CHAPTER 2

REVIEW OF LITERATURE

White et al. (1998) developed an instructional theory and consistent curricular elements that made systematic inquiry accessible to an extensive spread range of students, including fresher and inferior accomplishing students. They assumed that this could be attained by distinguishing the importance of meta-cognition and raising an instructional methodology that developed students' meta cognitive knowledge and skills through a course of scaffold inquiry, manifestation, and oversimplification. In the direction of this end, they obliged with teachers to engender a computer enhanced, middle school science curriculum that engaged students in learning about and shimmering on the procedures of scientific inquiry as they built progressively more multifaceted models of strength and movement incident. The resulting Thinker Tools Inquiry Curriculum centered on a meta-cognitive replica of investigation, entitled as the Inquiry Cycle, and a meta-cognitive procedure, called Reflective evaluation, in which students imitate on individual and different inquiry [19].

Edelson et al. (1999) presented a design history covering four peers of software and curriculum to display how these challenges ascend in classrooms and how the design strategies reply to them. They had been reconnoitering these challenges through a program of exploration on the consumption of scientific visualization technologies to upkeep inquiry-based learning in the geosciences. In this paper, they described five momentous challenges to employing inquiry-based learning and presented the strategies for lecturing them through the design of technology and curriculum [32]

Hopkins et al. (2002) discussed the individual replication on the persistence and possibility of school development. They continued the equivalent, he clarified the effort of instructive restructuring as being authoritative learning on the quantity of students, and
then established that this occurred in contexts where content was theoretical rather than specific, where learning was productive inquiry not unreceptive reception, and where the community climate was expansive instead of restrictive. Such classrooms existed in schools whose organizational conditions and cultures were characterized by high expectations, collaboration and innovation. Finally they argued that equity and high standards required a coherent policy framework that emphasized process as well as ingredient [58].

Xiuping et al. (2002) debated several benefits and drawbacks of problem based learning (PBL). Then some variances between mathematics and other fields of science were deliberated, using some examples to show the main points in mathematics teaching, and also using examples of Problem-based Learning in mathematics teaching. Finally, he discussed some of the skills of mathematics teaching. There was a tendency nowadays to refer to problem based learning modestly as PBL and it had been acknowledged as very important in our teaching and in students’ learning. However, he made a case for combining PBL with conventional teaching for the teaching of mathematics [93].

Black et al. (2002) took an experimental appearance at course scheme and liberty factors those authority student observations of learning and course fulfillment. They completed analysis of the process of concentrating on a variety of issues as they allied to conventional classroom courses, Internet itinerary and an assortment of the two. The finding of the study suggested that the practice of crossbreed methods of course delivery integrating elements of both the customary classroom and web-based instruction for providing the most advantageous "mix" for student learning. The implications of the results were conferred [47].

Kyza et al. (2002) discussed how inquiry-support software, the Progress Portfolio, could assistance students to contribute in meditative inquiry. They argued that self-regulation was one of the ancillary mainly life-threatening mechanisms of thoughtful inquiry and presented a pragmatic case of how the Progress Portfolio tool was planned to authorize students to extend self-regulated in their learning. Even though there was a wealthy prose on self-regulation, diminutive had been written about grouping self-regulation in inquiry-based science. Prelude results from a study with middle school students showed that
students employed the Progress Portfolio tool to inhabit in self-regulating perceptive activities, such as setting goals, planning, and observing their work [68].

Secker et al. (2002) used hierarchical linear models to assessment the amount to which 5 inquiry-based teacher practices promoted accomplishment of all students and diminish gaps in accomplishment among students with diverse demographic profiles (equity). Findings suggested that teacher applies that better-quality whole academic excellence simultaneously were as probable to subsidize to greater inequities among more and less advantaged students as they were to adjacent tenacious achievement gaps [31].

Malacinski et al. (2003) discussed that throughout junior-level scholar progression, broad-minded life cycles by frequent organisms were studied, with superior consideration where applicable to the human beginning. Morphological structures and courses were defined and current visions into the molecular biology of gene appearance were discussed. Ways were premeditated in which model systems, containing marine in vertebrates, amphibian, fruit flies and supplementary laboratory species were engaged to clarify general principles which relate to conception, cleavage, gastrulating and organogenesis. Special consideration was given to understandings into those topics which would soon be researched with facts from the Human Genome Project [48].

Garcia et al. (2003) shown that an inquiry based, pro-active method was the superlative way to demonstrate science in an ecosphere where facts modification repeatedly and the difficulty of the issues confronted would only growth with time. In reaction to this need, numerous higher school districts in the U.S. had implemented innovative science series in which the emphasis was on inquiry type instruction. Yet still, science literacy had been relaxed to illustration improvement in undeveloped children. This research was showed to see how considerable of a role teacher's attitudes towards science itself, and science instruction in specific, played in determining to practice an inquiry approach to teaching science. Surveys concerning science upbringing, science training and instruction, and teacher attitude towards science were directed to teachers presently in elementary classrooms teaching science. Replies were gathered and investigated, and the results were really amazing. Read on to discover how teachers actually felt roughly teaching science in today’s Schoolrooms [28].
Beerer et al. (2004) described that the National Science Standards recognized that inquiry-based teaching held noteworthy guaranteed for evolving systematically well-educated students. The Science Teacher Inquiry Rubric (STIR) was established based upon the National Science Education Standards’ indispensable features of inquiry instruction. An aviator using a purposive example of 10 science teachers was directed to found the rubric as both surveillance tool and a self-reflection tool. While the overall association of the tool (r=.58) did not sustenance its procedure as a self-assessment instrument, a perfect relationship between two raters (r=1) recognized the STIR as an effective surveillance tool. Additionally, the validation of the instrument provided numerous perceptions into the education of inquiry in science classrooms [66]. Alberta et al. (2005) described that the broad discerning among numerous science teacher educators inclined to be that teacher applicants and outmoded in-service educators who learned how to demeanor technical inquiry would actually impart science expending an inquiry method. Inappropriately, familiarity had revealed that purely erudition about technical inquiry in methods courses and professional development workshops did not inevitably interpret to execution of inquiry-based teaching. A numeral of significant and deserted external factors influence whether or not and to what magnitude inquiry was implemented in the classroom. Unless these disablements were challenged and committed, it was extremely improbable that even teachers who influenced a good sympathetic of science inquiry would recurrently implement inquiry-based teaching in their classrooms [9].

