

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

*by*

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

- Introduction
- Literature Review
- Methodology
- Data Analysis
- Discussion
- Conclusion

## **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).*

## Literature Review

### Pedagogy – Laurillard's (2002) Conversational Framework (Laurillard, 2002 & 2008)

*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.

## 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*

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## **Methodology - Research Design**

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

<i>Experimental (T)</i>	<i>RO<sub>1</sub></i>	<i>X</i>	<i>O<sub>2</sub></i>
<i>Control (C)</i>	<i>RO<sub>3</sub></i>		<i>O<sub>4</sub></i>

*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).*

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## **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*

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## Data Analysis – End of Course Results (Oct 12)

	Treatment	Control	Total
Pass	30 (97%)	34 (97%)	64 (97%)
Fail	1 (3%)	1 (3%)	2 (3%)
Total	31	35	66

### 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).*

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## **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<sub>2</sub>)*

*The Multiple Regression Model (revised) obtained:*

$$Y = 3.210 + 0.400X_2$$

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## **Data Analysis – Survey (n = 25) - Multiple Regression Analysis (Revised)**

### Conclusions (for revised model)

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

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

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

### *Individual Test:*

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

*Learning experience (Y) dependent on Application Sharing ( $X_2$ )*

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

## Discussion – Learning Analytics – Attendee List Report

Introduction  
Literature Review  
Methodology  
Data Analysis  
**Discussion**  
Conclusion



Close

### Attendee List

BUS8017 SYNCHRONOUS SESSION 1 TUE 9 OCT 12 11:30AM TO 3PM

Attendee	Attendee Name	Authentication	Is Chair	Is User	Launch Count	First Join	Last Leave	Total Active	Log(s)
1	Chih Seng	{Non-Chair Password}	No	No	1	2012-10-09 01:48 PM	2012-10-09 02:23 PM	00:35:24	<a href="#">View (1)</a>
2	Conan	{Non-Chair Password}	No	No	1	2012-10-09 01:41 PM	2012-10-09 02:26 PM	00:44:53	<a href="#">View (1)</a>
3	Elvy Sartika	{Non-Chair Password}	No	No	1	2012-10-09 01:48 PM	2012-10-09 02:25 PM	00:36:58	<a href="#">View (1)</a>
4	Ge Jian	{Non-Chair Password}	No	No	1	2012-10-09 01:27 PM	2012-10-09 02:28 PM	01:00:56	<a href="#">View (1)</a>
5	Germaine	{Non-Chair Password}	No	No	1	2012-10-09 01:40 PM	2012-10-09 02:24 PM	00:44:18	<a href="#">View (1)</a>
6	HAM	{Non-Chair Password}	No	No	1	2012-10-09 01:38 PM	2012-10-09 02:24 PM	00:46:21	<a href="#">View (1)</a>
7	Harshvardhan Karikwala	{Non-Chair Password}	No	No	1	2012-10-09 01:33 PM	2012-10-09 02:23 PM	00:50:08	<a href="#">View (1)</a>
8	Hasan Basri	{Non-Chair Password}	No	No	1	2012-10-09 01:31 PM	2012-10-09 02:25 PM	00:54:03	<a href="#">View (1)</a>
9	Hui Xin	{Non-Chair Password}	No	No	1	2012-10-09 01:44 PM	2012-10-09 02:24 PM	00:39:18	<a href="#">View (1)</a>
10	Imaculata Putri	{Non-Chair Password}	No	No	1	2012-10-09 01:38 PM	2012-10-09 02:25 PM	00:46:46	<a href="#">View (1)</a>
11	Jeky	{Non-Chair Password}	No	No	1	2012-10-09 01:40 PM	2012-10-09 02:25 PM	00:44:20	<a href="#">View (1)</a>
12	Jenny	{Non-Chair Password}	No	No	1	2012-10-09 01:47 PM	2012-10-09 02:26 PM	00:38:41	<a href="#">View (1)</a>
13	Jon	{Non-Chair Password}	No	No	1	2012-10-09 01:58 PM	2012-10-09 02:24 PM	00:25:36	<a href="#">View (1)</a>
14	Kausi	{Non-Chair Password}	No	No	1	2012-10-09 01:23 PM	2012-10-09 02:25 PM	01:01:29	<a href="#">View (1)</a>
15	Leonard	{Non-Chair Password}	No	No	1	2012-10-09 01:58 PM	2012-10-09 02:23 PM	00:25:24	<a href="#">View (1)</a>
16	Mr Yeung	{Invitee UID}	Yes	Yes	1	2012-10-09 01:06 PM	2012-10-09 02:22 PM	01:16:08	<a href="#">View (1)</a>
17	Yandi	{Non-Chair Password}	No	No	1	2012-10-09 01:55 PM	2012-10-09 02:25 PM	00:29:55	<a href="#">View (1)</a>
18	cheryl	{Non-Chair Password}	No	No	1	2012-10-09 01:28 PM	2012-10-09 02:25 PM	00:56:05	<a href="#">View (1)</a>
19	fenny	{Non-Chair Password}	No	No	1	2012-10-09 01:23 PM	2012-10-09 02:25 PM	01:02:45	<a href="#">View (1)</a>
20	Ikertini	{Non-Chair Password}	No	No	1	2012-10-09 01:42 PM	2012-10-09 02:25 PM	00:42:41	<a href="#">View (1)</a>
21	seelsuen	{Non-Chair Password}	No	No	1	2012-10-09 01:46 PM	2012-10-09 02:25 PM	00:39:23	<a href="#">View (1)</a>

