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THE DEVELOPMENT OF AN OBSERVATION INSTRUMENT
FOR DETECTING THE PRESENCE OF
REFLECTIVE TEACHING IN CLASSROOMS

DISSERTATION
Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
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1976

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CHAPTER I

INTRODUCTION

Statement of Problem

The purpose of this study is to propose and begin to answer a single question concerning the theory of reflective teaching. This question is: can a valid and reliable observation instrument be developed which detects the presence of reflective teaching in classrooms? The development of an instrument to answer this question is the problem of this study.

Importance of Study

This study can make a contribution to research on the effectiveness of different methods of teaching. In much of this research the independent variable has been "teacher behavior" and the dependent variable "results in student achievement." These results have been measured in terms of gains and losses in achievement and frequently have followed a pre-test, treatment, post-test pattern. The findings of studies measuring the comparative effectiveness of one method over another have typically been ambiguous and contradictory. They have failed to establish definite criteria that could be used to
measure the effectiveness of one method as compared with another.\textsuperscript{1} One reason for this may be the fact that the many studies did not confirm that the independent variable of a certain type of teacher behavior, or certain teaching method, did occur.\textsuperscript{2} It was just assumed to have occurred.

Shaver and Larkins comment on this problem and suggest the use of systematic observation as a means for solving it.

One cannot assume that because he has prepared special materials for his experimental and control teachers, or has given them instructions about how to behave, the anticipated differences in experimental and control instruction will occur. Gathering teachers' opinions about the extend to which they succeeded in modeling the desired behaviors is also not a reliable way to confirm an independent variable . . . In social studies, where there is so much interest in the effects of discussion techniques, systematic observation . . . is an especially fruitful means for verifying the independent variable.\textsuperscript{3}

Thus, in studies comparing the effectiveness of reflective teaching with other types of teaching, there is a need for a means to confirm the fact that reflective teaching has occurred. An observation instrument such as the one described in this study can provide one means for that confirmation.


\textsuperscript{2}L. G. Wispe, "Teaching Methods Research," \textit{American Psychologist}, (Vol. 8, 1953), pp. 147-150.

\textsuperscript{3}op. cit., Shaver and Larkins, p. 1249.
In addition to making a potential contribution to research on the effectiveness of teaching methods, this study can be of immediate, practical value to teacher educators and to elementary and secondary teachers. This value derives from the potential usefulness of the observation instrument as a teacher-learning tool in pre- and in-service teacher education programs. It has been the writer's experience as a teacher of undergraduate social studies methods courses at The Ohio State University that many students have difficulty understanding the concept of reflection when it is first introduced to them. These same students have even greater difficulty when they attempt to implement reflection in the classroom during their student teaching experience.

The same problem is found among experienced teachers. They, too, have difficulty understanding the concept. Even when they understand the concept as a thought process, they have difficulty transforming the thought process into a teaching process. As a university supervisor of student teachers this writer has had both student teachers and experienced teachers reveal to him that they liked very much the idea of reflection and teaching for thinking but they frankly did not know how to go about it in their classrooms.

The instrument could be used to sensitize prospective and practicing teachers to the behaviors, procedures, techniques, strategies, classroom climate, conditions, and activities that
are characteristic of reflective teaching. More will be said about the possible uses of the instrument in later chapters. It is sufficient here, however, to establish that there is a need for an observation instrument on reflective teaching and that there are definite uses to which it can be put.

**Observation as a Research Tool**

Observation as a research tool has been widely used by researchers in the social science disciplines. As a specific technique, it comes under a general approach to social science research known as ethnographic methodology. This methodology includes the use of the following techniques: enumeration, anecdotal records, tape recordings, field notes, participant observation, informant interviewing, and the systematic recording of data via a pre-determined observation schedule. The usefulness of this methodology in contributing to social science knowledge and theory has been firmly established in the well known studies of Lewis, Liebow, Whyte, and Gans.

Recently, educational researchers have begun to apply this methodology to a study of their field. Several well known

---


5The specific studies referred to in order here are: The Children of Sanchez, Tally's Corner, Streetcorner Society, and The Urban Villagers.
works which are excellent examples of the application of this methodology to education are Jackson's *Life in Classrooms*, Smith and Geoffrey's *The Complexities of An Urban Classroom*, and Wollcott's *The Man in the Principal's Office*.

Jackson presents an in-depth view of what school is like for students and teachers. The content of his book is based on his systematic observations of and informal conversations with the teachers and students in four classrooms of the Lower School of the University of Chicago Laboratory School and on previous research studies. In the concluding chapter, "The Need for New Perspectives," Jackson predicts that educational researchers in the future will spend more time observing classrooms and examining the records of classroom events. He states

... It almost goes without saying that in the future more researchers will spend more time observing in more classrooms, or at least pouring over records of classroom events. There has already been a noticeable increase of observational studies in recent years and the trend looks as though it will continue. Moreover, there is some evidence that classroom researchers are beginning to turn to disciplines other than psychology and educational measurement for their methods of analyzing classroom phenomena. The techniques of participant observation and anthropological field study are among those receiving greater attention from educational researchers. (emphasis added).6

*The Complexities of An Urban Classroom* represents the first

major attempt to employ "microethnography" to study the relationships and interactions between pupils and their teacher. The authors define microethnography as "the technique of direct observation of an ongoing naturalistic situation." Their study dealt exclusively with one classroom. Smith observed in the classroom nearly everyday for an entire semester. Geoffrey was the teacher in the classroom. Both Smith and Geoffrey collected data, Smith as a non-participant observer and Geoffrey as a participant observer. The data consisted of extensive longhand notes describing classroom events, interpretative comments mixed in with the notes, daily summaries recorded on audio-tapes, classroom documents such as assignments and letters sent home to parents, messages brought in to the teacher and brief field notes kept by the teacher himself.

Shaver and Larkins believe the two data sources, Smith as a non-participant observer and Geoffrey as a participant observer, are significant because they present both an "inside" and an "outside" view of the ongoing activity and its meaning in the naturalistic situation. The latter emphasizes objectivity and allows for the collection of detailed data while the former is very helpful in identifying such difficult to observe phenomena as teacher intentions.

8op. cit., Shaver and Larkins, p. 1255.
Smith and Geoffrey believe that research based on their methodology can make significant contributions to theoretical research on teaching. They state that microethnography is a legitimate and viable means for collecting data to propose hypotheses rather than to prove them. They refer to their work as mid-range theory and believe that the hypotheses suggested by their data can be verified or refuted by research that falls in what might be called the "statistical tradition." Experimental, quasi-experimental and correlational studies would be needed to prove or disprove the hypotheses developed through their use of classroom ethnography.

Wolcott's study is different from the other two in that it does not focus its attention on the events, people, objects and behaviors of the classroom. It is a "shadow study" which focuses on the man in the principal's office and is considered an excellent example of how the ethnographic methodology of the sociologist and anthropologist can be used to study education.

**Observational Studies of Teaching**

The idea for an observation instrument on reflective teaching was suggested by other studies which used systematic observation as a research tool. These studies are reviewed and
discussed by Medley and Mitzel\(^9\) and Rosenshine and Furst.\(^10\) A large number of these studies have been brought together in an anthology prepared by Simon and Boyer.\(^11\)

This anthology contained no instruments designed to determine the presence of reflective teaching in classrooms. There was, however, one instrument which seemed to be related to this. The instrument was the Teacher Practices Observation Record (TPOR) created by Bob Burton Brown.\(^12\) It was developed and used as one of a series of instruments designed as measures of experimentalism. He was concerned with the philosophy of experimentalism and the educational beliefs and practices of classroom teachers. Specifically, he wanted to know the degree to which experimental philosophical and educational beliefs of teachers correspond with their actual classroom practices. The TPOR was designed to measure the degree to which a teacher's actual


classroom practices were experimental or non-experimental. The TPOR, as described by Brown, seemed to correspond very closely to the concept of reflective teaching.

The correspondence, however, appeared to breakdown when Brown operationally defined experimental education practices on the TPOR. The sixty-two items on this instrument were divided into two broad categories; the odd numbered items supposedly being examples of non-experimental practices and the even numbered items examples of experimental practices. The either-or nature of the categories and statements on the observation instrument seemed necessary to facilitate scoring, but it raised questions about the accuracy of the operational definition. Item thirty-three for example was "Teacher provides pupil with detailed facts and information." According to the instructions on the use of the instrument this statement was clearly non-experimental. The questions raised were: (1) Does the experimental teacher, or reflective teacher, never provide pupils with facts and information? and (2) If not, does this mean that the experimental, or reflective, teacher never gives a lecture? Experts in reflective theory such as Hunt and Metcalf, Crabtree, Jewett and Griffin would answer these questions in the negative.

These and other questions led to the conclusion that while Brown's measures of experimentalism were similar to reflective theory, they were not identical. It was this conclusion primarily
that suggested the idea for this study.

The Use of Observation Instruments by Social Studies Educators

It is significant to note that this study is not the first attempt by a social studies educator to develop and use observation instruments for studying teaching. Some well known social studies educators who have worked with such instruments are: Ernest Horn, Hilda Taba, Donald W. Oliver, James P. Shaver and A. Guy Larkins.

The earliest of the instruments developed was the one Horn used to measure pupil participation. Medley and Mitzel comment on Horn's efforts.

