Synchronous Computer-mediated Instruction (CMI): A Study of Pedagogy, Action Research & Learning Analytics

by

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Research Questions

(1) Among a cohort of Diploma in Management Studies (DMS) students, what differences, if any, can be detected in their learning effectiveness between instruction offered using synchronous CMI and traditional classroom-based instruction?

(2) What are the characteristics of an effective pedagogical model that can be supported by synchronous technology?

(3) What contribution does Learning Analytics make in this study?
Literature Review

Research Topic - pedagogy for synchronous CMI is a topic in much need of further investigation (de Freitas & Newmann, 2009).

Synchronous Technology (adoption) - University of Southern Queensland (Reushle & Loch, 2008); Southern Cross University (Rowe & Ellis, 2010); The UK Open University (The Open University, 2009); Athabasca University (Athabasca University, 2011); IBM (West, 2010).
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**Literature Review**


Two levels of pedagogical operations:

Discursive level - learning is achieved through listening, reading, writing, discussing, communicating, debating, articulating, and presenting.

Experiential level - learning is achieved by doing, practicing, rehearsing, analyzing, testing, making, and building (constructing).
Literature Review

Action Research (AR) - Kurt Lewin (1946), a German psychologist, first coined the term ‘action research’ in his paper “Action Research and Minority Problems” (Lewin, 1946).

Originally, a methodology used to examine social problems through actions that led to social changes

Evolved and adopted by researchers for studying a diverse range of problems including teaching methods (Cohen, Manion, & Morrison, 2008).

One of AR’s underlying principles is the researcher as a member of the participants in the research process and that new knowledge is developed through actions or “doing” by the researcher.
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**Literature Review**

**Action Research & Pedagogy - Norton’s (2009)**

Pedagogical action research (PAR) - a cyclical process involving “spirals of reflection, planning, acting, observing and reflecting” (Norton, 2009, p. 55)

PAR’s 5-step iterative process:

1. Identifying a problem/paradox/issue/difficulty
2. Thinking of ways to tackle the problem
3. Doing it
4. Evaluating it (actual research findings)
5. Modifying future practice
Methodology - Research Design

Campbell and Stanley’s (1963) quasi-experiment: Pretest-post-test non-equivalent group design

Experimental (T) \( RO_1 \) \( \times \) \( O_2 \)
Control \( (C) \) \( RO_3 \) \( \circ \) \( O_4 \)

\( X \) represents the intervention
\( R \) random assignment to groups (Experimental (T) and Control)
\( O \) the process of observation or measurement

Note: In contemporary literature, Treatment (T) is preferred to Experiment (E).
Methodology – The Quasi-Experiment

A class of students taking the DMS Information Systems for Business (BUS017) course - invited to participate on a voluntary basis by the Research Assistant.

50% of all participants randomly assigned to Group T by the Research Assistant; remaining 50% to Group C. Non-participants (i.e. those who do not agree to participate) – assigned to Group C.

Based on a class-size of between 60 to 80 students, it is expected that Group T and Group C would comprise between 30 to 40 students, respectively.
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Methodology – Instrumentation

- **End-of-course results** collected and comparisons made between Group T and C.
- **Surveys** administered by the Research Assistant for all participants in Group T
- **Interviews** conducted by the Research Assistant for selected participants in Group T

**Purpose:** to determine the effectiveness of the intervention (X) as a result of Group T’s synchronous web-conferencing learning experience
Chi-squared test.

Null hypothesis (H0): there is no difference between the two proportions
Alternative hypothesis (H1): the two proportions are not the same

A chi-squared test statistics = 0.0076 was calculated with the critical value of the chi-squared test statistic of 3.841 obtained. Similarly, a p-value = 0.9350 > 0.05 was also obtained.

Conclusion: insufficient evidence to reject H0 in favour of H1 that the two groups are significantly different (i.e. no difference) with respect to the learning effectiveness as measured by whether students' success (i.e. passing the course) is attributable to a particular group (i.e. treatment or control).
Data Analysis – Survey $(n = 25)$

Multiple Regression Analysis (Revised Model)

A revised Multiple Regression Model with the following variables was performed:

- Learning Experience $(Y)$
- Application Sharing $(X_2)$

The Multiple Regression Model (revised) obtained:

$$Y = 3.210 + 0.400X_2$$
Data Analysis – Survey (n = 25) - Multiple Regression Analysis (Revised)

Conclusions (for revised model)

$R^2 = 0.338 \text{ (moderate)}$: 33.8\% of variation in $Y$ can be explained by $X_2$;

$R^2\text{ adj} = 0.278 \text{ (moderate)}$: 27.8\% is an improvement on the original model (25.8\%).

Global Test: sufficient evidence ($F = 5.614 > 3.44 \text{ (Critical Value)}$; $p$-value = 0.011 < 0.05) to reject $H_0$ that “at least one of the $\beta$’s is not zero”;

Individual Test:

$\beta_2 \text{ (t=2.740>2.0739; p-value=0.012<0.025)}$ – significant – sufficient evidence to reject $H_0$ ($\beta_2 = 0$)

Learning experience ($Y$) dependent on Application Sharing ($X_2$)
As for details of the **21 participants** present in Session (9 Oct 2011), they are shown on the Attendee List Report.
Information about session recordings (11 downloads) is shown by the Export Recording File Report and Recording Access Log.
**Discussion – Learning Analytics – Recording Access Log**

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Session (9Oct12) – recording viewed **11 times** (Export Recording File Report).

Session viewed by **7 participants**,
- 4 viewed one time (**4 downloads**)  
- 2 viewed twice (**4 downloads**)  
- one 3 times (**3 downloads**).
Discussion – Learning Analytics

Precise information about participants’ attendance and recording-viewing pattern available.

Better analyses of data on course results with accurate sample size.

Improved analysis of participants’ learning experience through targeted interviews.

Demonstrating value of learning analytics.
Conclusion

1) Introduced Research Topic
2) Discussed Literature Review
3) Explained Methodology
4) Performed Data Analysis
5) Discussed Learning Analytics
6) Limitations: lab-based intervention, single course/discipline, qualitative data (not included), single semester (for Oct12 so far).