

University of Wollongong - Research Online

Thesis Collection

Title: Learning as a game: exploring cultural differences between teachers and learners using a team learning system

Author: John Gilchrist Findlay

Year: 2008

Repository DOI:

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following: This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author. Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material.

Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Unless otherwise indicated, the views expressed in this thesis are those of the author and do not necessarily represent the views of the University of Wollongong.

Research Online is the open access repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

2008

Learning as a game: exploring cultural differences between teachers and learners using a team learning system

John Gilchrist Findlay
University of Wollongong, jfindlay@uow.edu.au

Follow this and additional works at: <https://ro.uow.edu.au/theses>

University of Wollongong

Copyright Warning

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site.

You are reminded of the following: This work is copyright. Apart from any use permitted under the Copyright Act 1968, no part of this work may be reproduced by any process, nor may any other exclusive right be exercised, without the permission of the author. Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material.

Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

Unless otherwise indicated, the views expressed in this thesis are those of the author and do not necessarily represent the views of the University of Wollongong.

Recommended Citation

Findlay, John G, Learning as a game: exploring cultural differences between teachers and learners using a team learning system, PhD thesis, School of Economics and Information Systems, University of Wollongong, 2008. <http://ro.uow.edu.au/theses/800>

NOTE

This online version of the thesis may have different page formatting and pagination from the paper copy held in the University of Wollongong Library.

UNIVERSITY OF WOLLONGONG

COPYRIGHT WARNING

You may print or download ONE copy of this document for the purpose of your own research or study. The University does not authorise you to copy, communicate or otherwise make available electronically to any other person any copyright material contained on this site. You are reminded of the following:

Copyright owners are entitled to take legal action against persons who infringe their copyright. A reproduction of material that is protected by copyright may be a copyright infringement. A court may impose penalties and award damages in relation to offences and infringements relating to copyright material. Higher penalties may apply, and higher damages may be awarded, for offences and infringements involving the conversion of material into digital or electronic form.

LEARNING AS A GAME: EXPLORING CULTURAL
DIFFERENCES BETWEEN TEACHERS AND LEARNERS
USING A TEAM LEARNING SYSTEM

by

JOHN G. FINDLAY

M.B.A. (Southern Cross)

A dissertation submitted for the degree of

Doctor of Philosophy of

The University of Wollongong

2009

DECLARATION

I certify that the substance of this thesis has not previously been submitted for any degree and is not being submitted for any degree.

I certify that any help received in preparing this thesis and all sources used have been acknowledged.

Signed

.....
JOHN G. FINDLAY

ACKNOWLEDGEMENTS

This study has many aunts and uncles, not in a genetic sense, but in the social sense. I am particularly appreciative of the assistance of my supervisors, Dr. Helen Hasan for the praise and encouragement and considerable down-to-earth guidance when I was struggling with the language of research and trying to draw many strands together and Dr. Kathryn Crawford who encouraged me to embark on what has been an amazing journey. I must also thank my colleagues of the original Novae Research Group and in particular, Dr. Robert Fitzgerald, with whom I have written many conference and some journal articles and who has read many of my drafts and Michelle Lee, who I hope one day will return to her research and complete what began as an interesting study.

The head teacher Mr. David Triggs, teacher and students of Greensward College in the United Kingdom have been extraordinarily helpful, initially, as the participants in the research and the original collectors of the data and more recently for their patience as we continued to discuss and confirm or reject emerging theories.

For all the people in our Zing network who have been thoughtful listeners or critics especially Dr. Alison Elliott of Charles Darwin University, Dr. Linda Newman of the University of Western Sydney, Dr. Greg Whymark of Central Queensland University, Dr. Lois Holzman and Dr. Carrie Lobman of the East Side Institute, New York; Leonie Dodd and Mary McQuilten of NYC Zing in New York, Ray Buschman of Solving the Impossible, Gosford, Australia and Tomas Rudolf and Monika Kida of Innovatika in Warsaw. Thanks for listening and providing opportunities to present and test out what probably seemed at the time outlandish ideas.

And for my children, Justin, Hamish, Liam, Sarah and Amelia who have listened politely and offered subtle encouragements when I tried to explain how the prototype theory might explain events in our lives, even though they all freely admit they mostly did not have a clue what I was waffling on about.

And a special thanks to Winnie Shea, a gifted, inspired and perceptive facilitator of learning, who started me off on this journey, by giving me a book, with the words “Read this. This is what is happening for the kids.”