The earliest attempts to obtain objective measurements of classroom behavior seem to have come, naturally enough, from supervisors. A need for objective measures to replace global ratings appears to have been felt before World War I when Horn (1914) proposed that a small circle be recorded by the classroom visitor in the appropriate space on the seating chart for 'each recitation' and a square for each time a pupil responds by doing something. The purpose was to ascertain the distribution of participation by pupils in the lesson. 13

Hilda Taba, in association with Samuel Levine and F.F. Elzey, developed and used an instrument for analyzing tape recorded transactions between pupils and teachers. Taba and her associates were concerned with the relationships between teaching strategies and student thought processes. To describe accurately and simultaneously the strategies and processes, they developed a

13 _op. cit._, Medley and Mitzel, p. 254.
system of scoring and rating the verbal transactions between students and teachers.\textsuperscript{14}

In the early 1960's Oliver and Shaver conducted research which focused on the relationship between teaching styles and student learning.\textsuperscript{15} They described two different styles of teaching, socratic-analytic and recitation-analytic, and developed an instrument to differentiate these two styles in live classroom situations. The instrument was also used to determine the extent to which the teachers in the research project could successfully role-play both styles. The effectiveness of the different styles was then evaluated by administering several measures of learning outcomes to groups of students who had experienced both styles of teaching. The major result showed no significant differences in the learning outcomes for the socratic-analytic or the recitation-analytic groups.

The professional educators and curriculum workers who developed materials for the Harvard Social Studies Project created and used two fairly complex observational systems to assess levels of student thinking as evidenced by their behavior.


\textsuperscript{15}Donald W. Oliver and James P. Shaver, "Teacher Style and the Analysis of Student Teacher Dialogues," in Hyman's Teaching: Vantage Points for Study, pp. 404-420.
during discussions. A key person working on this project was Donald W. Oliver. Oliver and his colleagues developed an instrument known as the Social Issues Analysis Test No. 4. This instrument was an adaptation of a system known as "interaction process analysis" originally developed by Robert Bales in 1950. A second instrument, the Analytical Category System, was created to provide the materials developers a tool for describing classroom interaction processes in sufficient detail to facilitate the choice of using or rejecting a particular story or teaching strategy to accomplish a certain goal.

In Teaching Public Issues in the High School Oliver and Shaver describe the Social Issues Analysis Test No. 4 and discuss its use in their research on citizenship education. Later Shaver and Larkins modified this instrument and used it to study critical thinking in the Utah State University Project. In its modified form the instrument was known as the Analytic Content Analysis System (ACAS).

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Methodology

The overall methodology used in the development of the instrument in this study was a combination of philosophical analysis and empirical inquiry. The beginning phases of the instrument's development required the philosophical analysis of selected works on reflection. The net result of this analysis was a general, written description of reflective teaching. This description, plus information from relevant sections of the selected works, served as the basis for the creation of the instrument.

Once developed, the instrument's content validity had to be established. This was done by submitting the instrument to a panel of five judges and asking them to answer this question: "Do the categories and questions on the observation instrument accurately represent the concept of reflection? If yes, to what extent?" All the judges answered in the affirmative and indicated that the instrument seemed to represent the concept of reflection very well.

Empirical inquiry came into play as the writer conducted field tests of the instrument to determine its reliability and to see if the items identified on the instrument existed in the real world of the public school classroom. To field test the instrument the writer with the assistance of two colleagues in social studies education made audio-tapes of live classroom situations in which experienced teachers were requested to teach
reflective, or inquiry-reflective, lessons. As the instrument was field tested on the tapes, data relevant to its reliability were generated. These data were analyzed and used to compute inter-observer agreement and within-observer agreement over time. The results are presented in chapter four.

Limitations of the Study

A major limitation of this study is found in the approach to field testing the instrument. Originally, it was anticipated that the instrument would be used in live situations, thus requiring live field testing. However, as the study progressed, time constraints forced the adoption of another approach. Audio-tapes of live situations were made and the instrument was field tested on these tapes.

A second limitation concerns the nature of observation instruments. Trained observers, rather than the instruments themselves, are the tools which actually collect the data. The usefulness of any instrument depends upon the skill of the observers using it. Although inter-observer and within-observer agreement over time are computed to determine the reliability of an instrument, the resulting statistical measure of reliability is more a measure of degree of agreement than it is a measure of the extent to which the items identified on the instrument actually occurred in the instructional situation. It is possible, though not likely, that two or more observers,
or one observer over a period of time, could make the same errors in judgment.

**Overview**

The organization of this dissertation is as follows: Chapter two discusses the concept of reflection as a thinking and a teaching process. In chapter three is a detailed description of the problems encountered and the procedures followed in developing the instrument and in establishing its content validity. Also included in that chapter is a discussion of methods used to determine the reliability of the instrument. Data analysis and interpretation are the subjects in chapter four. Chapter five presents a summary of the study, reports principal findings, discusses major conclusions, and makes recommendations for possible uses of the instrument.
CHAPTER II

THE REFLECTIVE METHOD - TWO PERSPECTIVES

Since the publication of Dewey's *How We Think* (1910), much has been written about reflection as "the method of education."¹ Most of this writing deals with reflective thinking; describing what it is and how it takes place, distinguishing it from other forms of thinking, and presenting arguments for making it the primary goal of education. In addition to being a thinking process, reflection has also been conceived of as a teaching process.² An examination of the concept of reflection both as a thinking and a teaching process is a necessary step in the development of the instrument for this study. This chapter undertakes such an examination by providing definitions, offering descriptions and giving examples of both reflective thinking and reflective teaching. Also considered is the relationship of reflection to the learning process.


The Nature of Reflection as a Thinking Process

Dewey's Definition and Description

The most famous and perhaps most clearly stated definition of reflective thinking is the one formulated by Dewey in 1910. Reflective thinking is the "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends . . .".

Dewey clarifies this definition by distinguishing reflective thinking from other, non-reflective forms of thinking. According to him one meaning people have for thinking is the "uncontrolled coursing of ideas through our heads." Dreaming, daydreaming and reverie are examples of this kind of thinking. A second fairly common meaning for thinking refers "to things not sensed or directly perceived, to things not seen, heard, touched, smelt, or tasted." Examples of this kind of thinking are the imaginative stories, incidents or episodes that people invent and narrate. A third meaning for thinking makes it nearly synonymous with believing. When a person states, "I think it will rain soon," the word "believe" could be substituted for the word

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4 Ibid., p. 4.
5 Ibid., p. 5.
"think" without a change in meaning. This third type of thinking is different from the other two in that it has a closer contact with reality.

Reflective thinking is different from these three forms of thinking in that: (1) it is controlled and orderly, (2) it is directed by an end or purpose, and (3) it is based on the observation, collection and examination of evidence. The emphasis in Dewey's classic definition is on the conscious and voluntary effort to establish a belief based on evidence and rationality.

Other Definitions and Descriptions

Advocates of reflective thinking from Dewey to the present have offered other definitions and descriptions of the process. Most of these are similar to Dewey's original definition or to his description of a complete act of thought. This act begins with a problem or felt difficulty, proceeds to the suggestion of hypotheses which are possible solutions to the problem, continues with the testing of these hypotheses by gathering data which supports or casts doubt on them and ends with the selection of the best hypothesis as the conclusion or solution to the problem.6

Alan Griffin, elaborating on Dewey's idea of the complete act of thought, described the act as involving the following

6 Ibid., chapter 1.
six steps.

1. The occasion of reflection, which arises when our routine habitual ways of behaving are interrupted in such a way as to create a doubtful or indeterminate situation.

2. The definition of the difficulty, or the identification of what it is that is blocking our path.

3. The rise of suggestions out of our prior experience, any one of which may or may not be adequate to dispose of our difficulty, remove the doubts that have arisen, and get us back into action.

4. The mental elaboration of suggestions, which involves their use as hypotheses to explain or take into account what we have observed as the facts of the case, and the prediction of things that would logically follow if the hypotheses are sound.

5. Testing, which involves the verification of our predictions and the judging of the adequacy of a suggested hypothesis to account for such new facts as we may come upon in the process of our inquiry.

6. Conclusion, or the actual moving back into action on the basis of a hypothesis which has satisfactorily met the foregoing tests.\(^7\)

The definition of reflective thinking by the Columbia Associates in Philosophy emphasized problem solving and finding meaning.

When thought ... is bent on solving a problem, on finding out the meaning of a perplexing situation, or reaching a conclusion which is trustworthy, it is to be distinguished from other types of mental activity

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and should be called reflection.\textsuperscript{8}

Boyd Bode offered a simple, concise and easy to remember definition. He referred to reflection as the "finding and testing of meaning."\textsuperscript{9}

Hullfish and Smith viewed reflection as controlled thinking and stressed the importance of three interrelated aspects which they identified as sentiency, memory and imagination.\textsuperscript{10}

Bayles reveals his intellectual debt to Dewey when he describes what it is to be reflective.

To be reflective is to be thoughtful; to be considered rather than impulsive in coming to conclusions ... It is only when what should be done about a situation is not immediately clear that we are confronted by the necessity of being thoughtful or reflective. Only when we meet a problem--a forked-road or no road situation--do we need to be reflective.\textsuperscript{11}

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\textbf{Examples of Reflective Thinking}
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Several examples of reflective thinking along with some comments on these examples will crystallize the conception of the process being presented in this chapter.

