

Project Title

Teaching Nurses Ophthalmic Surgery Protocol: Are Cognitive-Theory-Based Teaching Slides Superior to Traditional Teaching Slides?

Project Lead and Members

Project Lead: Yip CC

Project Members: Lai FW, Lim PK, Ding J, Hah YY, Au Eong KG

Organisation(s) Involved

Khoo Teck Puat Hospital, International Eye Cataract Retina Center

Healthcare Family Group(s) Involved in this Project

Nursing

Applicable Specialty or Discipline

Optometry/Optommetrist, Surgery

Project Period

Start date: July 2021

Completed date: Not Available

Aims

Cognitive theory theory-based teaching slides (CTS) addresses the three practical problems & is theoretically underpinned underpinned.

- Has many principles to optimize multimedia learning using words and graphics.
- Reduce extraneous processing
- Manage essential processing
- Foster generative processing

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Lessons Learnt

See poster appended/ below

Conclusion

See poster appended/ below

Additional Information

Singapore Health & Biomedical Congress (SHBC) 2023: Best Poster Award (Health Professions Education) – (Gold Award)

Project Category

Training & Education

Learning Theories & Framework, Cognitivism

Keywords

Cognitive, E-learning, CTML

Name and Email of Project Contact Person(s)

Name: Yip Chee Chew

Email: yip.cheechew@ntu.edu.sg

Teaching Nurses Ophthalmic Surgery Protocol: Are Cognitive-Theory-Based Teaching Slides Superior to Traditional Teaching Slides?

Yip CC¹, Lai FW², Lim PK¹, Ding J¹, Hah YY¹, Au Eong KG⁵

¹Department of Ophthalmology & Visual Sciences, Khoo Teck Puat Hospital, Singapore

²Day Surgery Center, Khoo Teck Puat Hospital, Singapore

³International Eye Cataract Retina Center, Singapore

Introduction

E-learning with **Traditional Teaching Slides (TTS)** faces 3 practical problems. ➔ We need efficacious teaching materials.

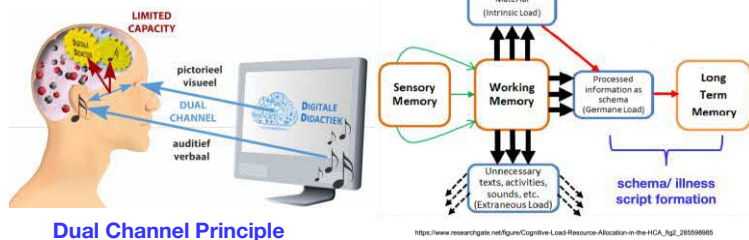
1. Dependent on **quality of instructional material**
2. **Less/indirect learner engagement** (asynchronous e-learning)
3. Often 'wordy' & crowded slides

Cognitive Theory of Multimedia Learning (CTML)

- Has many principles to optimise multimedia learning using words & graphics.
- Reduce extraneous processing
- Manage essential processing
- Foster generative processing

Cognitive theory-based teaching slides (CTS) addresses the three practical problems & is theoretically underpinned.

Theoretical underpinnings



Dual Channel Principle

Cognitive Load Theory

Hypotheses

1. CTS results in greater knowledge acquisition in than TTS.
2. CTS results in less knowledge decay than TTS.

Methods

Design & setting

- Assessor-blinded **longitudinal study**.
- Period: July 2021.
- DSRB Reference: 2021/00278

Subjects (random assignment)

- Forty-four operating theater nurses.
- Intervention/CTS (n=22)
- Control/TTS (n=22)

All participants have the experience as cataract surgery scrub nurses.

Materials (e-learning)

- **Topic of interest: Cataract Complication Proactive Response Protocol** ➔ assisting the management of cataract intra-operative complications.

1. **TTS: routinely used slides.**
2. **CTS: designed with Meyer's CTML.**

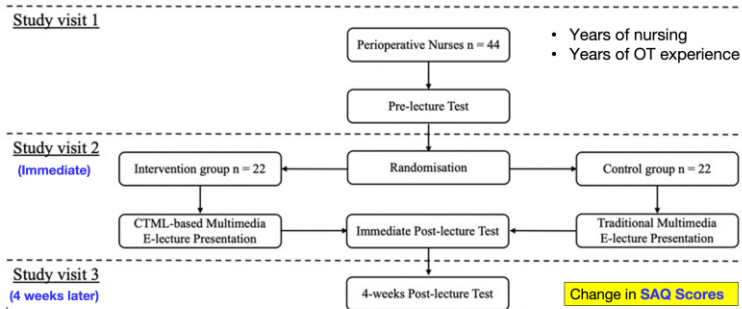
Differ in presentation format.