ABSTRACT

The research presented in this thesis aims to investigate the first-time use of a tool for collective knowledge creation in order to explain how cultural differences between teachers and learners in the context of the historical development of tools contributes to student engagement and learning. To this end, a study was conducted at a secondary school in the United Kingdom with 92 teachers and students. The study was exploratory and is presented as a series of case studies, using a mixed method approach including discourse analysis and social network analysis.

The study was interpreted via a complexity-activity framework based on cultural-historical activity theory (activity theory) as propounded by the original theorists (Luria, 1976; Vygotsky, 1978, 1986; Leont'ev, 1978) and more recent researchers (Engestrom, 1987; Miettinen, 1999; Tobach, 1999; Hedegaard, 2005). It is also informed by other theories of development or emergence including complexity theory and co-evolution (Cohen & Stewart, 1994; Kauffman, 1995), innovation theory (Rogers, 1983; Foster, 1987), brain sciences (Schore, 2000; Freeman, 2000; Goldberg, 2001) flow theory (Csikszentmihalyi, 1975) and theories of team development (Tuckman, 1965; Schein, 1988; Losada, 1999). Activity theory holds that humans develop culturally as well as genetically. Humans use language, symbols, gestures, signs and physical and psychological tools to transform themselves and society. Vygotsky showed that children develop in two main ways, via social interactions with adults and through collective play with their peers. Complexity theory offers a complementary explanation of the social, cultural and technological discontinuities and patterns of emergence in cognition and intersubjective relations that are evident in human activity.

The literature review revealed a new pattern of childhood development, in which young people are now learning what it is to be human by interacting with smart socio-cognitive tools and their peers. Many students are bored by their teachers' use of traditional monological pedagogical methods that maintain strict social control at the expense of learning. Students are frustrated by a lack of access to ICT and do not understand why teachers rarely use computers in the classroom. One in six students leave school unable to read, write and count, ill equipped for a world of work that demands high levels of literacy, numeracy, interpersonal skills and computer literacy for even the most basic jobs. At the same time, there are growing shortfalls for jobs that require complex negotiation and complex thinking skills to create, implement and maintain critical systems and infrastructure.

The main conclusion of the study is that teachers and students are separated by two generations of tool use. This finding is consistent with Vygotsky and Luria's original but discredited hypothesis of a periodic pattern to human learning and development at both a local and global scale. The teachers employed a centralized control model of tool use in their teaching that has its origins in the Industrial Age (1700-1940) whereas the students were more attuned to a social interactionist model that is Knowledge Age (1990-) centric. The teachers were reluctant users of the tool in the classroom and quickly reverted to the lecture, closed questioning and individual activities as their preferred pedagogy. However, the teachers made frequent use of the tool for their own professional development and community meetings. The students were enthusiastic users of the tool and enjoyed the opportunity to use high level thinking processes, discuss topics and express their own opinions. Some senior students who used the tool to recall memorized information saw little difference between the traditional classroom and the team learning system activities. In the role of the

facilitator, the teachers' and students' first performances were a chaotic mix of four speech types; the ideal and minimalist set of facilitator instructions required to coordinate a group, inner speech to guide the sequencing of the motor activity, previously learned speech routines applicable to other contexts and authority speech to maintain control. The facilitators' performances improved when the speech and motor activities became synchronised with the participant performances and the facilitator's fear of failure subsided in a shift from right brain to left-brain control. The senior students who were able to facilitate sessions competently after their initial training, were not encouraged to use their new skills in the classroom. All groups, with one exception, reported they were more engaged, enjoyed what they were doing and lost track of time when they participated in the team learning activity, which was consistent with the flow experience (Csikszentmihalyi, 1975). The groups also reported they felt more aware of their surroundings and each other, which may be indicative of a change of state in the group, from a disorganized structure focused on the self to a more aligned structure focused on the group. Questions and contributed concepts acted as catalysts, which sparked more concepts. In some sessions, the students generated avalanches of concepts consistent with team formation. Closed questions generated few responses. Open-ended discussible and high-level questions stimulated the most ideas and the most complex ideas.

The research findings have practical implications for school learning. The study showed that a tool such as the team learning system can scaffold rich questioning, promote high-level thinking and support leadership capacity in students, so that novice facilitators are able to successfully lead a group in complex learning activities after a few hours practice. A new model of learning characterised as “contagious learning” which involves playing “language games”(Wittgenstein, 1999) is proposed. Learners learn how to create and facilitate their own learning experiences and use the autocatalytic aspects of conceptual sets to accelerate the creation, spread and adoption of epidemics of ideas.