Kalia et al. (2005) explored the competence of MLS (Mastery Learning Strategy) and ITM (Inquiry Training Model) on the accomplishment of students in Science at VII Grade level. For this determination, the model of 90 students was sapped from VII Grade students from a school at Rohtak (Haryana) associated to CBSE. Three groups of students consisted of 30 students which were created and categorized as Experimental Group I, Experimental Group II and Control Group. These groups were allied on mental power using CCFIT (Cattell’s Culture Fair Intelligence Test). Lesson plans built for MLS and ITM were prepared and useful after pre-testing on Achievement Test [13]. Tuan et al. (2005) examined 8th grade students with dissimilar learning approach and their motivation outcomes after employing 10 weeks in ITM. Total 244 students were
elaborated in faltering group, this group of students experienced inquiry teaching. Two hundred and thirty two 8th graders were convoluted in control group; they were trained by conventional science teaching. Students’ motivation toward science learning questionnaire (SMTSL) was applied in both groups in the opening and at the ending of the study. Students in the faltering group filled out learning predilection questionnaire in the beginning of the study. Forty students which characterized dissimilar learning styles were selected from five experimental classes to carry out post-test interview. Paired t-test, MANOVA, analytic inductive methods were used for groping both qualitative and measureable data [59].

Abdelraheem et al. (2006) examined the end result of inquiry-based technology enhanced collaborative learning consciousness on students' learning experiences. Accomplishment had been illustrated in the growth of course units using technology as reasoning tools, promoting both graduate and undergraduate students. A balancing relationship exists between technology and inquiry based learning, the service of each one assisting the other. Inquiry-based learning showed that learning took place in conditions, while technology denoted to the approaches and atmospheres that involved learners [3].

Chih-Chung et al. (2006) investigated the effect of inquiry-based teaching on 8th graders’ observations about education atmospheres in the physical science classes. There were 295 8th graders contributed in the study, in the experimental group included five classes (n=155) that taught with three units of inquiry-based teaching which last for three months. In the control group, teachers castoff the textbooks to clarify five classes of students (n=140). The “What Is Happening In this Class?” (WIHIC) questionnaire was applied in both groups beforehand and afterward eight months to gather students’ perceptions about the constructivist learning surroundings. Results presented both inquiry-based and textbook-based teaching, the inquiry-based instruction would meaningfully (p<.001) increase students’ observations definitely. However, the inquiry-based instruction showed expressively sophisticated expansion scores (p < 0.05) than textbook-based teaching, especially in the scales of Teacher Support (TS), Student Involvement (SI), Investigation (IN), Cooperation (CO) and Equity (EQ). But the scales of Student Cohesiveness (SC) and Task Orientation (TO) showed undistinguishable. Four scales dominated students’ perceptions of the learning environments about inquiry-based
teaching; these were CO, TS, IN and TO (explained the variances over 5%). The IN and TO scales connected the Personal Development Dimensions and the TS and CO scales related the Relationship Dimensions (Dorman, 2003). At last, the consequences of Path analysis were conversing the relationships between the psychosocial factors about the Personal Development Magnitudes and the Association Magnitudes that were affected by inquiry-based teaching [30].

Chan et al. (2007) presented an incident on concerning WebQuest, a prototypical for constructivist inquiry-based education, to simplify the education and erudition of queuing concept. In this paper, the author pooled the involvement of assuming WebQuest as educational software. Impressions of constructivist pedagogies associated to WebQuest, specifically inquiry-based education, cooperative learning, and scaffolding, were also provided. Instead of teaching the classic topic in a teacher centered, direct teaching approach, the author built a WebQuest to assistance the students to enterprise and demeanor simulation projects to reply numerous nontrivial questions related to queuing theory. It supported the assistances such as complete metaphors of dealings and constructive associations to web resources, as well as an evaluation rubric, were also encompassed in the WebQuest. This paper also encompassed penalty of a measureable assessment on the competence of adopting WebQuest to promote students’ learning. Students’ consultation commentaries and the author’s personal indications were also assumed [92].

