CONTENTS

Acknowledgement i
List of Tables iii
List of Figures vii
Abbreviations viii

CHAPTER I
THE PROBLEM 1

1.0 Introduction
1.1 Science Education for Thinking and Problem Solving
1.2 Envisaged Role of Science Teachers
1.3 Content Knowledge and its Relevance for Science Teaching
1.4 Significance of Problem Solving in Science Classrooms
1.5 Content Knowledge and Problem Solving
1.6 Teaching Aptitude and Teacher Effectiveness
1.7 Teacher Education
  1.7.1 Need and Significance of Teacher Education
  1.7.2 Revamping Teacher Education for Quality Improvement
1.8 Need for Investigation
1.9 Research Questions
1.10 The Topic and Definitions of the Terms
  1.10.1 Statement of the Problem
  1.10.2 Operational Definitions of the Terms

CHAPTER II
THEORETICAL PERSPECTIVES 26

2.0 Introduction
2.1 Content Knowledge
  2.1.1 Content Knowledge: Meaning, and Definition
  2.1.2 Kinds of Knowledge
2.2 Problem Solving Ability
  2.2.1 Problem Solving Defined
2.2.2 Problem Solving: General or Domain Specific?
2.2.3 Steps in Problem Solving
2.2.4 Information Processing and Problem Solving
2.2.5 Cognitive Requirements of Problem Solving
2.2.6 Factors Affecting Problem Solving
2.2.7 Reflective Thinking and Problem Solving
2.2.8 Creative Thinking and Problem Solving
2.2.9 Critical Thinking and Problem Solving

2.3 Teaching Aptitude
2.3.1 Characteristics of Aptitude

2.4 Performance in Science at Degree Level

2.5 Teacher Competency, Teacher Competence, Teacher Performance and Teacher Effectiveness Differentiated

2.6 Teaching Competency
2.6.1 Teaching Skills
2.6.2 Teaching Skills and Their Components

2.7 Reforms in Science Education

2.8 Conceptual Frame Work for the Present Study.

CHAPTER III

REVIEW OF RELATED LITERATURE

3.0 Introduction

3.1 Studies Related to Mastery in Subject Content

3.2 Pedagogical Content Knowledge

3.3 Content Knowledge and Instructional Practices

3.4 Studies Related to Problem Solving Ability of School/College Students

3.5 Studies Related to Problem Solving Ability of Teacher Trainees/Teachers

3.6 Studies Related to Teaching Aptitude

3.7 Studies Related to Performance in Science

3.8 Teaching Competency and Allied Factors
CHAPTER IV

RESEARCH DESIGN AND METHOD OF INVESTIGATION

4.0 Introduction

4.1 Main Objectives of the Study

4.2 Hypotheses

4.3 Design of the Study

4.4 Tools used for the Study

4.4.1 Development of Test on Mastery in Subject Content of School Biology (Tool No.1)

4.4.1.1 Selection of the Units

4.4.1.2 Construction of the Test

4.4.1.2.1 Preliminary Draft of the Test

4.4.1.2.2 Pilot Study

4.4.1.2.3 Final Format of the Test

4.4.1.3 Reliability of the Test

4.4.1.4 Validation of the Test

4.4.1.5 Administration of the Test and Scoring Procedure

4.4.2 Problem Solving Ability Test (Tool No. 2)

4.4.2.1 Construction of the Problem Solving Ability Test

4.4.2.2 Pilot Study

4.4.2.3 Final Format of the Test

4.4.2.4 Reliability of the Test

4.4.2.5 Validation of the Test

4.4.2.6 Administration of the Test and Scoring Procedure

4.4.3 General Teaching Competency Scale (GTCS) Tool No.3

4.4.3.1 Components of General Teaching Competency Scale (GTCS)

4.4.3.2 Inter Observer Reliability

4.4.3.3 Validity of the GTC Scale

4.4.3.4 Administration of the GTC Scale and Scoring Procedure
CHAPTER V

ANALYSIS OF THE DATA AND RESEARCH RESULTS

5.0 Introduction

5.1 Section 1: Descriptive Analysis of the Data

5.1.1 Descriptive Analysis of the Data based on the Whole Sample

5.1.2 Descriptive Analysis of the Data – Categorywise Means and S.Ds for the Selected Variables

5.1.2.1 Mastery in Subject Content of High School Biology

5.1.2.2 Problem Solving Ability

5.1.2.3 a) Teaching Aptitude

5.1.2.3 b) Components of Teaching Aptitude

5.1.2.4 Performance in Science at Degree Level

5.1.2.5 a) Teaching Competency

5.1.2.5 b) Components of Teaching Competency
5.2 Section II: Differential Analysis of the Data Based on the Selected Personal Variables