New theory developed during the course of the study contributes to the field of social psychology by resolving several of the contradictions in activity theory (Davydov, 1999; Engestrom, 1999). The model focuses on the co-evolutionary relationship between the humans and tools, the automation of speech and motor routines and the ability of learners to deal with novelty and plan ahead. The new complexity-activity theory explains the differences between incremental and transformational change, clarifies the relationship between individual and collective activity, and provides a classification system for types of activity that links the worlds of the material and the ideal.

TABLE OF CONTENTS

Title and abstract.....	iv
Table of Contents	vi
List of Tables	x
List of Figures	xi
List of Appendices	xii

CHAPTER 1

INTRODUCTION

Introduction to the area of the study	1
Context: Differences in tool use by teachers and learners	3
The research question	7
Theoretical models for exploring cultural differences	8
A tentative complexity-activity theoretical model	9
Research method: A series of case studies	10
Reporting the findings of the research	10
Conclusions and recommendations for further research	11

CHAPTER 2

THE WORLD OF TEACHERS AND LEARNERS AND THEIR USE OF TOOLS

Overview of the chapter	13
The rapidly changing world of work	14
Efforts to transform school education in the United Kingdom	20
Young people as consumers and learners using technology	25
Schools and teachers continue to resist change	31
Knowledge creation is now an essential skill	34
The role of higher order thinking and meta-cognitive skills in learning	38
Teamwork and communications skill development at school	42
Limitations to the use of 21st Century technologies in the school classroom	47
The rich world of tools for participation and knowledge creation	54
Group decision support systems for real-time human-to-human interactions	58
The Zing team learning system and its' history	61
Summary	65

CHAPTER 3

ACTIVITY THEORY: A 'GENETIC' LAW OF HUMAN DEVELOPMENT

Overview of the chapter	68
The search for a grand unified theory of human development	70

The cultural transmission and transformation of human knowledge	78
The spectrum of activities that is activity	81
Work activity	82
Play activity	84
School-going activity	87
Learning activity	89
Novelty, automatic operations and the human brain	91
Change, development and transformation in activity systems	96
How tools evolve in a symbiotic relationship with humans	105
New knowledge and tool creating processes	111
Intersubjective relations and coordination models	115
Rules and discourse models	119
Roles and performance	123
Summary	126

CHAPTER 4

COMPLEXITY AND OTHER THEORIES OF DEVELOPMENT

Overview of the chapter	132
Self-organisation as an explanation for transformation	134
The rapid co-evolution of tools with slowly evolving humans	141
Barriers to change, innovation and the tools for transformation	152
The brain as a self-organising system in symbiosis with tools	161
The dynamics of small groups and the subtle role of leadership	169
The role of novelty, play and attention in transformation	177
Summary	183

CHAPTER 5

THE COMPLEXITY-ACTIVITY MODEL AND RESEARCH QUESTION

Overview of the chapter	188
A tentative complexity-activity theoretical model	188
Self-organisation	189
Goal-directed activity	190
The research question	193

CHAPTER 6

RESEARCH DESIGN

Overview of the chapter	195
Methodological considerations	197
Case studies	198
Mixed methods approach	199
Other methodological considerations	200
Ethical considerations	201
Selection of the study group	201
Research procedures	203

Introducing the teacher and student facilitators to the study	204
Introducing the students to the tool and the study	205
Data collection	206
Transcripts of the initial training activity	206
Transcripts of classroom activities	206
Transcript of student feedback sessions	206
Teacher feedback workshop	207
Pre- and post- session reports	207
Video record	208
Survey of the flow experiences	208
Innovation inventory questionnaire	209
Student academic ability data	209
Data Analysis	210
Analysis of the session transcripts	210
Analysis of the video transcript	211
Analysis of participant idea generation	211
Analysis of concept order	212
Social network analysis of contributions and concept order	213
2-mode social network analysis	213
Directed graphs analysis	214
Analysis of participant roles as innovators and adopters of concepts	215
Analysis of participants academic scores and concept order	215
Analysis of question type, length and elaboration	216
Group flow analysis	216
Test to determine if concepts acted as catalysts	217
Summary	217

CHAPTER 7

STUDENT AND TEACHER PERCEPTIONS OF THE TEAM LEARNING ACTIVITY

Overview of the chapter	220
Head teacher Mr. David and his experiences	222
Head of college Ms. Debbie and her experiences	230
History teacher Mr. James and his experiences	234
Textiles teacher Ms. Zoe and her experiences	241
The Year 12 history students' experiences	246
The Year 8 textiles students' experiences	252
The facilitator group experiences	260
The Year 7 textiles students' experiences	262
The Year 9 history students' experiences	264
Summary and conclusions	266

