

INDEX

CONTENT	PAGE No.
Certificate	i
Acknowledgement	ii
Index	v
List of Tables	xii
List of Frames	xv
List of Figures	xvi
CHAPTER – 1: INTRODUCTION	1-19
1.0 Introduction	1
1.1 Nature of Science in General and Physics in Particular	2
1.2 Landmarks in the Field of Science Education	4
1.2.1 University Education Commission/ Dr. Radhakrishnan Commission (1949)	4
1.2.2 All India Seminar on Teaching of Science (1956)	4
1.2.3 Indian Parliamentary and Scientific Committee	5
1.2.4 UNESCO Planning Mission (1963)	5
1.2.5 Indian Education Commission (1964–1966)	6
1.2.6 Ishwar Bhai Patel Committee (1977)	6
1.2.7 National Policy on Education (1986)	6
1.2.8 National Curriculum Framework (2000)	6
1.2.9 National Curriculum Framework (2005)	7
1.3 Importance of Teaching Physics at Secondary Level	7
1.4 Aims of Teaching Physics at Secondary School Level	9
1.5 Teaching and Learning of Science in General and Physics in Particular at Secondary Level	9
1.6 Rationale of the Study	12
1.7 Statement of the Problem	16
1.8 Objectives of the Study	16
1.9 Hypothesis	17
1.10 Explanation of the Terms	17

1.10.1	Intervention Programme	17
1.11	Operationalisation of the Terms	18
1.11.1	Achievement	18
1.11.2	Effectiveness	18
1.12	Delimitation of the Study	18
CHAPTER – 2: REVIEW OF RELATED LITERATURE		19-97
2.0	Introduction	19
2.1	Review of Studies Conducted in India	19
2.1.1	Studies on Status of Science Education	20
2.1.2	Studies on Effectiveness of Different Transactional Modes in Science Teaching	24
2.1.3	Studies on Learning Experiences, Scientific Inquiry and Conceptual Understanding of Science Concepts	48
2.1.4	Studies on Teaching and Learning of Physics	55
2.2	Summary of Studies Conducted in India	68
2.3	Review of Studies Conducted Abroad	75
2.3.1	Study on the Effectiveness of Different Transactional Modes in Teaching Science	75
2.3.2	Study on Teaching and Learning of Physics	83
2.4	Summary of Studies Conducted Abroad	92
2.5	Implications for the Present Study	94
CHAPTER – 3 : METHODOLOGY OF THE STUDY		98-111
3.0	Introduction	98
3.1	Population	98
3.2	Sample	98
3.3	Design of the Study	99
3.3.1	Phases of the study	100
3.4	Tools for Data Collection	106
3.4.1	Interview Schedule for Students	106
3.4.2	Information Schedule of Physics	106
3.4.3	Entry Level Test	106
3.4.4	Field Notes	107
3.4.5	Achievement Test	108

3.4.6	Images of Events Projected	109
3.4.7	Interpretation of Physics Concepts from the Stories	109
3.4.8	Reaction Scale	110
3.5	Data Collection	110
3.6	Data Analysis	110
CHAPTER – 4: DEVELOPMENT AND IMPLEMENTATION OF AN INTERVENTION PROGRAMME		112-197
4.0	Introduction	112
4.1	Identification of Topics of Physics From Standard IX Science And Technology Text Book	112
4.1.1	Analysis and Interpretation of Information Schedule of Physics	112
4.1.2	Analysis and Interpretation of Interview Schedule	116
4.1.3	Analysis and Interpretation of the Answer Sheets of Students	120
4.2	Findings from the Situational Analysis Phase	122
4.2.1	Findings from the analysis of Information Schedule of Physics	122
4.2.2	Findings from the Analysis of Interview Schedule	123
4.2.3	Findings from the Analysis of the Answer Sheets of Students	124
4.3	Development of an Intervention Programme	126
4.4	Implementation of the Intervention Programme	127
4.4.1	Implementation of Entry Level Test	127
4.4.2	Concept of Motion	127
4.4.3	Concept of Distance and Displacement	128
4.4.4	Concept of Scalar and Vector Quantities	129
4.4.5	Concept of Uniform Motion	130
4.4.6	Concept of Non Uniform Motion	130
4.4.7	Concept of Speed and Velocity	131
4.4.8	Concept of Acceleration and Retardation	132
4.4.9	Concept of Circular Motion	133
4.4.10	Revision	136
4.4.11	Concept of Force	137
4.4.12	Concept of Balanced and Unbalanced Forces	138
4.4.13	Concept of Frictional Force	139
4.4.14	Galileo's Observations and Conclusion	140