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\textsuperscript{10}\textit{op. cit.}, Hullfish and Smith, p. 36.
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\begin{flushright}
\textsuperscript{11}\textit{op. cit.}, Bayles, p. 188.
\end{flushright}
The other day, when I was downtown on 16th Street, a clock caught my eye. I saw that the hands pointed to 12:20. This suggested that I had an engagement at 124th Street, at one o'clock. I reasoned that as it had taken me an hour to come down on a surface car, I should probably be twenty minutes by a subway express. But was there a station near? If not, I might lose more than twenty minutes in looking for one. Then I thought of the elevated, and I saw there was such a line within two blocks. But where was the station. If it were several blocks above or below the street I was on, I should lose time instead of gaining it. My mind went back to the subway express as quicker than the elevated; furthermore, I remembered that it went nearer than the elevated to the part of 124th Street I wished to reach, so that time would be saved at the end of the journey. I concluded in favor of the subway, and reached my destination by one o'clock. 12

This example was, according to Dewey, prepared by one of his students and represented a case of reflective activity carried on in the normal course of everyday life. This case contains all the elements described in the complete act of thought. These are:

(1) A problem or felt difficulty. The problem was: What means of transportation should the man use to get from downtown to his appointment on 124th Street?

(2) The suggestion of hypotheses. These were: (a) He could use a surface car; (b) He could use the subway; (c) He could use the elevated train.

(3) Testing of hypotheses. Hypothesis number 1 was ruled out because the use of the surface car would cause the man to be

12 op. cit., Dewey, pp. 91-92.
late for his appointment. Data which led to this conclusion were: (1) It was 12:20; (b) He had an appointment at one o'clock; (c) He was downtown on 16th Street; (d) He needed to go to 124th Street; (3) It took an hour by surface car to get from downtown to 124th Street; (f) Conclusion - If he goes by surface car, he'll be twenty minutes late. Hypothesis number 2 was ruled out for a similar reason. He felt he would lose time because getting to the elevated train would use more time than it would save.

(4) **Drawing a conclusion.** Hypothesis number 3 was selected as the solution to the problem because the subway was quicker than the other two means of transportation and because the route of the subway took him nearer to his destination. He acted on the conclusion, reached his destination by one o'clock and thereby solved his problem.

Although this is a rather simple case, it concretely illustrates the various steps in the process. The testing phase was relatively easy to carry out in this example because the man was able to call up from his memory all the data, or evidence, required to solve the problem. This is not always possible. When evidence needed to solve a problem is not immediately available, the reflective process has to be temporarily suspended. The needed data must be sought after and obtained before the process can begin again. In cases where memory does not supply all the needed data, careful observation may enable an individual involved in a problem to reach a warranted conclusion. The
next example illustrates how such observation can both create a problem and suggest a solution.

Example #2

Projecting nearly horizontally from the upper deck of the ferryboat on which I daily cross the river is a long white pole, bearing a gilded ball at its top. It suggested a flagpole when I first saw it; its color, shape, and gilded ball agreed with this idea, and these reasons seemed to justify me in this belief. But soon difficulties presented themselves. The pole was nearly horizontal, an unusual position for a flagpole; in the next place, there was no pulley, ring, or cord by which to attach a flag; finally, there were elsewhere two vertical staffs from which flags were occasionally flown. It seemed probable that the pole was not there for flag-flying.

I then tried to imagine all possible purposes of such a pole, and to consider for which of these it was best suited; (a) Possibly it was an ornament. But as all the ferryboats and even the tugboats carried poles, this hypothesis was rejected. (b) Possibly it was the terminal of a wireless telegraph. But the same considerations made this improbable. Besides, the more natural place for such a terminal would be the highest part of the boat, on top of the pilot house. (c) Its purpose might be to point out the direction in which the boat is moving.

In support of this conclusion, I discovered that the pole was lower than the pilot house, so that the steerman could easily see it. Moreover, the tip was enough higher than the base, so that, from the pilot's position, it must appear to project far out in front of the boat. Moreover, the pilot being near the front of the boat, he would need some such guide as to its direction. Tugboats would also need poles for such purpose. This hypothesis was so much more probable than the others that I accepted it. I formed the conclusion that the pole was set up for the purpose of showing the pilot the direction in which the boat pointed, to enable him to steer correctly.  

\[13\text{ibid.}, \text{ pp. 92-93.}\]
This case also concretely illustrates the various steps in the complete act of thought. It is different, however, from the first example in that the problem does not arise as a practical difficulty to be overcome in the normal course of everyday life. It is an example of an intellectual problem that just happened to occur to the man as he was riding a ferryboat. The driving motivation in this problem is curiosity, or the compelling desire to know. It should be pointed out that his conclusion concerning the pole—it was set up to enable the pilot to steer the boat correctly—could have been tested further. While the data the man collected through careful observation and examined by logical analysis did support the conclusion, they were not absolute proof of the accuracy of the conclusion. To establish this accuracy the man could have asked the pilot to inform him on the nature and purpose of the pole.

It should be noted here that in reflection absolute proof is often not obtained. Decisions are made and conclusions drawn on the basis of evidence of correctness rather than on absolute correctness. The reflective person strives for warranted assertability of propositions or beliefs. Conclusions are held tentatively and are always subject to rejection, further confirmation or revision upon the introduction of new evidence. The last example illustrates the problem of evidence and the need for tentative conclusions.
Example #3

A five year old boy and his mother are in the living room of their home. The boy is playing with his toys while his mother is busy preparing a shopping list for the grocery store. On a coffee table in the room is a pot which contains an arrangement of flowers the mother has just received as an anniversary gift from her husband. The mother interrupts her work to answer the telephone in the kitchen. When she returns she finds the pot broken, the flowers scattered about the room and her son sitting quietly watching a cartoon on the television. She is exasperated and wants to know what happened. She turns to her son for an explanation and begins crying hysterically and is unable to answer her questions. Without the information which her son could supply she begins to formulate several theories, or working hypotheses, which could explain the facts of the case. The first hypothesis is that her son either accidentally or on purpose knocked the pot off the table and then scattered the flowers about the room. She asks, "Sweetheart, did you accidently knock the pot off the table?" He refuses to answer. She checks his hands for pieces of glass and dirt and the smell of fresh flowers. This search provides no evidence to support her theory. She looks around the room and finds a small, plastic ball bat in the middle of the mess on the floor. She examines the bat and finds a piece of glass from the pot lodged in the end of it. She concludes that the bat was responsible for the disaster and that her son probably hit the pot by accident while playing.

This example is different from the others in that all the evidence to support a conclusion or to explain the problem is not immediately available to the mother. She does form a conclusion and operates on its assumed validity until her son tells her what really happened. If he never supplies additional information, the mother can never know for sure what really happened. All the evidence she could obtain points to him, but there is always the possibility that he was not
responsible. For example, a frisky but friendly house cat could have been the culprit. Or, a curtain blowing wildly in the breeze could have caused the disaster. Or, a neighborhood playmate of the son could have entered the room while the mother was on the phone and accidentally knocked over the pot while playing with the bat. Each of these hypotheses creates new problems which need to be resolved. The cat or the curtain could explain the broken pot, but not the piece of glass lodged in the bat. Perhaps the son used the bat to chase the cat from the room and the piece of glass became lodged in the bat as he tried to punish the cat for his wrongdoing. Because of a lack of evidence the mother cannot consider such hypotheses. All she can do, until the son supplies more information, is operate on the basis of the evidence immediately available to her.

A comment on the role of hypotheses in explaining the facts of any case is in order. All hypotheses serve the function of directing a search for additional facts to support or refute an assertion. Cast in the form of if-then propositions, they are powerful tools to use in the solution of problems or in reaching conclusions concerning problems.

In the next section the role of the classroom teacher in creating conditions which call for reflective thinking on the part of students will be considered, other examples of reflective thinking will be given, and additional comments on the various stages of the process will be made.
The Nature of Reflection as a Teaching Process

Dewey's Conception of Reflective Teaching

Although Dewey talked and wrote extensively about the teacher's responsibility for fostering in students good habits of reflective thought, it appears that he never used the term "reflective teaching." In his writings he seems to have focused more on the concept of thinking than teaching. He took great pains to explain reflection as a thinking process but devoted only limited space to concrete suggestions on how it could be deliberately promoted by teachers in the classroom. While the term does not appear in his writing, it is implied throughout his works on education. Whenever he discusses or casually mentions what teaching should be or what teachers should do, he is describing what this writer calls "reflective teaching" and the "reflective teacher." His central idea on what teaching should be is suggested in the following quote.

The sole direct path to enduring improvement in the methods of instruction and learning consists in centering upon the conditions which exact, promote and test thinking. Thinking is the method of intelligent learning, of learning that employs and rewards mind. We speak, legitimately enough, about the method of thinking, but the important thing to bear in mind about method is that thinking is method, the method of intelligent experience in the course in which it takes.14

From this quote it can be inferred that teaching for Dewey is creating "conditions which exact, promote and test thinking" with the teacher being the person who helps students do the exacting, promoting and testing. It seems logical to assume that these conditions would include such items as the proper classroom climate, the existence of problems, the provision for experiences or situations which could generate problems, and the presence of materials and data which could be used in the possible solution of problems. The teacher is responsible for creating the conditions which generate problems and for helping students solve the problems, or at least reach conclusions in regards to the problems.

Some of Dewey's ideas on what teachers should do when engaged in the direct act of teaching are seen in another passage.

When engaged in the direct act of teaching, the instructor needs to have subject matter at his fingers' ends; his attention should be upon the attitude and response of the pupil. To understand the latter in its interplay with subject matter is his task, while the pupil's mind, naturally, should be not on itself but on the topic in hand. Or to state the same point in a somewhat different manner the teacher should be occupied not with subject matter in itself but in its interaction with the pupils' needs and capacities.\textsuperscript{15}

Thus, the reflective teacher focuses his attention on the mental processes of students and continuously tries to create conditions which require students to engage in the reflective

\textsuperscript{15}ibid., p. 183.
process. Reflection becomes the guide that furnishes purposes for and gives direction to the thinking and acting of both students and teacher. The teacher's own reflective thought processes constitute the principal means by which students are involved in genuine problems and with which they are helped to resolve these problems. Reflection in this sense is both a method of learning for students and the basis for a rationale that guides the behavior of the teacher. This rationale determines the overall method of teaching and is used as the primary criterion for selecting various techniques, devices, activities, and strategies to be used in the classroom.