As for details of the **21 participants** present in Session (9 Oct 2011), they are shown on the Attendee List Report.

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## Discussion – Learning Analytics – Export Recording File Report

Blackboard collaborate

My Schedule | My Recordings | Profile | Utilities | Reports | Software | Logout

Export Recording File

Previous | Sort/Filter | All | None | CSV Export Summary | CSV Export Details

2 of 3 (45 items) | First | Prev | Next | Last

Room Name	File Name	Created	Size (MB)	Attendees	Requests	Downloads
BUS017 SYNCHRONOUS SESSION 1 TEST	2012-04-04_1940.M.65F8508E08E1C92480C967549	2012-04-05 10:34 AM	14.5485	2	12	8
BUS017 SYNCHRONOUS SESSION 1 THU 5	2012-04-04_2308.M.80B213A229CD7BE3B5ADE034	2012-04-05 07:11 PM	6.6869	76	15	8
BUS017 SYNCHRONOUS SESSION 1 TUE 9	2012-10-08_2306.M.E9FB0634293B2AEEA8EA978A	2012-10-09 02:30 PM	49.0622	21	16	11
BUS017 SYNCHRONOUS SESSION 2 TEST	2012-10-16_1932.M.7264A7051407F2718E39581E9	2012-10-16 10:01 AM	31.0032	2	2	1
BUS017 SYNCHRONOUS SESSION 2 TEST	2012-10-14_2054.M.454E7B80A3A1928F45802384F	2012-10-15 11:31 AM	0.4937	1	0	0
BUS017 SYNCHRONOUS SESSION 2 TEST	2012-10-14_2133.M.454E7B80A3A1928F45802384F	2012-10-16 12:03 PM	47.4001	2	2	1
BUS017 SYNCHRONOUS SESSION 2 TEST	2012-04-11_1923.M.DE76727E368D11DAB429068B0	2012-04-12 09:45 AM	7.375	2	10	4
BUS017 SYNCHRONOUS SESSION 2 THU 1	2012-04-11_2149.M.54033BC20484EEFFB38662D0C	2012-04-12 02:35 PM	7.706	48	14	7
BUS017 SYNCHRONOUS SESSION 2 TUE 1	2012-10-15_2250.M.370A032870F4EAFB4CB047DF	2012-10-15 03:19 PM	51.2000	28	8	6
BUS017 SYNCHRONOUS SESSION 3 LAB 2	2012-01-18_2207.M.B792CE50C3C40D34529E98FD	2012-01-19 02:32 PM	6.3756	16	4	2
BUS017 SYNCHRONOUS SESSION 3 TEST	2012-10-17_1929.M.691483D3789A7B97752EE8921	2012-10-18 09:42 AM	20.2637	2	0	0
BUS017 SYNCHRONOUS SESSION 3 THU 1	2012-10-16_0016.M.D4AFC4E4CC15D8361B77D134	2012-10-16 02:45 PM	17.7612	3	7	5
BUS017 SYNCHRONOUS SESSION 3 WED 1	2012-04-17_2149.M.00F4071F0BDE588B925BD7DF	2012-04-18 02:41 PM	3.5968	31	5	3
BUS017 SYNCHRONOUS SESSION 4 THU 1	2012-04-18_2148.M.D579F00A71B9374E0EA1221CA	2012-04-19 02:47 PM	3.2435	42	5	3
BUS017 SYNCHRONOUS SESSION 4 TUE 2	2012-10-22_2218.M.DA4138CAB2234484185FF869D	2012-10-23 02:43 PM	51.3714	12	17	9
BUS017 SYNCHRONOUS SESSION 6 TEST	2012-05-07_1909.M.6180B94CE85F0802679CD9926	2012-05-08 09:31 AM	4.2999	2	3	2
BUS017 SYNCHRONOUS SESSION 6 TUE 3	2012-10-28_2327.M.374D0579173CE1B9CADD9F10	2012-10-30 02:45 PM	28.2641	17	5	3

