

# An Overview of Inquiry-Based Learning at School Level

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## BACKGROUND

Inquiry, which strongly emerged from the proliferation of new Social Studies projects in the late sixties and early seventies, has been riding on a high crest in Social Studies education. Social studies not only borrowed the concepts, generalisations and value concepts from the social sciences, but also the methodology of it. As such, inquiry is viewed as a methodological framework of the new social studies (Tassel, 1986).

According to Welch (1981) there is a semantic confusion associated with 'inquiry'. For the sake of clarification, inquiry should be considered as a general process which human beings seek information or understanding. In other words, inquiry is a way of thought. Scientific inquiry, a subset of general inquiry is concerned with the natural world and guided by certain beliefs and assumptions.

The Inquiry Approach, the heart of new social studies, involves three groups of objectives: attitudes and values, a mode of inquiry involving the development and testing of hypotheses, and a variety of knowledge objectives. In a general sense, inquiry and discovery are interchangeably used in the literature. There are numerous interpretations of the inquiry or discovery approach. They range from a belief in total discovery in which the teacher acts as a stimulator and facilitator, to a directed discussion in which the discussion becomes more teacher oriented and the students receive cues regarding the path of inquiry being pursued (Fenton, 1967).

Inquiry teaching is a multifaceted, omnibus term, and at present there is little consensus among theorists as to what comprises inquiry teaching. Despite this difficulty, inquiry has been widely used in various National and International projects in Social Studies. A large volume of literature is available on inquiry as a strategy though

research evidence is scant, fragmentary and to a large extent, inconclusive.

## 1.0 The Development of" Inquiry-Based Learning

Inquiry has always been a part of education. It predates Socrates and his method of leading students to self-knowledge through aggressive questioning. Dewey's reform of the educational system led to the first inquiry-based learning methods in the United States. He advocated child- centered learning based on real world experiences.

The Educational Policies Commission (1961) reacted on the central purpose of American Education and suggested that students needed to develop "ten rational powers". These were: recalling and imagining; classifying and generalizing; comparing and evaluating; analyzing and synthesizing; and deducing and inferring. These are also some of the fundamentals of inquiry learning.

Spurred by fears that the Russians were gaining a technological and military advantage over the U.S. In the fifties, the educational establishment became particularly interested in helping students to become creative problem-solvers. Then, in the sixties, there was a movement toward the so-called alphabet soup curricula. These had such titles as Biological Sciences Curriculum Study (BSCS), the Chemical Education Materials Study (CHEM Study), the Science Curriculum Study (SCIS), the Elementary Science Study (ESS), and the Physical Science Study Committee (PSSC Physics) — hence the name "alphabet soup".

These efforts seriously attempted to turn the traditional "cookbook" approach to science education into 'hands-on involvement' with a focus on developing reasoning abilities. Unfortunately, the hands-on approach never fully turned into a truly engaging approach to learning. Critics charged

that the students were spending too much time "messaging around" with materials and too little time on analysis.

These problems were to a great extent, due to the nature of the school-community system, into which these programmes were introduced. Then, too, they focused mainly on only one element of the school- community system i.e., the teacher.

While these programmes did not bring about the changes anticipated in the era in which they were introduced, they did produce other fallouts and unanticipated changes. They brought significant changes in the ways that Science, Mathematics, and Social Studies textbooks were developed. Textbook publishers began to give more consideration to ways in which the students can be actively involved in the learning process.

The 'Whole Language Movement' was a very positive development in the history of inquiry-based learning. The recognition of the roles that reading and writing play, in learning, began to change attitudes and practices in the schools.

Systemic change is the latest and most significant effort that has the potential to impact inquiry learning. In 1984, a conference at the National Academy of Sciences brought together top scientists, educators, business leaders, politicians, parents, and others, in direct response to a report entitled "*Nation at Risk*" that detailed the failings of American schools. This conference led to an attempt to reform the U.S. system of education in order to achieve a status of "first in the world by near the end of the twentieth century". Much of this effort was and still is directed toward getting students involved in the process of learning and meeting the needs of modern society by changing the educational system.

If one examines critically the evolution of frameworks set forth for education, it becomes evident that many of the ideas in these frameworks are still valid in today's educational efforts. It is now really a matter of doing more to implement the ideas, rather than reinventing them. The efforts toward systemic reform in particular have much promise, but there are also a number of factors that promote resistance to them.