This explanation of Dewey's conception of the reflective teacher and reflective teaching can be clarified by examining several passages in which he describes the non-reflective teacher and non-reflective teaching. Although these passages are not labelled as such by him, it seems fair to classify them in that way.

The accumulation and acquisition of information for purposes of reproduction in recitation and examination is made too much of. "Knowledge," in the sense of information, means the working capital, the indispensable resource, of further inquiry; of finding out, of learning, more things. Frequently it is treated as an end in itself, and then the goal becomes to heap it up and display it when called for. This static, cold-storage ideal of knowledge is inimical to educative development. It not only lets occasions for thinking go unused, but it swamps thinking. One could not construct a house on ground cluttered with miscellaneous junk. Pupils who have stored their 'minds' with all kinds of material which they have
never put to intellectual uses are sure to be hampered when they try to think.\textsuperscript{16}

Non-reflective teachers typically place a premium on the accumulation and acquisition of knowledge for use primarily in recitation and on examinations. Knowledge or subject matter is viewed as an end in itself, rather than as a means for solving problems. Dewey was extremely critical of this view.

A passage which reveals his criticism of teaching for regurgitation or what he calls "gradgrind preoccupation with facts" and which provides an example of non-reflective teaching is as follows.

It is hardly an exaggeration to say that too often the pupil is treated as if he were a phonographic record on which is impressed a set of words that are to be literally reproduced when the recitation or examination presses the proper lever. Or, varying the metaphor, the mind of the pupil is treated as if it were a cistern into which information is conducted by one set of pipes that mechanically pour it in, while recitation is the pump that brings out the material again through another set of pipes. Then the skill of the teacher is rated by his or her ability in managing the two pipelines of flow inward and outward.\textsuperscript{17}

The reflective teacher, as distinguished from the non-reflective teacher, is not primarily a teller, a lecturer, or an information-giver. He is primarily a questioner, a materials-provider, a helper, and a creator of conditions which stimulate

\textsuperscript{16}\textit{Ibid.}, p. 158.

\textsuperscript{17}\textit{Op. Cit.}, How We Think, p. 261.
and promote thinking. This does not mean that the reflective teacher never tells students answers, gives a lecture, or provides information. The reflective teacher engages in these activities when it is appropriate to promote one or more of the phases in the process of reflective thinking.

Other Conceptions of Reflective Teaching

Many writers since Dewey have not differed significantly in their conception of reflective thinking. They have accepted Dewey's theory and have devoted more attention to ways in which the theory can be implemented in the classroom.

The writers to be considered in this section fall into two general categories: (1) those who have applied Dewey's theory to the teaching of social studies and (2) those who have applied the theory to teaching in general. It is neither feasible nor desirable in this chapter to consider all the writers in these two categories. Therefore, representatives from them have been selected and their ideas on the application of Dewey's theory to classroom teaching will be discussed.

Representatives from the Social Studies

Among the many writers who have made significant contributions to the application of the theory of reflective thinking to the social studies classroom are: Alan F. Griffin, Robert E. Jewett, Lawrence E. Metcalf and Maurice P. Hunt.

A central idea in the writings of these social studies
educators is the promotion of reflective thinking by the critical examination of beliefs in general and the beliefs of students in particular. All discuss the necessity on the part of the teacher of securing an intimate acquaintance with the beliefs of students and using these beliefs as a starting place from which the reflective process can be carried forward in the classroom. In their view it is the responsibility of the teacher to become aware of these beliefs, to create a climate in which students freely express them, and to use knowledge from history, social science and other sources as evidence in the testing of these beliefs.

Jewett states the logic behind the view of using student beliefs as the starting point for reflection.

From this statement [Dewey's classic definition of reflective thinking as presented on page seventeen of this chapter] we may infer that the beliefs of pupils are central to the reflective process and that the grounding of these beliefs in relevant evidence is a method by which reflection is carried forward. It may be reasonably assumed that students have many more beliefs than problems. It becomes the purpose of the teacher to alter these beliefs to the nature of hypotheses for the pupil. At that point, the reflective process can begin to operate.18

Griffin reveals the emphasis which all four writers place upon student beliefs when he says,

The high school teacher of history who is not

directing his materials toward the present beliefs of his students, or at least toward certain hypotheses about the nature of these beliefs, is addressing the air or talking to himself.¹⁹

That these writers stress the use of knowledge, or subject matter, as data in the grounding of student beliefs is seen in another passage.

The first problem, then, (from the standpoint of classroom procedure, although not necessarily from the standpoint of teacher preparation) is clearly that of ascertaining something about what beliefs students hold. This does not mean that a separate 'belief-finding' operation must be carried on by means of tests or questionnaires, although such procedures can be useful at times. Rather in the process of looking at historical material the teacher can uncover pupil beliefs and then and there further use subject matter both as data to convey the belief into a hypothesis and as evidential material bearing upon the hypothesis.²⁰

All four writers are critical of teaching facts for fact's sake and take the view that one of the most important roles facts, or data, can play in the educational process is as evidence to support a conclusion, warrant a belief or resolve a problem. The use of facts as a means, rather than as an end in itself, is a basic characteristic of reflective teaching. Hunt and Metcalf state this position quite clearly when they say,

There is only one role which facts can play in meaningful learning; to function as evidence. If they do


not, they may perhaps be memorized and retained for a while, but their meaning and future usefulness will be slight.21

Although student beliefs are heavily emphasized by all four writers, the beliefs examined in class are not limited to these. Any belief, as long as it is relevant to a problem considered by a particular class and has some bearing on the teaching of social studies, is fair game.

In concentrating on beliefs, these educators do not favor the inculcation of a particular set of beliefs. Rather, they emphasize the grounding of beliefs in evidence. They are primarily concerned with how beliefs are acquired and held and with whether or not they are logically sound and supported by evidence. The process of reflective thinking is advocated as the means by which beliefs are grounded.

Representatives Outside the Social Studies

Among the many writers who have made significant contributions to the application of the theory of reflective thinking to classroom teaching in general are: H. Gordon Hullfish, Philip G. Smith and Earnest E. Bayles. Their conceptions of reflective teaching are very similar to those considered above. They differ, however, in the emphasis placed upon student beliefs.

Hullfish and Smith, for example, mention but do not dwell upon these. They view reflective teaching as "a process in which the dogged pursuit of ideas is the sole issue . . ." They take the position that reflective thinking is the method of learning and lean heavily on Bode's definition of thinking as the "finding and testing of meanings." They emphasize teaching beyond the recall level and make a distinction between the "ability to utter" and the "ability to speak." The ability to utter is merely to repeat the words of another. It is not to be equated with the grasping of meaning. The ability to speak goes beyond this level and involves an inquiry into meanings. Teaching becomes reflective when both students and teacher operate at the "speak" level. Bayles' conception of reflective teaching parallels Dewey's description of the complete act of thought. The following passage illustrates this conception.

In reflective teaching, classroom procedure follows the general form of reflective study. The class is first maneuvered into a problem, an I don't-know situation. Unless a group of students is faced with a question whose answer is to them unknown, no reflection is for them possible. It makes no difference who else knows the answer, the teacher of the whole outside world; if the answer to a given question is unknown to the members of the group involved, for them the question is 'food for thought' . . . Then follows problem-solving . . .

\[22\text{ op. cit.}, \text{ Hullfish and Smith, p. 209.}\]
A problem-solving process may be short and simple. Others may be long and involved. But, whether short, long, or in-between, it is reflective teaching only if the class members themselves are actively working and thinking the matter through to a conclusion. . . .

Examples of Reflective Teaching

Several examples from the works of the previously mentioned educators and some comments on these examples will clarify further the conception of reflective teaching being presented in this chapter.

Example #1

Let us suppose a world history course in which students have encountered . . . the statement . . . 'Alexander crossed the Hellespont with 35,000 men and began the series of conquests that quickly made him master of Darius' empire.'

In the actual course of events, this statement would be 'believed' in the limited sense of 'not doubted,' but nobody would be likely to care much one way or the other about it, except on the off chance that an examination might call for its regurgitation . . .

Suppose, however, that the teacher raises the question, 'Could that sentence be a misprint? Surely it doesn't sound reasonable that 35,000 troops could conquer a land containing many millions of people.'

That much is enough to get the flow of hypotheses started. 'Maybe there weren't so many people in those days.' Investigation will bear this out, but not in sufficient degree to explain Alexander's conquests. 'Maybe his army increased as he went along.' Investigation supports this also—at least, a student can readily find out that Alexander trained some 30,000 of his conquered subjects in Macedonian military techniques—but again the explanation is quantitatively inadequate. 'Maybe the people had no weapons.'

23 op. cit., Bayles, pp. 189-190.
But Macedonian weapons were not particularly complicated, as the student can readily discover. Vast numbers of peoples armed with only equipment for hunting, farm implements, clubs, and stones could make a fair showing against a small army. However, a new question could be introduced by the teacher, namely, 'Why didn't Darius see to it that every household contained the simple weapons of his day?'