CHAPTER 8

THE FACILITATOR PERFORMANCES

Overview of the chapter	271
The video record of the sessions	272
The ideal facilitator activity	272
Analysis of the facilitators' performances	275
Benchmark performances by the trainer	277
Year 8 cloning session with the researcher	278
Year 12 cloning session with the researcher	282
The history teacher's first performance	284
The history teacher's second performance	289
The textiles teacher's first performance	296
The student facilitators' performances	306
Facilitator speech patterns	308
Summary and conclusions	310

CHAPTER 9

THE PARTICIPANTS PERFORMANCES

Overview of the chapter	313
Participants' contributions	314
Summary of participants' contributions	315
Regularity of participation	316
Idea frequency and length by participant	319
Age and idea contribution	319
Rate of idea contribution	320
Concept generation, sharing and knowledge building	320
Facilitators group social network analysis	321
Year 12 history social network analysis	325
Year 12 cloning social network analysis	329
Year 8 feedback social network analysis	332
Year 8 cloning social network analysis	338
Year 8 textiles social network analysis	340
Questions as catalysts for concept generation	342
Types of questions and graph types	342
Knowledge creation model and graph types	343
Concepts as catalysts of further concept generation	344
Concept generation and verbal, mathematical and non-verbal skills	345
Concept generation and preferences for change and certainty	347
Question types and idea frequency and elaboration	348
Teacher and student question crafting abilities	350
Participant engagement and enjoyment	351
Summary and conclusions	354

CHAPTER 10

CONCLUSION AND RECOMMENDATIONS

Overview of the chapter	358
Summary of the major findings	360
Incremental, transformational and regressive change	364
Transformational change	364
Incremental change	365
Regression	366
Transformations in human activity	366
Individual	366
Collective	367
Cultural	368
Autocatalytic mechanisms in activity	368
Learning: A discontinuous or spiral process?	370
Collective objects and individual aspirations	371
Suggestions for further research	376
Implications for teaching and learning	378
Limitations of the study	380
Concluding personal thoughts	381
REFERENCES	384
APPENDICES	431

LIST OF TABLES

Table 6.1: Composition of the study population	202
Table 6.2: Types of data collected by source	203
Table 7.1: Summary of the case studies	221
Table 7.2: Year 12 history comments about their experiences	248
Table 7.3: Year 8 textiles comments about their experiences	254
Table 7.4: Facilitators group comments about their experiences	261
Table 7.5: Year 7 textiles student comments about their experiences	263
Table 7.6: Year 9 history student comments about their experiences	265
Table 7.7: Play, flow, team formation and reflective communication similarities	269
Table 8.1: Duration of the question cycles for the videotaped sessions	272
Table 8.2: Team learning etiquette and facilitator speech	274
Table 8.3: Question cycle times for Year 8 cloning session	279
Table 8.4: Question cycle times for Year 12 cloning session	283
Table 8.5: Question cycle times for the seniors' session	285
Table 8.6: Question cycle times of the Year 12 history session with Mr. James	289
Table 8.7: Question cycle times for the Year 8 textiles facilitated by Ms. Zoe	297
Table 8.8: Use of personal and collective pronouns by the facilitators	308
Table 9.1: Summary of participants' contributions	315
Table 9.2: Frequency and length of ideas per participant	319
Table 9.3: Frequency and length of ideas: younger vs. mature participants	320
Table 9.4: Rate of idea generation	320

Table 9.5: Summary of t-tests of means of isolated and connected concepts	344
Table 9.6: Relationship of concept generation with innovation index	347
Table 9.7: Relationship of Bloom's type to question length and frequency	349