Information about session recordings (11 downloads) is shown by the Export Recording File Report and Recording Access Log.

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## Discussion – Learning Analytics – Recording Access Log

Room Name	Owner Name	Created	Size (MB)	Requested	Downloaded	IP Address
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	09/10/2012 15:05	UNINITIALIZED	202.172.246.7	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	09/10/2012 15:06	09/10/2012 15:06	202.172.246.7	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	09/10/2012 15:57	UNINITIALIZED	202.172.246.7	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	09/10/2012 15:57	09/10/2012 15:57	202.172.246.7	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	11/10/2012 13:23	11/10/2012 13:23	202.172.246.7	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	14/10/2012 23:25	14/10/2012 23:27	222.165.97.89	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	14/10/2012 23:29	14/10/2012 23:32	58.182.53.37	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	14/10/2012 23:49	UNINITIALIZED	58.182.53.37	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	14/10/2012 23:53	14/10/2012 23:54	58.182.53.37	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	16/10/2012 0:26	UNINITIALIZED	182.55.169.10	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	16/10/2012 0:26	16/10/2012 0:32	182.55.169.10	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	16/10/2012 20:19	16/10/2012 20:20	121.7.224.147	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	14/11/2012 11:39	14/11/2012 11:40	42.61.33.156	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	15/11/2012 11:21	15/11/2012 11:21	42.61.33.156	
BUS017 SYNCHRONOUS SESSION 1 TUE 9OCT12 11:MR_YEUNG	09/10/2012 14:30	48.0062	26/11/2012 10:34	26/11/2012 10:35	203.2.35.163	
BUS017 SYNCHRONOUS SESSION 2 TUE 16OCT12 1:MR_YEUNG	16/10/2012 15:19	51.2066	17/10/2012 10:05	17/10/2012 10:06	202.172.246.7	
BUS017 SYNCHRONOUS SESSION 2 TUE 16OCT12 1:MR_YEUNG	16/10/2012 15:19	51.2066	17/10/2012 12:32	UNINITIALIZED	42.61.33.131	
BUS017 SYNCHRONOUS SESSION 2 TUE 16OCT12 1:MR_YEUNG	16/10/2012 15:19	51.2066	17/10/2012 12:32	17/10/2012 12:32	42.61.33.131	

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)** while **one 3 times (3 downloads)**.

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## **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.*



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## **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).*