Sooner or later, someone will discover that the ordinary inhabitant of an Asiatic empire never took part in wars at all— that he apparently cared not at all who ruled over him. By the time a student has found out why, and has come to compare the passive helplessness of the natives of Persia with the vigorous self-defense against Persia carried on by the Greek cities a century and a half earlier, and perhaps to wonder what had enabled Alexander to conquer those same Greek cities...24

This example contains the primary elements of reflective thinking— i.e., problem, hypotheses, testing, and a tentative conclusion— and provides an excellent illustration of a way in which the teacher can engage students in the process. The questions asked by the teacher and the teacher's responses to those questions come under the heading of reflective teaching. The problem in this example— How was Alexander with an army of only 35,000 men able to conquer a land containing many millions of people?— was not presented directly to the students. Rather, it was suggested by the teacher's question about the possibility of a misprint. This question was sufficiently intriguing to some students to cause them to see the problem and to suggest immediately hypotheses that would resolve it. The alternative hypotheses suggested

24 op. cit., Griffin, pp. 179-181.
and tested were: (1) "Maybe there weren't so many people in those days," (2) "Maybe his army increased as he went along," (3) "Maybe people had no weapons," and (4) "The ordinary inhabitant of an Asiatic empire never took part in wars at all."

The last hypothesis seemed to represent the best conclusion considering the available data. This conclusion, if discussed further in class, might be transformed in a generalizable proposition such as, "people will not fight to maintain a government in which they believe they have no stake." This proposition, or grounded belief, could conceivably surface again in later class discussions as other periods of history are studied. In that event the proposition would become data which the teacher or students could use as evidence in testing other hypotheses. If in the new situation, the proposition does not hold up, students will be forced to revise it in light of new found evidence. In this manner the teacher not only teaches the subject but the reflective process as well. The subject matter of history learned by students is, in a sense, a by-product of the application of the process. Learning is not limited to the rote memorization of minutia. It reaches beyond what Bloom calls the knowledge of specifics, or the recall level of thinking, and involves the higher, more sophisticated skills of comprehension, application, analysis, synthesis, and evaluation.
Example #3

Ramon: Well, I guess I'm one of those reactionaries who believes that you can't change human nature.

Teacher: I don't know whether holding that belief makes you a reactionary. If so, I would guess that you have lots of company. I would be interested in knowing just what you mean, though, when you say that you can't change human nature.

Ramon: Well, I mean that people are basically the same now as they were as far back as we have any records—as far back as the ancient Egyptians, for example.

Teacher: Do you mean people have the same customs now?

Ramon: No, not the same customs—oh, I guess some customs haven't changed much.

Teacher: Do you mean people have the same beliefs today as they had in ancient Egypt—about politics, economics, religion, sex, and so on?

Ramon: No, I don't mean that—you can't say that people haven't changed. But there are some things that don't change.

Teacher: For example?

Ramon: People have always been and always will be basically selfish. And they still fight wars.

Teacher: Then you would say that there are a few drives or motives that remain the same?

Ramon: Yes.

Teacher: Would you say man has changed in more ways than he has remained the same, or remained the same in more ways that he has changed?

Ramon: Well, you've got me there. I suppose I will have to take back part of it. It wasn't a very careful statement.25

This example represents only a small piece of a more extended class discussion. This particular excerpt illustrates a reflective teacher encouraging a student to examine critically one of his beliefs. The problem for the student is to explain the meaning

of his statement by marshaling evidence to support it. The problem for the teacher is to get the student to reconsider, and possibly qualify, the very general statement that "you can't change human nature." The teacher helps the student evaluate this belief by asking questions that cause him to begin to doubt its acceptability. As they engage in dialogue and bring evidence to bear on the belief, the student sees that his original statement was not a careful one and that it probably needs some revision. This dialogue provided the teacher an opportunity to get inside the reflective process of the student. Such dialogues occur often in classrooms where students are encouraged and given many opportunities to express themselves freely.

Often reflective teaching requires more than one class period to present a problem and to pursue it to an adequate conclusion. The following example illustrates this and supports previous points concerning the examination of beliefs and the use of historical facts as evidence in testing them. Also, it presents a praise-worthy model of the teacher's essential role in guiding students through the process by helping them identify problems, state hypotheses, uncover relevant data and draw warranted conclusions.

Example #3

Teacher: Why did we fight the War of 1812?
Pupil: For freedom of the seas.
Pupil: To stop the British from impressing our seamen.
Teacher: Who were some of the men who urged us to go to war with Great Britain?

Pupil: Henry Clay, Calhoun. They were known as the war hawks.

Teacher: John, what reason did you give for our going to war?

John: The book said our freedom of the seas.

Pupil: That's right, our seamen were being impressed by Great Britain. Our ships were stopped at sea by British warships.

Teacher: Yet Mary tells us that Clay and Calhoun led the movement for war. Where were they from?

Pupil: Clay was from Kentucky and Calhoun was from South Carolina.

Teacher: What section of the country engaged in foreign commerce?


Pupil: Then why did the 'war hawks' who were from the West, not the New Englanders want war?

Pupil: Maybe Clay and Calhoun were the exceptions that prove the rule.

Teacher: What do you mean?

Pupil: Maybe they didn't represent the real feeling in the West. They may have been patriotic and thought of their country's welfare rather than the interests of their section.

Teacher: That is quite possible. Has anyone in his reading found anything that will throw light upon John's idea?

Pupil: Yes. Beard said that the congressmen from the frontier regions voted for war and that the congressmen from the coastal region and New England voted against war.

Teacher: Yes, that is correct. What bearing would that have upon John's explanation?

Pupil: It shows that Clay and Calhoun were not exceptions. The whole West wanted war.

Pupil: And New England didn't.

Teacher: Was there anything else in your assignment today that would suggest that New England either favored or opposed the war?

Pupil: Yes, the Hartford Convention.

Teacher: What was the Hartford Convention?

Pupil: A convention of the New England states held during the war to protest against it. They even threatened to secede.

Pupil: That doesn't sound like New England favored war.
Teacher: This doesn't make sense. We fought the war for freedom of the seas. New England was more adversely affected by the British impressment than other sections, yet New England opposed the war; and the West, not directly affected by British sea policy wanted to go to war to stop the impressment.

Pupil: The book said we fought for freedom of the seas.

Pupil: Maybe the West was braver than New England. Maybe New England was afraid to fight.

Pupil: Maybe we didn't fight for freedom of the seas. There may have been another reason.

Teacher: Let us see if we can unravel this mystery for tomorrow. I suggest that you might read the report drawn up by the Hartford Convention in Commager's Documents to get further information on New England's attitude toward the war. You might find some clues in Morison and Commager's American History and Beard's Rise of American Civilization.

The following day's discussion is given below:

Teacher: Well, why did we fight the War of 1812?

Pupil: To get Canada.

Pupil: And Florida.

Pupil: To destroy the Indian menace on the frontier.

Teacher: Bill, what evidence do you have that we fought the war to get Canada?

Pupil: Clay said that we should have Canada and that we could take it from England if we went to war.

Teacher: Why would we want Canada?

Pupil: More land, and the British in Canada were stirring up the Indians against us.

Pupil: Spain owned Florida, she was the ally of England. If we fought England we might be able to take Florida from Spain.

Pupil: We did attempt to take both Canada and Florida during the war.

Pupil: In the treaty at the close of the war nothing was said about freedom of the seas, but England agreed to leave our forts which she had occupied since the Revolution. This shows that we were interested in the frontier, not the sea.

Pupil: The Hartford Convention charged the West with dragging us into a war for expansion.
Teacher: Then, is it fairly clear why we fought the War of 1812?

Pupil: Yes, not for freedom of the seas but for land and security from the Indians.  

The Relationship of Reflection to the Learning Process

Dewey, Hullfish and Smith, and Hunt and Metcalf often speak of reflective thinking as if it were "the process" by which people learn. Dewey refers to thinking as "the method of an educative experience." At one point in How We Think he states that "learning is learning to think." Hullfish and Smith emphasize the same points by entitling their book, Reflective Thinking: The Method of Education. In the opening lines of this book they ask: "If young people do not learn to think while in school, how are they to keep on learning?" Hunt and Metcalf occasionally use the term "reflective thinking" as a synonym for "reflective learning."

These observations raise several questions. Is reflective thinking merely another term for reflective learning? Or, is there a difference between them? Is reflective thinking the method of education? In seeking answers to these questions

27 op. cit., Dewey, Democracy and Education, p. 163.
28 op. cit., Dewey, How We Think, p. 78.
29 op. cit., Hullfish and Smith, p. 3.
Dewey's definitions of thinking, education, and experience were reviewed and a specific passage in which Dewey explicitly defined learning was sought. A passage which shed some light on these questions was found in *Democracy and Education*.

The nature of experience can be understood only by noting that it includes an active and a passive element peculiarly combined. On the active hand, experience is **trying** . . . On the passive, it is **undergoing**. When we experience something we act upon it, we do something with it; then we suffer or undergo the consequences. We do something to the thing and then it does something to us in return: such is the peculiar combination. The connection of these two phases of experience measures the fruitfulness or value of the experience. Mere activity does not constitute experience . . . Experience as trying involves change, but change is meaningless transition unless it is consciously connected with the return waves of consequences which flow from it. When an activity is continued **into** the undergoing of consequences, when the change made by action is reflected back into a change made in us, the mere flux is loaded with significance. We **learn something**. (emphasis added) It is not experience when a child sticks his finger into a flame; it is experience when the movement is connected with the pain he undergoes in consequence. Henceforth the sticking of the finger into the flame means burn.

From this and other passages it was concluded that the key element in learning for Dewey was experience. He seemed to be saying that thinking, or the intentional noting of connections, was the means by which we have experiences and that experiences were the means through which we learn. If thinking were a means and learning an end, then reflective thinking was not merely another word for reflective learning.

