Virtual Classroom Simulation:

Design and Trial in a Preservice Teacher Education Program

A thesis submitted by

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for the degree of Doctor of Philosophy

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Appendix A.

Software and Resources

Below is a list of software, tools and resources used in the development, testing, data collection, analysis and reporting of this research.

A.1. Operating Systems

The final version of the VCS has been successfully tested on the following operating systems using the Java Runtime Environment and Java Development Kit, version 6.

Microsoft Windows 2000 Used for development and testing.

Microsoft Windows XP Tesed only, no development work.

Microsoft Windows Vista Used for development and testing.

Microsoft Windows 7 Tested only, no development work.

Sabayon Linux Tested only, no development work.

Ubuntu Linux Tested only, no development work.

* An earlier version of the VCS was successfully tested on the Apple Mac OSX. The current version has, however, not been tested on this platform.

A.2. For Software Development

A.2.1. Platforms

Apache Derby (Java DB) An open source relational database implemented entirely in Java. Java DB is Sun Microsystem's supported distribution of Apache Derby and is now included in the Java Development Kit. The VCS uses Apache Derby for data storage and retrieval.
© 2004-2007 Apache Software Foundation.
http://db.apache.org/derby/
http://developers.sun.com/javadb/

Java Technology The VCS was developed on the Java 2 Platform, Standard Edition (Java 2SE)[1], using the Java programming language. The VCS is compatible with the Java Runtime Environment 6 (JRE 6).
© 1994-2008 Sun Microsystems, Inc.
http://java.sun.com/

A.2.2. Applications

NetBeans 5/6 An open source Integrated Development Environment for software developers. Through an informal, though quite extensive, evaluation of a number of free IDEs for Java programming, NetBeans was chosen by the researcher as the most suitable IDE for VCS development.
© 1997-2008 Sun Microsystems Inc.
http://www.netbeans.org/

SQL Workbench/J, Build 102 A free DBMS-independent database tool used extensively to create and test various SQL syntax for VCS tables, as well as for probing VCS data output.
© 2002-2007 Thomas Kellerer.
www.sql-workbench.net/

Microsoft Notepad For all kinds of development work in plain text (e.g. PHP,

---

[1]From December 2006, version upgrade to Java SE 6

HTML, XML, SQL, LISREL scripts, etc.).
© 2007 Microsoft Corporation.
http://www.microsoft.com/

A.2.3. Libraries and Modules

The VCS employs a number of free (most open source) 3rd party libraries and modules.

Flexdock An open source Java docking framework for Java Swing applications. The Flexdock library used in the VCS for flexible panel layouts was provided as part of the SyntheticaAddons package.
https://flexdock.dev.java.net/

Modern Heap View The VCS makes use of Scott Violet's source code for a Modern Heap View module (the component on the status bar displaying memory usage).
© 2006 Scott Violet.
http://weblogs.java.net/blog/zixle/archive/2006/06/modern_heap_vie.html

JFreeChart An open source Java chart library for displaying professional quality charts. The results charts in the VCS were created using this library.
© 2005-2008 Object Refinery Limited.
http://www.jfree.org/jfreechart/

SwingX Contains extensions to the Swing GUI toolkit, including new and enhanced components that provide functionality commonly required by rich client applications. The VCS makes use of a few components included in the SwingX library provided by the SyntheticaAddons package.
https://swingx.dev.java.net/

Synthetica A 'Look and Feel' for Java Swing. The VCS facilitates access to a number of Look and Feels provided by Synthetica and SyntheticaAddons.
© 2004-2008 JAVASOFT Software Engineering.
http://www.javasoft.de/jsf/public/products/synthetica/

SyntheticaAddons Provides additional components, UI-delegates and Painters for
Swing, the SwingX project and for JIDE components. The provided
components are either completely build from the scratch or based on SwingX
(e.g. Flexdock). Each component comes along with its own look for every
available Synthetica theme. The SyntheticaAddons package includes libraries
for the following: Flexdock, Apache Commons Logging, SwingWorker and
SwingX.
© 2004-2008 JAVASOFT Software Engineering.
http://www.javasoft.de/jsf/public/products/syntheticaaddons

A.3. For Data Collection, Analysis and Reporting

A.3.1. Data Collection

LimeSurvey 1.70+,_Build 4470 Survey data for this study was collected using
LimeSurvey, an open source survey application implemented for online use in
the PHP scripting language (and using MySQL). Features export to many
formats commonly used for statistical data analysis (e.g. CSV, XSL, SAV).
The application was installed, configured, styled, hosted and administered
solely by the researcher.
© 2008 LimeSurvey Team, represented by Carsten Schmitz.
http://www.limesurvey.org/

VertrigoServ A small and flexible install package for the Windows platform
consisting of Apache HTTP server, PHP, MySQL and PhpMyAdmin (tool
written in PHP intended to handle the administration of MySQL). Used in
this study for local testing and evaluation of several online survey
applications, including LimeSurvey.
© 2004-2008 Dariusz Handzlik.
http://vertrigo.sourceforge.net/

Opera A free Internet web browser that has been particularily useful for this
study with regards to preparing online material (Opera Dragonfly provides
debugging and inspection tools for JavaScript, CSS, HTML, etc) for use in

data collection.

© 1995-2008 Opera Software ASA.

http://www.opera.com/

WinSCP An open source SFTP client and FTP client for Windows. Facilitates safe copying of files between a local and a remote computer. Used in this study for deploying LimeSurvey onto two separate servers.

© 2000-2008 Martin Přikryl.

http://winscp.net/

A.3.2. Data Analysis and Mining

ACER ConQuest A computer program for fitting item response (Rasch) and latent regression models. License held by the University of Adelaide.

© 1998-2008 Australian Council for Educational Research (ACER).

http://shop.acer.edu.au/acer-shop/group/CON2

LISREL 8.80 Structural equation modeling (SEM) software. In this research study, LISREL was used in the SEM of VCS HCI Survey data. License held by the University of Adelaide.

© 2007 Scientific Software International Inc.

http://www.ssicentral.com/

Microsoft Excel 2002/2007 Original format for containing survey data (default export format from LimeSurvey). Usually exported into more specialised software for further analysis (e.g. RapidMiner, SPSS, SPSS Text Analysis for Surveys). The software was also used to test some algorithms used in the VCS. Licenses held by the researcher and the University of Adelaide.

© 1983-2001 Microsoft Corporation.

http://www.microsoft.com/

RapidMiner 5.0 Software system for data mining using nestable operators. Very useful in this study for mining qualitative data using the Text Processing Extension. Open source (community edition) license.

© 2001-2010 Rapid-I and contributors.

http://www.rapid-i.com/

SPSS Text Analysis for Surveys 2.1 Software for qualitative analysis that allows for coding of data and identification of themes. Also used in this study to quantify text responses for analysis with other quantitative survey data in SPSS. License held by a colleague.

© 2008 SPSS Inc.

http://www.spss.com/

SPSS 16 and 17 Software for statistical data analysis. Used extensively in this study, mostly for descriptive statistics. License held by the University of Adelaide.

© 2008 SPSS Inc.

http://www.spss.com/

A.3.3. Reporting

CutePDF A virtual printer software for saving documents in the Portable Document Format (PDF).

© 2008 Acro Software Inc.

http://www.cutepdf.com/

LyX 1.6.2 An open source document processor for the advanced typesetting system named LATEX. LyX was the document processor used for writing this thesis, while MiKTEX provided the underlying typesetting system.

© 1995 Matthias Ettrich, 1995-2008 LyX Team.

http://www.lyx.org/

MiKTEX An open source, always up to date, typesetting system for the Windows operating system which includes TEX, pdfTEX and XeTEX.

© 2008 Christian Schenk.

http://www.miktex.org/

JabRef 2.4 JabRef is an open source bibliography reference manager. The native file format used by JabRef is BibTEX, the standard LATEX bibliography format.

© 2008.

http://jabref.sourceforge.net/

OpenOffice.org An open source office suite. *Impress* (for presentations) and *Calc* (for spreadsheets) were particularily useful in this study.

© 1995-2007 Sun Microsystems Inc.

http://www.openoffice.org/

Microsoft PowerPoint 2002/2007 Standard format used for a number of presentations and information sessions throughout the candidature. Some graphical components used in the thesis and other reports were created using PowerPoint's 'SmartArt' feature. Licenses held by the researcher and the University of Adelaide

© 1983-2001 Microsoft Corporation.

http://www.microsoft.com/

Microsoft Word 2002/2007 Word processing software. Mainly used where compatibility concerns were an issue, such as file format for article submissions, but also useful when making shorter document handouts etc. Licenses held by the researcher and the University of Adelaide

© 1983-2001 Microsoft Corporation.

http://www.microsoft.com/

Adobe Reader 9 Free software for viewing PDF documents.

© 2008 Adobe Systems Inc.

http://www.adobe.com/

A.4. For Graphical Representation

Adobe Illustrator CS3 Vector-based computer drawing tool. Mainly used for creating scalable diagrams for inclusion in this thesis.

© 1987-2007 Adobe Systems Inc. License held by the researcher.

http://www.adobe.com/

Adobe PhotoShop CS3 Graphics editing program used extensively in this study for several purposes, e.g. adding hair to student faces created in FaceGen Modeller. License held by the researcher.
© 1987-2007 Adobe Systems Inc.
http://www.adobe.com/

FaceGen Modeller Provides an easy way to create realistic 3D human faces. The evaluation version, which was used in this study, has the full functionality of the paid version, except for exporting to external 3D formats and displaying the 'SI' logo on the forehead.
© 2007 Singular Inversions Inc.
http://www.facegen.com/

Google SketchUp Google SketchUp allows you to easily create 3D models. It was used for creating the introductory classroom sketch displayed in the VCS main window prior to starting the simulation.
© 2007 Google Inc.
http://sketchup.google.com/

A.5. Other

A.5.1. Utilities

7-Zip An open source Windows utility for archives which supports most common formats (e.g. zip, gzip, rar, tar). Since many tools and resources are provided in archived formats, 7-Zip has been invaluable in this study.

A.5.2. Icons

Carpicon The VCS software includes some icons by Lothar Grimme, Carpicon.
© 2006 Lothar Grimme.
http://www.carpicon.com/

Crystal Clear The VCS software includes some icons from the Crystal Clear Icon package by Everaldo Coelho.

© 2005 Everaldo Coelho.

http://www.everaldo.com/

Icon-King The VCS software includes some icons by David Vignoni, a.k.a. Icon-King.

© 2003-2006 David Vignoni.

http://www.icon-king.com/

nuoveXT The VCS software includes some icons from the nuoveXT Icon Package by Alexandre Moore.

© 2005-2007 Alexandre Moore.

http://nuovext.pwsp.net/

Appendix A. Software and Resources

Appendix B.

VCS Virtual Students
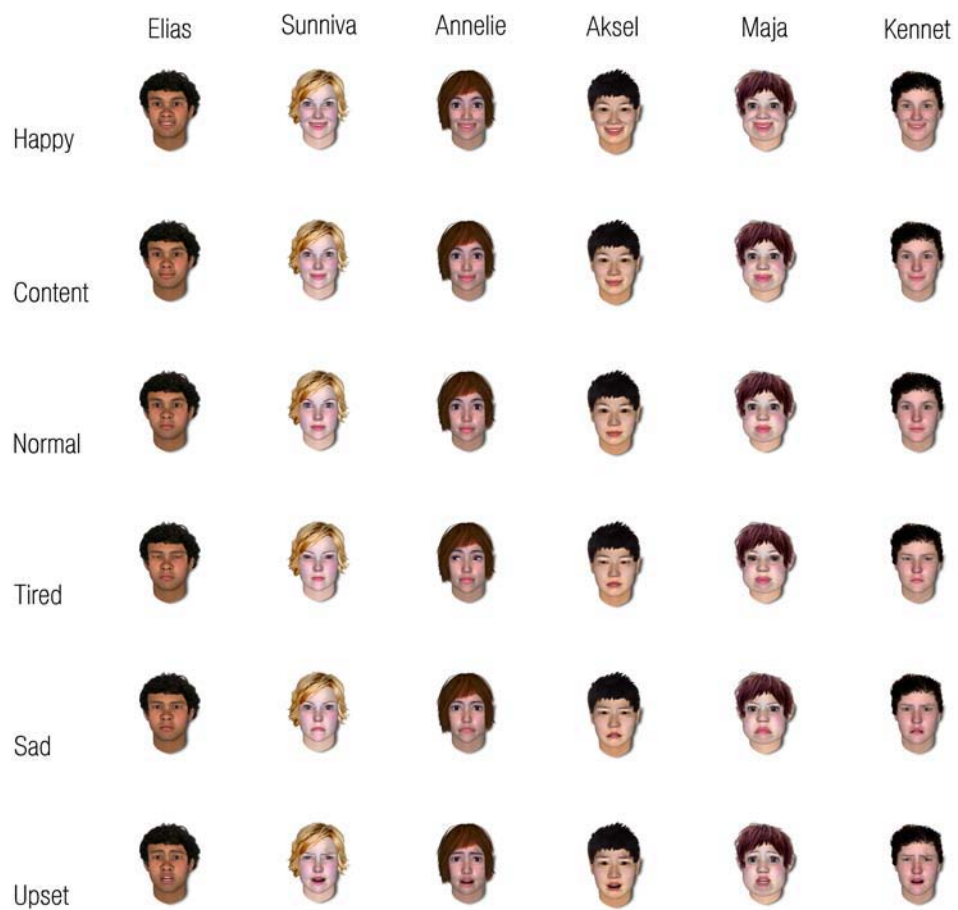
See Figure B.1 for the six virtual students and their associated mood states.

Figure B.1.: VCS Students' Mood States

Appendix B. VCS Virtual Students

Appendix C.

Email Correspondence With a Professor From a Technology Institute in Sweden

Below is a complete transcript of the email correspondence with a Professor from an Institute of Technology in Sweden. A translation of his response is included at the end of the transcript. Parts of the transcript have been replaced with `**REMOVED**` to protect the individual's identity.

```
Subject: RE: Computer Simulation
From: **REMOVED**
Date: Tue, 21 Feb 2006 21:25:13 +0100
To: 'Simon Skrodal' <simon.skrodal@adelaide.edu.au>

Hej Simon!

Ditt projekt verkar vara mycket komplext (vilket både är bra och dåligt). Jag
    känner tyvärr inte till något verktyg eller plattform som skulle kunna hjälpa
    dig...

Kommer du även att utveckla ett avancerat grafisk gränsnitt (GUI)? I så fall kan
    det blir lika svårt som själva simulatorn...

Lycka till!
Med vänlig hälsning,
** REMOVED **
-------------------------------------------------------------
Professor **REMOVED**                   Tel: +46 **REMOVED**
** REMOVED ** Institute of Technology   Mobile: +46 **REMOVED**
Department of Systems & Software Eng.    Fax: +46 **REMOVED**
** REMOVED **, Sweden                    www: **REMOVED**
```

```
-------------------------------------------------------------
-----Original Message-----
From: Simon Skrodal [mailto:simon.skrodal@adelaide.edu.au]
Sent: den 21 februari 2006 03:24
To: **REMOVED**
Subject: Computer Simulation
```

Dear Mr. **REMOVED**,

I have just started a Ph.D. in the field of computer simulation, and my project is aimed at building a 'Virtual Classroom Simulation'. My intention is to create a tool that will train and prepare prospective teachers, much like a flight simulator helps train pilots... I.e. better to crash in the simulation than in the classroom.