Chin et al. (2007) investigated the consequence of ITM based mathematics schooling on astonishing achievers’ metacognitive potentials. A varied methodology combing qualitative and quantitative approaches was used to inspect students’ metacognition in an inquiry-based classroom setting. The chief research instrument for congregation quantitative data was the Metacognition Inventory questionnaire which was showed before hand and subsequently the inquiry-based teachings. The qualitative data, such as interviews with students, videotaped classroom teaching, students’ work sheets and feedback sheets, and teacher’s journals, were also unruffled and evaluated. The results showed that there was delicate but no significant correlation between student’s mathematics accomplishment and their metacognition [41].
Spronken-Smith et al. (2007) raised concerns which the authors were fronting as they were affianced on a project to manuscript and united the examples of inquiry-based learning (IBL) in four tertiary foundations in New Zealand. The paper began by benevolent the circumstantial to the growth of IBL as a hypothetically practical and meaningful way to emphasize teaching-research links and advancement student learning. Then the paper was unremitting by raising numerous issues that had come to lissome as they boarded on this research project funded by the Ministry of Education. They suggested that these issues could be auxiliary deliberated in the Colloquium [78].

Tsai et al. (2007) investigated the consequence of inquiry-based teaching on 8th graders’ impulses in learning physical science. Total 295 students were involved in this reading. The experimental group (EG) enclosed of 5 classes (n=155), the nested inquiry-based instruction model was conceded out in three units: “The basic structures of matter”, “The structure of element” and “Temperature and Heat” over the phase of four months. The control group (TTM) contained 5 classes of students (n=140). Students’ discernments on the fundamental inspiration were steadfast using the students’ motivation towards science learning (SMTSL) questionnaire, composed from both groups before and after the tentative period [90].

Balaban et al. (2007) discussed the sanction on the consequence of inquiry learning in the sciences. She serrated out that although people might expected different things/practices when they referred to inquiry-based learning, there were decisive characteristics that required being nearby, including an integrated prospectus across regulation, a problem-based teaching loom, and deliberation to skills enlargement [18].

Jiang et al. (2008) illustrated the remunerations and disadvantages of CALL. It pointed out that CALL was opinionated by unfashionable language teaching and learning methods to some enormity. It accomplished that what was momentous in their university system was that CALL design and execution should equivalent the users’ needs, since CALL was not persistently greater to conventional language culture and teaching technique [94].

Friedel et al. (2008) argued that science classrooms must substitute away from training and submissive solicitations of recalled thoughts to the implementation of awe-inspiring intelligent backings as the most important ingredient in restriction erudition. Yet
unsatisfactory studies had examined the possibility of noticeably teaching for momentous discriminating on successive skill magnification. The principle of this study was to evaluate if blatantly teaching for wobbly thinking, as a teaching technique, endorsed to description growths in hazardous complicated ability notches of scholar students connected in agricultural biotechnology. One congregation of students were taught employments of tremendous thinking and then asked to practice the recently educated skills in class. A nonequivalent control group was inculcated using the inquiry based teaching technique. Adding together femininity to the model did not appreciably augment the enlightenment of variance in critical thinking skills. Also, a scrawny constructive connection was initiated between entire critical thinking proficiency score and entire critical thinking temperament score [44].

Atkinson et al. (2008) discussed that the Sociologists frequently looked for customs to make straightforward their students’ capabilities to ponder resembling a sociologist. In this article, the authors elected inquiry based activities that were recognized in a garage to simplify instructors’ accommodating of inquiry based education [14].

Biermann et al. (2009) described construction of an innovative preparatory course in Physics to facilitate counter attrition rates in major. It included three basic components: research techniques, faculty discussions of their own research and conclusion of a research project. Biermann noted consequence of having students learning how to do science, not unbiased learning about science [20].

Brickman et al. (2009) authenticated better-quality enhancements in students’ science literacy and research services using inquiry lab teaching. They also initiated that inquiry students gained self-confidence in systematic aptitudes, but traditional students’ gain was better-quality potential demonstrating that the conventional curriculum endorsed over-confidence. Inquiry lab students appreciated extra trustworthy science experience but recognized that undergoing the impediment and anticipation faced by keen scientists was stimulating, and elucidated the all-embracing reported student altercation to inquiry pamphlets [75].

Jones et al. (2009) quantified that the knowledge about IR within approved courses of study allowed the users of search engines to employ them supplementary cleverly and competently, while providing the groundwork point for the examinations of new
researchers into innovative exploration technologies. Although IR could be qualified in an outdated style of formal classroom teaching with students being guided through the particulars of the subject and conventional to imitate this in evaluation, the nature of IR as a theme finished it an wonderful subject for inquiry-based learning routines to teaching. In an inquiry-based learning approach students were habituated to the ideologies of a subject and then enthused to extend their sympathetic by answering planned or open problems. The implementation through resolutions in following class deliberations enabled students to soar the obtain capability of special solutions as premeditated by their classmates. Following this approach student not only obtained the details of IR techniques, but significantly, detectably learnt to smear them in declaration of problems [46].

Adams et al. (2009) described a study in which professors discovered and distinguished their perspectives about teaching and university education. Results showed that concerted, inquiry-based faculty development predisposed their growth as operative teachers. Additional recurrent response from schoolboys and classmates was realized as a main influence in helping professors recover, while a continued emphasis on professional inquiry was seen to subsidize to professors’ deeper considerate of the intricacies and difficulties of operative university education [74].

Golding et al. (2009) provided a summarized of inquiry/enquiry-based education and some of the sketch out that these perspectives used in their conceptualization of inquiry-based learning. The guide incorporated an illustration of an inquiry-based method in Literary Studies class [51].

Gregerman et al.(2009) noted the eminence of undergraduate research occasions in retaining different (and conventionally diminished) students and found that involvement in undergraduate research reduced scuff, amplified withholding, and augmented achievement of degree [55].