LIST OF FIGURES

Figure 1.1: Groups discuss ideas using the team learning system	5
Figure 2.1: Percentage change in task types 1969-1989	17
Figure 2.2: Gap between required skills and what teachers teach	34
Figure 2.3: The power law of participation model	55
Figure 2.4: User interface of the team learning system: Year 8 feedback	62
Figure 2.5: The team learning system is used in school classrooms	63
Figure 3.1: Modern interpretation of Vygotsky's model of mediated action	72
Figure 3.2: Leont'ev's triarchic structure of activity	77
Figure 3.3: Structure of human activity	83
Figure 3.4: Contradictions in activity systems	102
Figure 4.1: Formation of large component by linking nodes and edges	138
Figure 4.2: Period doubling cascade and definition of the Feigenbaum number	139
Figure 4.3: Percentage of population employed in key sectors – 4mya to present.	145
Figure 4.4: S-curve model of innovation	148
Figure 4.5: Sequence of S-curves in tool evolution	150
Figure 4.6: Mediation model	151
Figure 4.7: Language adaptation under selective pressure	167
Figure 4.8: Stages of team development and change of phase	173
Figure 4.9: Modified model of language and tool evolution	184
Figure 5.1: Model of incremental and transformational change in activity	189
Figure 5.2: Joint model of activity where tools are symbiotic extensions	190
Figure 5.3: Tools as exoskeletons: Sigourney Weaver in Aliens	192
Figure 5.4: Revised definition of role in relation to tools	192
Figure 5.5: Analytical tool to explore change in activity systems	193
Figure 6.1: Definition of unique, first, total, maverick and maven concepts	213
Figure 6.2: Example of the coding method for 2-mode graphs	214
Figure 6.3: Example of the coding method for directed graphs	215
Figure 6.4: Research plan, data collection and analysis	218
Figure 6.5: Data analysis and organisation of chapters	219
Figure 7.1: Concept analysis of Mr. David's responses	224
Figure 7.2: Concept analysis of Ms. Debbie's responses	230
Figure 7.3: Concept analysis of Mr. James's responses	235
Figure 7.4: Concept analysis of Ms. Zoe's responses	242
Figure 7.5: Concept analysis of Year 8 textiles experience of the classroom rules	256
Figure 7.6: Concept analysis of Year 8 textiles view of team learning system rules	257
Figure 7.7: Cultural gap between traditional and team learning system classrooms	266
Figure 8.1: Year 8 session facilitated by the researcher	278
Figure 8.2: The researcher facilitates a session with Year 12 history	282
Figure 8.3: Seniors session facilitated by Mr. James	284
Figure 8.4: Mr. James consulted the manual when he forgot what to do and say	291
Figure 8.5: Year 12 history student body language during a mini lecture	294
Figure 8.6: Ms. Zoe facilitates her first team learning session with Year 8 textiles	296
Figure 8.7: Two students facilitated the first cycle of the seniors' session	306
Figure 9.1: Frequency of ideas generated per person per discussion cycle	317

Figure 9.2: 2-mode network graphs for the Facilitators group session	322
Figure 9.3: Directed graphs analysis: Small 3-core at question 5	324
Figure 9.4: First concepts vs. connectivity of the members of the facilitator group	324
Figure 9.5: 2-mode network graphs for the Year 12 history session	325
Figure 9.6: Directed graphs analysis: Large 3-core at question 8	328
Figure 9.7: First concepts vs. connectivity of Year 12 history	328
Figure 9.8: 2-mode network graphs for the Year 12 cloning session	329
Figure 9.9: Directed graphs analysis: Large 3-core at question 1	331
Figure 9.10: First concepts vs. connectivity of Year 12 cloning	332
Figure 9.11: 2-mode network graphs for the Year 8 feedback session	333
Figure 9.12: Directed graphs analysis: 3-cores and 4-cores of question 8	337
Figure 9.13: First concepts vs. connectivity of Year 8 feedback	337
Figure 9.14: 2-mode network graphs for the Year 8 cloning session	338
Figure 9.15: 2-mode network graphs for the Year 8 textiles session	341
Figure 9.16: Summary of the network graphs associated with concept generation	343
Figure 9.17: Attempts at constructing open-ended questions	350
Figure 9.18: Changes in the flow state of groups using the team learning system	353
Figure 9.19: Directed graphs of three classroom models	357
Figure 10.1: Cultural gap between the team learning and the traditional classroom	361
Figure 10.2: Revisions to the triarchic model of activity	362
Figure 10.3: Transformational change in Ms. Zoe's Year 8 textiles classroom	364
Figure 10.4: Incremental change in Mr. James Year 12 history classroom	364
Figure 10.5: Regressive cultural change	366
Figure 10.6: Model of joint activity: Collective subjects and objects	373
Figure 10.7: Classification of activity based on roles and rules	374

LIST OF APPENDICES

I	Participant survey form	431
II	Feedback questions for Year 8 textiles and Year 12 history students	435
III	Feedback questions for teachers	437
IV	Reliability statistics for flow before and after	438
V	Directed graphs	440
VI	Relationship of attitude to learning with concepts	444
VII	Independent sample t-tests of isolated concepts and concepts in cliques	446
VIII	Session reports: session transcript, video transcript and concept analysis	447
IX	Information letter to parents	451