A constructivist theory of learning: implications for teaching

Graham Dale Hendry
University of Wollongong

Recommended Citation
A constructivist theory of learning: implications for teaching

Graham Dale Hendry
University of Wollongong

http://ro.uow.edu.au/theses/1764

This paper is posted at Research Online.
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.
A CONSTRUCTIVIST THEORY OF LEARNING: IMPLICATIONS FOR TEACHING

A thesis submitted in fulfilment of the requirements for the award of the degree

DOCTOR OF PHILOSOPHY

from

THE UNIVERSITY OF WOLLONGONG

by

GRAHAM DALE HENDRY, BA(HONS)

FACULTY OF EDUCATION

1992
DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except that which is acknowledged.

Signed

Graham D. Hendry
ACKNOWLEDGEMENTS

My thanks go first to my Family, who throughout the writing of this dissertation supported and believed in me.

To my supervisor, Professor Ronald C. King, for his inspiration, guidance and encouragement, I extend a special thank you.

I also wish to convey my gratitude to Mr Lawrence Hill of Helensburgh, for his generosity and support, and to my colleagues and friends at the University of Wollongong for their advice and thoughtful comments.
# TABLE OF CONTENTS

Acknowledgements ii  
Abstract iii  
Table of Contents iv  
List of Figures and Tables vii  
List of Appendices ix  

**CHAPTER 1**  
1.1 Introduction 1  
1.2 A selective historical review of ideas about knowledge and learning 8  
1.3 Summary 13  

**CHAPTER 2**  
2.1 Introduction 14  
2.2 The mechanical view in physics and the philosophy of Hume 14  
2.3 The mechanical view in education 16  
2.4 Network models of memory 17  
2.4.1 Learning 19  
2.5 The cognitive structure theories of Ausubel and Novak 20  
2.5.1 Learning 21  
2.6 Schema 23  
2.7 Schema theories 28  
2.7.1 Comprehension and inference 34  
2.7.2 Learning 37  
2.8 Summary 41  

**CHAPTER 3**  
3.1 Introduction 44  
3.2 Constructivism 44  
3.3 The generative model of learning 47  
3.4 The theory of genetic epistemology 49  
3.5 Summary 54  

**CHAPTER 4**  
4.1 Introduction 56  
4.2 The brain and the cerebral cortex 59  
4.3 The neuron 61  
4.4 The synapse 61  
4.5 The generation of a nerve impulse 63  
4.6 Chemical synaptic transmission 65  
4.7 Spatial and temporal summation 66  
4.8 The structure 68  
4.9 Reduction 71  
4.10 Post-tetanic potentiation 72  
4.11 Long-term potentiation 73  
4.12 Synaptic growth 74  
4.13 Inhibition of protein synthesis 76
# CHAPTER 5

5.1 Introduction
5.2 The production of sensory impulses
5.3 The thalamus and hippocampus
5.4 The reticular formation
5.5 The ascending reticular activating system
5.6 Summary of the process of construction
5.7 Summary

# CHAPTER 6

6.1 Introduction
6.2 Word meaning
6.3 Intrinsic motivation
6.4 Memorisation
6.5 Approaches to learning tasks
6.6 The transmission view
6.7 Children's ideas and meanings in science education
6.8 Summary of expanded theory

# CHAPTER 7

7.1 Introduction
7.2 Method
   7.2.1 Participants
   7.2.2 Procedure
   7.2.3 Measures
7.3 Results
7.4 Discussion
   7.4.1 General
   7.4.2 Instructions A
   7.4.3 Instructions B
   7.4.4 Summary
7.5 Students' ideas about teaching and learning

# CHAPTER 8

8.1 Introduction
8.2 Future psychological research
8.3 Future physiological research
8.4 Summary

# CHAPTER 9

9.1 Introduction
9.2 Implications for teaching
   9.2.1 General teaching strategies
   9.2.2 Implications for teachers' subject knowledge
   9.2.3 Implications for curriculum
   9.2.4 Implications for assessment
9.3 Summary of implications
LIST OF FIGURES AND TABLES

Figure 4-1. Lobes of the cerebrum and areas of the cerebral cortex. In the left hemisphere, Broca’s area and Wernicke’s area are associated with the production and comprehension of language respectively. Interaction between nerve impulses generated in the visual and auditory cortices is believed to occur in an area called the angular gyrus, situated in the parieto-temporal region (from Geschwind, 1979, p. 161).

Figure 5-1. Location of the thalamus in the brain showing the major specific (S), association (A) and non-specific (N) thalamic nuclei (from Kelly, 1985a, p. 233).

Figure 7-3-1. Percentage of students (N=48) who categorised each example as an animal and the total percentage of students who correctly classified all six examples.

Figure 7-3-2. Percentage of total reasons chosen of the five most frequently chosen reasons by students. Also shows the percentage of total reasons chosen of the five most frequently selected reasons by Teachers’ College students in the Bell (1981) study.

Table 7-2-1. Study Process Questionnaire (SPQ) profiles and typical approaches (from Biggs, 1987b).

Table 7-3-1. Students’ Study Process Questionnaire (SPQ) profiles and typical approaches.
Table 7-3-2. Classification of students’ structures for animal and keywords as either alternative (A) or prerequisite (P).
LIST OF APPENDICES

Appendix A  Text with instructions A.  226
Appendix B  Text with instructions B.  229
Appendix C  Survey 1.  232
Appendix D  Intended meanings of 'animal' and keywords.  238
Appendix E  Multiple-choice survey.  240
Appendix F  List of reasons.  249
Appendix G  Affect questionnaire.  250
Appendix H  Survey 2.  251
Appendix I  Neuroglial cells.  252
Mankind’s plague is the conceit of knowing.

Montaigne, 1575-76.\(^1\)

---