5.2.1 Differences in Mastery in Subject Content of High School Biology of Teacher Trainees Owing to Differences in Selected Personal Variables

5.2.2 Differences in Problem Solving Ability of Teacher Trainees Owing to Differences in Selected Personal Variables

5.2.3 Differences in Teaching Aptitude of the Teacher Trainees Owing to Differences in Selected Personal Variables

5.2.4 Differences in Performance in Science at Degree Level of the Teacher Trainees Owing to differences in Selected Personal Variables

5.2.5 Differences in Teaching Competency of the Teacher Trainees Owing to Differences in Selected Personal Variables

5.3 Section III: Correlational Analysis

5.3.1 Relationship between i) Mastery in Subject Content of high school Biology, ii) Problem Solving Ability, iii) Teaching Aptitude, iv) Performance in Science at Degree Level and v) Teaching Competency.

5.3.2 Relationship between Components of Teaching Competency and i) Mastery in Subject Content of High School Biology ii) Problem Solving Ability iii) Teaching Aptitude and iv) Performance in Science at Degree Level.

5.3.3 Relationship between Components of Teaching Aptitude and i) Mastery in Subject Content of High School Biology ii) Problem Solving Ability iii) Performance in Science at Degree Level and iv) Teaching Competency.
5.4 Section IV: Multivariate Analysis

5.4.1 Regression Analysis
5.4.1.1 The effect of Independent Variables like Mastery in Subject Content of High School Biology, Problem Solving Ability, Teaching Aptitude and Performance in Science at Degree Level on Teaching Competency.

5.4.1.2 Regression Equation for Teaching Competency
5.4.1.3 Effect of Components of Teaching Aptitude on Teaching Competency
5.4.1.4 Regression Equation for Teaching Competency
5.4.1.5 Effect of all the Selected Variables in the Study on Teaching Competency
5.4.1.6 Regression Equation for Teaching Competency

5.4.2 Discriminant Analysis
5.4.2.1 The Selected Variables that Discriminate between High Competent and Low Competent Teacher Trainees.

5.4.2.2 Discriminant Function
5.4.2.3 Validating the Function

5.4.3 Validation of the Hypothesised Path Model for Teaching Competency
5.4.3.1 Validated Path Model
5.4.3.2 Direct Effect
5.4.3.3 Indirect Effect
5.4.3.4 Total Effect

5.5 Section V: Discussion of the Results

CHAPTER VI

SUMMARY AND CONCLUSIONS

6.0 Introduction.
6.1 Research Design and Method.
6.1.1 Main Objectives of the Study.
6.1.2 Hypotheses.
6.1.3 Tools used.
6.1.4 Sample for the main study.
6.1.5 Collection of the Data.
6.1.6 Design for the Analysis of the Data.

6.2 Major Findings of the Study.

6.3 Educational Implications of the Findings of the Present Study.
6.3.1 Integration of Content and Pedagogy in Teacher Training Programmes.
6.3.2 Changing Instructional Strategies in Teacher Education.
6.3.3 Science Classrooms for thinking and Problem Solving.
6.3.4 Evolving New Criteria for Admission to B.Ed. Course
6.3.5 Faculty Improvement Programmes.
6.3.6 Male Touch in Teaching Profession.

6.4 Suggestions for Further Research.

6.5 Conclusion.

BIBLIOGRAPHY

APPENDICES

Appendix – A  Test on Mastery in Subject Content of High School Biology

Appendix – B  Problem Solving Ability Test

Appendix – C  Personal Data Sheet

Appendix – D  General Teaching Competency Scale

Appendix – E  Blue Print for the Test on Mastery in Subject Content of High School Biology

Appendix – F  Rating of the Items by Subjects Experts

Appendix – G  Conventional Representations Used in the Study for the Path Analysis Causal Model.