water consumption in older adults. 2. Describe how 2 [choose 2 only] components of pharmacokinetics (absorption, distribution, metabolism, or excretion) can be altered in older adults due to physiologic changes brought about by aging.	You are caring for a 78-year-old patient recently admitting to a long-term care facility after a fall at home, followed by a total hip replacement and a 3-week stay at a sub-acute rehab facility. The patient has Parkinson's disease and early stage dementia (Aware of their disease and A&0x4 with occasional forgetfulness). Currently, the patient is refusing to eat the food at the long-term care facility. The patient's last bowel movement was 4 days ago, and the patient has had no urine output in the past 24 hours. 1. Prioritize the case study components of most concern to the nurse. Include a rationale. 2. Determine 4 priority nursing actions and interventions to address your concerns and that will help the client reach the intended elimination goal.

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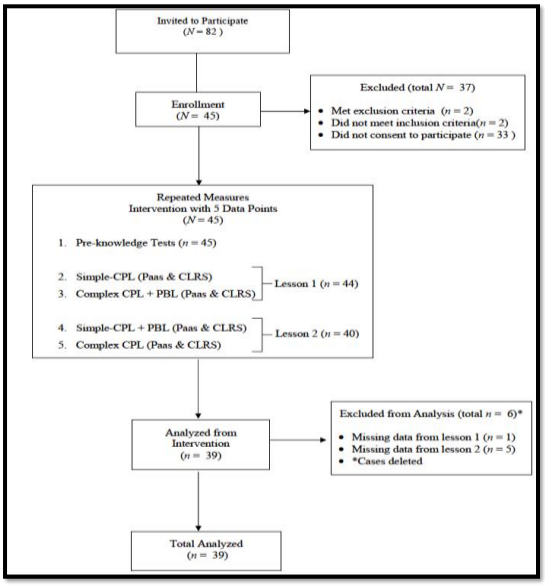
Activity Prompts: Lesson 2

Simple Activity CPL + PBL	Complex Activity CPL
You are a nurse caring for a 68-year-old patient. The patient's medical history includes hypertension, and diabetes mellitus (type 2). After completing your assessment, you note that the patient is not compliant with their medications. 1. List at least 2 types of medications you expect to be ordered for this patient. 2. Based on the patient's medication noncompliance, list two education points that you would discuss with this patient.	1. Predict how errors may occur at each step of the nursing process related to medication administration. 2. Determine how the nurse should properly apply each of the 11 rights of medication administration.

Participant Flow



RESEARCH QUESTIONS & RESULTS

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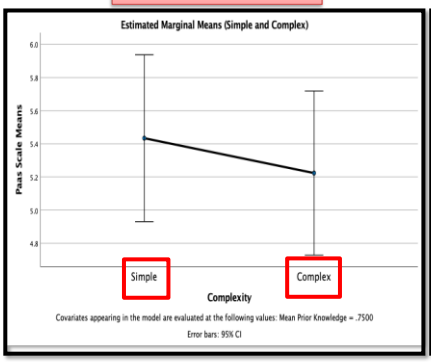
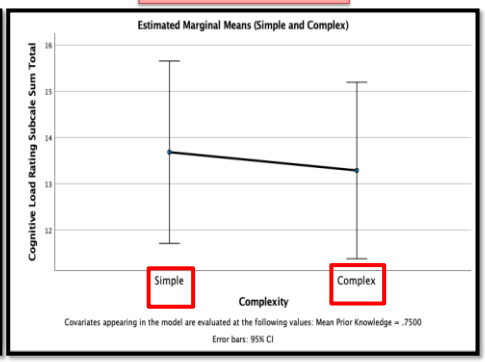
To what degree does lesson complexity affect mental effort / cognitive load when accounting for prior knowledge?

Mental Effort



Cognitive Load



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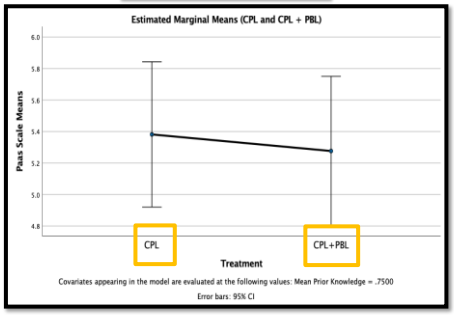
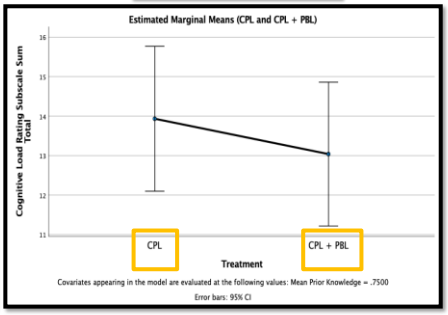
To what degree does the instructional strategy affect mental effort / cognitive load when accounting for prior knowledge?

Mental Effort



Cognitive Load



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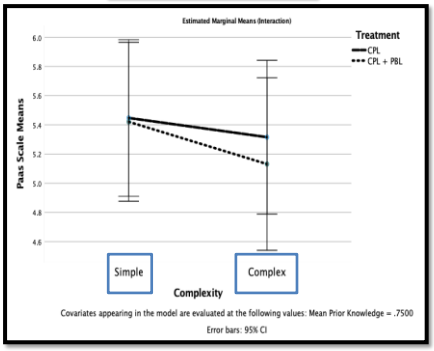
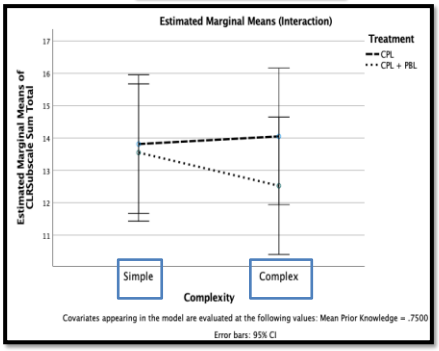
To what degree is there an interaction between lesson complexity and the instructional strategy?

Mental Effort



Cognitive Load



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Limitations

- Limitations
  - Measurement Tools
  - Design
  - Sample

Recommendations for Nursing Education

- Preliminary evidence suggests:
  - Simple: less of an impact
  - Complex: CPL + PBL
- Use of simple to complex per the Cognitive Load Theory
- Further research is warranted
- Theory development

References

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