4.4.15	Concept of Inertia	141
4.4.16	Relating Inertia and Mass	143
4.4.17	Types of Inertia	145
4.4.18	Newton's First Law	146
4.4.19	Concept of Momentum	146
4.4.20	Concept of Gravitational Force	147
4.4.21	Concept of Acceleration due to gravity	148
4.4.22	Acceleration due to Gravity at Poles and at Equator	149
4.4.23	Concept of Mass and Weight	150
4.4.24	Revision	151
4.4.25	Newton's Second Law of Motion	153
4.4.26	Conservation of Momentum	155
4.4.27	Newton's Second Law in Daily Life	156
4.4.28	Newton's Third Law of Motion	157
4.4.29	Newton's Third Law of Motion in Daily Life	159
4.4.30	Revision	161
4.4.31	Concept of Pressure	163
4.4.32	Pressure in Daily Life	165
4.4.33	Concept of Buoyancy	167
4.4.34	Floatation	168
4.4.35	Concept of Density	169
4.4.36	Buoyant Force and Volume of Object Immersed in Liquid	173
4.4.37	Archimedes's Principle	174
4.4.38	Archimedes's Principle in Daily Life	176
4.4.39	Revision	177
4.4.40	Concept of Work	179
4.4.41	Forms of Energy	180
4.4.42	Energy Transformation and Law of Conservation of Energy	181
4.4.43	Commercial Unit of Energy	182
4.4.44	Revision	183
4.4.45	Concept of Sound	185
4.4.46	Production and Propagation of Sound	186
4.4.47	Sound needs a Medium to Travel	187

4.4.48	Amplitude, Frequency and Timbre of Sound	188
4.4.49	Reflection of Sound	190
4.4.50	Reflection of Sound in Daily Life	192
4.4.51	Concept of Echo and Reverberation	193
4.4.52	Ultra Sound in Daily Life	194
4.4.53	Auditory Aspect of Human Ear	194
4.4.54	Revision	195
CHAPTER – 5: DATA ANALYSIS AND INTERPRETATION		198-264
5.0	Introduction	198
5.1	Effectiveness of the Developed Intervention Programme	198
5.1.1	Achievement of the Students on the Conceptual Understanding of Physics Concepts	198
5.1.2	Interpretation of the Physics Concepts from the Stories	200
5.1.2.1	Interpretation of the Physics Concepts from the Story: The Hare and the Tortoise	202
5.1.2.2	Interpretation of the Physics Concepts from the Story: The Thirsty Crow	206
5.1.2.3	Interpretation of the Physics Concepts from the Story: The Magical Lantern	211
5.1.2.4	Interpretation of the Physics Concepts from the Story: The Cricket Match	216
5.1.3	Identification and Logical Sequencing of Physics Concepts from the Images of Events Projected	221
5.1.3.1	Identification and Logical Sequencing of Physics Concepts from the Image 1	222
5.1.3.2	Identification and Logical Sequencing of Physics Concepts from the Image 2	224
5.1.3.3	Identification and Logical Sequencing of Physics Concepts from the Image 3	226
5.1.3.4	Identification and Logical Sequencing of Physics Concepts from the Image 4	228
5.1.3.5	Identification and Logical Sequencing of Physics Concepts from the Image 5	230

5.1.3.6	Identification and Logical Sequencing of Physics Concepts from the Image 6	233
5.1.3.7	Identification and Logical Sequencing of Physics Concepts from the Image 7	235
5.1.3.8	Identification and Logical Sequencing of Physics Concepts from the Image 8	237
5.1.3.9	Identification and Logical Sequencing of Physics Concepts from the Image 9	239
5.1.3.10	Identification and Logical Sequencing of Physics Concepts from the Image 10	241
5.1.3.11	Identification and Logical Sequencing of Physics Concepts from the Image 11	243
5.1.3.12	Identification and Logical Sequencing of Physics Concepts from the Image 12	245
5.2	Analysis of Student's Response Towards the Intervention Programme	247
CHAPTER- 6: SUMMARY AND DISCUSSION		265-284
6.0	Introduction	265
6.1	Statement of the Problem	269
6.2	Objectives of the Study	269
6.3	Hypothesis of the Study	270
6.4	Explanation of the Terms	270
6.4.1	Intervention Programme	270
6.5	Operationalization of the Terms	270
6.5.1	Achievement	270
6.5.2	Effectiveness	271
6.6	Delimitation of the Study	271
6.7	Methodology of the Study	271
6.7.1	Population	271
6.7.2	Sample	271
6.8	Design of the Study	272
6.9	Tools for Data Collection	272
6.9.1	Interview Schedule for Students	272

6.9.2	Information Schedule of Physics	272
6.9.3	Entry Level Test	272
6.9.4	Field Notes	273
6.9.5	Achievement Test	273
6.9.6	Images of Events Projected	273
6.9.7	Interpretation of Physics Concept from the Stories	274
6.9.8	Reaction Scale	274
6.10	Data Collection	274
6.11	Data Analysis	274
6.12	Major Findings	275
6.13	Discussion	276
6.14	Implication of the Present Study	281
6.15	Suggestions for Further Study	282
6.16	Conclusion	283
BIBLIOGRAPHY		285-305
APPENDICES		
Appendix A to H		I – XXXVI