There are at least two important factors in the systemic-reform effort that make it difficult to implement it in the

current climate. One of these factors is that the effort is focused almost exclusively on Mathematics and Science education. It will be difficult to change a school- community system that is focused on only two disciplines in the school curriculum. A second factor is that many educators have little experience in evaluating the important systemic elements and aligning them with outcomes for students. For example, when students do not perform well on statewide tests, teachers generally react with attempts to "fix students" by demanding that they try harder, rather than fix the system. But lack of student motivation is often symptomatic of a larger systemic problem. Inquiry-based learning, today, however, can be integrated into our classroom and school system gradually as teachers, principals, parents, and other community members become aware of its importance in preparing students for the postmodern world.

## 2. O INQUIRY-BASED LEARNING

Content of disciplines is very important, but as a means to an end, not as an end in itself. The knowledge base for disciplines is constantly expanding and changing. No one can ever learn everything, but everyone can develop their skills and nurture the inquiring attitudes necessary to continue the generation and examination of knowledge throughout their lives. For modern education, the skills and the ability to continue learning should be the most important outcomes. The rationale for its necessity is explained in the following figures illustrated by Exline (1995).

## 3.0 THE NATURE OF THE INQUIRY APPROACH

'Inquiry' is defined as 'a seeking for truth, information or knowledge by questioning'. Individuals carry on the process of inquiry from the time they are born until they die. This is true even though they might not reflect upon the process. The process of inquiry begins with gathering information and data through applying the human senses—seeing, hearing, touching, tasting and smelling. An old adage states; "Tell me I forget, show me I remember and involve me I understand". The last part of this statement is the essence of inquiry- based learning. Inquiry implies involvement that leads to understanding. Furthermore, involvement in learning implies possessing skills and attitudes that permit to seek resolutions to questions and issues, while constructing new knowledge.

Inquiry is a form of self-directed learning and follows the four basic stages defining self-directed learning. Students take more responsibility for: Determining what they need to learn. Identifying resources and how best to learn from them. Using resources and reporting their learning. Assessing their progress in learning.

### Importance of Inquiry

Memorizing facts and information is not the most important skill in today's world. Facts change and information is readily available. What's needed is an understanding of how to get and make sense of the mass of data. Educators must understand that schools need to go beyond data and information accumulation and move towards generation of useful and applicable knowledge, a process supported by inquiry learning. In the past, our country's success depended on our supply of natural resources. Today, it depends upon a workforce that 'works smarter. Through the process of inquiry, individuals construct their understanding of the natural and human-designed worlds. Inquiry implies a "need or want to know" premise. Inquiry is not so much seeking the right answer - because often there is none — but rather seeking appropriate resolutions to questions and issues. For educators, inquiry implies emphasis on the development of inquiry skills and the nurturing of inquiry attitudes or habits of mind that will enable individuals to continue the quest for knowledge throughout life.

### Inquiry Its Characteristics

Inquiry aims to build research skills in students. Teaching through "inquiry" involves engaging students in the research process with instructor support and coaching at a level appropriate to their starting skills. Students learn discipline specific content, but in doing so, engage and refine their inquiry skills. An inquiry course:

Is question driven, rather than topic or thesis driven?

Begins with a general theme to act as a starting point or trigger for learning. Emphasizes asking good researchable

questions on the theme, and coaches students in doing this.

Builds library, interview, and web search skills, along with the critical thinking skills necessary for thoughtful review of the information. Coaches students on how to best report their learning in oral or written form.

- Provides some mechanism (interviews, drafts, minutes of group meetings, bench mark activities, etc.) to help students monitor their progress within the course.
- Draws on the expertise and knowledge of the instructor to model effective inquiry and to promote reflection.

Recent developments in the nature of inquiry have revealed a number of characteristics, which the teacher should have in mind when using inquiry in the classroom:

- The classroom reflects an open atmosphere.
- The student is active in the learning process.
- The student participates fully.
- Inquiry involves higher levels of thinking.
- It often results in the development of new knowledge.
- Students practice systematic investigation.
- Inquiry is basically an inductive method.
- The processes (skills, attitudes, values) and the product (content) are both important to inquiry.