Jones et al. (2010) stated that interdisciplinary approach had developed a significant and stimulating technique in the in the contemporary curriculum. The interdisciplinary approach combined more than one discipline and formed teams of teachers and students that improved the complete educational knowledge. Many researchers found numerous benefits, as well as drawbacks, of interdisciplinary studies. Student education had
agonized the substandard teaching of outdated methodologies that distilled precisely on single castigation. The interdisciplinary approach provided numerous reimbursements that developed into considerable wanted enduring knowledge abilities that were indispensable to a student’s forthcoming education [65].

Abdurrahman et al. (2010) investigated the effect of Learner-Centered Micro Teaching (LCMT) on the development of teacher candidates’ teaching potentials. To achieve this objective, teacher candidates’ teaching recital on subject area, scheduling, teaching progression, classroom administration, communiqué, and assessment had been pre- and post-tested, and the effectiveness of LCMT had been clear-thinking based on amendment in the results of pre-tests and post-tests. The experimentation was assembled based on LCMT model. The results based on the marks in the pre- and posttests showed that LCMT model had an enlargement in teacher candidates’ teaching behaviors on subject area, scheduling, teaching progression, classroom administration, communication, and assessment [4].

Schwerdt et al. (2010) concluded that teachers were essential for student learning but it remained indeterminate what actually unwavering active teaching. This study steadfastly analyzed into the black box of educational construction by groping the organization between lecture chic teaching and student achievement. Based on coordinated student-teacher data for the US, the ballpark figure strategy conquered between-subject variation to control for overlooked student traits. Results précised that outmoded lecture style teaching was associated with significantly higher student achievement. No provision for detrimental effects of allocation style teaching could be found even when assessing imaginable selection unfairness due to unobservable teacher features [56].

Gillani et al. (2010) presented Piaget’s reasoning theory and derived an inquiry-training model from it that would rations a constructivist method to teaching and learning. supplementary, an example developed by the author and his graduate students offered whom used the Web as a appropriate instructional delivery intermediary to apply Piaget’s reasoning theory to create e-learning environment. The result was a variety of humble, fixed, and operative inquiry-training math web sites for elementary and middle school students. The information offered could be practical to other subject areas as well [21].
Courtade et al. (2010) determined if teachers of students with judicious and undecorated intellectual incapacities could acquire to practice a task analysis for inquiry-based science instruction and if this training increased student responding. The conclusions of this study confirmed a practical association between the inquiry-based science teaching preparation and teacher’s capability to teach students with reasonable and simple incapacities in science [50].

Shih et al. (2010) presented a nomadic analysis movement that intended for uncomplicated students to acquire throughout a social science tumult with digital sustenance from mobile devices and wireless communications. The students were positioned in the tangible world and the cybernetic world mutually to enlarge their learning understandings. The learning activities between the field and the digital system not only recognized the practices of mobile learning, which decorated learning that ensued adjacent to real life, but also provided digital learning appreciative to simplify students’ field studies. To improve the learning concert of the students, an inquiry-based mobile learning approach was engaged to support the students in constructing their particular knowledge by taking intellectual consignment into deliberation [84].

Elrod et al. (2010) recommended that they pervaded pedagogy of research and discovery into courses across the program. It rehearsed the findings of the benefits of undergraduate research – increased learning, increased persistence to degree, increased retention of historically underrepresented students, and higher likelihood of graduate/professional school enrollment. The most effective characteristics of a pedagogy concentrated on discovery and inquiry were to have students engaged in innovative research, helped students understand the importance of research for solving real-life problems, provide adequate time for students to involve in research, provide suitable comment, and provided occasions for students and faculty to interrelate [40].

Friedman et al. (2010) described the use of inquiry based learning in several disciplines by faculty who were using it for the first time in the subsequent disciplines; philosophy, journalism and quantity infrastructures, business and technology education, community health, civil engineering, and collective work. They labeled the indispensable of inquiry based learning (IBL) as they assumed it, policies and execution of IBL, student replied to IBL, and what they saw as the implications of IBL for sophisticated education [45].
Opara et al. (2011) contributed to the ongoing debate on enhancing teaching and learning strategies through innovation and changes in the contemporary epoch of new world order, thus globalization and technology. Meaning that, there was an implication, there was an irresistible anxiety over the superiority and significance of education internationally. Unquestionably, the quality of education was a straight significance and consequence of the excellence of teachers and teacher education. The socialization of the child was a long process which requires careful and systematic application of workable principles as to achieve the desired results. To perhaps improve the student’s academic achievement in biology, a shift would be necessary from what had traditionally been experienced in the Nigeria classrooms toward more inquiry teaching practices, which facilitated teaching for meaningful learning [61].

Lehesvuori et al. (2011) addressed the space between varieties of inquiries by publicizing a dialogic inquiry-based approach to science teaching. This approach united the principles of inquiry and dialogic education. Based on this framework they scrutinized a extent of primary student teachers’ (n=28) conceptualizations of science teaching and estimated to what extent dialogic inquiry-based teaching informed these conceptualizations. Analysis exposed that dialogically was not current in student teacher pre-conceptions, their pre-conceptions rather paying attention on outmoded practices connected to science teaching. The learning trajectories produced for six cases, however, nominated an amplified consciousness of inquiry-based teaching including the dialogic characteristic over the era of the course [83].

