

Contents

1 The Unified Learning Model	1
Working Memory	2
Knowledge	2
Motivation	3
Three Principles of Learning	3
Notes	4

Part I Developing the Unified Learning Model

2 Learning	7
The Neurobiology of Learning	7
The Operation of the Neuron	8
The Architecture of the Brain	9
What Is Knowledge?	10
How Learning Works	10
Meaningful Learning	11
The Centrality of Working Memory	13
Motivation	13
General Rules of Learning	14
1. New Learning Requires Attention	14
2. Learning Requires Repetition	14
3. Learning Is About Connections	14
4. Some Learning Is Effortless; Some Requires Effort	15
5. Learning Is Learning	15
Our Last Words on the Neurobiology of Learning	16
Notes	16
3 Working Memory	19
Working Memory Capacity	19
How Working Memory Functions	20
Learning Principle 1: Working Memory Allocation	22
Rule 1: New Learning Requires Attention	23
Rule 2: Learning Requires Repetition	24
Rule 3: Learning Is About Connections	25

Expanding Working Memory Capacity	27
Working Memory as Consciousness	29
Basic Rules of Working Memory	29
Storage Rules	30
Retrieval Rule	30
Notes	33
4 Knowledge	33
Long-Term Memory in the Brain	34
Storage in Long-Term Memory	34
Retrieval from Long-Term Memory	35
Connection in Long-Term Memory	36
The Location of Knowledge in the Brain	36
Episodic Memory	38
Semantic Knowledge	39
Declarative and Procedural Knowledge	39
Declarative Knowledge	40
Building a Chunk	43
Procedural Knowledge	45
Building a Procedure: Proceduralization	47
Automaticity	49
Building Larger Knowledge Networks	49
Declarative Networks	50
Procedural Networks	51
Situating Knowledge and Transfer	53
Problem Solving and Critical Thinking	54
Incidental Learning	56
Knowledge and Working Memory Interaction: Expanding Capacity	58
ULM Learning Principle 2: The Prior Knowledge Effect	61
Basic Knowledge Processes	62
Notes	65
5 Motivation	66
Learning Principle 3: Working Memory and Motivation	67
The Neurobiology of "Biological" Motivation; Drives	68
Extensions of Drive Theories	68
Beyond Drive	69
Goals	70
Goal Value	71
Contingencies: The Experienced Past; The Expected Future	73
Specific Motivational Expectancies	74
Self-Efficacy	76
Emotion	77
Emotional Content of Knowledge	78
Emotions as Goals	78
The ULM and Emotion	78

Interest	78
Situational Interest	79
Personal Interest	80
Interest Is Idiosyncratic	81
The Hierarchical Structure of Motivation	82
Motivating Working Memory Allocation	83
Notes	85
6 How the ULM Fits In	85
Ability	86
Heredity	89
Cognitive Development and Stages	92
Vygotsky – ZPD; Social Construction	94
Short-Term Memory	95
Cognitive Load	96
"Ah, Ha" Moments Involve Special Marking for Later Retrieval	97
Ordinary Learning Moments Require No Special Marking	98
Savants: Prodigies	99
Special Memory	99
Multiple Intelligences	101
Learning Styles	101
The Executive	102
Gender Differences	102
Primary Versus Secondary Learning	104
History and Background	105
Our Purpose in This Chapter	106
Notes	

Part II Applying the Unified Learning Model

7 Classroom Applications Overview	115
Notes	116
8 Supporting Motivation	117
Learning Goals	118
Belief in Effort	121
Goal Value and Outcome Expectancies	124
Self-Efficacy	126
Interest	129
Discouraged Terms	131
Summary Thoughts on Motivation	131
Notes	131
9 Efficient Instruction	135
Cognitive Load	135
The CORE Lesson Model	135
Explicit Knowledge Is Teachable; Implicit Knowledge Isn't	136

Optimal "Difficulty" for New Content	138
Storage and Retrieval	139
Notes	140
10 Feedback and Assessment	141
Assessment	142
Feedback	143
New Learning Requires Attention	143
<i>Learning Requires Repetition</i>	144
Learning Is About Connections	144
Teaching to the Test	145
High-Stakes Testing Versus Feedback	146
Praise Versus Encouragement	147
Scaffold Learning by Responding to Outputs	148
Notes	149
11 A Focus on Thinking	151
Content-Specific Thinking	152
Have Students Anticipate (Expectancy-Driven Methods)	153
Teachers Create Sub-goals (Parse the Intrinsic Load)	153
Remove the Scaffolding	154
Have Students Imagine Outcomes	154
Accommodate Cognitive Artifacts	155
Experts Practice Deliberately	156
Conceptual Change	157
Notes	158
12 Encouraging Self-regulation	161
Five Students	161
Five Profiles of Student Motivation and Self-regulation	162
What Can Teachers Do?	165
Final Thoughts on Self-Regulation	166
Notes	167
13 Managing the Classroom Environment	169
Structure – Based on Goals	169
Contingency	170
Outcome Expectancy	171
Classroom Deportment	171
Teach Expected Behaviors	172
Dealing with Inappropriate Behavior	172
Breaking Up Is Hard to Do	173
Notes	175
14 Improving as a Teacher	177
Teachers' Prior Knowledge	178
Methods Courses Versus Professional Meetings	179
Video Clubs	180

Attention: New Learning Requires Working Memory	180
Repetition	181
Connections	181
Effortless Versus Requiring Effort	182
Connections Are Connections	183
Closing Thoughts	184
Notes	184
15 Policy	187
Pre-school	187
Schools	188
School: Discourage Words Suggesting Innate Abilities	188
District, State: Organize Based upon Knowledge	189
Gifted Students, Skipping Grades, and Advanced Placement	190
State, National: Large Pre- and Primary School Impacts	192
Early-Career Teacher Mentoring	192
Policy Summary	193
Notes	194
16 Frontiers	197
Declarative Versus Procedural	197
Where Is Working Memory?	198
Parental Involvement; Rote Memorization	198
Laboratory Teaching	198
The Science Demonstration	199
Informal Education	200
Evaluating Teachers	201
College Teacher Evaluation	201
K-12 Teacher Evaluation	201
Quantitative Modeling	202
Notes	203
17 Epilogue	205
Notes	207
Index	209