In other words, my ultimate goal is to create a virtual classroom in which the user (teacher) can execute and receive feedback on different teaching techniques based on the attributes of the virtual students. For example, a group of 20 students will comprise of individuals of varying knowledge, motivation, participation, confidence, impairments etc. etc. We have a list of ~100 student and environmental factors that we hope to incorporate in the tool.

Searching for relevant research and readings online, I came across a few of your papers. In particular, I found your 2002 article '**REMOVED**' (from the Journal of **REMOVED**) to be highly informative and relevant to the field I'm in. I believe that my simulation will have to deal with the fusion of the three components you mention, alas ABSS.

My background is in the field of computer science, but I am now situated in the Graduate School of Education, working together with educationalists (Social Sciences) on building this tool. They provide the educational theories, and my job is to build the simulation. I suppose it is no secret that I write to you not only to thank you for your great work, but also to get some advice on where I should head from here. With so many open source architectures and platforms out there that deal with simulation and agents, and so many contradictive definitions on what constitutes an Agent, for example, it is a little daunting to take the plunge.

I was hoping that you might have a few minutes to share your thoughts on the above, and perhaps recommend relevant literature, software and whatever else that comes to mind. I have read up on and reviewed several OS simulation/agent architectures, and the more I read, the more confused I get. It appears none of these deal with interactiveness (human in the loop) as well as cater for real-time execution. The comparison I made between the Virtual Classroom and a flight simulator is quite appropriate, since the interaction and time factor is the same for both. But what architecture/platform would be appropriate for this type of simulation? Perhaps the best thing would be to start from scratch?

I realise that you might not have the capacity to respond to my enquiry, so all apologies for disturbing your day, and my gratitude for your time.

```
Kind Regards
Simon Skrødal

PS! I did notice that you're working in Sweden, and your surname is certainly of
    Swedish descent, but I resisted writing to you in Norwegian since all text on
    the University (and your) site was in English... If you are indeed Swedish,
    feel free to suggest any Scandinavian resources as well.
--
Simon Skrødal
School of Education
The University of Adelaide, AUSTRALIA 5005
Ph : +61 8 8303 7196
Fax : +61 8 8303 3604
e-mail: simon.skrodal@adelaide.edu.au
```

Translation

Hello Simon!

Your project seems to be very complex (which can be both good and bad).
Unfortunately I do not know of any tool or platform that could help you...

Will you develop an advanced graphical user interface as well? If so that
could be just as difficult as the simulation itself...

Good luck!
Kind Regards,
REMOVED

Appendix C. Email Correspondence With a Professor From a Technology Institute in Sweden

Appendix D.

Email Correspondence With an A/Prof From a University in the USA

Below is a complete transcript of the email correspondence with an Associate Professor from the School of Computer Science at a University in Florida, USA. Parts of the transcript have been replaced with `**REMOVED**` to protect the individual's identity.

```
Subject: Re: Classroom Simulation System
From: **REMOVED**
Date: Tue, 20 Jun 2006 08:43:09 -0400
To: Simon Skrodal <simon.skrodal@adelaide.edu.au>

Simon

Interesting - actually, this classroom simulator was given as a term project in my
    undergraduate software engineering class. I haven't formally published anything
     about it, please give me a citation if you do.

Simon Skrodal wrote:

Dear Mr. **REMOVED**,

Greetings from the University of Adelaide, Australia. I am currently in the early
    stages of a PhD research study involving the development of a computer
    simulation. I got your details from my supervisor, Dr. Sivakumar Alagumalai,
    who picked up a conference paper of yours entitled **REMOVED**. Having searched
     through your list of publications and your resume, I have yet to find any more
     details on this paper, or anything related to it. I am curious to learn more
    about your research in this area, as my own study also involves a classroom
```

```
    simulation.

It would be much appreciated if you could tell me more about the study and/or
    redirect me to other researchers in the same field.

Thank you for your time.
Kind Regards , Simon


--
Simon Skrødal
School of Education
The University of Adelaide , AUSTRALIA 5005
Ph : +61 8 8303 7196
Fax : +61 8 8303 3604
e-mail: simon.skrodal@adelaide.edu.au
```

Appendix E.

Email Correspondence with J-Sim Developer

Below is a complete transcript of the email correspondence with Jaroslav Kačer, the main developer of the J-Sim simulation framework architecture.

```
Subject: Re: J-Sim
From: Jaroslav Kacer <**REMOVED**>
Date: Mon, 12 Feb 2007 19:36:05 +0100
To: Simon Skrodal <simon.skrodal@adelaide.edu.au>


Hello Simon!

--< Simon Skrodal wrote:
First of all, thanks for the great work on J-Sim. I have read through all
    documentation, and played around with creating some simple simulations, and J-
    Sim is very intuitive, powerful and easy to get started with.
-->


Thank you

--< Simon Skrodal wrote:
I was hoping that you would be able to give me some advise on the following:
**
I am planning to program a combined discrete -and continuous social simulation
    where the user can interact with 'agents' real time. These agents are humans
    with their own set of behaviours, desires and intentions - a bit similar to the
     Sims. The simulation is real-time and continuous in that these human agents
    change state continuously over time, even when there is no interaction from the
     user.I do not wish to bother (or bore) you with details, but in your opinion,
    would J-Sim be suitable for such a simulation?

I presume I would have to add a few modules to make it meet my requirements?
-->
```

Well, not J-Sim alone. I think you are creating a kind of distributed simulation
    which J-Sim is not designed for. Moreover, there is a discrete-model-time part
    and a real-time part. Not easy at all, I would say.

Some years ago, US DoD created a standard for distributed and heterogenous
    simulation, called "High Level Architecture". There is also an IEEE standard
    for it.I supervised a master's thesis that should adapt J-Sim for HLA to allow
    it to be used for distributed simulation too. There was a problem to find a
    free RTI (Runtime Infrastructure) for HLA that could be used. Finally we found
    XRTI, developed at a US Navy school: http://www.npsnet.org/~npsnet/xrti/ (Just
    now it seems to be down.)

Unfortunately even some fundamental parts were missing and the student had to
    implement them, so the whole thesis took him 2 years. Here is the result: http
    ://www.j-sim.zcu.cz/Download/DistributedSimulationWithJSim-HLA.ZIP The ZIP also
     contains XRTI with all modifications made by my student. We haven't
    contributed the modifications back but I'd like to do that if someone at the
    school is interested. If you decide to go the HLA way, I can provide you with a
     few useful links. I also had a nice book on HLA back at school.

--< Simon Skrodal wrote:
Also, J-Sim runs in text or GUI mode, but is the implementation of a custom GUI
    catered for (i.e. not using the provided GUI)?
-->

Unfortunately not (yet). You can only re-implement the way how an object (process,
    queue, ...) is displayed but the main GUI window stays the same. I already
    wanted to redesign the GUI and take some code from the core classes to achieve
    looser binding but unfortunately I haven't had time yet. Don't hesitate to
    write me again or to contact me via the Support mailing list if you have some
    questions.

Good Luck! Jarda Kacer
--
Jaroslav Kacer
Kacer.BIZ

Smolnice, Czech Republic, EU
Phone: +420.**REMOVED**
Mail: mailto:**REMOVED**
Web: http://www.kacer.biz
Skype ID: **REMOVED**

Appendix F.

VCS Results Help Dialog

The help dialog (see Figure F.1) for the VCS Results Window is accessible from the `Help` menu in the VCS Results Window. It is capable of displaying hypertext documents, useful for styling and inclusion of screenshots. The content of the help document is listed in Figures F.2, F.3 and F.4.
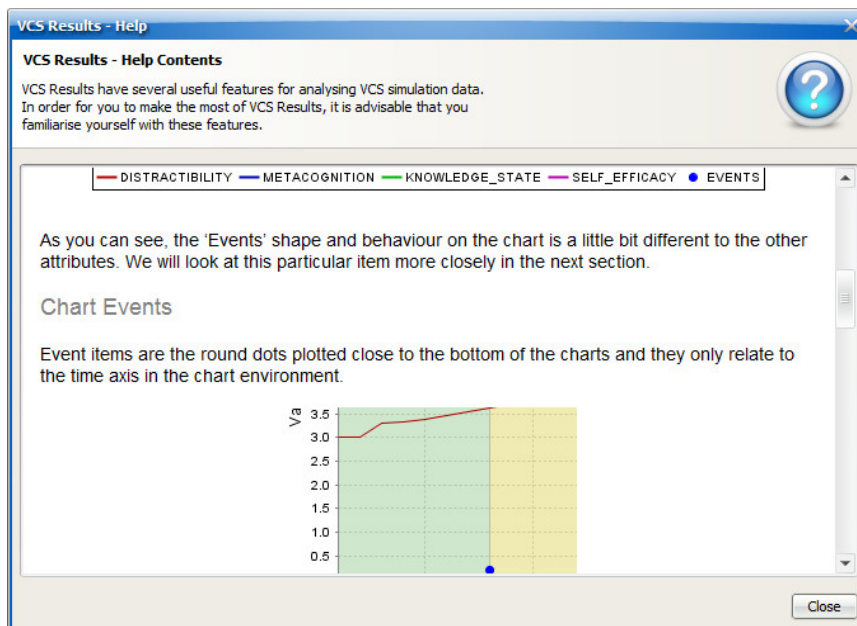

Figure F.1.: VCS Results Help Dialog

Introduction

VCS Results (VCS-R) is an add-on for the Virtual Classroom Simulation (VCS). VCS-R processes data sets from a VCS simulation output and presents it in a format much easier to read and analyse than numerical information. Basically, it churns through massive amounts of digits from a simulation run and plots this data onto charts (one chart per student).

Even at first glance, you would probably agree that it is quite straightforward to read the charts. Each student chart plots a selection of essential attributes that were subject to change in the VCS run. The legend describes what these attributes are, and the axes give a clear indication of the correlation between time and value.

However, the charts themselves have several handy inbuilt features that will make your data analysis experience straightforward and more efficient. Some of these features are not obvious, so it might pay off to at least quickly skim through this document before you return to looking at your results.

The Legend

If you have ever looked at a chart before, the legend is probably not a stranger to you. The VCS-R legend (see screenshot below) clearly labels each coloured line to its corresponding student attribute.
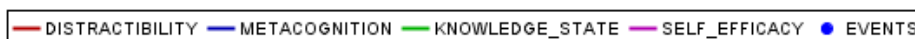
As you can see, the 'Events' shape and behaviour on the chart is a little bit different to the other attributes. We will look at this particular item more closely in the next section.

Chart Events

Event items are the round dots plotted close to the bottom of the charts and they only relate to the time axis in the chart environment.
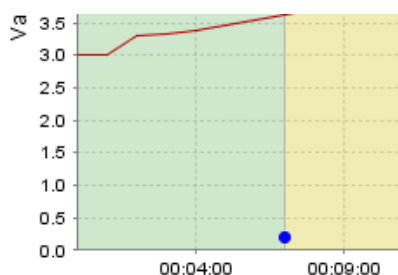
The event item has a very important function when analysing the charts, because it contains textual information about what type of action (i.e. question asked to class, student x gave an incorrect answer etc.) was made at a specific point in time. This could be very useful as it may explain the change in attribute values.

Figure F.2.: VCS Results Help File, Page 1

To display the information contained in an event item, simply hover your mouse pointer over the circle. The event description will then appear in the status bar, as shown below.
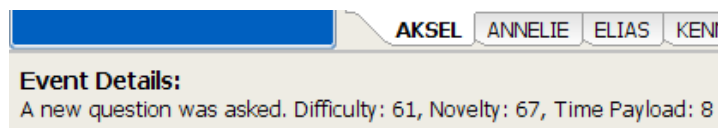
## The Chart Background (Event States)

You may also have noticed that the chart background colour changes as the graphs travels along the time axis. Just like chart event items, this is another type of visual information which may aid in explaining why student attributes changes at particular points in time.
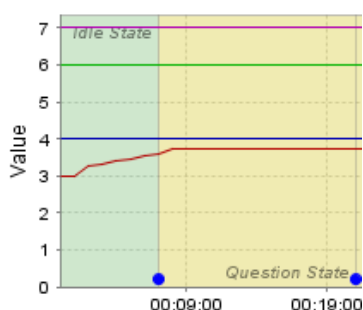
The colour highlighting signifies different *event states* of the simulation, where each event state has a different colour and a label (i.e. Idle State and Question State). Changes in student attribute values are affected by what state the simulation is in – for example; a long lasting idle state will have a great impact on Student Distractibility.

Interactive Charts (Zoom)

Did you know that the VCS-R charts are interactive? You can zoom in at any level of the charts to see the attribute changes in more detail. To zoom, hold down the left mouse button and drag rightwards and downwards to highlight the rectangular area you wish to zoom in on.
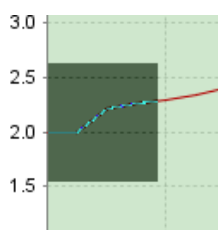
To zoom back out to see the entire chart, left click and drag upwards or leftwards. You can also right-click on the chart and play with the zooming options.

Figure F.3.: VCS Results Help File, Page 2

Other Features

The menu bar and left-side menu items offers other useful options for your chart.

- Save As...: Select to save the displaying chart as an image file.
- Print...: Prints the displaying chart.
- Properties...: Allows you to edit chart colours and titles.
- Hide chart tabs: Hides the student tabs at the bottom of the chart.
- Hide/show series: Allows you to hide/show individual attribute lines on the chart.
- Set line width: Changes the width of the graph lines.
- Student Details Menu Pane: Click on a student name for more information.

Figure F.4.: VCS Results Help File, Page 3

Appendix G.

VCS About Dialog

The about dialog for the VCS application, which provides copyright information, software version number, contact details and credits, is accessible from the ▷ Help menu in the VCS main window. Much of the information in the 'About' tab is contained in a hypertext document, the content of which is displayed in Figures G.1 and G.2.

VCS :: Virtual Classroom Simulation
Preservice teacher training simulator
Prototype Version 0.3.8 ALPHA

Simon Skrødal
EduPEx Pty Ltd

simon.skrodal@edupex.com
http://www.edupex.com/vcs/

Synthetica Versions

Synthetica Version: 2.6.0 Build 48
SyntheticaAddons Version: 0.9.5 Build 2
Theme: Synthetica BlueMoon Look and Feel, Version: 2.4.0 Build 4

Java DB (Derby) Details

Product Name: Apache Derby
Version: 10.2.2.0

People

Developer:
Simon Skrødal
Supervisors Education:

- Sivakumar Alagumalai
- Michael J. Lawson

Supervisors Computer Science:

- Paul Calder
- Andrew Wendelborn

Special Thanks To:

- Francisco Ben
- Alan Larkin
- Nina Maadad
- Rikki Skrødal

Figure G.1.: VCS About Dialog Information, Page 1 of 2

Third Party Components

FlexDock
https://flexdock.dev.java.net
This application makes use of the flexdock package which is distributed under the MIT (Massachusetts Institute of Technology) License.
See http://www.opensource.org/licenses/mit-license.php

JFreeChart and JCommon
http://www.jfree.org/jfreechart/ and http://www.jfree.org/jcommon/
This application makes use of the JFreeChart and JCommon packages which are distributed under the LGPL (Lesser General Public License).
See http://www.gnu.org/licenses/lgpl.txt

Jide Common Layer
http://www.jidesoft.com/products/oss.htm
This application makes use of the Jide Common Layer package which is distributed under the GPL (General Public License) with classpath exception.
See http://www.gnu.org/licenses/gpl.txt and http://www.gnu.org/software/classpath/license.html

Modern Heap View
http://weblogs.java.net/blog/zixle/
This application makes use of Scott Violet's Modern Heap View component which is distributed under the Creative Commons License.
See http://creativecommons.org/licenses/by-nc-sa/2.0/

SwingX
https://swingx.dev.java.net
This application makes use of the swingx package which is distributed under the LGPL (Lesser General Public License).
See http://www.gnu.org/licenses/lgpl.txt

Synthetica
http://www.javasoft.de
This application makes use of the Synthetica package and the Synthetica Look and Feels under JavaSoft's non-commercial license agreement.
See http://www.javasoft.de/jsf/public/products/synthetica/license/

SyntheticaAddons
http://www.javasoft.de
This application makes use of some SyntheticaAddons components under JavaSoft's non-commercial license agreement.
See http://www.javasoft.de/jsf/public/products/syntheticaaddons/license/

Third Party Icons

Everaldo
http://www.everaldo.com
This application makes use of some icons from the Crystal Clear Icon package which is distributed under the LGPL (Lesser General Public License).
See http://www.gnu.org/licenses/lgpl.txt

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Figure G.2.: VCS About Dialog Information, Page 2 of 2

Appendix H.

