

Contents

1	Reconceptualizing Nature of Science for Science Education	1
1.1	Introduction.....	1
1.2	Brief History of NOS in Science Education Research.....	3
1.3	NOS in Curricular Context	9
1.4	Key Contributions of the Book	13
	References.....	16
2	Family Resemblance Approach to Characterizing Science.....	19
2.1	Introduction.....	19
2.2	Justifying the Family Resemblance Approach.....	24
2.3	Extending the Family Resemblance Approach	27
2.4	The FRA as a Holistic Model	28
2.5	The Relationship of FRA to Research Traditions and Policy in Science Education.....	31
2.6	Potential Challenges in Applying the FRA in Science Education.....	33
2.7	The Layout of the Book	36
	References.....	38
3	Aims and Values of Science	41
3.1	Introduction.....	41
3.2	What Are Aims and Values of Science?.....	43
3.3	Generating a Framework on Scientific Aims and Values for Science Education	48
	3.3.1 What Are Aims and Values in Science?	48
	3.3.2 How Do Aims and Values Function in Science?.....	49
3.4	Educational Applications	50
3.5	Fostering Scientific Aims and Values in Science Education.....	54
3.6	Conclusions.....	57
	References.....	64

4 Scientific Practices	67
4.1 Introduction.....	67
4.2 Differentiating Scientific Practices, Processes and Activities.....	69
4.3 Examples of Scientific Practices: Classification, Observation and Experimentation	71
4.4 A Proposed Heuristic of Scientific Practices	80
4.5 Application of the Benzene Ring Heuristic	83
4.6 Conclusions and Discussion	85
References.....	86
5 Methods and Methodological Rules	91
5.1 Introduction.....	91
5.2 Beyond the “Scientific Method”	92
5.3 Scientific Methods and Methodological Rules	96
5.4 Methodological Rules as Evolving Entities	104
5.5 Educational Implications	105
5.6 Conclusions.....	111
References.....	111
6 Scientific Knowledge.....	113
6.1 Introduction.....	113
6.2 Classification of Scientific Knowledge Forms.....	116
6.3 Domain-Specificity of Scientific Knowledge	120
6.4 Evaluation of Scientific Knowledge.....	125
6.5 Explanatory Dimension of Scientific Knowledge.....	126
6.6 Educational Applications	131
References.....	132
7 Science as a Social-Institutional System	137
7.1 Introduction.....	137
7.1.1 Professional Activities.....	139
7.1.2 Scientific Ethos	140
7.1.3 Social Certification and Dissemination.....	141
7.1.4 Social Values of Science	142
7.2 Elaborating on Science as a Social-Institutional System.....	142
7.2.1 Social Organisations and Interactions.....	145
7.2.2 Political Power Structures.....	146
7.2.3 Financial Systems	148
7.3 Educational Applications	150
7.3.1 Teaching and Learning of Science as a Social-Institutional System.....	150
7.3.2 Curricular Policy	156
7.4 Conclusions.....	160
References.....	161

8 Towards Generative Images of Science in Science Education	163
8.1 Introduction.....	163
8.2 Educational Applications of FRA and GIS	166
8.2.1 Vertical Articulation	167
8.2.2 Horizontal Articulation	171
8.3 FRA, GIS and Curriculum Policy Documents.....	174
8.3.1 Example 1: HS-LS3 Heredity: Inheritance and Variation of Traits.....	174
8.3.2 Example 2: From Molecules to Organisms – Structures and Processes.....	176
8.4 Potential limitations of the FRA and GIS	176
8.5 Recommendations	181
8.5.1 Teaching	181
8.5.2 Teacher Education.....	181
8.5.3 Curriculum and Assessment.....	183
8.6 Contributions to Research and Practice in Science Education.....	183
8.7 Conclusions.....	185
References.....	186
Authors Biographies	189

Reconceptualizing the Nature of Science for Science
Education

Scientific Knowledge, Practices and Other Family
Categories

Erduran, S.; Dagher, Z.

2014, XIX, 189 p. 25 illus., Hardcover

ISBN: 978-94-017-9056-7