Chapter I		Conceptual Framewor	
	_	_	

1.0	Introduction	1
1.1	Need for engineering and technical (E&T) professionals	2
1.1.1	History of engineering	2
1.1.2	Civil and construction industry	4
1.2	Engineering and technical education history	6
1.2.1	History of technology	6
1.2.2	Emergence of technical education around the world.	7
1.2.3	Technical education origin in India	8
1.2.4	Pre-Independence technical education development period in India	8
1.2.5	Post-Independence technical education development period in India	9
1.2.6	Government's Five-Year Plan for the development of engineering	9
	and technical Education	
1.3	Current engineering and technical education in India	12
1.3.1	Role of undergraduate engineering and technical education	13
1.3.2	Undergraduate engineering and technology education curriculum	14
1.3.3	Objectives of civil engineering Study	17
1.4	Teaching and learning approach in technical and engineering education	19
1.5	AICTE's study report on employability of fresh graduates in India	20
1.6	AICTE curriculum's shortcomings	23
1.6.1	Internship program for engineering graduates	25
1.6.2	Project based learning – PBL	26
1.6.3	PBL in relation to engineering disciplines	27
1.7	Need for PBL approach as an internship program in Civil Engineering	28
	discipline	
1.7.1	Constructionism	30
1.7.2	Internship program and Project based learning (PBL)	33
1.7.3	Constructionism and Project based learning	33
1.7.4	Constructionism, Project based Learning and Internship Program	34
1.8	Research questions	35
1.9	Rationale of the Study	35
1.10	Statement of the problem	39
1.11	Objectives of Study	39

1.12	Operational definition of the terms	40
1.12.1	Explanation of terms	40
1.13	Limitation of the study	42
1.14	Hypothesis	42
1.15	Summary	43
1.15.1	Chapters included in the thesis	43
	•	
Chapter	Review of Related Literature	
2.0	Introduction	45
2.1	Review of related studies	45
2.1.1	PBL studies conducted on Primary and Middle school students	46
2.1.2	Overview of the PBL studies reviewed for Primary and Middle school students	49
2.1.3	PBL studies conducted on High School students	50
2.1.4	Overview of the PBL studies reviewed for High school students	53
2.1.5	Studies conducted on Higher Education	54
2.1.6	Overview of impact of PBL studies at Higher education level	70
2.2	Studies conducted on Internship program	72
2.2.1	Overview of studies related with internship program	75
2.3	Implication of the review of related literature for the present study	76
2.4.	Summary of reviewed related literature	79
Chapter	HII Research Methodology	
3.0	Introduction	81
3.1	Statement of the Study	81
3.2	Title of the Study	81
3.3	Objectives of Study	81
3.4	Operational definition of terms	82
3.4.1	Explanation of terms	82
3.5	Population	84
3.6	Sample and Sampling technique	85
3.7	Research methodology and design of the study	88
3.8	Variables of the Study	88
3.9	Delimitation of the Study	89

3.10	Hypothesis	89
3.11	Components of the developed curriculum for present study	90
3.12	Tools of Data Collection	91
3.12.1	Validation of Tools	94
3.13	Process of Data collection	95
3.14	Data analysis	105
3.14.1	Quantitative analysis	105
3.14.2	Qualitative analysis	106
3.14.3	Researcher's observations of students during PBL based internship	106
	program's implementation	
3.15	Summary	107
Chapter	IV Presentation and implementation of developed curriculum	
4.0	Introduction.	108
4.1	Planning and development of PBL based internship program.	108
4.2	PBL based internship program's curriculum development	110
4.3	Presentation and implementation pattern of developed PBL based	110
	internship curriculum's project practicums.	
4.3.1	Presentation and implementation pattern of developed PBL based	114
	internship curriculum's project practicums.	
4.3.1.1	Construction site survey and orientation	114
4.3.1.2	Site survey and ground investigation	114
4.3.1.2.1	PBL based internship program's site survey and ground	114
	investigation information	
4.3.1.2.2	Field practicums for site survey and ground investigation.	115
4.3.1.3	Construction site excavation	127
4.3.1.3.1	PBL based internship program's construction site excavation information	127
4.3.1.3.2	Field practicums for construction site excavation.	128
4.3.1.4	Soil testing and foundation design	137
4.3.1.4.1	PBL based internship program's soil testing and foundation	137
	design information	
4.3.1.4.2	Field practicums for soil testing and foundation design	138
4.3.1.5	Reinforced cement concrete (RCC) foundations construction.	145

4.3.1.5.1	PBL based internship program's RCC foundations construction	145
	information	
4.3.1.5.2	Field practicums for RCC foundations construction.	146
4.3.1.6	Building construction	162
4.3.1.6.1	PBL based internship program's building construction	162
4.3.1.6.2	Field practicums for building construction	162
4.3.1.7	Precast construction	168
4.3.1.7.1	PBL based internship program's Precast construction	168
4.3.1.7.2	Field practicums for precast construction.	168
4.3.1.8	Construction Management and Administrative practices	177
4.3.1.8.1	PBL based internship program's construction management	177
	and administrative practices information	
4.3.1.8.2	Field practicums for construction management & administrative	178
	practices	
Chapter	V Data Analysis and Interpretation.	
5.0	Introduction	190
5.0.1	Objectives of the Study	190
5.1	Tools and nature of data collection	192
5.2	Data Analysis	192
5.2.1	Quantitative Analysis	193
5.2.2	Qualitative Analysis	193
5.2.1.1	Analysis of Pre-test and Post-test	193
5.2.1.2	Analysis of Pre-test, Post-test, and Delayed Post-test	195
5.2.2.1	Analysis of technical writing for project reports and project	197
	presentations of students for PBL based internship program	
5.2.2.2	Analysis for supervisor's evaluation and feedback form	200
5.2.2.3	Statistical analysis for students' feedback for following parameters	214
	of PBL based internship program.	
5.2.2.4	Researchers observations on students' interaction, involvement	240
	while conducting project practicums of PBL based Internship program.	
5.2.2.5	Post site visit questionnaire analysis.	245
5.3	Discussion on interpretation of data	251

5.4	Findings of the Sudy	253
Chapter	VI Summary and Findings	
6.0	Introduction	257
6.1	Need for engineering and technical (E&T) professionals in the	257
	developing industry	
6.2	Study report on employability of fresh graduates in India	258
6.3	Project Based learning (PBL), internship and constructionism	258
6.4	PBL and engineering education	259
6.5	Need for PBL approach as an internship program in Civil engineering	260
	discipline	
6.6	Review of related literature	260
6.7	Rationale of the study	262
6.8	Research questions	266
6.9	Statement of the study	266
6.10	Objectives of the study	266
6.11	Operational definition of terms	267
6.11.1	Explanation of terms	267
6.12	Delimitation of the study	269
6.13	Hypothesis	269
6.14	Nature and source of data	270
6.15	Research Methodology and design of present study	270
6.16	Population	271
6.17	Sample and Sampling technique	271
6.18	Tools of data collection	272
6.19	Components of the developed curriculum for proposed PBL based	276
	internship program	
6.20	Process of data collection	277
6.21	Data analysis	285
6.21.1	Quantitative analysis	286
6.21.2	Qualitative analysis	286
6.21.3	Researcher's observation of students during the PBL based	287
	internship program's implementation	

6.22	Major findings of the study	287
6.23	Discussion	289
6.24	Implication of the study	290
6.25	Suggestions for future studies	291
6.26	Conclusion	292