Taylor et al. (2011) designed practical exploration to investigate the efficacy of ITM approach as connected to teacher-directed teaching in 5th-grade students studying Science & mathematics subjects. AMSTI provided widespread professional development and enduring stipulation for the employment of inquiry-based mathematics and science teaching. AMSTI also recurrently sent kits of indispensable materials to the subject school to nourishment the implementation of inquiry-based mathematics and science coaching. The research questioned current 5th-grade teachers and drew hypothesis about the teachers’ observations of inquiry-based teaching in the wider prospectus as well as feelings of self-efficacy. Of note, many teachers discussed the standing of acceptable
time stipends to spirits of self-efficacy and the place of inquiry-based schooling in the wider prospectus [64].

Pandey et al. (2011) investigated the efficiency of Inquiry Training Model over conservative teaching technique in teaching physical science at the secondary level of science students. A total of 100 students contributed in the study. The author designated the randomized groups, pre-test post-test enterprise in true untried design. Results exposed a statistically noteworthy consequence of Inquiry Training Model (ITM) over conservative teaching method on Academic accomplishment of students. Based upon the achievement test in physical science (ATPS), schooling of physical science through Inquiry Training Model was additional operational than the teaching through the Predictable Method at the subordinate level. The ITM model might be encouraged as a better tool than the conventional method for teaching Physical Science. However, the work carried out was having certain limitations such as the unit of lesson-plans based on Physical Science was specified only 4 sub-units [2].

Akpullukçu et al. (2011) investigated how to upgrade the retention level for academic achievement and science concepts and how to improve positive attitudes towards science. Quasi-experimental design had been used in the study. In order to pursue the effect of inquiry based education approach, two of the classes constituted by the school management, except for random distribution, had been defined as experiment and control group. 72 students, studying at a state school in the city of Aydın, had formed the working group of the research. In the study, “Academic Achievement Test” prepared by the researcher, had been used to determine the developments in the academic achievements of the students. According to the findings of the study; the academic achievements of the students towards science and technology, who had been in the experiment group studying in inquiry based learning environment has displayed a difference in a significant way compared to those in control group studying in the environment to which 2005 Science and Technology curriculum had been applied. As a result of interpreting the findings obtained from the research, it had been considered that using of the techniques practiced in inquiry based learning environment in science and technology could be profitable for the academic achievements of the students towards the course [85].
Hosson et al. (2011) presented two teaching-learning sequence based on historical grounds and organized in order to favor inquiry-based approaches. The didactical organization of these sequences leaned on a specific reading of the history of science that clearly depended on the children’s difficulties and ideas. This did actually orientated reading appeared to be different from the reading proposed by historians or philosophers of science. Here, the impact on the children’s motivation and conceptual change of such reconstructions were discussed [29].

Opara et al. (2011) conducted the study through three research enquiries with null hypotheses with the aid of a quasi-experimental research stratagem. These students were intermittently assigned to two groups (treatment and control group). Treatment group were those sophisticated biology using the briefed inquiry teaching method while conventional method (lecture) was used for the control group. (1) Biology Achievement Test (BAT) was recognized on the following units in biology, flower pollination, muscle structure and function and seed germination. All these were worried from anatomy and physiology of flowering plants and animal physiology in the biology textbook of SS1, to scope the introduction and fatal academic accomplishment of the students. (2) Lesson notes were prepared on the above discovered units using the inquiry teaching method and the conventional method using a pre - test, post - test experimental treatment. Thus, it was the controversy of the author that the inquiry approach would advance students’ achievement in biology, hence the heave of this study [62].

Aditomo et al. (2011) observed inquiry based learning at three Australian universities. They discovered the learning tasks that were pronounced by 224 teachers. The article précised the forms of inquiry based learning (IBL) that the tasks represented in the variety of disciplines, class sizes, and levels of student (undergraduate and graduate students). They found that there were two mutual refrains in the tasks were acknowledged. The first theme was energetic scholarship while the second theme was that the tasks were problematic/enquiry driven as conflicting to topic driven. Two other conclusions were deliberated; practical/logistical issues in using IBL and concerns about the genuineness of the research accomplishments in terms of building information. The value of the article was not inadequate to the assumptions but in the subdivisions that
addressed classifications of IBL, forms and magnitudes of IBL, and educational objectives of IBL [6].

Tahir et al. (2011) described the SCIB project design and the uncomplicated approach of a three years completing cycle that would maintenance in expansion and sustainability of science curriculum enhancement efforts in Pakistan. The course and accomplishments of the project demarcated the enlargement of teaching plans, leading trainers training, teacher exercise, school collection and representation survey of schools and organization of forums at the Federal and the Provincial levels. The paper enclosed an exploration of some issues associated to SCIB teaching model development in the perspectives of ground genuinenessness and the experience learned from utilizing such groundbreaking projects in past. The concept of Teaching through Easily Available Material (TEAM) and SCIB teaching approach being qualified in Pakistan might be esteemed for the developing countries of the area [38].

Alkaher et al. (2011) described the progression of three faculties employing inquiry-based learning (IBL) in their surroundings. The focus of the article was on in what way the instructors made conclusions related to expending IBL in their classes. They provided a stimulating representation of their conclusions and their discernments of the usefulness of their decisions. Observations from the teachers provided a frame into how they were thoughtful about using the IBL attitude in their classrooms [10].

Khalid et al. (2012) compared instructional component based on constructivist approach with the conventional Method in Lahore city. This study was delimited to Lahore due to research plan, time and funding limitations. It was explored that both the groups were equivalent regarding their achievement scores in teaching of English communication earlier than the experiment but after experimentation together were dissimilar in their accomplishment. It was accomplished that this noteworthy presentation of experiment group may be due to teaching student teachers of investigational grouping with constructivist methodology [5].