Ethical Approval

The Virtual Classroom Simulation study was approved by the Human Research Ethics Committee of the University of Adelaide on 11 October 2006. This approval was valid for a one year period only and was therefore renewed on 8 October 2007 (see attached document on page 328).

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

RESEARCH BRANCH
RESEARCH ETHICS AND COMPLIANCE UNIT

SABINE SCHREIBER
SECRETARY
HUMAN RESEARCH ETHICS COMMITTEE
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CRICOS Provider Number 00123M

8 October 2007

Dr S Alagumalai
Education

Dear Dr Alagumalai

PROJECT NO: *Virtual classroom simulation*
H-136-2006

Thank you for your report on the above project. I write to advise you that I have endorsed renewal of ethical approval for the study on behalf of the Human Research Ethics Committee.

The expiry date for this project is: 31 October 2008

Where possible, participants taking part in the study should be given a copy of the Information Sheet and the signed Consent Form to retain.

Please note that any changes to the project which might affect its continued ethical acceptability will invalidate the project's approval. In such cases an amended protocol must be submitted to the Committee for further approval. It is a condition of approval that you immediately report anything which might warrant review of ethical approval including (a) serious or unexpected adverse effects on participants (b) proposed changes in the protocol; and (c) unforeseen events that might affect continued ethical acceptability of the project. It is also a condition of approval that you inform the Committee, giving reasons, if the project is discontinued before the expected date of completion.

A reporting form is available from the Committee's website. This may be used to renew ethical approval or report on project status including completion.

Professor Garrett Cullity
Convenor
Human Research Ethics Committee

Figure H.1.: Ethical Approval

Appendix I.

# Student Teacher Interaction in the Classroom 1 — Course Outline

This appendix provides the "Student Teacher Interaction in the Classroom 1" (STIC 1) course outline for Semester 1, 2008. This is the subject in which the STIC Questionnaire (Section 6.3.1, Chapter 6), VCS Introductory Lecture (Section 6.3.2, Chapter 6), VCS User Trials (Section 6.3.3, Chapter 6), VCS Surveys (Sections 6.3.4 and 6.3.5, Chapter 6) and VCS Assignment (Section 6.3.6, Chapter 6) were administered.

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

SCHOOL OF EDUCATION

EDUC 4039 GD
EDUC 4701 UG
Student Teacher Interaction in the Classroom I
(2 units)

COURSE OUTLINE – Sem 1, 2008
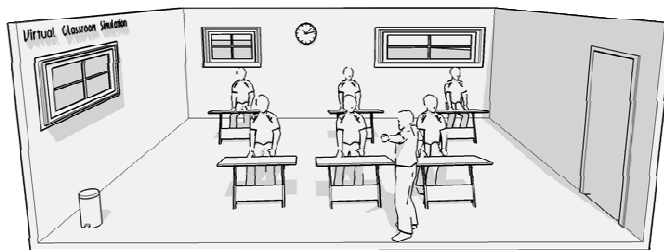
Lecturer:

Name:	Dr Nina Maadad
Location:	Room 807, Level 8, 10 Pultney Street
Telephone:	8303 3711 (work)
Email:	nina.maadad@adelaide.edu.au
Course website:	www.myuni.adelaide.edu.au

Faculty of the Professions

Figure I.1.: STIC 1 Course Outline 1/6

COURSE OBJECTIVES

Course Goal: To explore, understand and promote effective classroom interaction(s) constituent with the process of learning.

This course introduces pre-service teachers to the knowledge, awareness and skills relevant to their future interactions with students in the classroom. The examination of practical strategies within the context of a range of theoretical approaches will be a key focus. The course content should be understood within the overall context of parts I and II combined. In other words, it makes sense to comprehend this as a year long course. In semester one, Part I of the course focuses on preparation for teaching practice, where as in second semester, Part II opens into a much broader enquiry that is more suited to laying a foundation for your longer term professional career. The remainder of the description in this document is confined to Part I of the course.

Aim:

There are two key aims for this course; these are to obtain knowledge, awareness and skills in the areas of:

» Theories of learning and instruction:
  Various approaches to learning will be explored and consequent
  instructional strategies examined.
» Establishing positive learning environments:
  Exploring ways to motivate students and how to manage classrooms -
  from authoritarian to relaxed management styles.

The assessment has been designed to encourage the practical application of concepts drawn from these two areas.

Learning Outcomes:

Upon completion of this course, students should be able to:
• Appreciate the multiple dimensions of learning and associated theories.
• Research and analyse pedagogical theories and formulate implications
  for classroom practice.
• Demonstrate awareness of current trends in classroom practice
  for middle/secondary schools.
• Identify stages of (adolescent) development.
• Realise the factors involved in student motivation and demonstrate strategies for
  maintaining student engagement with their learning.
• Articulate specific approaches to promote a positive learning environment.
• Demonstrate understandings of individual characteristics of students.
• Identify and utilise the skills of successful teachers in enhancing interactions
  and learning in the classroom.

Figure I.2.: STIC 1 Course Outline 2/6

Appendix I. Student Teacher Interaction in the Classroom 1 — Course Outline

Graduate Attributes:

The Graduate Diploma in Education is a one year program undertaken by students who have completed an undergraduate degree. Students take courses at the University that interact with practical experiences pursued in schools. That is, the program is considered as a unified whole and the attributes of each course are those that are stated for the program. The attributes will form the basis of the assessment procedures related to the Graduate Diploma in Education. At the completion of the program students are able to register as secondary school teachers in Australia and internationally.

The skills to be acquired by a student in the program include:

- A significant understanding of basic domains of knowledge – gained through the discipline-based undergraduate degree.
- A competence in constructing a pedagogical approach to teaching in the classroom.
- A capacity to integrate the particular and special concerns of families, peers and neighbourhoods into their teaching – gained from ongoing experiences in a variety of schools.
- An understanding of the existing school systems and the ability to explore how the next generation of schools might most appropriately be designed.
- A capacity to collaborate and network with the broader community of Practice

In particular, the Graduate Diploma in Education will contribute to the development of the following Graduate attributes:

1   knowledge and understanding of the students' chosen discipline areas
2   cognitive skills in analysing, evaluating and synthesising information
3   the capacity for critical thinking and problem solving
4   interpersonal and communication skills of a high order
5   the ability to innovate changes within the teaching profession and community at large
6   a proficiency in the appropriate and responsible use of modern technologies
7   an awareness of the need to participate responsibly and critically within their discipline and their profession, as well as their local communities and the wider world
8   an understanding of social justice including aspects related to moral standards and cultural diversity.
9   the capacity to engage in reflective practice and professional learning.

COURSE OVERVIEW

READING

A course reader will be available with weekly readings.

TEXT BOOK(S) – Weekly readings are from the following recommended text:
Krause, K., Bochner, S. and Duchesne, S. (2003). *Educational Psychology: For Learning and Teaching*. Thompson.

McInerney, D. & McInerney, V. (2006) *Educational Psychology: Constructing Learning*,

Pearson Education Australia (4th Edn).   (referred to as M&M)

Figure I.3.: STIC 1 Course Outline 3/6

Note the M&M text book is also recommended for the second semester course, Student Teacher Interaction in the Classroom II. Also the 4th edition is available at Unibooks (cost, $111.95 – 12% discount if before by 11th March). There are multiple copies of the 2nd and 3rd editions available in both the main and reserve collections of the Barr Smith Library BSL call number: 370.15 M152.

The topics (may be varied)

Week #	Topic:	Reading from M & M
01	Introduction to effective teaching and learning. Overview of course. Stages of teacher development. Different types of teachers. Characteristics of the student and teacher relationship.	Chapter 1
02	Developmental perspectives on cognition and effective learning. Piaget's stage theory of cognitive development. Vygotsky's zone of proximal development.	Chapter 2
03	Alternative perspectives on cognition and intelligence. Gardner's multiple intelligence. Bruner's theory of cognitive development and learning. Ausubel and reception learning. Metacognition and self-regulated learning.	Chapter 3 p. 54-56 (3rd ed) Chapter 4
04	Behavioural perspectives on learning. Reinforcement in the classroom. Punishment and learning. Teaching strategies based on behaviourism. Information processing and effective learning. Strategies to help learning and remembering.	p. 125-140, 73-97 (3rd)
05	The positive classroom environment. The ABC (antecedents, behaviour and consequences) technique of classroom management.	Readings will be supplied.
06	Motivation for effective learning: cognitive perspectives. Intrinsic and extrinsic motivation. The goals of schooling.	Chapter 9
07	Preventative steps towards classroom management. Planning and preparation for the positive classroom environment.	p. 243, 251-263
08	Managing common and chronic misbehaviour. Models of discipline.	p 244-250, 263-273

LECTURES AND TUTORIALS
The University expects full-time students (ie those taking 12 units per semester) to devote a total of 48 hours per week to their studies. Students in this course are expected to attend *all lectures* throughout the semester plus *one tutorial class* each week. Please refer to Access Adelaide for your timetable and enrolment details.
http://www.adelaide.edu.au/access/

TUTORIALS
Classes will be held weekly commencing the week beginning (*Monday 25 July*). Membership of tutorial classes is to be finalised by *the end of the second week* of semester. Students wishing to swap between tutorial classes after this time are required to

Figure I.4.: STIC 1 Course Outline 4/6

present their case to the lecturer-in-charge, but should be aware that such a request may not be approved.

Tutorials are an important component of your learning in this course. The communication skills developed in tutorials by regularly and actively participating in discussions are considered to be most important by the School and are highly regarded by employers and professional bodies.

CONSULTATION AND COMMUNICATION
Please check your student email as course-related announcements are communicated via email.

I will be available for consultation at the following time:
Thursday 3:00pm-4:00pm

ASSESSMENT

Assignment 1: Group presentation   **10%**

A group presentation (2-3 students) will be given in the tutorial on weekly bases. The groups will be allocated in tutorials of Week 1 and the topics of discussion will be assigned to each group early in the semester. You may present in a format of your choice. For example, power point presentation, role play, etc. Details of what to cover and presentation can be finalised in the first tutorial in discussion with the lecturer in charge. The relevant numbers of attributes that will be covered are: 1, 2, 3, 4 and 9.

Assignment 2:   Collaborative teaching   30%

Relates to a classroom simulation topic demonstrated in lectures 4 and 5. Describe how it relates to your own experiences. Additional information will be given to all in weeks 4 and 5 and the topic will be discussed during tutorials.
The relevant numbers of attributes that will be covered are: 1, 2, 3, 4, 5, 6 and 7.
Length of assignment should be 600 words (approx). **Due Date is on the 28th of April**

Figure I.5.: STIC 1 Course Outline 5/6

Assignment 3: Handbook on promoting a positive learning environment   60%

You are to write a handbook outlining the essential aspects of promoting and maintaining a positive learning environment. The handbook format is to be a user friendly, resource guide, in a form of a teacher's guide to classroom practice that will undoubtedly continue to grow through your career. Your submission should not be an essay. Examples will be demonstrated during lectures.

You should include both theoretical and practical views. For those who go out on teaching practice in semester one should include your own reflections on your lessons.

As a minimum of content, you should cover the following aspects of the positive learning environment:

1. Maintaining motivation and attention.
2. Classroom management.
3. Strategies for managing common classroom behaviour problems.

There is an art to writing a good handbook. The information should be succinct, easy to read, well organised and rich in application and understanding.

The relevant numbers of attributes that will be covered are: 1, 2, 3, 4, 5, 6, 7, 8 and 9.
Length of assignment: 1400 words (approx). **Due Date:** Friday 6th of June

Marking Scheme for assignment 3:

	Criteria	**Earned Points**
Content	A range of theorists (at least 5). A brief statement on the essential ideas of each.	/20
Teaching and Learning	A range of teacher strategies to establish and /or maintain a positive learning environment. Indicate sources for each of these.	/20
Resources	As range of teacher resources and student materials (diagrams, tables, charts, concept maps, lists, etc.).	/15
Presentation	The final presentation should be easy to read, concise, unambiguous and include a diverse, carefully selected set of materials.	/5
Bibliography	A range of references and sources including print and electronic media	/25
Self Review/ Reflection	A range of personal reflections and critical self evaluation of your materials and their organisations	/15
Total		/100

Figure I.6.: STIC 1 Course Outline 6/6

Appendix J.

VCS STIC Questionnaire — Pre-Lecture

In the week prior to the VCS introductory lecture, the coordinator of the course "Student-Teacher Interaction in the Classroom 1" (STIC 1) circulated this questionnaire to her students.

Student-Teacher Interaction in the Classroom

Please answer the following questions concerning classroom interaction. The information you provide will be useful for the STIC course in this semester as well as STIC II.

There are no right or wrong answers (they will not be assessed), and the purpose of this exercise is to allow you to reflect on your conceptions of STIC before and after your teaching practicum.

Name: _____

Student ID: _____   (Your personal details will be kept confidential)

---

1. Briefly identify at least three characteristics of a teacher that would be useful in the <u>interaction</u> in the classroom?

   1. _____

   2. _____

   3. _____

More (optional):

   4. _____

   5. _____

---

2. What factors affect student learning in the classroom?

   1. _____

   2. _____

   3. _____

More (optional):

   4. _____

   5. _____

---

3. In posing a question or task to a student, what do you bear in mind about the question/task?

   1. _____

   2. _____

   3. _____

More (optional):

   4. _____

   5. _____

Figure J.1.: VCS Questionnaire — Pre-Lecture

Appendix K.

VCS Student Report Cards

The VCS Student Report Cards page (Figure K.1) was distributed to all education students present at the VCS introductory lecture.

Virtual Classroom Simulation

Student 'Report Cards'

To the teacher:

Familiarising yourself with the class will make the VCS trial more interesting, so if you have some spare time, please read through the student descriptions below.

Aksel

Age: 15
Startup Mood: Content
Knowledge: Average

Aksel is a dedicated student who works hard in most of his subjects. However, despite his confidence in subject matters and strong focus on future career opportunities, being an ESL student makes him a little shy and less confident with public speaking.

Nonetheless, his involvement in lessons is still apparent, as he is always taking notes and listening with great concentration.