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30 op. cit., *Democracy and Education*, p. 139-140.
This conclusion suggested an answer to the third question. Reflective thinking may be the method of an educative experience—i.e., one that contributes to the growth of an individual by adding to the meaning of experience and increasing his ability to direct the course of later experience—but it is not "the process" by which people learn. Dewey's writings on reflective thinking may be an accurate description and a valid explanation of how one type of learning comes about. It may even be the most significant type of learning in that it purportedly leads to the development of intellectually autonomous human beings. But, it is not the alpha and omega of learning theory. The fact that field theorists write about insight and behaviorists write about conditioning indicates that there is more than one method of learning. Or at least, it shows that there is more than one view of what learning is and how it takes place.

With this chapter as theoretical background it is now possible to consider the observation instrument and to discuss the procedures followed in its development.
CHAPTER III

THE OBSERVATION INSTRUMENT

This chapter describes the procedures followed and the problems encountered in developing an observation instrument for detecting the presence of reflective teaching in classrooms. Both the problems and the procedures began with the formulation of the question: "How does one go about developing such an instrument?" Serious consideration of this question suggested several possible approaches.

**Beginning Approaches**

The first approach considered was to study the phenomenon of reflective teaching as it existed in live classroom situations. The adoption of this approach would require the identification of reflective teachers and the development of an observation schedule to collect data on their teaching. Data might be collected by using audio or video tapes and by maintaining a log of the activities and behavior of the teacher and students. Data could be analyzed and used to formulate an accurate written description of reflective teaching. Such a description could serve as the basis for the creation of the instrument.
This approach excited the writer but his excitement was blunted by the emergence of some substantive and methodological problems. How, for example, would the teachers be identified? Who would identify them? What criteria would be used? Who would establish the criteria? Would the criteria be valid? How could the validity of the criteria be determined? How many teachers were actually promoting reflection in their classrooms? Would these teachers, once identified, teach reflectively every day? If they did not, how would an observer know when a particular teacher was and was not teaching reflectively? These problems are similar to the problem of identifying and observing unicorns without first knowing what unicorns are. Before an observer can recognize a certain phenomenon he must first know something about it. He must know what features define it and what features distinguish it from other phenomena. The problems in this initial approach could be solved by identifying and validating criteria for reflective teaching, establishing criteria for selecting teachers to be observed and contacting these teachers to make arrangements for the observation.

Consideration of these problems and their possible solutions led eventually to a second possible approach for developing the observation instrument. The phenomenon in question could be studied by collecting and analyzing samples of reflective classroom dialogues written by recognized authorities on reflection.
Such dialogues would have to be labelled clearly by these authorities as examples of reflective teaching. A careful analysis of these dialogues could result in an accurate written description of reflective teaching and this description could serve as the basis for the creation of the instrument.

This approach seemed to answer some of the disturbing questions raised by the first approach. The authorities would identify real or hypothetical reflective teachers, basing the criteria on their knowledge of and experience with reflection. Since the writers of the dialogues were authorities it would be reasonable to assume that their criteria were valid.

Although this approach seemed more promising, it left three questions unanswered. How many teachers were actually promoting reflection in their classrooms? Would these teachers teach reflectively every day? If not, how would a classroom observer know when a particular teacher was and was not teaching reflectively? The questions were dealt with by judging them irrelevant within the context of the second approach. However, in the process of judging the irrelevance of these questions, a problem with this second approach materialized. Must a researcher possess some knowledge of reflection before he could fruitfully analyze reflective dialogues? The response to this question was, "Yes, he could analyze the dialogues without a knowledge of reflection, but the fruitfulness of the analysis might be questionable."
This response led to a re-formulation of the question: Given a situation where two people are analyzing reflective dialogues and only one of the two people is knowledgeable about reflection, whose analysis is likely to be more fruitful? It seemed obvious that the analysis undertaken by the knowledgeable person would be more fruitful.

This answer led eventually to the conclusion that any researcher developing an observation instrument for reflective teaching must have a sound knowledge of reflection before he attempted to examine sample dialogues or observe reflective classrooms. This conclusion raised a question which had been present implicitly in the first two approaches: How does a researcher come to possess a sound knowledge of reflection? The answer to this question suggested a third possible approach in developing the observation instrument.

This approach involved extensive reading and intensive analysis. The researcher could read extensively on the topic of reflection and select from this reading certain works for the purpose of careful and intensive examination. The selected works should be classics in the field and would be analyzed with certain concepts in mind. For example, the researcher would focus his attention on whatever the authors of these works had to say about classroom teachers and how these teachers might use classroom climate and various teaching strategies, techniques and activities to promote reflective thinking in the classroom.
From the extensive reading and intensive analysis, the researcher could gain a sound knowledge of reflection and develop some fairly definite ideas on what constituted reflective teaching. Then he could begin to formulate some concepts which could be used to determine if a particular teacher on a particular day, or series of days, was or was not teaching in a reflective fashion. These concepts would become, or at least suggest, some of the categories to be used on the observation instrument.

A Projected Plan

After prolonged deliberation on these three possible approaches it occurred to the writer that they could be combined into a single, comprehensive approach. The following represents the plan he decided to follow in creating the instrument:

Stage One: Extensive reading on the topic of reflection, identification of selected works and intensive analysis of these works.

Stage Two: The development of an accurate written description of reflective teaching based on the reading, analysis and examination of proto-type dialogues.

Stage Three: The actual creation of the instrument based on the written description and on relevant sections of the sources identified for intensive analysis.
Stage Four: The establishment of the instrument's content validity.

Stage Five: The determination of the instrument's reliability by field testing it.

The remainder of this chapter is devoted to an explanation of the procedures followed during these five stages.

**Stage One: Extensive Reading**

Sources consulted during the extensive reading phase of this stage are denoted by asterisks in the bibliography. During this stage the writer was able to clarify his somewhat fuzzy conception of reflection. From the extensive reading the following works were identified as classics in the field and were selected for intensive examination:

1. *How We Think* (1910 and 1933) by John Dewey
2. *An Introduction to Reflective Thinking* by the Columbia Associates in Philosophy
3. *Democracy and Education* by John Dewey
7. *Reflective Thinking: The Method of Education* by H. Gordon Hullfish and Philip G. Smith
As these sources were consulted and examined, the writer increased his knowledge and understanding of reflection. He discussed the major ideas of these works in graduate seminars and in informal conversations with colleagues. He attempted to implement many of these ideas in teaching an undergraduate social studies methods course, in conducting student teaching seminars and in working individually with student teachers. Several conversations with the three professors of social studies at Ohio State also helped to clarify his conception of reflection.

Stage Two: Description of Reflective Teaching

Portions of chapter two contain the writer's attempt to develop an accurate, general description of reflective teaching. From this description and from the relevant sections of the selected works on reflection the writer began to work out an operational definition of reflective teaching. The starting point for the operational definition was with the identification of five general categories which could be used to analyze reflective teaching lessons. These five general categories are as follows:

I. The Teacher as a Classroom Leader Who Guides Students Through the Various Stages of Reflective Thinking

II. The Teacher and Subject Matter
III. The Teacher and Student Beliefs

IV. The Teacher and the Use of Techniques

V. The Teacher and Classroom Climate

All the selected works, with the exception of that of the Columbia Associates in Philosophy, contained much discussion on these five general categories. All described reflective thinking as a multiple-phase process and offered suggestions on how a classroom teacher could successfully guide his students through it. Although these sources differed on the exact number of steps in the process and in the emphasis given each of them, all contained the following four items: (1) identifying and coming to feel a problem (2) suggesting possible solutions, or hypothesizing, (3) testing and (4) drawing a conclusion. This four phase conception of the reflective process was incorporated into the observation instrument.

All the authors of the selected works, again with the exception of Columbia Associates, saw the teacher's conception and use of subject matter as a significant aspect of reflective teaching. Subject matter was not conceived solely in the terms of the content of a particular social studies course or of the knowledge derived from the academic disciplines. It was conceived very broadly and referred to as anything that could be used by the teacher or students to promote reflective thinking. Dewey described this very broad conception of subject matter when
he said that it consists of facts observed, recalled, read and talked about, and the ideas suggested, in course of the development of a situation having a purpose.\textsuperscript{1}

Griffin revealed this broad conception of subject matter when he wrote the following:

Shifting the emphasis in the teaching of high school history toward the use of historical materials in reflection requires a reorientation at several points. In the first place, we need to consider what the term 'subject-matter' is going to mean within the new frame of reference.

It is clear enough that what used to be called 'subject-matter,' namely, the content of the textbook or course of study, has status within the theory we are considering only to the extent that it actually enters into the reflective experience of students. We may reasonably anticipate that much of it will never get inside the process at all. Presumably we shall have to regard 'subject-matter' in its familiar sense as 'potential subject-matter' within the reflective process, which may or may not be learned, depending upon its coming to be seen as relevant . . .

We are therefore justified in giving the name 'subject-matter' to any belief or purported knowledge which enters into the process of reflecting thinking.\textsuperscript{2}

This passage also suggests that the use of subject matter as a means for promoting reflective thinking, rather than as an end in itself, is a distinguishing feature of reflective teaching.