### 3.3 The Difference between the Inquiry Approach and Other Teaching Methods

Table 1 outlines the major differences between ***Inquiry Approach*** and ***Conventional Textbook Approach***.

Classification	Inquiry Approach	Conventional Textbook Approach

<b>Objectives</b>	<ul style="list-style-type: none"> <li>• Development of new knowledge</li> <li>• Focuses on "Learning Things"</li> <li>• Emphasis on 'How we come to know'</li> <li>• Preparation for life long learning</li> </ul>	<ul style="list-style-type: none"> <li>• Mastery of content</li> <li>• Focuses on 'Learning about Things'</li> <li>• Information about 'What is known'</li> <li>• Preparation for the next grade level</li> </ul>
<b>Content</b>	• Means to develop information processing and problem solving skills	• Assimilation of existing information
<b>Lesson plans</b>	• Facilitated learning plans	• Used to organise the various steps in the learning process for the whole -class approach
<b>Method</b>	• Student -centered	• Teacher - centered
<b>Classrooms</b>	<ul style="list-style-type: none"> <li>• Open - system</li> <li>• Make use of resources beyond the classroom and school</li> </ul>	<ul style="list-style-type: none"> <li>• Closed - system</li> <li>• Limited use of resources within class room or school</li> </ul>
<b>Use of technology</b>	• Application of technology to enhanced learning	• Learning about technology
<b>Role of teacher</b>	<ul style="list-style-type: none"> <li>• Facilitator of learning</li> <li>• Motivator</li> <li>• Monitor</li> <li>• Advisor</li> <li>• Referrer</li> <li>• Counsellor</li> </ul>	<ul style="list-style-type: none"> <li>• Dispenser of learning</li> <li>• Provider of information</li> <li>• Monitor</li> <li>• Disciplinarian</li> </ul>
<b>Input of the student</b>	<ul style="list-style-type: none"> <li>• Systematic investigation, critical thinking</li> <li>• High involvement</li> <li>• Higher level thinking</li> </ul>	<ul style="list-style-type: none"> <li>• Memory work</li> <li>• Low involvement</li> <li>• Low level thinking</li> </ul>
<b>Assessment</b>	• Focused on determining the progress of skills development, attitudes and values	• Less emphasis on the development of skills, attitudes and values

### 3.3.1. The Difference between Inquiry and Problem-Based Learning

Table 2 outlines the major differences between the two different teaching methods.

**TABLE 2**

	<b>Inquiry j Problem-Based Learning</b>	
How does it begin?	• General theme or issue	• Authentic, specific scenario or used as a trigger
Timescale (duration of study)	• Generally months; may repeat the inquiry cycle a second time within a single course	• From one class to a few weeks; will examine a series of scenarios within a single course
Breadth of study	• Varies by student interest, within theme.	• Focused area of study
Depth of study	• Opportunity for sustained study	• Study limited by time
Final Product	• Varies. Defined by students with guidance from class and instructor	• Expectations are fairly specific. E.g., discussion, presentation, role play, written submission
The instructor/tutor	• Chooses themes or issues under examination chooses triggers for learning (movies, books, articles, guest speaker, simulations, role play)	• Creates a series of "problems" (scenarios) intended to bring about learning of a specified area of curriculum; often with specific content goals
	• Identifies general content objectives; identifies specific skill objectives	• Identifies specific content objectives; identifies specific skill objectives
	• Designs activities to help develop specific inquiry skills (e.g., how to critically read and assess information on the web)	• Skills are developed inductively through repetition, with feedback
	• Facilitates the process of inquiry (to ensure skill and content goals are met)	• Facilitates exploration of problems posed (to ensure skill and specific content goals are met)
	• Moderates various activities	• Moderates discussion with a view to developing moderation skills in students
	• Provides Feedback on the quality of the question, research and communication	• Provides Feedback on quality of issue identification, research and communication
	• Guides self and peer feedback	• Guides self and peer feedback
	• Assesses student performance usually with peer feedback	• Assesses student performance usually with peer feedback