Annelie

Age: 15
Startup Mood: Happy
Knowledge: Above average

Annelie is a confident, friendly and sociable individual. Her cognitive level is well above average and she has good problem solving skills.

In general, Annelie is keen on learning and interacting in class as long as the subject matter appeals to her own interests.

That being said, Annelie is easily distracted and, with best friend Sunniva in the same classroom, it is not always easy to stay motivated in class...

Elias

Age: 15
Startup Mood: Tired
Knowledge: Average

Elias is a bright and hard-working individual whose dream is to go to university straight after high school. His aspirations are attested in his homework, which is always well above average.

Elias is also very talented in sports and he spends most of his spare time training.

On top of this, both of his parents are busy professionals who work long hours, so Elias is often required to look after his two younger siblings. Consequently, Elias is often tired at school and struggles to keep motivated.

Kennet

Age: 14
Startup Mood: Happy
Knowledge: Below average

Kennet is the class clown; always happy and cheerful, his class presence can be both inspiring and annoying.

Kennet has dyslexia, a rather low cognitive level and has a tendency to avoid any type of learning.

Nonetheless, as long as he is not distracted by other things, he is always active in class and is happy to interact and take a punt on questions at any level of difficulty.

Is it possible that, despite of (or maybe because of) his behaviour in the classroom, Kennet's confidence is actually not that high...?

Maja

Age: 14
Startup Mood: Sad
Knowledge: Average

Maja is a bit of a loner with very few or no good friends.

She is quiet and shy, has a low self esteem, and is often teased by other students because of her weight.

She likes school (apart from recess), is always focussed in class, and is not easily distracted.

Maja's cognitive level is about average compared to her peers, but due to her low confidence, she will rather not interact in class because she is worried she might say the wrong thing.

Sunniva

Age: 15
Startup Mood: Normal
Knowledge: Average

Sunniva's best friend is Annelie, and their personalities are very similar. They share many of the same interests and have a tendency to distract each other in class.

Sunniva is not as school-smart as Annelie, but she draws a lot of confidence from being one of the more popular students at the school.

Sunniva does not aspire to do any further education after high school, and she can't wait to graduate.

With a cognitive level below average, coupled with an attitude to always impress other people, Sunniva is often visibly upset when she is incorrect in class.

Figure K.1.: VCS Student Report Cards

Appendix L.

VCS STIC Lecture

In the week prior to user trials and surveys, a 50 minute VCS introductory lecture was held in the course "Student-Teacher Interaction in the Classroom 1" (STIC 1) . The PowerPoint slides used by the researcher in this lecture are included below.

Figure L.1.: Slides 1-3

The Word Cloud

students student task environment question teacher knowledge good learning clear level ability classroom class interesting understanding skills question task topic behaviour confidence enthusiasm relevant questions patience physical understand motivation time communication teaching interest Relevance prior engaging open learn voice engage answer resources humour friendly emotional subject background teacher's distractions Approachability attitude required prior knowledge cultural content concise age encouraging organised classroom environment management communication skills activities emotional environment cultural background good communication knowledgeable outcomes outcome abilities Home difficulty task question personal students level group set sense Peer interaction engagement teachers personality interactions discussion Listening Technology tasks organisation ways learning environment clarity individual listen material atmosphere approachable Interactive listening skills ended Compassion explain lack direct listener Empathy good communication skills relationships engaged Creativity good listener respect capabilities open ended speaking development control work approach comprehend words student's inability Noise teacher's inability lessons clear voice simple respectful relationship factors room teacher interactions delivery Confident materials previous good teacher explained ways students learn understanding activity teacher good good communicator learns physical environment emotional environment student context teacher attitude Sensitive Number lighting monotone presented behaviour management family student ability Passion comfort physical revise teaching Positivity independent Helpful caring understood Health easy objectives opinions outgoing personality articulate environment technology seeking minded teach constant Appropriateness student interaction friends completion topic good comfortable sleep health physical interpersonal prior learning presentation seating levels variation feel mind inclusive thinking stimulating complete ideas sums problems students engaged numeracy communicator negative students set bad worded child comfort clear speaking Disruptive intelligence social Creative loud Air experiences students capabilities Enthusiastic area open minded revise require safe disabilities willingness Boredom constructive find enthusiasm clear voice method language external suitable answers idea speaking voice Outgoing Literacy task relevant

Battling Conceptions

- Theory vs. Practice
  - Is 'common sense' always obvious in practice?
  - Understanding behaviour
- Can behaviour be predicted?
  - What commands behaviour?
- Be selective, remember context
  - Deconstruct & Reconstruct

I wonder...

Will **Alan Larkin** stand up and shout

YEEEEEEEEEHA!

after reading this slide???

Figure L.2.: Slides 4-6

Figure L.3.: Slides 7-9

Figure L.4.: Slides 10-12

Figure L.5.: Slides 13-15

Figure L.6.: Slides 16-18

Figure L.7.: Slides 19-21

Figure L.8.: Slides 22-24

Appendix L. VCS STIC Lecture

Appendix M.

Research Project Information Sheet

The Research Project Information Sheet was supplied to all participants of the VCS trials.

THE UNIVERSITY OF ADELAIDE AUSTRALIA

Simon Skrødal, PhD Candidate
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School of Education, Level 8, 10 Pulteney St, SA 5005

RESEARCH PROJECT INFORMATION SHEET
Virtual Classroom Simulation

Introduction
My name is Simon Skrødal and I am a PhD research student at the School of Education, University of Adelaide. My research project entitled 'Virtual Classroom Simulation' (VCS) involves the development of a computer simulation-training tool aimed at pre-service teachers.

Background
The VCS contains a number of virtual students that each contain a set of attributes relevant to the teaching learning scenario that goes on in the classroom. Some examples of these attributes include confidence, knowledge and mood. The user of the VCS (the pre-service teacher) takes on the role as the teacher of the class, and is able to interact with the students by the means of asking questions, receiving answers and giving feedback. At the end of the simulation, the VCS will supply the user with feedback on how the students progressed during the course of the lecture. It will highlight what/when/why attributes changed in the students.

Purpose of the Study
There are two main purposes of this study:

1. The VCS aims to train and promote pre-teachers' pedagogical thinking. Through the use of the VCS, coupled with group discussions, we want to evaluate if the simulation is assisting in advancing the users' perception of classroom teaching.

2. The VCS is still a prototype, and feedback from pre-service teachers will be of great help in improving the features and functionality of the software.

Participant's Role
Your role as the participant is:

1. To sit through the background information session about the research and the VCS software.
2. To participate in the hands-on exercise using the VCS software.
3. To answer three questionnaires (two prior to practicum placement and one after)
5. To take part in a group discussion with other participants of the study.

Benefits of the Study
The main benefit of this study is to determine to what extent a simulation tool like the VCS would be useful in teacher training. The study will also identify areas of the VCS that are more effective than others, as well as how the usability and functionality can be improved as to better suit a specific group of users.

Please Note
Participation in this study is completely voluntary. Your participation or non-participation will not affect your academic progress in any way. Should any of the findings from the study be published, they will neither mention of your name, nor any details that could be linked to you.

Thank you for considering this request.
Simon Skrødal

_____   ___/___/200___
Simon Skrødal   Date

Figure M.1.: Research Project Information Sheet

Appendix N.

Consent Form

Standard consent form for people who are participants in a research project. Supplied to all participants of the VCS trials.

Appendix N. Consent Form

THE UNIVERSITY OF ADELAIDE HUMAN RESEARCH ETHICS COMMITTEE

STANDARD CONSENT FORM
FOR PEOPLE WHO ARE PARTICIPANTS IN A RESEARCH PROJECT

---

1. I, …………………………………………………………… *(please print name)*

   consent to take part in the research project entitled: Virtual Classroom Simulation

2. I acknowledge that I have read the attached Information Sheet entitled:

   RESEARCH PROJECT INFORMATION SHEET (Virtual Classroom Simulation)

3. I have had the project, so far as it affects me, fully explained to my satisfaction by the research worker. My consent is given freely.

4. I have been informed that, while information gained during the study may be published, I will not be identified and my personal results will not be divulged.

7. I understand that I am free to withdraw from the project at any time and that this will not affect my academic progress in any way, now or in the future.

8. I am aware that I should retain a copy of this Consent Form, when completed, and the attached Information Sheet.

   …………………………………………………………………………………………...
   (signature)   *(date)*

WITNESS

   I have described to ………………………………………….. *(name of subject)*

   the nature of the research to be carried out. In my opinion she/he understood the explanation.

   Status in Project**: Participant | Non-Participant**………………………………….

   Name: ………………………………………………………………….……

   …………………………………………………………………………………...
   (signature)   *(date)*

Figure N.1.: Consent Form

Appendix O.

VCS Trial Instruction Sheet

The VCS Trial Instruction Sheet was distributed to all participating education students at the start of the trial. Appendix P provides background information about Step 1 of the trial instructions.

Virtual Classroom Simulation :: VCS

STIC I 2008 - Trial Instruction Sheet

Dear beginning teacher,

Thanks again for your contribution to the evaluation and improvement of the VCS.

As you are about to try the simulation software first-hand, please read the following instructions carefully. Keep in mind that there is a fair bit of 'stuff' we need to get through today, and we only have 50 minutes (at most).

Step 1: Download and Install the VCS

1. Please log-in to your MyUni account, enter the STIC I course page and click on the 'Course Resources' link in the left menu.
2. Select the 'Virtual Classroom Simulation Trial' link, and proceed to download the file to your desktop (make sure you save the file as '**vcs.exe**')
3. Once download has completed, double-click on the file and click on the 'Unzip' button. Extracting all the files may take a minute. This is a good time to fill in the research consent form that has been handed out to you.
4. Once complete, open the folder called 'VCS' on your desktop and double-click the file '**VCS.bat**'. The VCS application should now open.

Step 2: Running the VCS

Once everyone has successfully started the program, Simon Skrødal will run a quick demo on the projector screen to make sure everyone is comfortable with the tasks ahead. Highlights are: If you haven't already, click to view student reports, set lesson duration to 5 minutes, give the simulation a name (don't worry about description), and proceed.

Step 3: Evaluation, Part 1

In order to learn from your experience, we need to get some input. We have prepared two online surveys for this purpose. Survey number 1 aims to learn about your overall impression of the VCS and your understanding of the educational concepts presented.

To start the survey, double click on the file called '**Survey 1 – Educational**' located in the VCS folder on your desktop.

*** Please note that there are quite a few questions in this survey. Allow approx 1 minute per question.*

Step 3: Evaluation, Part 2

The second survey we would like you to take part in, aims to evaluate the usability of the VCS as a software application, i.e. the Human Computer Interaction (HCI) aspect.

To start the survey, double click on the file called '**Survey 2 – HCI**' located in the VCS folder on your desktop.

This survey is shorter than the previous, and most questions use tick-boxes rather than open-ended answers.

*** Be careful not to confuse the 'NA' option on the right hand of the answer scale as a value.*

Figure O.1.: VCS Trial Instruction Sheet

Appendix P.

Deployment Issues

The VCS software trials (and survey data collection) demanded access to a computer lab with a capacity to host groups of up to 40 individuals at the same time. The School of Education's student computer lab was ideal, as it featured 60 modern computers on which all education students were already granted access privileges. These computers also provided access to the Internet, which was an essential prerequisite for students being able to undertake the online surveys. For security reasons, the machines had several measures put in place to prevent inappropriate access to the file system (local and network), which in turn caused a few issues in deploying the VCS. The following sections describe these issues and solutions in more detail.

P.1. Java Compatibility

Throughout the software development cycle the VCS went through several version upgrades, one of which was the move from Java 5 SE to Java 6 SE. In practical terms this meant that, in order for the VCS to run, the Java Runtime Environment (JRE) 6 or higher had to be installed on the host computer. The first obstacle was indeed JRE-related as the host computers in the trial lab were running JRE 5, a lesser version than that required by the VCS. To perform a manual upgrade of the JRE on each computer was not possible as restricted access to the local drive (with the exception of the Desktop) had been put in place by Information Technology Services at the University of Adelaide (ITS). An upgrade request was therefore sent to the ITS, but their projected timeline for meeting trial requirements was inadequate.

Conducting the trials in a different computer lab within the university would not mend this problem, since all student lab machines run the same software 'image' (i.e. the operating system, its configurations and standard software, such as the JRE, are mirrored on all computers).

The next approach was therefore to inspect the VCS source code, re-write parts of the system that made use of Java 6-specific features and re-compile using javac's `[-target `*`version`*`]` option in order to achieve backwards compatibility with Java 5. These efforts resulted in several compiled versions that were tested in the computer lab without success. Although some compiled versions of the VCS did run on the lab computers, the sacrifice of Java 6-dependent features had a negative impact on the user interface. The approach highlighted that the original source code (using Java 6) contained too many features, dependencies and complexities that could not be traded off for an earlier version of the JRE.

P.2. Portability

Observing other Java software functioning on computers with no JRE installed (e.g. ItemQual, a free item analysis software used in analysing some of the VCS survey data) instigated an alternative approach; to bundle the JRE 6 with the VCS. The 'README' file included in Sun Microsystem's Standard Edition Java Runtime Environment Version 6 confirms that the JRE (or parts thereof) can be freely (and legally) distributed with a project, subject to the terms and conditions of the Software License Agreement. Thus, by including a copy of the runtime folder of an existing JRE installation as a sub-folder within the VCS directory, no installation (or registry entries) of the JRE on the host computer is required. In practical terms, this means that the VCS application files and the runtime folder containing all essential JRE files can be stored in the system's Desktop folder and executed from this location without the need of an installation. This approach 'penalised' the VCS distribution size with an extra ~80MB (the size of the JRE files), although in compressed form (zip archive) the runtime files and the VCS files combined were reduced to ~37MB.

By making the zip archive self-extractable (as an '`.exe`' file) there was no need for a compression software to be available on the host computer (adding to the

portability). When extracted (on the user's Desktop), the folder structure would look like this:

```
|-Desktop       // Logged in user's desktop folder
  |- VCS        // Root directory for the VCS (contains .bat file)
    |- vcs      // Contains the VCS .jar file
      |- lib    // Contains VCS-related files
      |- rt     // Root folder for the JRE
```

On a system where a JRE is properly installed, the VCS will normally run when double-clicking the file `VCS.jar`. In this instance, however, the VCS had to be explicitly initialised using the Windows Command Processor (i.e. a MS DOS window) by calling JRE 6 directly from the command line as follows: `vcs\rt\bin\java.exe -jar vcs\VCS.jar` (presuming the active directory was `Desktop\VCS`). In order to make the execution of the simulation more user-friendly, the command was stored in a batch file (`.bat`, basically a plain text file with commands to be executed in DOS). A double-click on a batch file executes the commands stored in the file.

P.3. Host System Restrictions

While this procedure worked well on a personal computer, the PCs in the computer lab presented further issues. As it turned out, the users' Desktop folder is stored on the network, not on the local hard-drive. The solution was to temporarily store the Desktop's network path to memory. This was achieved adding extra commands to the batch file:

```
pushd %HomeShare%\Desktop\VCS\
vcs\rt\bin\java.exe -jar vcs\VCS.jar
POPD
```

Line 1 creates a temporary path to the VCS folder by merging the users' network path variable (`%HomeShare%`) with the Desktop and VCS folder using the `pushd` command. The second line passes the VCS software to `java.exe`, which executes the program. The third line releases the temporary path created in line 1.