Jewett referred to subject matter within the frame of reference of reflective thought as "a tool for the realization of purpose."\(^3\) Dewey stated very clearly the idea of using subject matter as a means and a tool when he said

\[\ldots\] textbooks must be used as means and tools, not ends. They are useful to arouse questions and to supply information with which to answer them. But, when they are permitted to dictate or even dominate the conduct of recitation, the result is a dulling of thought.\(^4\)

The general category of the teacher and student beliefs received substantial treatment in the selected works. One of the principle means by which reflection is carried forward according to the authors is by getting students to examine their beliefs and to ground them in evidence. In the reflective classroom subject matter in the sense of data functions as evidence in the critical examination and possible reconstruction of student beliefs. The following three quotes from Hunt and Metcalf, Jewett and Griffin reveal the importance these authorities placed on student beliefs.

Teachers must familiarize themselves with present knowledge, understandings and beliefs of students. One often hears the injunction, 'Teachers should start where pupils are,' which reflects the


principle of continuity of learning. Unfortunately, teachers neglect this principle; particularly do they ignore points of conflict and confusion in the beliefs of students. According to the theory underlying this book, student beliefs are raw materials—starting points—for reflective learning. Therefore, teachers need the most comprehensive and accurate picture they can obtain of their students' beliefs.

Assuming that the teacher is steadily alert to the expression of student beliefs and that he utilizes the methods described above, or other methods, for ascertaining these beliefs, he can follow a textbook, and even proceed by page assignments if that seems desirable. The important point is that the teacher is dealing with the subject matter under discussion on any particular day, should watch for opportunities to use subject matter as data relevant to pupil beliefs.

The central point is that whenever a student expresses a judgment, a belief, a conviction, an idea, an opinion, a hypothesis, something further ought to happen to it. An expression of some kind which represents the views of the student is the bridge over which the teacher can get inside the student's reflective process. That bridge is not let down so often that we can afford to miss opportunities; and when the bridge is raised, there is no way of forcing ingress, even with the aid of all the coercive or punitive machinery the school can bring to bear.

The category of the teacher and the use of techniques came primarily from Hunt and Metcalf. The other authorities mentioned the use of devices, techniques, and strategies for promoting reflection, but Hunt and Metcalf provided the most extensive treatment of this general topic. In fact, these authors in their

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6 op. cit., Jewett, p. 34.

7 op. cit., Griffin, p. 173.
1968 book devoted an entire chapter to "Techniques for Promoting Reflection." In that chapter they stated the importance of techniques as follows.

If teaching is to be reflective, each teaching technique should be fashioned to help and encourage students to move through one or more of the steps in an act of reflective thought.\(^8\)

The importance of the proper classroom climate in the successful promotion of reflective thought was discussed in all but one of the selected works. This fact suggested the fifth general category, the teacher and classroom climate. The authorities agreed that one type of climate was much more conducive to the promotion of reflection than others. They reasoned that a particular type of climate was required not only to get students to state their beliefs, but also to get them to examine and possibly change these beliefs in the light of warranted evidence. Adjectives used by these authorities to describe the proper climate for the promotion of reflection included the following: problematic, open, non-threatening, intellectually permissive, socially sensitive, accepting of individuals and ideas, and intellectually rigorous.

Jewett described what is meant by the problematic aspect of classroom climate when he stated the following.

... let us turn to an examination of the atmosphere

\(^8\)op. cit., Hunt and Metcalf, p. 168.
which must exist if problem-solving is to occur. If the student is to become engaged in problem-solving he must be doubtful, uncertain or puzzled concerning something within his experience and have the desire through inquiry to remove the doubt . . . the initial task confronting the teacher is that of creating the state of uncertainty or doubt in the mind of the student.9

The clearest and most complete description in a single passage of the classroom climate required for reflection was also provided by Jewett.

An intellectually permissive atmosphere is essential for a worthwhile discussion and an important factor in gaining maximum student participation in the discussion. All that is meant by the term 'intellectually permissive atmosphere' is a classroom environment in which students feel free to express their opinions, knowing that their opinions will be courteously, fairly entertained, but rigorously analyzed. If an idea expressed by a student is met with sarcasm, that student and probably others will hesitate to participate in class in the future. If the teacher indulges in personal attacks rather than in an examination of the ideas presented by the students, he will dry up the flow of honest discussion. This does not imply that the teacher should praise or accept without critical examination an inane, thoughtless, irrelevant or inappropriate comment of a student. The purpose of establishing a permissive atmosphere is to promote a worthwhile discussion, not to stimulate participation for the sake of participation. The point is that the teacher should see to it that the ideas expressed by students in the course of a problem-solving discussion are energetically, carefully, but fairly examined.10


10 Ibid., pp. 63-64.
Once the five general categories for analyzing reflective teaching were identified, the problem of what to do with them emerged. It was decided to use these categories as the basis for the construction of the instrument.

**Stage Three: Creation of Instrument**

The actual creation of the instrument began with this stage. Since the purpose of the study was to develop an instrument which could be used to determine the presence of reflective teaching in classrooms, it was decided that a format of questions requiring a "yes" or "no" response was an appropriate method for collecting information on reflective teaching lessons. Questions concerning reflective teaching were formulated for each of the five general categories of analysis. Responses of "yes" or "no" determined whether a particular characteristic of reflective teaching was present or absent in the lessons observed.

Below is an excerpt from the first draft of the instrument that concretely illustrates this idea.

I. The Teacher as a Classroom Leader Who Guides the Students Through the Various Stages of the Reflective Process.

A. Identifying and coming to feel a problem. (Stage #1)
A topic or a concept is not a problem. A problem exists when a person is puzzled, perplexed or doubtful about something which really matters to him. With this in mind answer the questions below.

Yes  No

___  ___  1. Is there a problem in this particular class lesson, discussion or activity?
2. Is it felt to be a problem by one or more students?

3. Does the teacher present the problem to the students?

4. Does the teacher help students to discover a problem?

5. Do one or more students identify the problem?

6. Is the problem clearly defined?

B. Suggesting possible solutions, or hypothesizing.

(Stage #2)

Hypotheses are general statements, or generalizations, which make sense out of data and show relationships between and among concepts. They are sometimes referred to as "if-then" propositions.

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Are possible solutions, or hypotheses, to the problem suggested?</td>
</tr>
<tr>
<td>2.</td>
<td>Does the teacher suggest hypotheses as possible solutions to the problem?</td>
</tr>
<tr>
<td>3.</td>
<td>Do students suggest hypotheses?</td>
</tr>
<tr>
<td>4.</td>
<td>Does the teacher help students to identify hypotheses?</td>
</tr>
<tr>
<td>5.</td>
<td>Does the teacher help students frame (state) hypotheses?</td>
</tr>
<tr>
<td>6.</td>
<td>Are inferences made?</td>
</tr>
</tbody>
</table>

This same procedure was followed for the remaining categories.

All questions formulated for the categories on the first draft were based on the writer's knowledge of the reflective process acquired from his readings, conversations with colleagues and professors of education, and personal experience as a college
classroom teacher and student teaching supervisor trying to exemplify this process in his own teaching. The first draft turned out to be too long (nine pages) for practical use in live classroom situations. It also contained other weaknesses. A number of questions were vague, ambiguous and needed to be re-phrased and more clearly specified. Many additions and deletions were needed. Several questions needed to be stated in terms of observable classroom behavior. The number of high-inference items had to be reduced. There were repetitions and redundancies to be eliminated. The simple "yes-no" system was not relevant to several questions in each category and was wholly inadequate for the general category of the teacher and classroom climate.

To correct these and other weaknesses a second draft was created. This draft was shorter, simpler and more usable than the first but was still unsatisfactory. Third, fourth, and fifth drafts were written and each draft proved to be a slight improvement over the one that preceded it. A significant change was made in the classroom climate category. Instead of asking an observer to mark "yes or no" beside descriptors of classroom climate, a rating technique was adopted which required the observer to indicate the extent to which certain items were present in the classes to be observed. Below are examples from the first and fifth drafts which illustrate the nature of the
change. This category as it appeared on the first draft is as follows.

II. Classroom Climate
A. The items below describe the classroom climate most conducive to the promotion of reflective thinking. Place a check mark in front of the items which are accurate descriptions of the climate in this classroom.

   1. democratic
   2. more informal than formal
   3. accepting of individuals and ideas
   4. one in which students feel free to express themselves without sarcasm
   5. intellectually permissive
   6. socially sensitive
   7. intellectually vigorous
   8. warm and friendly
   9. supportive of student expression of ideas
   10. supportive of examination of ideas
   11. non-threatening
   12. one free from personal attacks
   13. relaxes
   14. lack of hostility
   15. open
   16. class is a cohesive group rather than a collection of individuals

This category as it appeared on the fifth draft is as follows.

IV. Classroom Climate
A. Rate the items below that accurately describe the climate of this classroom by placing check marks in the appropriate blanks.

   1. teacher actively encourages student expression of ideas
   2. student opinions are courteously entertained
   3. student opinions are fairly examined
   4. student opinions are rigorously analyzed
   5. teacher actively discourages student expression of ideas
   6. student opinions are not courteously entertained
   7. student opinions are not fairly examined
   8. student opinions are not rigorously analyzed
This change was made because it was felt by the writer, his advisors and colleagues that the first draft of the classroom climate category contained emotionally loaded words and overlapping items that did not provide the kind of information most useful in describing classroom climate. The fifth draft was judged to be better because it was simpler, easier to use and could provide more reliable information.

Another significant change involved combining several categories and adding a new one. Category IV, the teacher and the use of techniques, was integrated at appropriate points into Category I, the teacher as a classroom leader who guides students through the various stages of the process. The new category, labelled miscellaneous, contained items that were relevant to reflective teaching but were not present in the other categories.