Nature of the questions asked by students	<ul style="list-style-type: none"> <li>• Develops a good question, this may involve questions for which there is no known answer (could require primary research)</li> </ul>	<ul style="list-style-type: none"> <li>• Identifies good questions from problems posed; generally involves questions for which answers exist. E.g., what are the primary causes of ulcers?</li> </ul>
	<ul style="list-style-type: none"> <li>• Students are not dependent on the research of others but benefit from their colleague's research</li> </ul>	<ul style="list-style-type: none"> <li>• Students are dependent on the research of others to fully understand the opening scenario or situation posed</li> </ul>

**Inquiry is closely related to research as seen in table 3.**

### 3.3.2 The Relationship between Inquiry and Research

**TABLE 3**

How Research is Conducted ?	How Inquiry is Conducted ?
<ul style="list-style-type: none"> <li>• Researcher selects an area of study</li> </ul>	<ul style="list-style-type: none"> <li>• Instructor identifies a general theme</li> </ul>
<ul style="list-style-type: none"> <li>• Researcher forms "good questions" on which to base their research</li> </ul>	<ul style="list-style-type: none"> <li>• Students determine what they need to learn in the area and draft "good questions" on which to base their Inquiry</li> </ul>
<ul style="list-style-type: none"> <li>• Researcher identifies resources and how best to learn from them; consults primary literature and conducts primary research</li> </ul>	<ul style="list-style-type: none"> <li>• Students identify resources and how best to learn; they consult research from primary and secondary literature and could engage in original research</li> </ul>
<ul style="list-style-type: none"> <li>• Researcher reports their insights (learning) by publishing papers, giving presentations</li> </ul>	<ul style="list-style-type: none"> <li>• Students use resources and report their insights (learning) in a variety of formats (symposium, skit, formal paper)</li> </ul>
<ul style="list-style-type: none"> <li>• Researcher assesses their own learning and peers play a role in the review of research quality</li> </ul>	<ul style="list-style-type: none"> <li>• Students assess their own learning, peers, peers may play a role but the instructor is responsible for assigning a grade</li> </ul>
<ul style="list-style-type: none"> <li>• Researcher identifies the next set of research questions</li> </ul>	<ul style="list-style-type: none"> <li>• Students may identify the next set of research questions</li> </ul>

## 4.0 THE PROCESS OF HISTORICAL INQUIRY

The focus of the curriculum is inquiry. This is developed in the in- depth studies in which students identify a historical issue, investigate that issue and reach conclusion or make judgements about it.

This process will provide learning situation that facilitate the fulfillment of the objectives specified in this syllabus.

Therefore, there will be no need to teach the objectives one by one. Rather, teachers will highlight the various processes, skills and concepts as they are encountered during the investigation.

In any in-depth study, the use of a variety of historical sources, primary as well as secondary, will be crucial. This is a principle of historical inquiry. Other such principles of historical inquiry are described within the context of the following discussion



#### 4.1 Phases of Historical Inquiry

To ensure a process of inquiry, historical studies should usually proceed through the following phases:

- Identification of an issue.
- The framing of relevant research questions for hypotheses.
- The framing of sub questions to guide the investigation.
- The location of varied, relevant evidence.
- Interpretation, analysis, evaluation and corroboration of evidence.
- Identification of any additional evidence needed.
- Creation of the first and subsequent drafts with reconsidered judgements.
- Completion of the final presentation.

#### 4.2 Guidelines of Historical Procedure

There are a number of guidelines that historians use in the various phases of inquiry. It is generally accepted that in any historical inquiry, there should be:

A relevance to student and their surrounding culture.

- A concern with the causes and consequences of change and continuity in human events.
- Responses to issues that emerge from the evidence.
- A willingness to make: tentative judgements based on the evidence.
- Support for the key components of the conclusion with evidence.
- Evaluation of the problematic nature of historical evidence.

The creation of a structured response that has drawn upon many sources and that incorporates these new conclusion or ideas.

Students will be able to apply these principles more readily if they are given class time during the in-depth study to

interact with other students and the teacher. Time may allow students the opportunity for sustained reflection, which in turn may allow the development of empathy and clarification of values.

- Students may then proceed to express their judgements and their proficiency in inquiry through:
- Presenting a written assignment, which may involve developing a series of drafts.
- Responding under test conditions, which could involve response to stimulus,
- recall of information and short and extended writing tasks.
- Developing a presentation in oral, dramatic, artistic or other suitable forms.