P.4. Delays

Before the VCS trials could commence, every education student had to store and extract the 37MB VCS file. And since local storage access was restricted, the file had to be distributed to the students in the trial session after they had logged in to their user account. With up to 40 students in each trial session, it would take too long to manually copy the file to each computer using a USB storage device or similar. The file was therefore made available for download on 'MyUni', the University of Adelaide's online learning environment. All students were instructed to open the web-browser, navigate to MyUni and log in, navigate to the STIC course's dedicated page, download the file and finally double-click the file to start extracting the content. These steps, as outlined in Appendix O, imposed a significant delay before the trials could commence.

P.5. Summary

A number of unanticipated restrictions and limitations were imposed by the configuration of PCs in the student computer lab. This Appendix has described the series of troubleshooting exercises, as well as solutions, involved to address these issues. Valuable time was consumed by the procedures put in place to get the VCS running on the PCs. This reduced the time available to administer user trials and surveys. Consequently, a number of students ran out of time to complete the surveys. These restrictions were beyond the control of the researcher.

Appendix Q.

VCS STIC Assignment

The VCS STIC Assignment made part of the formal student assessment for the course Student-Teacher Interaction in the Classroom 1 (STIC 1). The assignment and the VCS charts related to the question text are included on the pages following.

STIC I 2008 – VCS Assignment 2

Discuss how the terms below are defined through literature and add on your own understanding of the interaction between all of them.

Use the VCS graphs to make these connections and to exemplify your interpretation.

'Traditional' STIC Theory:
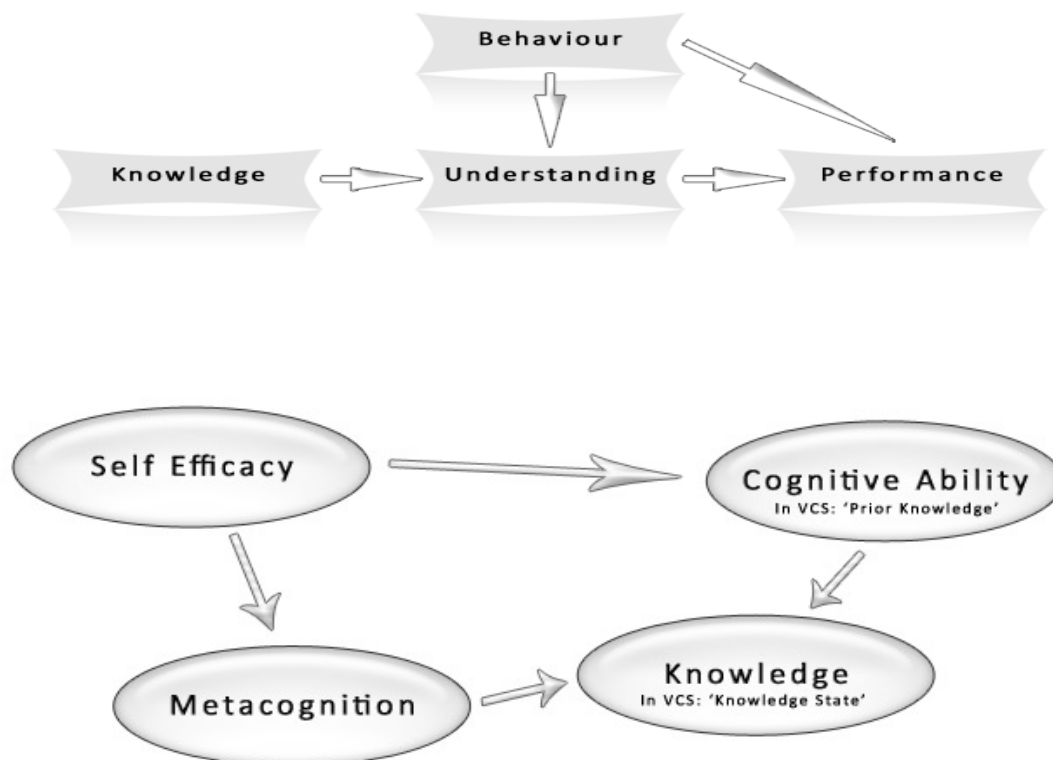
Word limit: 600 words

Good luck

Figure Q.1.: VCS STIC Assignment
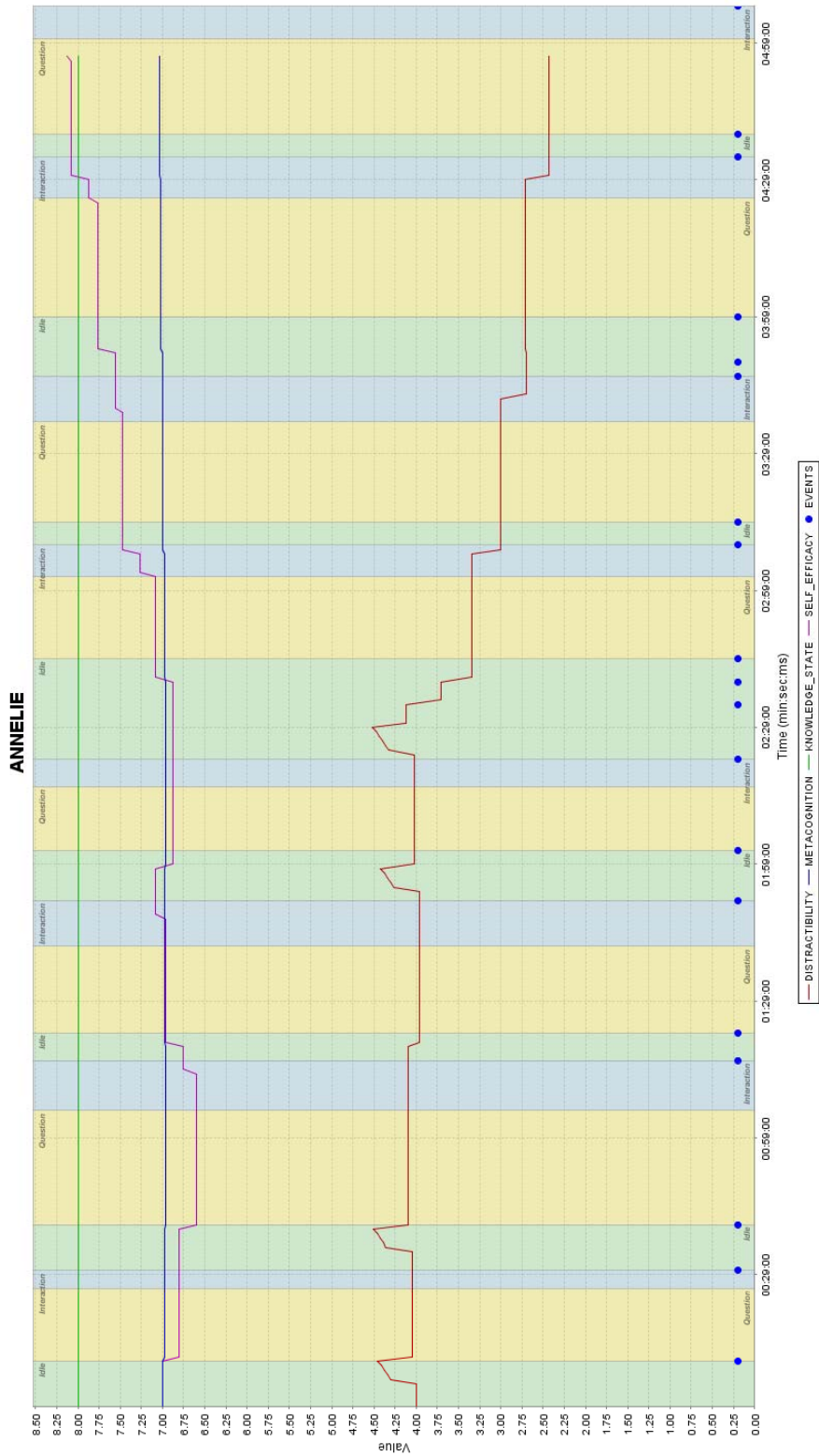
Figure Q.2.: Student Graph 1

Figure Q.3.: Student Graph 2

Appendix R.

VCS Education Survey

The series of screenshots included in this section display the visual arrangement of the VCS Education Survey.

Figure R.1.: VCS Education Survey, Page 1/7: Information

Figure R.2.: VCS Education Survey, Page 2/7: Personal Details

Figure R.3.: VCS Education Survey, Page 3/7: Part A

VCS survey

VCS :: Educational Survey #1

Progress:
0% ████ 100%

Part B
Open ended questions.

From your understanding of the VCS, what are the attributes of the students that the teacher need to take into consideration when posing a task or question?

Can you list the attributes of a teacher, as presented either explicitly or otherwise in the VCS?

In posing a question or task to the class or a student, what does the teacher need to know to minimise distractibility and optimise learning?

What are the strengths of the VCS?

Please give specific examples.

From your knowledge and experience in classrooms, does the simulation meaningfully resemble the real environment?

Please comment.

What improvements need to be incorporated into the VCS as a teaching and/or training tool?

<< prev   next >>

[Exit and Clear Survey]

Figure R.4.: VCS Education Survey, Page 4/7: Part B

Figure R.5.: VCS Education Survey, Page 5/7: Part C

Figure R.6.: VCS Education Survey, Page 6/7: Part D

Figure R.7.: VCS Education Survey, Page 7/7: Thank You

Appendix S.

VCS HCI Survey

The series of screenshots included in this section display the visual arrangement of the online VCS HCI survey. Question items in Figure S.3 (Experience in ICT) are based on the Computer Familiarity Instrument of the PISA 2000 Study (Adams and Wu, 2002). All other items are based on the Questionnaire for User Satisfaction (QUIS, Chin et al., 1988).

Figure S.1.: HCI Online Survey, Page 1/10: Information

Figure S.2.: HCI Online Survey, Page 2/10: Personal Details

Figure S.3.: HCI Online Survey, Page 3/10: Experience in ICT

Figure S.4.: HCI Online Survey, Page 4/10: Overall Reactions

Figure S.5.: HCI Online Survey, Page 5/10: Screen

Figure S.6.: HCI Online Survey, Page 6/10: Terminology and System Information

Figure S.7.: HCI Online Survey, Page 7/10: Learning

Figure S.8.: HCI Online Survey, Page 8/10: System Capabilities

Appendix S. VCS HCI Survey

Figure S.9.: HCI Online Survey, Page 9/10: Comments

Figure S.10.: HCI Online Survey, Page 10/10: Thank You

Appendix T.

VCS Survey Codebook

The VCS Survey Codebook contains metadata that describe the variables in the datasets. The codebook is a useful reference guide during the data analysis process, as it provides quick access to items' descriptions, variable names and coding instructions.

Tables T.1, T.2 and T.3 comprise the different sections of the HCI Survey of this study. Table T.4 describes data from the VCS Education Survey that were quantified.

Table T.1.: VCS Survey Codebook, Section 1: Personal Details

1. Personal Details			
Full variable name	*SPSS/LISREL variable name*	*Type (length)*	*Coding instructions*
Name (First Last)	**OMITTED**	VARCHAR	**OMITTED**
Student ID	**SID**	Integer (7)	7 digits (removed preceding 'a')
Gender	**GENDER**	Integer (1)	F=1, M=2

2. VCS HCI Survey (Experience in ICT)			
Full variable name	*SPSS/LISREL variable name*	*Type (length)*	*Coding instructions*
How comfortable are you with using a computer for the following tasks?		Integer (1)	4=Very Comfortable 3= Comfortable 2=Somewhat comfortable 1=Not at all
1. Using a computer in general	1. **CMF_GEN**		
2. Using a computer to write a paper	2. **CMF_PPR**		
3. Taking a test on a computer	3. **CMF_TST**		

1. Personal Details

Full variable name	SPSS/LISREL variable name	Type (length)	Coding instructions
Name (First Last)	OMITTED	VARCHAR	OMITTED
Student ID	SID	Integer (7)	7 digits (removed preceding 'a')
Gender	GENDER	Integer (1)	Female=1, Male=2

Table T.2.: VCS Survey Codebook, Section 2: Experience in ICT

2. VCS HCI Survey (Experience in ICT)

Full variable name	SPSS/LISREL variable name	Type (length)	Coding instructions
How comfortable are you with using a computer for the following tasks? 1. Using a computer in general 2. Using a computer to write a paper 3. Taking a test on a computer CMF_* = LATENT: COMCOMF	1. CMF_GEN 2. CMF_PPR 3. CMF_TST	Integer (1)	4=Very Comfortable 3= Comfortable 2=Somewhat comfortable 1=Not at all
If you compare yourself with others in your course, how would you rate your ability to use a computer?	• ABILITY	Integer (1)	4=Excellent 3=Good 2=Fair 1=Poor
How often do you use a computer at the following places? 1. At home 2. At school 3. In the library that you use 4. At another place	1. CFRQ_HOM 2. CFRQ_SCH 3. CFRQ_LIB 4. CFRQ_OTH	Integer (1)	5=Daily 4=A few times a week 3=Between once a week and once a month 2=Less than once a month 1=Never
How often do you use each of the following kinds of computer software? 1. Games 2. Office related 3. Drawing, painting, video, etc. 4. Email client 5. Internet web browser	1. SFRQ_GMS 2. SFRQ_OFF 3. SFRQ_MED 4. SFRQ_EML 5. SFRQ_WEB	Integer (1)	5=Daily 4=A few times a week 3=Between once a week and once a month 2=Less than once a month 1=Never
The computer is a very important tool for me	CMP_IMP (Excluded from SEM)	Integer (1)	1=Yes 0=No
To play or work with a computer is really fun	CMP_FUN	Integer (1)	1=Yes 0=No
I am generally very interested in computer technology	CMP_INTR	Integer (1)	1=Yes 0=No
I forget the time when I am working with the computer	CMP_TIME	Integer (1)	1=Yes 0=No
CMP_* = LATENT: COMATT			

Table T.3.: VCS Survey Codebook, Section 3: Overall User Reactions (VCS)

3. VCS HCI Survey (Overall User Reactions to the VCS)			
Full variable name	*SPSS/LISREL variable name*	*Type (length)*	*Coding instructions*
Overall reactions to the Virtual Classroom Simulation **REA_* = LATENT: VCS_REA**	**REA_WON** *(Terrible - Wonderful)* **REA_SAT** *(Frustrating-Satisfying)* **REA_STM** *(Dull-Stimulating)* **REA_EAS** **(Excluded from SEM)** *(Difficult-Easy)* **REA_PWR** *(Inadeq. Power-Adequate Power)* **REA_FLX** *(Rigid-Flexible)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
In terms of readability, how did you find the text on the screen?	**VCS_READ** *(Hard to Read-Easy to Read)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
Were the screen layouts helpful?	**VCS_LOUT** *(Not at All-Very Helpful)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
Does the terminology relate well to your education course?	**VCS_TERM** *(Unrelated-Well Related)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
How would you rate the help, information and error messages that appeared in the program?	**HLP_CNST** *(Inconsistent-Consistent)* **HLP_CLR** *(Confusing-Clear)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
Did the program keep you informed about what it was doing?	**VCS_INFD** *(Never-Always)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
Did you get any error messages? If so, how helpful were they?	**VCS_ERR** *(Unhelpful-Helpful)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
How difficult was it to learn to use the VCS?	**VCS_DIFF** *(Difficult-Easy)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
Could the tasks in the program be performed in a straight-forward manner?	**VCS_TSKS** *(Never-Always)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
How would you rate the help messages in the program?	**VCS_HLP** *(Confusing-Clear)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
How was the speed of the VCS?	**VCS_SPD** *(Too Slow-Fast Enough)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
How reliable was the program?	**VCS_RLB** *(Very Unreliable-Very Reliable)*	Integer (1)	Likert Scale 1-4 (Neg→Pos)
Do you think the needs for both experienced and inexperienced users have been taken into consideration?	**VCS_NEED** *(Never-Always)*	Integer (1)	Likert Scale 1-4 (Neg→Pos
Comments	**OMITTED**	VARCHAR	**OMITTED**