Wade et al. (2012) focused his research on the experience of secondary science teachers who advanced their understanding of inquiry-based learning and instruction through a six-week summer Research Experience for Teachers (RET) program. Research had shown that science teachers were likely to teach science in the manner in which they
were taught, indicating that teachers who lack scientific research experiences may have difficulty teaching science by inquiry. Thus one of the goals of the RET program was for the participating teachers to be students of inquiry in research labs. Another goal was for teachers to create an instructional module that integrated the secondary science standards they teach with their research experience in order to assist students in conceptualizing and understanding STEM topics at a deeper level. They needed to answer the following research question: What was the experience of secondary science teachers as they developed a deeper understanding of inquiry-based learning in a RET program? This research was important in light of the fact that the U.S. Department of Education had found a decline in the number of students that studied post-secondary STEM content from 32% 1994 to 27% in 2008. Also, the Institute of Engineering Education reported that less than 15 percent of high school graduates had earned sufficient science and mathematics credits to pursue a STEM degree [26].

Spencer et al. (2012) explored inquiry-based instructional approaches as a technique for producing student attention in science. Inquiry was a procedure that students used to decide indecision. Grounded in the work of John Dewey, inquiry was compulsory a person to practice philosophical and perilous thinking assistances. Inquiry-based teaching was student centered and the teacher was watched as the implementer of knowledge and learning. The paper engrossed on two inquiry-based instructional approaches: The 5E model and Concept accomplishment. The 5E model used five stages: engage, explore, explain, elaborate, and evaluate. The concept accomplishment model was suitable for teaching ideas that had a vibrant set of characteristics. This approach used a procedure that agreed students to generate their own descriptions and considerate [89].

Sever et al. (2013) conducted research in the radiance of the metaphysical frame of ITM teaching. The research convoluted the exhibition of experiments on basic science concepts that had been conventional for validity through inquiry-based processes. The experiments were articulated initially to standardize what differences there would be in student academic accomplishment and in their approach toward the school subject of Science and Technology when the experimentation were habituated by demonstration or in a video. Another intention of the study was to produce technology-supported teaching materials to improve the learning atmosphere. Further the results were being
amalgamated with the reflection factors discussed by scholars. The study concentrated on strapping and undernourished features of both teaching strategies [86].

Ifeanyi-Uche et al. (2013) required to realize out the significance of ITM method on educational exploit of 10th class students in Home. In this study, the Quasi-experiment method was being applied. Different groups (Control & Experimental) were chaotically experimented from 15 schools. The experimental groups were taught with inquiry based method while the control group was sophisticated using lecture method. Home Economics Achievement test was developed by the researcher and authenticated by researchers’ colleagues which was used to evaluate the subject triumph. Data were investigated using fraction, spiteful and t-test figures. The findings exposed that the performance of ITM approach achieved expressively superior than the TTM method [91].

Eagan et al. (2013) affirmed the remunerations of undergraduate research and recapped that contribution in undergraduate research connected completely with meanings to register in STEM graduate students. They also found that STEM students who had research understandings were supplementary expected than supplementary STEM students to designate their attention in following a graduate degree. Being mentored by graduate students and teaching assistants also rises quantified meaning to pursue graduate STEM degree [39].

Pukkila et al. (2013) described UNC’s Graduate Research Consultant (GRC) Program, which entrenched a research involvement into a course. Valuation data specified that faculty, GRCs and undergraduates had constructive feedbacks to this program/policy. Most faculty who had used a GRC indicate that they would expenditure a GRC over and felt that the GRC program had a noteworthy or transformative inspiration on their students’ learning and that students became energetic learners [76].

O’Donnell et al. (2013) validated the optimistic results when students contributed in/had access to high-impact practices and renowned that factually understated groups in advanced education in general were diminished in terms of membership in these high-impact practices as well. Kuh notes some of the features that make HIPs operative, including affianced teaching and learning, and structuring projects and assignments in
ways that inspired students to amalgamate and assimilate information and material across courses [67].

Njoroge et al. (2014) implemented a Quasi-Experimental Research Proposal. The Solomon-Four Non-equivalent Groups Design was convoluted. Stratified random sampling technique was cast-off to tremendous 4 boys’ and 4 girls’ county secondary schools in Nyer, County. 4 schools in each class were allocated to treatment and control groups by simple random sampling procedure. All group had one boys’ and one girls’ county secondary school. Every school afforded one process two class for the study and a total of 370 students were complicated. Students in all the groups were educated the equivalent physics relaxed but the tentative groups were taught using IBT approach while the control groups were educated through Regular Teaching Methods (RTM) such as lecture method and teacher rallies. The experimental group I and the control group II were pre-tested preceding to the enactment of the IBT conduct. Consequently four weeks, the entire the four groups were post-tested using the Students’ Physics Achievement Test (SPAT). The method had been authenticated by 5 experts in education and pilot tested before use to assessment its dependability. The reliability coefficient using K-R21 was 0.87. The acceptable threshold for steadfastness coefficient was 0.7 and above. The tools were recorded and data was examined using t-test, one way ANOVA and ANCOVA at a consequence level of coefficient alpha ($\alpha$) equal to 0.05. The findings of the study showed that Inquiry-Based Teaching (IBT) methodology occasioned into higher students’ scores in accomplishment in physics. The study authorized that Teacher training institutions, Kenya Institute of Curriculum Development (KICD) and physics teachers should ratify IBT methodology as the selected physics teaching approach in Kenyan secondary schools [71].