#### 5.0 THE RELEVANCE OF THE INQUIRY APPROACH IN THE CLASSROOM

Most of our schools focus on teaching a set of basic skills that do not serve the needs of modern society. Traditionally, schools stressed the accumulation of information, and did not emphasize skill development or nurturing inquiry-based habits of mind. Our modern society is faster paced, globally networked, technologically oriented, and requires workers who can solve problems and think critically. Today, much learning, if not most, occurs after formal schooling. Our schools must change their approach to education to produce students who can thrive in the modern world.

The traditional focus of education is no longer appropriate. The world has changed: local apprenticeships are rare, and young people must master new ways of acting and thinking. Our society is becoming increasingly larger and more complexly diverse. Young people must be able to develop an understanding for the complexities of modern life and be able to grapple with new ethical and practical issues. We must educate our young so they can participate as responsible members in contemporary society. They also need to be given the chance to grow and develop fulfilling personal identities in settings that are relatively free of risk.

"Habits of mind" should be an important goal, or outcome, in education. These habits can produce a worldview that incorporates different disciplines or subjects. They can be

thought of as the "ground rules" for a particular discipline, and include, but are not limited to, verification and respect for data in science, the importance of beauty and desirability in art, and the role of belief and faith in religion.

### **5.1 The Usage of Inquiry-Based Learning in Conjunction with Other Educational Techniques**

inquiry is an important part of multiple-intelligence work. Cooperative and collaborative learning is inherently inquiry-based. Inquiry is also a key tool for learning in constructivism. Standards can be met with inquiry based learning by ensuring that they are incorporated early in the planning and by guiding the students towards questions that will help them learn the required material.

### **5.2 Inquiry - Implementation**

In theory, research results indicate that inquiry, when administered properly, can be beneficial to students and teachers. Based on research in inquiry teaching, the following recommendations have been developed:

- Students are considered to be and treated as investigators.
- During the inquiry process, a problem, a situation, and a topic is explored.
- Problems should be of the kind for which evidence is available. Problems should also encourage calculated guesses and hypotheses.
- Students must make inductive use of the evidence.
- Evidence should be presented as raw and uninterrupted.
- All data should not be presented in a single chunk.

The scope of the inquiry-based investigation often becomes increasingly larger.

Content serves as both a vehicle and a goal.

Inquiry or discovery teaching is concerned with content, concepts, and basic skills, thinking skills, feelings and values.

The following steps are a useful guide when leading students to the world of inquiry (Fair and Kachaturoff, 1988): Recognizing element of doubt.

- Analyzing the problem and developing clear questions, which will help, resolve doubt.
- Formulating a hypothesis.
- Selecting and defining necessary terminology.
- Collecting relevant data.
- Interpreting data.
- Checking whether data supports hypothesis or not.
- If data do not support hypothesis then alternative ways to continue investigation will be considered and implemented.
- Fair and Kachaturoff (1988) developed the following suggestions to keep in mind when implementing inquiry in the classroom:
- Settling on one correct answer for an entire class defeats the learning
- purpose and inhibits students from making their own decisions.
- Covering less material but covering it in greater depth encourages learning
- in higher order intellectual processes.
- Hands on activities are a necessary "supplement".
- Learning activities should be varied in order to appeal to a wide range of abilities and interest.

Teachers need to make a conscious effort to break away from using activities, which centre only on reading the textbook, listening, workbooks and tests. In other words teachers need to provide activities, which focus on reasoning skills rather than recall.

Instructional materials of all kinds should be readily accessible in order to meet varied developmental levels.

Teacher's questions should generate the students' sense of doubt about what to accept or believe.

Questions should sometimes encourage intuitive thinking, which involves guessing or following hunches.

- Teachers should offer lots of opportunity for large and small class discussion.
- Teachers should ask questions which require divergent answers.



- Assignments should require the student's investigation and reasoned consideration to reach a conclusion.

### 5.3 The Art of Questioning

Questions whether self-initiated or 'owned', are at the heart of inquiry learning. While questions are also a part of traditional classroom, the sources, purposes, and levels of questioning are quite different. In the traditional classroom the teacher is frequently the questioner. Questions are usually intended to provoke feedback about a reading or activity assignment. In an inquiry classroom, the teacher asks questions that are more open and reflective in nature. Appropriate questioning techniques are important in an inquiry-based classroom.