Table T.4.: VCS Survey Codebook, Section 4: VCS Education Survey (Quantification)

4. VCS Education Survey (Quantification)			
Full variable name	*SPSS/LISREL variable name*	*Type (length)*	*Coding instructions*
How do you view the educational value of the VCS?	**Q1_V**(aluable, useful, helpful, good, interesting) **Q1_P**(otential, fair, moderate) **Q1_U**(nsure) **Q1_N**(one, low, minimal) **Q1_NA** **QUALI_Q1**	Integer (1)	A score of 1 for each coder assignment. E.g. if all coders rate a response as Valuable: • Q1_V == 5 • Q1_* == 0 Quantitative category values from 0-4 (Neg→Pos)
	Q1_FLAG	Decimal (0.00)	Percentage of coder agreement, i.e. 5 out of 5 == 1.00 4 out of 5 == 0.80
Do you believe the VCS is an effective means of training?	**Q2_Y**(es) **Q2_P**(otentially) **Q2_U**(nsure) **Q2_N**(o) **Q2_NA** **QUALI_Q2**	Integer (1)	A score of 1 for each coder assignment. E.g. if all coders rate a response as Yes: • Q2_Y == 5 • Q2_* == 0 Quantitative category values from 0-4 (Neg→Pos)
	Q2_FLAG	Decimal (0.00)	Percentage of coder agreement, i.e. 5 out of 5 == 1.00 4 out of 5 == 0.80
Do you believe the VCS generates a valuable learning experience?	**Q3_Y**(es) **Q3_P**(otentially) **Q3_U**(nsure) **Q3_N**(o) **Q3_NA** **QUALI_Q3**	Integer (1)	A score of 1 for each coder assignment. E.g. if all coders rate a response as Yes: • Q2_Y == 5 • Q2_* == 0 Quantitative category values from 0-4 (Neg→Pos)
	Q3_FLAG	Decimal (0.00)	Percentage of coder agreement, i.e. 5 out of 5 == 1.00 4 out of 5 == 0.80

Appendix U.

Email Correspondence With a Lecturer From a University in the USA

Below is the complete transcript of a VCS-related enquiry from a lecturer from a university in Indiana, USA. The email prompted a number of email exchanges between the researcher and the lecturer. Parts of the transcript have been replaced with **REMOVED** to protect the individual's identity.

```
Subject: EduPEx Contact Enquiry
From: **REMOVED**
Date: Fri, 30 Jan 2009 18:50:59 -0500
To: simon.skrodal@edupex.com


  -------------------------------------------------------------------------
     WEBSITE CONTACT ENQUIRY
  -------------------------------------------------------------------------


  Name: **REMOVED**
  Email: **REMOVED**
  Company: **REMOVED**
  Website:

  Message:

I am looking for a classroom simulation for my preservice teachers, and in
    particular for one that will allow them to give students evaluative feedback on
     student work and allow  them to change lesson planning based on student work.
     What does your classroom simulation do, is it available, and how much does it
     cost?
```

```
Thanks
**REMOVED**

  ------------------------------------
  End of Email
```

Appendix V.

Email Correspondence With a University Professor From Greece.

Below is the complete transcript of an email from a Professor from a University in Greece. It initiated a number of email exchanges in which the researcher provided comprehensive support and advice for the research initiative. Parts of the transcript have been replaced with **REMOVED** to protect the individual's identity.

```
Subject: research proposal _ Greece
From: **REMOVED**
Date: Mon, 21 Sep 2009 12:57:49 +0300
To: simon.skrodal@adelaide.edu.au

Dear Mr. Skrodal,

My name is **REMOVED** and I am a Professor in the Department of **REMOVED** at
    University of **REMOVED** in Greece. My research team and I are preparing a
    research proposal for a European Funded Program that promotes and supports long
    -life education.

Our general idea is to evaluate the results of training pre-service kindergarten
    teachers by combining a Virtual Classroom Simulation with organised practice
    sessions in actual school classrooms. The literature research we performed
    informed us (hopefully correctly) that you are one of the few researchers
    engaged with the specific research topic.

Before I fill you with further information, I would like to know whether you might
    be interested in cooperating with our team in any way, as your knowledge on the
     subject will be more than valuable to us.

For more information on the european program, you can visit the following link
```

Appendix V. Email Correspondence With a University Professor From Greece.

```
http://www.edulll.gr/default.asp?siteID=1&pageID=104&tablePageID=9&langID=1&entryid
    =75#

I'm looking forward to hearing from you soon
Yours sincerely

**REMOVED**

Professor in Educational Sciences
Faculty of **REMOVED**
University of **REMOVED**
**REMOVED** Str.
**REMOVED** - Greece
Tel.: +30**REMOVED**
Fax: +30**REMOVED**
e-mail: **REMOVED**
Mob. Phone: +30**REMOVED**
```

Appendix W.

VCS Assignment Submissions

W.1. VCS Assignment, Student 0058

The VCS Assignment response from Student 0058 is included on the following pages. There are 5 pages to this assignment.

The assignment was scanned from paper form to a digital format.

The 'traditional' STIC theory (Student Teacher Interaction in the Classroom), as demonstrated in the diagram below, posits that knowledge leads to understanding and performance; behaviour also affects understanding and leads directly to performance.

Behaviour

Knowledge → **Understanding** → **Performance**

If we take the diagram above one step further, and focus on *intrinsic* learning patterns related to the student's prior understanding (Cognitive Ability), emotional state and self esteem (Self Efficacy) and metacognition (thinking about thinking), we can see that all of these factors are inter-related within classroom practice, leading eventually to knowledge (knowledge state). The Virtual Classroom Simulation (VCS) builds on the nexus between self efficacy, cognitive ability, metacognition and knowledge, as demonstrated by the following chart:

Self Efficacy → **Cognitive Ability** In VCS: 'Prior Knowledge'

Metacognition → **Knowledge** In VCS: 'Knowledge State'
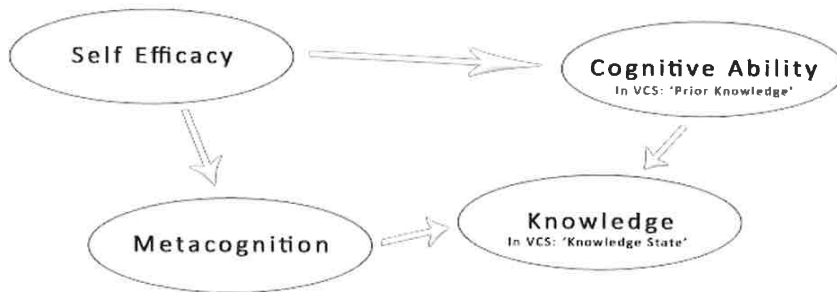
Utilising the fundamental principles established by this chart, teachers use socially constructivist skills, such as Vygotsky's zone of proximal development, scaffolding and behaviour management

Figure W.1.: VCS Assignment (Student 0058), Page 1

to actively, deliberately and explicitly challenge a student's distractibility, megacognition, knowledge state and self efficacy, encouraging 'deep knowledge' (heightened sense of understanding). Teachers can also use Piaget's theory of schemes (or schemas) to actively promote disequilibrium, *"when an inconsistency arises between what is known and expected, and something strange, unexpected and new. This is where the process of adaptation takes place."*[1]

Using the Virtual Classroom Simulation (VCS), the link between self efficacy and knowledge is clearly demonstrated. Let's consider Kennet first. Kennet has dyslexia and a rather low cognitive level (below average), with a tendency to avoid any type of learning. Nonetheless, as long as he is not *distracted*, he is always active in class and is happy to interact and take a punt on questions at any level of difficulty. If we look carefully at Kennet's chart, there are three interactions towards the end of the VCS lesson (3:29:00 – 3:59:00) where his *distractibility* decreases substantially. Shortly afterwards, a *question* is asked and Kennet's self efficacy, knowledge state and metacognition all increase. This underlines the crucial nature of emotive as well as cognitive teaching: *"Teachers need to be aware of social-emotional learning. If we recognise that schools are social and emotional places, and we are social and emotional beings, then we must place emphasis on more that our cognitive brain"*.[2] Kennet finishes the class with a lower level of self efficacy than when the class commenced, however, his knowledge state has increased, possibly due to an episode involving disequilibrium.

Now let's consider Annelie's chart. Annelie is a confident, friendly and sociable individual. Her cognitive level is well above average and she has good problem solving skills. In general, Annelie is keen on learning and interacting in class as long as the subject matter appeals to her own

---

[1] Sandra Bochner Kerri-Lee Krause, Sue Duchesne, *Educational Psychology for Learning and Teaching* (South Melbourne Thomson Learning, 2003), p 54.
[2] David N. Evans Hellmut R. Lang, *Models, Strategies, and Methods for Effective Teaching* (Sydney: Pearson, 2003)., pp 42 – 43.

Figure W.2.: VCS Assignment (Student 0058), Page 2

interests. That being said, Annelie is easily distracted and, with best friend Sunniva in the classroom, it is not always easy to stay motivated in class. When we look at Annelie's chart, her metacognition and knowledge states are much higher than Kennet's, and her distractibility levels are reasonably lower than Kennet's. Perhaps one of the most important differences between her classroom experience and that of Kennet is her self efficacy charting. Annelie slowly grows in confidence and self esteem (self efficacy) during the class, until her knowledge state is almost on a par with her self efficacy. Kennet, however, has a rather low cognitive level which reflects on his lower level of self efficacy. Annelie's metacognition increases slightly over the course of the lesson, whereas Kennet's slowly decreases during the lesson. Curiously, Annelie's knowledge state does not increase at all during the lesson, possibly because none of the interactions or events are sufficiently difficult or novel enough to stimulate her knowledge.

When reflecting upon the positive increases in metacognition by both Kennet and Annelie, this can be related directly to Bloom's taxonomy. While the cognitive domain has increased in both students, the affective domain is directly influenced by the interactions of both with the teacher. Specifically, both have *responded* to questions and interactions with the teacher, and have displayed some new behaviour as a result of experience and responding to the experience.[3]

The findings of the VCS have important implications for teaching theory and my own personal application during practicum. While still in a rudimentary form, the VCS is particularly effective for conceptualising performance among different types of students, and demonstrates the linkages between the facets of extrinsic and intrinsic behaviour that affect learning. It also illuminates the key paradigms of educational theoreticians such as Piaget, Vygotsky and Bruner, shedding light on otherwise intangible and seemingly random linkages for student teachers such as myself.

---

[3] Richard I. Arends, *Learning to Teach* (Boston: McGraw-Hill, 2004)., p118

Figure W.3.: VCS Assignment (Student 0058), Page 3
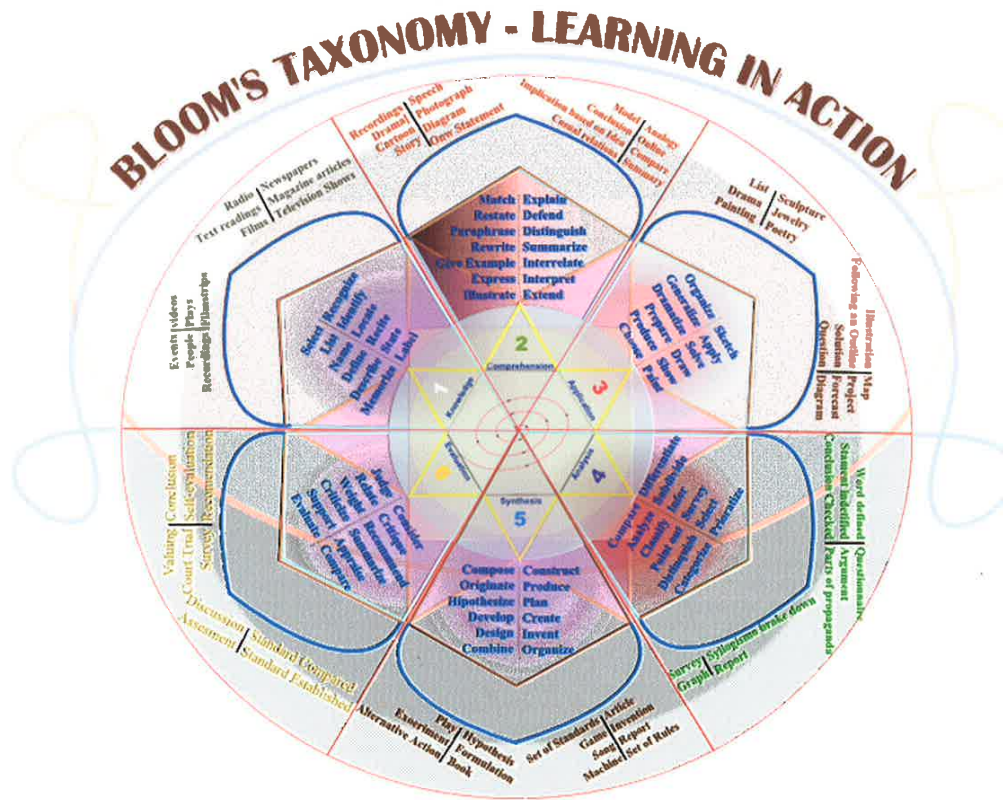
Bloom's Rose[4]

[4] John M. Kennedy, "Taxonomy of Educational Objectives," wikipedia.com, http://en.wikipedia.org/wiki/Blooms_taxonomy., accessed 17/4/2008

Figure W.4.: VCS Assignment (Student 0058), Page 4

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Kerri-Lee Krause, Sandra Bochner, Sue Duchesne. *Educational Psychology for Learning and Teaching* South Melbourne Thomson Learning, 2003.

Figure W.5.: VCS Assignment (Student 0058), Page 5

W.2. VCS Assignment, Student 0159

The VCS Assignment response from Student 0159 is included on the following pages. There are 3 pages to this assignment.

The assignment was scanned from paper form to a digital format.

STIC I 2008 – VCS Assignment 2

Discuss how the terms below are defined through literature and add on your own understanding of the interaction between all of them.

Use the VCS graphs to make these connections and to exemplify your interpretation.

In this assignment the terms under discussion are called "Model 1" and "Model 2" (see Appendix 1). The two models represent theories about the learning process. Model 1 represents the "traditional" information processing model of learning; where knowledge is an input, flowing linearly from teacher to students. The passive student receives it, processes it and demonstrates their understanding via performance (Jensen, 1995). Model 2 represents a constructivist view of learning. Piaget is described as "one of the founders of constructivism" (Illeris, 1999?) as he argues that the assimilation of new information (learning) is done in relation to existing cognitive understanding. Illeris (1999?) also highlights how modern theorists are engaged in understanding the relative value of the three interactive dimensions of cognition, society and emotion in the learning process.