Gaspard-Richards et al. (2014) examined the potential for improved learning outcomes and engaged learner experiences in two mathematics courses that incorporate digital technology inputs, designed to help learners engage in an immersive skills building environment that supports their learning in a meaningful way. A mixed method approach explores teaching and learning interventions, assessment outcomes and overall learner experiences to highlight the potential for inquiry based teaching and learning in two online courses. The underlying premise was that inquiry based learning infused with and
supported by digital technology was a useful application to resolve ongoing concerns regarding trends in student outcomes in mathematics courses offered in an online environment. Learners in this environment were required to engage with an academic preparation skills based mathematics course prior to taking their Level 1 undergraduate core mathematics course. However the failure rates had been trending in excess of the 25 percent failure rate beyond which the university's quality assurance processes and procedures require immediate interventions and feedback. A mixed method approach that combined data from inquiry based teaching and learning interventions, assessment outcomes and discovery of prior and real time learner experiences in two online courses, provided a context for continued development of good practice in the design and online delivery of undergraduate level mathematics courses [37].

Greenwald et al. (2014) compared predominantly conservative and inquiry-based clinical case (IBCC) teaching methods to regulate which would harvest superior improvements in life-threatening thoughtful and content information. Results showed students in the conservative neuronatomical course gained less than 3 nationwide percentile ranks while IBCC students expanded over 7.5 within one academic term using the legal and consistent California Critical Thinking Skills Test. In addition to 2.5 times superior improvements in critical intellectual, IBCC teaching methods also formed 12% greater final exam presentation and 11% advanced grades using common grade performance benchmarks. Classroom observations also indicated that IBCC students were supplementary intellectually engaged and participated to a greater extent in classroom discussions. Through the results of this study, it was anticipated that faculty who qualified neuroanatomical and desired greater critical thinking and content student learning outcomes would deliberate using the IBCC method. [54].

Treagust et al. (2014) discussed the nature of inquiry learning and how this related to inquiry teaching and the kinds of evidence needed to ascertain that this mode of learning and teaching was operational. First, he measured what was meant by inquiry learning and teaching, and then examined particular curriculum backgrounds based on inquiry learning, such as Primary Influences, Model-based Education, and Process-Oriented Guided Inquiry Learning [35].
Olagoke et al. (2014) provided information gained from Junior Secondary School teachers on their orientation towards the usage of inquiry-based methodology for teaching Elementary Science in Ekiti State, Nigeria. The populace of the study included all the Basic Science teachers in the State. A sample of one hundred and eighty (180) teachers was selected from the three (3) senatorial districts of the State using multi-stage sampling technique. A fifteen-item scaled response questionnaire was used as an instrument. The items addressed teachers’ related beliefs, orientation and difficulties in implementing IBL in Basic Science classrooms. The four-scale, adopted likert-scale questionnaire was distributed by the researchers to the participants in their schools. The instrument was validated by experts in the fields of language, science education and evaluation while the reliability coefficient of 0.74 was obtained for the questionnaire. Data collected were analyzed using the mean score and standard deviation of each statement while the only hypothesis formulated was tested using t-test statistics at 0.05 level of significance. The result showed that many teachers had no knowledge of IBL as reflected in their responses, but they had a strong belief that IBL has the potential to overcome learning problems of students in Basic Science. The study also revealed that teachers suffer from lack of resources, unequipped laboratory, too large class size and lack of time allocation in the school time-table for implementing IBL. The study also revealed that the opinion of male and female teachers in the use of IBL did not differ significantly. It was recommended that practicing science teachers should endeavor to employ IBL in their teaching because of its great benefits to students as it allows them to reflect on their own ideas in an effort to build their knowledge, understanding and interpretation of ideas [15].

Yadav et al. (2014) offered a education of academic performance evaluation using soft computing techniques inspired by the effective application of K-means, fuzzy C-means (FCM), subtractive clustering (SC), hybrid subtractive clustering-fuzzy C-means (SC-FCM) and hybrid subtractive clustering-adaptive neuro fuzzy inference system (SC-ANFIS) methods for cracking academic recital assessment problems. Modeling of students’ academic performance was a problematic optimization problem. They explored the applicability of K-means and FCM, SC, hybrid SC-FCM and SCANFIS clustering methods to the new student’s allocation problem, which allocated new students into some
Classes. These classes consisted of related students and the amount of students in each class not ahead of its concentrated aptitude. The models were combined with fuzzy logic techniques to estimate the students’ results. In this article, they had conducted clustering based computational experiments to investigate the possessions of the different clustering algorithms like K-means, FCM, SC, hybrid SC-FCM and hybrid SC-ANFIS clustering methods for modeling students’ academic recital estimation. Based on the comparison of the results, it was found that the hybrid SC-ANFIS clustering was enhanced than the other methods [79]

Elmose et al. (2014) described and deliberated a three-dimensional model for estimating IBSE inspired teaching, where the goal for teaching was to grow science competences of the scholar. The characteristics of IBSE teaching in Danish public schools were pronounced and these criteria for good inquiry teaching subsidized to one dimension in a method of estimating the teaching-learning relationship. The concept of science competence underwrite to another dimension in the model for evaluation. Thirdly the concept of quality of a science competence was familiarized and integrated in the model, which could be visualized as a three dimensional evaluation model. Finally this model and its theoretical substance was conversed for its value as a exploration model for qualitative evaluation of teaching and learning, and as a tool for influential evaluation in applied teaching as to its ability to investigate relations between inquiry based teaching and competency learning [87].