Wolf (1987) in 'The Art of Questioning' suggests that there are four major types of questions: inference questions, interpretation questions, transfer questions, and questions about hypotheses.

#### ***Inference Questions***

These questions ask students to go beyond the immediately available information. Through careful questioning and discussion, the students realize that the image contained hints that implied a whole network of information: clues to content, technique and meaning or attitude. To push beyond the factual in this way is to ask students to find clues, examine them, and discuss what inferences are justified.

#### ***Interpretation Questions***

If inference questions demand that students fill in missing information, then interpretive questions propose that they understand the consequences of information or ideas.

#### ***Transfer Questions***

If inference and interpretation questions ask a student to go deeper, transfer questions provoke a kind of breadth of thinking, asking students to take their knowledge to new places.

#### ***Questions about Hypotheses***

Typically, questions based on what can be predicted and tested are thought of as belonging to sciences and other "hard" pursuits. But, in fact, predictive thinking matters in all domains. Skilled teachers probe for predictions as a

way of making students actively aware of their expectations.

### ***Students doing Inquiry Learning***

The following list describes some of what inquiry learning looks like in practice.

*Students view themselves as learners in the process of learning.*

- They look forward to learning.
- They demonstrate a desire to learn more.
- They seek to collaborate and work cooperatively with teacher and peers.
- They are more confident in learning, demonstrate a willingness to modify ideas and take calculated risks, and display appropriate skepticism.

*Students accept an "invitation to learn" and willingly engage in an exploration process.*

- They exhibit curiosity and ponder observations.
- They move around, selecting and using the materials they need.
- They confer with classmates and teacher about observations and questions.
- They try out some of their own ideas.
- *Students raise questions, propose explanations, and use observations.* They ask questions (verbally and through actions).
- They use questions that lead them to activities generating further questions or ideas.

They observe critically, as opposed to casually looking or listening. They value and apply questions as an important part of learning. They make connections to previous ideas.

*Students plan and carry out learning activities.*

- They design ways to try out their ideas, not always expecting to be told what to do.
- They plan ways to verify, extend, confirm, or discard ideas.
- They carry out activities by using materials, observing, evaluating, and recording information.
- They sort out information and decide what is important.

- They see detail, detect sequences and events, notice change, and detect differences and similarities.
- *Students communicate using a variety of methods.*
- They express ideas in a variety of ways including journals, drawing, reports, graphing, and so forth.
- They listen, speak, and write about learning activities with parents, teacher, and peers.

They use the language of learning, apply the skills of processing information, and develop their own "ground rules" appropriate for the discipline.

*Students critique their learning practices.*

- They use indicators to assess their own work.
- They recognize and report their strengths and weaknesses.
- They reflect on their learning with their teacher and their peers.

### **Teacher's Role in an Inquiry Classroom**

*The teacher reflects on the purpose and makes plans for inquiry learning.*

He plans ways for each learner to be actively engaged in the learning process.

She understands the necessary skills, knowledge, and habits of mind needed for inquiry learning.

He understands and plans ways to encourage and enable the learner to take increasing responsibility for his learning.

She ensures that classroom learning is focused on relevant and applicable outcomes.

He is prepared for unexpected questions or suggestions from the learner.

She prepares the classroom environment with the necessary learning tools, materials, and resources for active involvement of the learner.

*The teacher facilitates classroom learning.*

- The teacher's daily, weekly, monthly, and yearly facilitation plans focus on setting content learning in a conceptual framework. They also stress skill development and model and nurture the development of habits of mind.

- She accepts that teaching is also a learning process.

- He asks questions, encouraging divergent thinking that leads to more questions.

- She values and encourages responses and, when these responses convey misconceptions, effectively explores the causes and appropriately guides the learner.

- He is constantly alert to learning obstacles and guides learners when necessary.

- She asks many Why? How do you know? and What is the evidence? type of questions.

- He makes student assessment an ongoing part of the facilitation of the learning process.

Ultimately, the importance of inquiry learning is that students learn how to continue learning. This is something they can take with them throughout life - beyond parental help and security, beyond a textbook, beyond the time of a master teacher, beyond school — to a time when they will often be alone in their learning.

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