The two models define "knowledge" differently. In Model 1, knowledge is at the start of the learning process. It is a pre-packed bundle transferred from teacher to student. In Model 2, however, the student comes first; interacting with new knowledge by drawing upon past experiences to assimilate it. Therefore, in Model 1 knowledge is fixed, but in Model 2 knowledge is flexibly interpreted by the student. Model 2 can be seen in the VCS graphs as teacher input (shown by events) promotes different self-efficacy responses in Annelie and Kennet (see Appendix 2 and 3).

In Model 1 "understanding" is linked with "performance". Student understanding is valued, and limited to, the ability to understand the new knowledge and competently perform a related task. "Model 2, on the other hand, provides an explanation of what internal processes are involved in understanding new knowledge. Model 2 (as shown in the VCS graphs) suggests that for students to understand new knowledge they have to:-

- be confident that they can learn the new knowledge (**self-efficacy**), which is affected by **distractibility**;

Figure W.6.: VCS Assignment (Student 0159), Page 1

- be able to use their existing cognitive ability/**prior knowledge** to assimilate new knowledge;

- use **metacognition**. This is defined by Thomas (2005) as having "knowledge about cognition", such as using the metacognitive skill of reading to understand the meaning of a new text.

In Model 2 these interactive processes are the key to understanding. This is very different to Model 1 where the emphasis of understanding is on the ability to perform.

Behaviour is related to knowledge and understanding. In Model 1, "bad" behaviour interrupts the transmission of knowledge from teacher to student. Thus peak learning is achieved by being "quiet and subservient" (see Charles 2004, p131). In Model 2, teachers need to use good classroom management to build student confidence in their ability to learn as outlined by Charles (2004). Students then become responsible for their own learning and behaviour.

There are elements of Model 1 and Model 2 in the VCS Simulation ("VCS"). The VCS graphs could demonstrate a link between understanding and behaviour if the "knowledge state" where to be affected by self-efficacy and distractability. However, "knowledge state" on the VCS graphs shows little change in the five minutes. Over a longer period of time it would be expected that a link would be demonstrated. What the VCS graphs draw attention to are the interactive processes emphasised in Model 2. Events on the VCS graphs (such as a teacher question or interaction) affect the distractability and self-efficacy of Annelie and Kennet.

In conclusion, there are connections between the two models as they explore the process of learning and look at processes such as knowledge, behaviour and understanding. The Models place different interpretations and emphasis on these as shown in the VCS graphs examples.

Figure W.7.: VCS Assignment (Student 0159), Page 2

References

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Figure W.8.: VCS Assignment (Student 0159), Page 3

W.3. VCS Assignment, Student 0087

The VCS Assignment response from Student 0087 is included on the following pages. There are 2 pages to this assignment.

The assignment was scanned from paper form to a digital format.

VCS Assignment 2

Personal knowledge rooted in individual experience and involving personal belief, perspective, and values[1]. Normally, we use the word knowledge to mean that we have some information. For instance, we know drink too much causes hangover. When we have this type of knowledge then we are able to express it.

In Minsky's explanation, understanding is the ability to connect a representation to many other representations.[2] This means that person understand things when they connect each other in routes.

Behavior varies from human to human because it depends on what knowledge the person possesses. Both knowledge and surrounding environment contribute the position of behavior. Knowledge initiates our character to react, and the influence of environment forces our character performance[3]. Therefore, understanding the positive environment (surrounding human behavior) is crucial. Positive environment always have its impact on the behavior, so higher the number of good behavior stronger the positive performance.

Performance is the final outcome and the accomplishment by a child.

Knowledge is the foundation of understanding. Children express their knowledge as parroting a sequence of phonemes naturally, suppose a young child came up to you and said, "If you drink too much, you will have a hangover." Yes, you agree with the child, but question: How did the child come to know this? Obviously, they have this knowledge that learned from someone else, and not from heavy drinking. However, does the young child understand what he is saying, and will he or she not drink in the future? Another factor which affect understanding and learning is people behavior. The popular wisdom is that children of non-drinking families learn early on the harm of drinking, and are thus naturally less possible

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[1] Davenport T., Prusak L. (1998). *Working Knowledge.* Harvard Business School Press: Boston, MA.

[2] Marvin Minsky, *The Society of Mind* and *The Emotion Machine* (2007).
[3] What is "behaviour", **http://www.sadashivan.com/negativepositivefactorsandwe/id5.html**, viewed as 20 April.

Figure W.9.: VCS Assignment (Student 0087), Page 1

time.

In first graph we have already found out that learning knowledge base on one's individual experiences and prior knowledge, so that the cognitive ability has been linked to knowledge directly. However, is the learning process likely simple, and what exactly is the learning process? Suppose a student is given a math task, and then making sure the task are done correctly. Firstly, student may use prior knowledge in planning how to approach this math task, thinking about the link between their own information and the new task. The self-evaluations have influenced all manner of his or her experience at the same time, including the goals for which people strive, the amount of energy expended toward goal achievement, and likelihood of attaining particular levels of behavioral performance[8], which are reflects the student's confidence in ability to complete the task, but then the student may know he or she has difficulty with result analyze and explanation, so the student decide to answer the mathematic problems first and save the analyze problems for last, this is metacognition which means actively used in a strategic manner to ensure that the task is complete.

Furthermore, Metacognition has been linked to cognitive ability (intelligence) as well. Sternberg refers to these executive processes as "metacomponents"[9]. This process involves planning task, monitoring problems and evaluating. Sternberg also pointed out that the ability to appropriately allocate cognitive resources, such as deciding how and when a given task should be accomplished, is central to intelligence[10].

Kennet, a 14 years old boy, has dyslexia and wants desperately to be like other children, but he has lower cognitive level, in hence he tends to avoid any type of learning. According to Knnet's VCS paragraph, his distractibility starts at very high level and unstable all the time, however it decrease over time as the teacher asked questions more frequently. Kennet's self efficacy decrease over time as well, it is due to the fact that he cannot answer the question properly or correctly. Therefore, we can see the evidence which suggest that kennet's knowledge and metacogniiton are all below average.

Overall, the VCS graph strongly support that there is a link between self efficacy, metacognition, cognitive ability and knowledge state.

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[8] Borkowski, J., Carr, M., & Pressely, M. (1987). "Spontaneous" strategy use: Perspectives from metacognitive theory. *Intelligence, 11,* 61-75.

[9] Sternberg, R. J. (1986a). Inside intelligence. *American Scientist, 74,* 137-143.
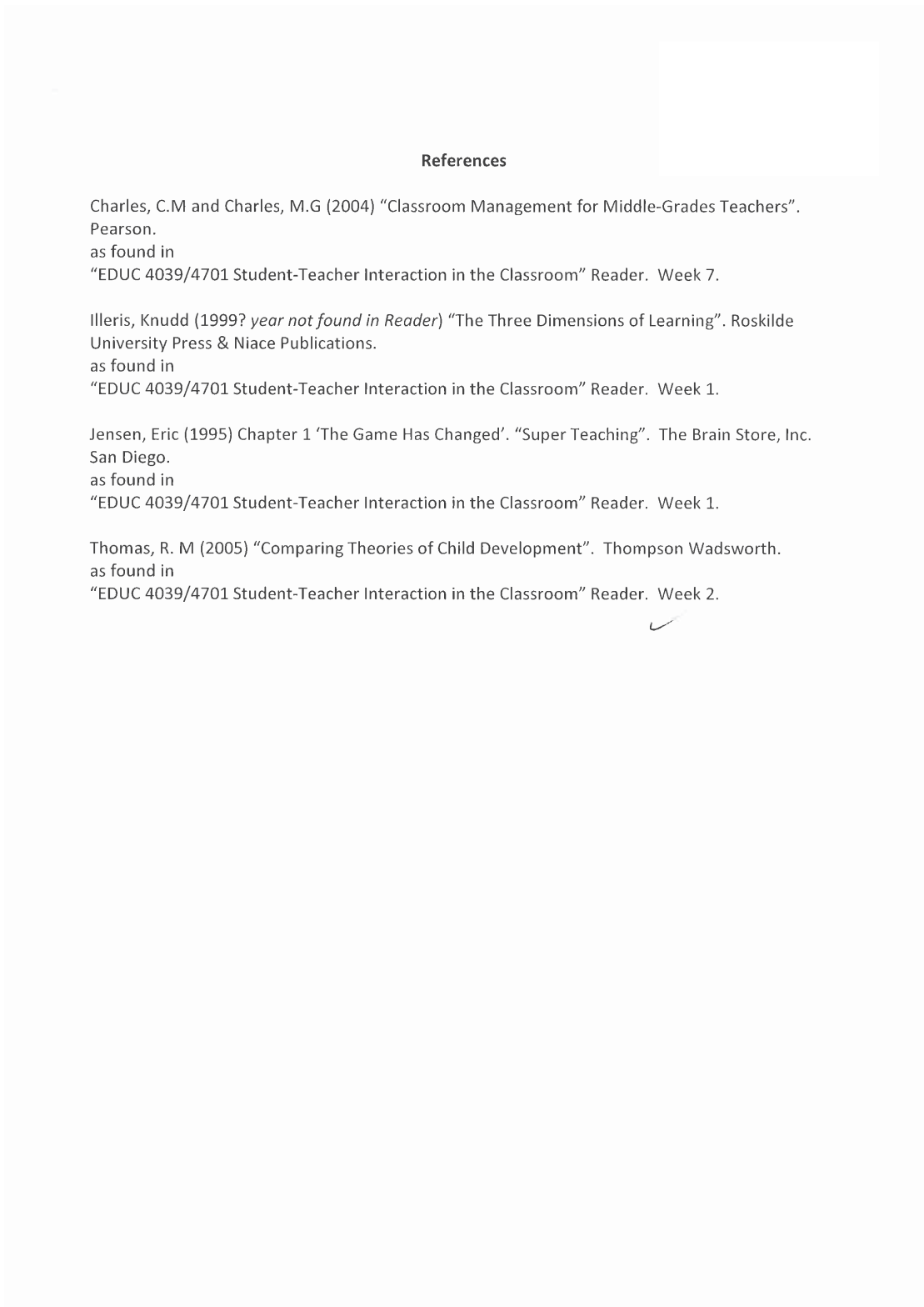[10] ibid

Figure W.10.: VCS Assignment (Student 0087), Page 2

W.4. VCS Assignment, Student 0148

The VCS Assignment response from Student 0148 is included on the following pages. There are 5 pages to this assignment.

The assignment was scanned from paper form to a digital format.

Student Teacher Interaction in the Classroom

VCS Assignment 2

Student Teacher Interaction in the Classroom (STIC) theory discusses how interaction between factors affects learning. The factors and their interaction will be discussed and a Virtual Classroom Simulation (VCS) will be used as a practical example.