Hartikainen-Ahia et al. (2014) identified that circumstances, the major stage of the PROFILES model, had a significant role in preliminary the learning development. Scenarios wanted to arouse students’ central motivation and encouraged students towards finding out about the problematic, or issue offered in the consequence. This leaded to the Inquiry Stage, the subsequent phase of the PROFILES teaching approach. They investigated over 20 circumstances created by the Finnish PROFILES teachers and established an assessment tool based on their content, framework, possible consequence to students, how they complicated students reflecting on their preceding knowledge, and how the circumstances arouse students’ desire for inquiry. With the tool, science teachers and CPD providers could design and appraise efficiency and consequence of circumstances for the teaching of modules [12].
Warner et al. (2014) acquired innovative tools to accomplish altered tasks in his shop, teachers, too, should examination for tools to add to their repertoire of educational practices. One tool was not appropriate to establish every task a woodworker must comprehensive, and one schooling method should not be measured appropriate for teaching all topics and consultation all ethics. Inquiry-based teaching procedures provided agricultural educators with another teaching procedure for evolving life-long learners. They demonstrated exclusively useful in transporting concepts that rely heavily on science. This paper built on the publication “What Is Inquiry-Based Learning?” by directing on the environment of inquiry and providing uncomplicated strategies and strategies for employing inquiry-based teaching approaches [11]. Hughes et al. (2014) scrutinized whether exercise environmental science lab GTAs in inquiry-based methods enhanced teaching efficiency to a superior gradation than did the existing “unsurpassed preparation” model. Undergraduate environmental science courses, like those in other methodical chastisements, habitually complicated the expenditure of structured-inquiry workshop happenings to teach apprentices how to relate controlled inquiry skills. This instructive approach was entrenched in inquiry teaching. The chief calculation of the proposition was preserved in that all three measures recorded higher teaching effectiveness scores for GTAs recorded in the inquiry-based learning training group. Detailed SEEQ and CLE influences/items showed robust adjustments and apprentice responses showed larger modifications than GTA self-assessments. Students scored IBL-group GTAs higher in six of nine SEEQ features and in four of six CLE items, including three of the four highest-level cognitive skills, which corresponded to the deeper learning objectives of the Revised Bloom’s Taxonomy. Undergraduate students with GTAs who acknowledged inquiry-based learning training had suggestively higher mean course grades than students with GTAs who received the control group training. Generally, inquiry-based learning training for GTAs was associated with erudite teaching practicality and better-quality apprentice students’ disciplined exploration supports [80]. Abdi et al. (2014) investigated the belongings of inquiry-based learning method on students’ academic accomplishment in sciences class. A total of 40 fifth grade students from two different classes were convoluted in the study. They were selected through purposive sampling technique. The group which was allocated as tentative group was
initiated through inquiry-based learning technique whereas the supplementary group was conventionally educated. This experimental study persisted eight weeks. To determine the efficiency of inquiry-based learning method over outdated teaching, an achievement test about sciences which entailed of 30 items was directed as pre-test and post-test to students both in the investigational and control groups. For the numerical analysis, Analysis of Covariance (ANCOVA) was used. The results exhibited that students who were instructed through inquiry-based learning were accomplished greater score than the ones which were inculcated through the outmoded method [60].

Kazempour et al. (2014) carried out the literature on specialized overstatement which was successful with scholarships that exploited the survey, interview, and classroom observation data, primarily collected post dedicated to growth accepting to conclude the teachers’ awareness, opinions and engagements; however, they required a clear compassionate of teachers’ knowledge progression and likenesses during the professional development. The current study expected to statement the abovementioned gaps in the literature, by exploiting applicant reproductions and assignments during a summer professional development prospect, to contrivance it in planning phase, in addition to factors they believed persuasive in this process. The findings addressed three questions about specialized development: 1) participants’ process of emerging work wise, 2) features of operative professional enlargement, and 3) the affiliation between participants and the program. Additionally, a web of interrelationships was exposed between participant-identified advantageous programmatic features, evolving commencements and politics, and the translation of these beliefs into practice, as evident in their immediate implementation of ideas in instructional planning [70].

Nuangchalerm et al. (2014) exposed ITM learning in teacher training agenda and the innovation of the study helped the students to appreciative actual view of ITM classroom and its process. The information and data were self-possessed with the help of the qualitative methods. The results could be open-minded in terms of lesson educated for school science put into practice of inquiry-based learning and instructive approaches. It could be lucid, fundamentally to amalgamate for all-purpose science subject classroom, and also be slanting to ITM routines [77].
Clarke et al. (2014) studies Ontario’s multi-phased methodology from 2011 through 2013 to contribute all 72 school districts in benevolent, supportive, inquiry-based assessment to scrutinize the brunt of over 100 technology-based limited modernism projects on teaching and student agreement. The findings might exhibit beneficial to other authorities seeking to contribute districts, schools, educationalists, and students in technology-based, pedagogy-driven teaching and learning in a knowledge and technology-intensive era [52].

**Conclusion:**

After studying various research papers on the topic of Inquiry-based teaching model, it is observed that this model motivates the students to ask their queries for the purpose of finding new facts related to the concerned topic in the classroom. The traditional teaching model makes the students passive in the classroom.