- Same teacher, content, slide count (n=19), presentation order and teaching time (20min).

Instruments

- **Short Answer Questions (SAQ)**
 - ❖ 3 tests across 3 visits.
 - ❖ 6 SAQs per test (12 marks): assesses **diagnostic reasoning** and **clinical judgement** ('knows how' level).

Intervention & Procedures



Statistical analysis

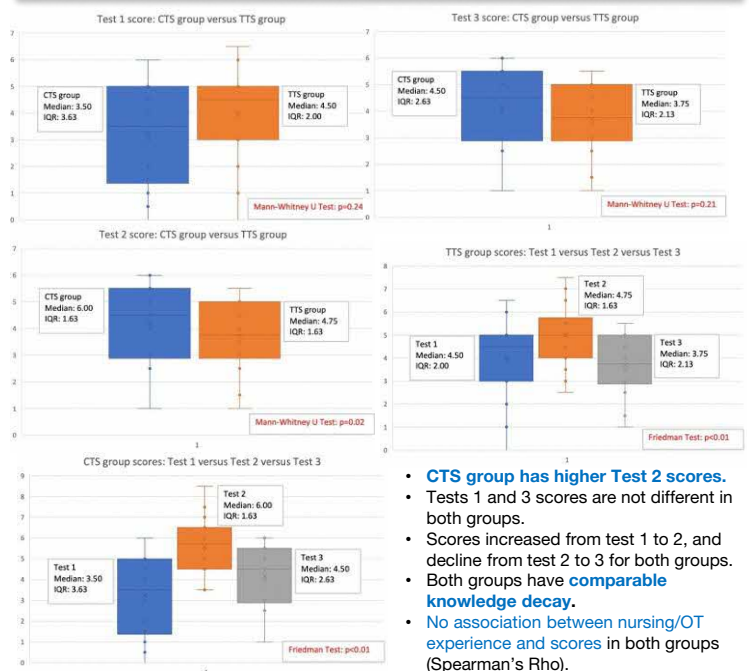
- **Non-parametric** tests (small sample size).
- **Median** with interquartile range.
- $\alpha = 0.05$
- Post-Bonferroni adjustment $\alpha = 0.017$

Comparisons made at intra and inter-group levels.

Conclusion

1. CTS results in **better** knowledge acquisition, possibly by optimizing cognitive load through visual and auditory channels.
2. **Knowledge decay is comparable** between groups and may be attributed to insufficient practice.
3. CTS is **efficacious** in teaching nurses surgery protocol knowledge and may be applied to other disciplines.

Results



- **CTS group has higher Test 2 scores.**
- Tests 1 and 3 scores are not different in both groups.
- Scores increased from test 1 to 2, and decline from test 2 to 3 for both groups.
- Both groups have **comparable knowledge decay**.
- **No association between nursing/OT experience and scores** in both groups (Spearman's Rho).

Discussion

CTS resulted in greater knowledge acquisition with comparable decay.

➔ Hypothesis 1 proven true.

- CTML enhances **immediate knowledge transfer**.
- Cognitive load may be optimized by dual presentation of **auditory & visual stimuli**.
- CTS' lack of superiority in reducing knowledge decay may be due to the lack of revision in a short study period.

Postulated cognitive load changes	Theoretical backing
Higher germane load ↑	Voice principle: delivering content with narration
Reduced intrinsic load ↓	Modality principle: using voice rather than texts
Reduced extrinsic load ↓	Contiguity principle: placing words next to graphics

Strengths	Limitations
Subject allocation: randomized assignment (reduced selection bias).	Small sample size <ul style="list-style-type: none"> • Predisposes to Type II errors.
Robust procedures: 3 different tests delivered at different times. <ul style="list-style-type: none"> • Reduced learning effects • Reduced testing effects 	Lack of qualitative analysis <ul style="list-style-type: none"> • Unable to establish how subjects learnt with CTS.
Instrument selection: authentic SAQs <ul style="list-style-type: none"> • Complex assessment with face validity improved reliability. • No prompting or guessing. 	Knowledge-only assessment <ul style="list-style-type: none"> • Competency assessment is complex, involving knowledge, skills, and attitude.