STIC theory is a follows:

```
                    Behaviour
                        |
                        v
Knowledge  ----->   Understanding  ----->      Performance


Self-Efficacy  ----------->   Cognitive Ability

          Metacognition  ----->  Knowledge
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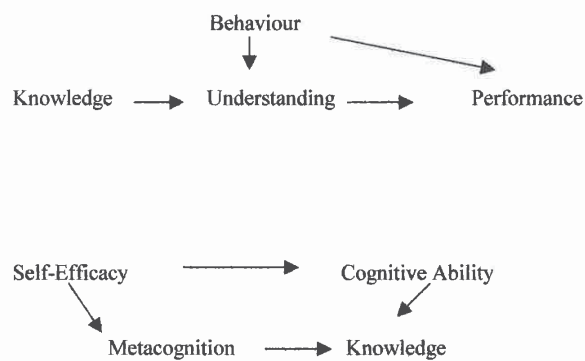
Behaviour is the way in which students act, feel or think.[1] Behaviour leads to certain consequences whether good or bad.[2] A consequence of good behaviour is understanding. Understanding is giving meaning to knowledge and been able to apply it in different contexts.[3] Learning behaviour such as active listening and concentrating leads to student

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[1] Bloom et al. *Taxonomy of Educational Objectives* David McKay New York, 1956 p 13.
[2] Levin, J and Nolan, J.F. " *What every teacher should know about classroom management*" Pearson Education, Frenchs Forest, 2005 p 39
[3] Killen, R " Effective Teaching Strategies-lessons from research and practice" 4th Edition Thomson Learning Nelson South Melbourne, 2007 p 11

1

Figure W.11.: VCS Assignment (Student 0148), Page 1

understanding.[4] This behaviour will also lead to performance. Performance is the showing what the student has learnt and is the effect of instruction.[5] If the student exhibits conducive learning behaviour he/she will be able to perform or show what they have learnt. Conversely bad behaviour such as disruption will lead to the consequence of wrong or no understanding and bad or no performance.[6]

Knowledge is an acquisition of facts[7] and a transferring of information by experience.[8] Knowledge also leads to understanding and consequently performance. Students cannot understand information without first knowing the information and performance confirms that the knowledge has been acquired and that knowledge can be transferred into understanding and application[9]

Two students within the VCS Kennet and Annelie' s results demonstrate the above interaction. In the VCS Kennet is highly distractible and is not exhibiting good learning behaviour. Consequently he does not understand what is been asked and cannot answer the questions or perform the information that is been presented. Toward the end of the virtual simulation at 4 minutes 29 seconds his knowledge state increases (he has acquired information) and his distractibility remains stable. He is not getting distracted and therefore is exhibiting good learning behaviour. He has gained knowledge and understanding and should be able to perform if asked. Annelie has a low distractibility and when a question is asked her distractibility is stable. Throughout the VCS she only has small changes in her distractibility and as time goes on it consistently drops.

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[4] Lang, H.R and Evans, D.N. *Models, Strategies, and Methods for Effective Teaching* Pearson Education Frenchs Forest, 2003 p 47.
[5] Bloom, et al. *Taxonomy* 1956 p 13
[6] Charles, C.M. and Charles, M.G. *Classroom Management for Middle-Grades Teachers* Pearson, Frenchs Forest, 2004 p 130
[7] " Knowledge" *Heinemann Australian Dictionary*. 4th Edition ed. Port Melbourne 1992.

2

Figure W.12.: VCS Assignment (Student 0148), Page 2

Although her knowledge state remains stable (She has not acquired new information) indicating Annelie knows the information presented, to perform correctly she needs the knowledge, but also understanding and good learning behaviour.

Self-efficacy is belief in oneself; to be successful the student must believe they can be successful.[10] Metacognition judges the effort and time it takes to acquire information,[11] plus strategies and conduct needed to learn.[12] Self-confidence in successful strategies the student uses to learn will lead them to set goals and regulate their learning, to achieve the goals they believe they can reach.[13]

Cognitive ability is the ability to think, reason and understand the world. Cognitive ability develops over time [14] and is depended on the cultural context.[15] If the student has a high self-efficacy they will have confidence that they can learn and therefore will develop their cognitive ability much quicker. Both Metacognition and cognitive ability leads to knowledge. If a student's cognitive ability is high or the student wants to improve their ability, the amount of knowledge acquired increases due to activation in cognition. Similarly if a student has a high metacognition and has the skills on how to learn knowledge they can self regulate and change their learning style so that knowledge acquisition is increased.

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[8] Killen, *Effective Teaching* 2007 p 18
[9] Killen, *Effective Teaching* 2007 p 12
[10] Killen, *Effective Teaching* 2007 p 38
[11] Land, R et al. " Implications of Threshold Concepts for Course Design and Evaluation in Meyer, J.H.F. and Land, R. (eds) *Overcoming Barriers to Student Understanding* Routledge London, 2006 p 201.
[12] McInerney, D and McInerney, V. *Education Psychology- Constructing Learning*, Prentice Hall Frenchs Forest, 2002 p 113
[13] McInerney, and McInerney, *Education Psychology*-2002 p 114
[14] Krause, K.l. et al. *Educational Psychology for Learning and Teaching* Thomson Learning South Melbourne, 2003. p 39
[15] McInerney, and McInerney, *Education Psychology*-2002 p 54

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Figure W.13.: VCS Assignment (Student 0148), Page 3

The VCS illustrates the above interaction. In a five-minute period metacognition and cognitive ability will not often change significantly because for information to be processed it takes time. Annelie's self-confidence, metacognition and cognitive ability are high. As the VCS proceeds her self efficacy increases and although her metacognition and knowledge state does not it can be assumed that she gains increasing confidence that she has the right learning style (metacognition) and her cognition is at the right level. Kennet however has a low cognitive ability and metacognition. His self-efficacy starts off high but consistently decreases. At the 4 minute 29 second mark when Kennet acquires knowledge his self-efficacy simultaneously increases, he has confidence in himself and has learned something. However his metacognition stays stable. Kennet may have learned new knowledge but he does not know how he learned it. To retain and retrieve knowledge students must also know how they learned what they learned.[16]

Learning is not about remembering information alone. It is an interaction between behaviour, knowledge, understanding and performance, as well as self-efficacy, metacognition, cognitive ability and knowledge.

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[16] McInerney, and McInerney, *Education Psychology*-2002 p 113

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Figure W.14.: VCS Assignment (Student 0148), Page 4

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Figure W.15.: VCS Assignment (Student 0148), Page 5

W.5. VCS Assignment, Student 0059

The VCS Assignment response from Student 0059 is included on the following pages. There are 3 pages to this assignment.

The assignment was scanned from paper form to a digital format.

STIC Assignment 2 – VCS and Collaborative Teaching
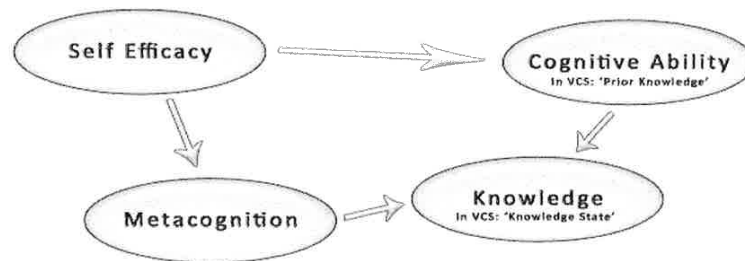
Self-Efficacy – This term may be loosely understood to refer to a student's feelings of self confidence towards a set task. Gist and Mitchell state that 'people who think they can perform well on a task do better than those who think they will fail' (1992, p.183). Similarly, Bandura notices that 'knowledge, skill and prior attainment are often poor predictors of subsequent attainments because the beliefs that individuals hold about their abilities...powerfully influence the ways in which they will behave' (as cited in Pajares, 1996, p.543). The graphs show little change in 'knowledge state' and 'metacognition' over the time period, but self-efficacy changes quite dramatically, which suggests that this factor is largely influential for creating positive student outcomes.

Metacognition – refers to the inherent knowledge of your own thoughts and the factors that influence your thought process. The relationship with self-efficacy suggests that if students feel confident about what they know and confident in their ability to think, they will achieve better learning outcomes. The relationship between these two factors is observable in the graphs; both Kennet and Annelie show a slight increase or decrease in metacognition when self-efficacy is increased or decreased. Metacognition is concerned with the building of a useful 'framework of thinking' (What Flavel calls 'one's knowledge regarding one's own cognitive processes' (1976, p.232)) around the prior knowledge of a student.

Figure W.16.: VCS Assignment (Student 0059), Page 1

Cognitive Ability – Bloom, Engelhart et.al., comment that 'the cognitive domain includes those objectives which deal with the recall or recognition of knowledge and the development of intellectual abilities and skills (1956, p.7). Essentially 'cognitive ability' refers to one's ability to think and build understanding. It involves mental processes that are associated with taking in, organising and making sense of information – processes which include perceiving, attending to, understanding and recalling information (Krause, Bochner & Duchesne, 2006,p.39). Whereas cognition is 'involved in doing', metacognition is 'involved in choosing and planning what to do, and monitoring what is being done' (Garofalo & Lester, 1985, p.164).

Knowledge – As the diagram suggests, the 'knowledge state' is the coming together of metacognition and cognitive ability. It is the final stage in which content is actually taken in and understood by the student. Beginning with self confidence (self-efficacy), if students have the ability to think and build upon prior knowledge (cognitive ability), and they have access to the appropriate frameworks and thought processes required for a task (metacognition), then the acquisition of knowledge is the logical result. Kennet's graph shows this relationship: in the final moments of the test, an increase in his 'knowledge state' is also accompanied by an increase in metacognition and self-efficacy.
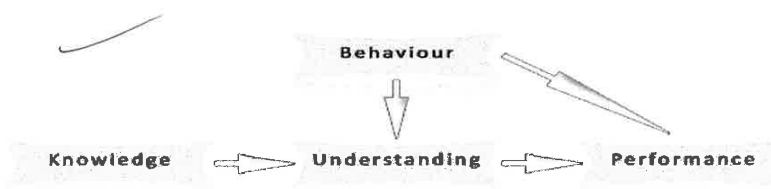
Knowledge – While a myriad of different 'knowledges' may converge in each classroom, in the case of this diagram I think knowledge should be taken to mean 'prior knowledge'. In this context, the term is understood as an expression of what experiences and ideas students bring with them into the classroom. This knowledge has an impact on student learning because, as Killen states 'without the necessary background information,

Figure W.17.: VCS Assignment (Student 0059), Page 2

students cannot learn new things because learning is essentially a process of making sense of new information by applying existing understanding to new experiences and ideas' (2007, p.38).

Understanding –Gaining understanding of a topic, rather than just knowing the facts, is facilitated through teacher behaviour such as scaffolding and the presentation of topics and methods which can include and engage all students. Indeed, students 'understand something when it has meaning for them or when it makes sense for them' (Killen, 2007, p.11). Laird acknowledged the importance of a holistic approach to learning because 'personality consists of many elements…intellect, emotions, body impulse, intuition and imagination that require activation for learning to be effective' (1955, p.121), and the role of the teacher is to take into account all such factors in teaching students.

Behaviour – is related to the factors 'self-efficacy' and 'distractability' which appear on the VCS graphs. The graphs show that there is a direct correlation between how engaged a student is with the task at hand, and their feelings of self-confidence at their ability to complete said task. This suggests that behaviour management in the classroom (which includes keeping students engaged and on task) has a large impact on student outcomes ('understanding' and 'performance'). The role of the teacher is to acknowledge Thorndike's 'law of effect' (as cited in McInerney & McInerney, 2006, p.131), and provide reinforcement for appropriate behaviour so that classroom time can be more effectively spent on building understanding and eliciting successful student performance.

Performance – refers to the actual outcomes which occur as a result of the combined efforts of the student and the teacher. As the diagram above shows, it is influenced by the student's prior knowledge ('knowledge'), the ability of the teacher to provide scaffolding and appropriate and engaging tasks ('understanding'), classroom management and the student's attitude to their learning and their desire to achieve positive outcomes ('behaviour').

Figure W.18.: VCS Assignment (Student 0059), Page 3

W.6. VCS Assignment, Student 0139

The VCS Assignment response from Student 0139 is included on the following pages. There are 4 pages to this assignment.

The assignment was scanned from paper form to a digital format.

STIC 1 Assignment 2

Collaborative teaching and the Virtual Classroom Simulation

Educational psychology theory allows us to understand the determinants affecting student learning and behaviour in the classroom. The self-efficacy, prior knowledge and metacognitive levels of individual students affect the ways that, and ability of, students to gain new knowledge and understanding to then apply this new knowledge through certain behaviours (performance).

Self-efficacy is the belief individuals have in their own ability to perform certain behaviours or complete certain tasks (Schunk, 1991, p.121). Self-efficacy is not directly related to ability. It is possible one may have high notions of self-efficacy in certain areas but perform poorly, and vice versa, although high self-efficacy is usually related to better performance (Schunk, 1991, p.121-122).

Metacognition refers to "cognition about cognition", or, "thinking about thinking" (Flavell, 1985, p.104). Using metacognition the learner is actively involved in thinking about their learning during the performance of certain behaviours and directs student approaches to this learning. Levels of metacognition are related to development level, with higher levels of development being associated with the use of metacognition in student self-regulated learning (McInerney & McInerney, 2002, p.114).

Cognitive ability relates to a student's development level. This may be assessed using Jean Piaget's stages of intellectual development whereby a learner moves through distinct psychological and biological stages concurrently, each stage representing a higher-order of thinking or cognition that is based upon and related to the one before (McInerney & McInerney, 2002, pp.26-28). If we look at the social constructivist theory of Lev Vygotsky and his "zone of proximal development" one's growth in knowledge is constantly being built upon the foundation of previous knowledge and this process is helped along by the use of scaffolding in a social context (for

1

Figure W.19.: VCS Assignment (Student 0139), Page 1

example, in the home, in the school) until the learner reaches independent understanding and is then challenged once more. Each theory is considered constructivist. Knowledge, just like a building, is constantly reaching new heights and being built upon formerly made foundations.

What is knowledge? To know is to be "to be cognizant of; have a concept of in the mind". Knowledge is "a result or product of knowing; information or understanding acquired through experience; practical ability, or skill" (Funk & Wagnalls Standard Desk Dictionary, 1981). Simply, it is the myriad experience that exists within the mind of the individual.

What is the relationship between self-efficacy, cognitive ability, metacognition and the attainment of knowledge in relation to the graphs presented to us in Virtual Classroom Simulation (VCS) and the processes going on within the minds of Annelie and Kennet during question time in class?

The most distinct difference between the two students is their value levels relating to knowledge state (Annelie 8, Kennet 3.50) and metacognition (Annelie 7, Kennet 3.00). It is interesting to note that Kennet's knowledge state rises slightly toward the end of the "lesson" although his level of metacognition is consistently declining. This may be interpreted as him listening to the correct answer of a question that he did not know, but not being conscious of his own thinking processes at the time (active listening).

The two students have relative levels of distractibility (Annelie 4, Kennet 5). Kennet's distractibility level is keenly erratic, especially in idle periods. This is a student who needs to be constantly engaged! Both students have a keen drop in distractibility throughout the session. This may mean they are engaged in the learning process and that it is meaningful. For learning to be meaningful, for students to be engaged in the attainment of new knowledge, the new subject matter to be taught should not come out of "left-field" but should be based on prior knowledge. Random, unique information that has no "schema" to be attached to can be easily forgotten (McInerney & McInerney, 2002, p.80). As discussed above, from the constructivist perspective,

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Figure W.20.: VCS Assignment (Student 0139), Page 2

knowledge is constantly being built upon foundations that have come before. Perhaps the teacher has used an advance organiser advocated by David Ausubel (McInerney & McInerney, 2002, p.111). This can also relate to the students high levels of self-efficacy. They have begun the lesson with confident notions of their ability based upon prior knowledge. Annelie's self-efficacy progressively rises while Kennet's declines. This may relate to the development level between the two, or the incongruent nature of Kennet's prior knowledge (McInerney & McInerney, 2002, p.83).

As discussed earlier there is a distinct difference between the knowledge states of the two students. Annelie is a whole 4.50 value points ahead of Kennet in knowledge state. It is interesting to note that Annelie's knowledge state does not change throughout the lesson. Kennet's rises toward the end. We might conclude that Annelie has not been challenged. Kennet has. He has been challenged and learnt some new information (knowledge) and his metacognition has been fluctuating throughout. Annelie's has been relatively stable with an inclination to rise. She is thinking about the information being presented but perhaps not acting upon it (that is, raising her hand and being asked). If we look at Kennet's reactions at 4.29 horizontal we find that his self-efficacy, knowledge state and metacognition all rise, while his distractibility lowers. Perhaps he has answered a question correctly on the basis of intuitive knowledge and it has been validated by the teacher. He has learnt.

There are myriad ways in which one could draw links between educational psychology literature and the VCS. Although there is no way to replace practical experience within the classroom (why can they all be manipulable cyborgs?) it does offer us a wonderful insight into "real time" relations between the teacher and their students. Limitations are that questions are non-specific, but it does take into account the inner workings of individuals within a certain environment. Just like metacognition, we need to look *behind* what is immediately perceivable and find ways in which to enrich experiences for both students and teachers; it is a reciprocal relationship.

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Figure W.21.: VCS Assignment (Student 0139), Page 3

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Figure W.22.: VCS Assignment (Student 0139), Page 4

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Nomenclature

3D   Three-dimensional

ABM Agent Based Modelling

ABMS Agent Based Modelling and Simulation

ABS   Agent Based Systems

ABSS Agent Based Social Simulations

AGFI Adjusted Goodness-of-Fit Index

AI   Artificial Intelligence

ANL Argonne National Laboratory

API   Application Programming Interface

BTeach Bachelor of Teaching

CFA   Confirmatory Factor Analysis

CFI   Comparative Fit Index

CSM Conceptual and Simulation Modelling

CSS   Cascading Style Sheets – used to separate content (HTML) from style (CSS) in a web page

CTA   Computerised Text Analysis

CTT   Classical Test Theory

Nomenclature

DBMS Database Management System

DEEWR Department of Education, Employment and Workplace Relations

df   degrees of freedom

DIAS Dynamic Information Architecture System

DM   Data Mining

EduPEx Education and Pedagogy Expert Solutions

EFA   Exploratory Factor Analysis

FU   Flinders University

GFI   Goodness of Fit Index

GradDipEd Graduate Diploma in Education

GUI   Graphical User Interface

HCI   Human-Computer Interaction

HREC Human Research Ethics Committee

HTML HyperText Markup Language — file format for the World Wide Web

I/O   Input and Output (of data)

ICT   Information and Communication Technology

IDE   Integrated Development Environment

Infit MNSQ Infit Mean Square

IP   Intellectual Property

IRT   Item Response Theory

ITS   Information Technology Services, University of Adelaide

JAR   Java ARchive

JAXP Java API for XML Processing

JVM Java Virtual Machine

LISREL Linear Structural Relations

LMS Learning Management System

M&E Measurement and Evaluation

MHV Modern Heap View (Java Module)

MI Multiple Imputation

MySQL An open source DBMS (see DBMS)

OECD The Organisation for Economic Co-operation and Development

OS Open Source;
Operating System

PA Path Analysis

PCK Pedagogical Content Knowledge

PCM Partial Credit Model

PHP Hypertext Pre-Processor — an open source server-side scripting language
used to develop dynamic web pages

PISA Programme for International Student Assessment

QUIS Questionnaire for User Interaction Satisfaction (Shneiderman, 1992)

RAM Random Access Memory

RMR Root Mean Square Residual

RMSEA Root Mean Square Error of Approximation

RP Research Problem

Nomenclature

RSM   Rating Scale Model

SAX   Simple API for XML

SEM   Structural Equation Modelling

SF   Simulation Framework

SICTAS Strategic ICT Advisory Service

SPSS   Statistical Package for the Social Sciences

SPSS TAS SPSS Text Analysis for Surveys

SQL   Structured Query Language

STIC   Student-Teacher Interaction in the Classroom

TTA   Traditional Text Analysis

UoA   University of Adelaide

VCS   Virtual Classroom Simulation

WWW World-Wide-Web

XML   Extensible Markup Language