As a final step in stage three a preliminary field test of the instrument was conducted. Five classroom teachers well acquainted with the reflective process were contacted and asked to make an audio-tape of a lesson taught reflectively. Two colleagues in Social Studies Education at Ohio State were asked to assist with
the preliminary field test. Shortly after receiving the tapes from
the classroom teachers, the writer and his colleagues spent six
hours listening to them, using the instrument and discussing pos­
sible changes in it. These tapes and the listening session served
two purposes; they facilitated critical examination of the instru­
ment and played a major role in training observers.

At this time many procedural and substantive questions were
raised and answered. There was a lengthy discussion over the
practicality and feasibility of using the instrument in live situa­
tions. Although it had been reduced from nine to four pages, it
was still rather detailed and complex. One of the colleagues
raised a question about the inhibiting effects an observer using
the instrument in the live situation might have on the teacher.
The other colleague expressed the opinion that an observer might
fail to record significant events in the live instructional situa­
tion if he got too caught up in shuffling the pages of the instru­
ment trying to locate a particular category. As the questions
were discussed the writer proposed a plan for observers to follow
when making the tapes. No one would use the instrument in the live
situation. During the taping the observers would give their
undivided attention to the teacher's lesson and the responses of
students to the lesson. As soon as possible after the observa­
tion, the observer would listen to the tape of the lesson and use
the instrument then. As this plan was proposed the writer realized
that what he was creating was not entirely an observation instrument. It was becoming a combination observation-listening instrument. Live observations were to be made but the instrument was to be tested only on the tapes.

There seemed to be two distinct advantages of this approach. The first is related to the limited amount of time an observer has to make a decision in the live situation as compared with the increased amount of time he could have in the taped situation. If an observer in a taped situation had difficulty answering certain questions on the instrument about a given lesson, he could always play the tape again. The re-play, by giving an observer an unlimited amount of time to make decisions, could facilitate the resolution of such difficulty. The second advantage concerns the reliability question that any researcher attempting to develop an observation instrument must answer. The tapes create the possibility of obtaining a measure of the instrument's reliability that would not have existed otherwise. By having a tape recording of a live situation it is possible for an observer to use the instrument on the same lesson twice. The marks recorded on the instrument during the first listening session can be compared to the marks recorded by the same observer during a second listening session. The degree of agreement between the marks recorded on the instrument during the first and second sessions can be computed to obtain a "within-observer agreement" measure of reliability. Without the tapes the only other method of determining reliability
is computing "inter-observer agreement." With the tapes both methods of determining reliability can be used.

As a result of the preliminary field test and the training session, some minor changes were made in the instrument. Some questions were deleted, some added, and others were re-assigned from one category to another. To clarify the terminology used on the instrument the writer decided to add a page in which key terms were explained. One more step remained before the instrument was ready for actual field testing, the establishment of the instrument's content validity.

**Stage Four: Establishment of Content Validity**

To establish the content validity of the instrument a panel of competent judges approach was adopted. Five professors of education were selected as judges. Three were from Ohio State, one from the University of Illinois and one from Southern Methodist University. All had extensive training in and experience with the reflective method. One was a nationally known author and expert on the subject. Another was a recognized authority on the educational philosophy of John Dewey. Two had reputations within the social studies profession as scholars, writers and reflective classroom teachers. All were known for their advocacy of reflection.

A copy of the fourth draft of the observation instrument was submitted to these judges. They were asked to consider this question: "Do the categories and questions on the instrument
accurately reflect the concept of reflection? If yes, to what extent?" The judges were unanimous in the opinion that the instrument represented the concept very well. All expressed some reservations about the length of the instrument and questioned the practicality of using it in live situations. Three offered suggestions on how the problem of length might be overcome.

Upon completion of the content validation procedure three minor changes were made in the instrument. After months of reading and thinking about and discussing the concept of reflection and months of writing, re-writing, examining and criticizing different drafts of the instrument, it appeared that the Observation Instrument for Reflective Thinking was ready for field testing. Appendix A contains a copy of the instrument used during field testing.

Stage Five: Determination of Reliability

A problem confronting any researcher attempting to develop an observation instrument for classroom teaching is how to determine the reliability of the instrument. This problem was attacked in this study by field testing the instrument on audio-tapes of classroom lessons taught by experienced teachers. The procedures followed in field testing included the following: (1) the clarification of the meaning of reliability as applied to observation instruments, (2) the selection of teachers to
observe and the making of audio-tapes, (3) the selection and training of observers, and (4) the generation of data for resolving the reliability problem. Each of these is discussed in this section.

The Meaning of Reliability

The concept of reliability when applied to observation instruments has a somewhat different meaning than that applied to non-observational tools. Instrument reliability in the former case refers to the reliability of observers who use the instrument. In the latter case it refers to the reliability of the tools themselves. In both cases it is a measure of the accuracy, consistency or stability of the instrument. Kaplan viewed the reliability question in relation to observational research as a matter of two different observers asking, "Do you see what I see," and achieving a high degree of agreement on what is seen.11 Kaplan's view was adopted in this study and the reliability question was framed as follows: "Can two or more observers use the same observation instrument on the same lesson and obtain accurate, consistent and stable results?" An affirmative answer to this question establishes instrument reliability; a negative answer casts doubt upon it. This method of determining reliability is known as inter-observer agreement.

Another method of determining reliability, within-observer agreement over time, was employed. The question asked by this method was: "Can one observer use the same instrument on the same lesson on two different occasions and achieve stable results?" Answers to these two reliability questions are presented in chapter four.

Teacher Selection and Taping

The teachers selected for observation and taping were experienced classroom teachers in school districts in the metropolitan area of Columbus, Ohio. They taught in public and parochial schools and in college. All were graduates of the undergraduate or Master's programs in social studies at the Ohio State University and were identified by the writer and a Professor of Social Studies as teachers who were probably promoting reflection in their classrooms.

The belief that these teachers were promoting at least some level of reflective thinking in their students was the single, most important criterion in teacher selection. Without the identification of reflective teachers it would not have been possible to field test the instrument. To field test the instrument on teachers selected arbitrarily would have been pointless and probably would have made as much sense as trying to determine the effectiveness of teachers as discussion leaders by observing them only when they gave lectures.
Once a target population of teachers had been identified, it became necessary to contact them and request their assistance in this study. The teachers were told that the study was attempting to develop an observation instrument for reflective teaching and that they had been identified as people likely to be using this method in the classroom. They were asked if it would be possible sometime in the very near future to visit their classroom, observe and make an audio-tape of them teaching. They were also asked if, on the day of the visitation, they would prepare and teach a reflective lesson. Of the twenty-four teachers initially contacted all agreed to participate in the study.

After the initial requests for participation, later contacts were made to set up schedules for observation. Setting up the schedules proved to be a fairly easy task. Following them, however, became impossible. Events over which the researcher and teachers had no control—e.g., school assemblies, teacher absences, field trips, unannounced administrative changes in daily school schedules and end of the year school activities—lead to a cancellation of the planned observations.

An alternate plan was adopted. Teachers were supplied with cassette tapes and requested to audio-tape a reflective lesson at their convenience. These tapes were to be mailed to the researcher. The plan offered advantages for the teacher as well as the researcher. Events such as those described above would not interfere with taping. Teachers could make more than one
tape and select the best example of reflective teaching. They and their students were freed from the anxiety often produced by the presence of a stranger in their room observing their performance. The researcher would save a tremendous amount of time and avoid much frustration.

Despite these advantages the plan had its drawbacks. Trained observers would not be present when the tapes were made. The non-verbal aspects of classroom communication would be lost. Some teachers did not fulfill their obligation to provide the researcher a tape of their classes. Of the twenty tapes that were made and returned four were of such poor technical quality that they could not be used. Thus, the actual field testing of the instrument was done on sixteen tapes.

Observer Selection and Training

Three observers were selected to field test the instrument. All were advanced doctoral students in the social studies education program at Ohio State. The primary criteria for observer selection was a knowledge of reflective thinking and a familiarity with ways in which it could be promoted in the classroom. As supervisors of student teachers and instructors in undergraduate methods courses at Ohio State, the observers satisfied these criteria very well.

Although some comments on the training of observers were made earlier in this chapter, several points can be reviewed
here. Before attempting to field test the instrument on the sixteen audio-tapes it was tried out on five training tapes. The observers spent approximately six hours listening to these tapes and discussing the use of the instrument on them.

The training session resulted in a refinement of the instrument. It also sharpened the observers' conception of reflective teaching and sensitized them to the kinds of judgments that would be required during the actual field testing.

**The Generation of Data**

It should be pointed out here that the taped lessons were not the data for this study. They were used to generate the data. The data consisted of check marks the observers made on the instrument as they listened to the lessons.

The actual field testing, or generation of data, took place during a three week period. During the first week of this period all three observers listened to six of the tapes together. The same listening and marking procedure was followed on all tapes. A tape was played through to its conclusion. Comments were kept to a minimum. As soon as a tape was completed, observers would without consultation place check marks in the appropriate categories on the instrument. Then, disagreements were identified and discussed. Questions concerning the use of the instrument and the interpretation of the tapes were raised and answered. After using the instrument together on six of the tapes observers
felt confident to complete the field testing on their own. Thus, the remaining ten tapes were field tested independently. The results of this field testing are presented in the next chapter.

To obtain a measure of within-observer agreement one of the observers volunteered to use the instrument again on the same tapes. This measure of reliability and the procedures followed in obtaining it are also presented in the next chapter.
CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

The final stage in the development of the observation instrument for reflective teaching required a determination of the reliability of the instrument. Measures of reliability were obtained by analyzing data generated by observers as they listened to audio-tapes of lessons taught reflectively. The analysis resulted in degree of agreement scores for the forty-five classifications (questions) on the instrument and degree of agreement scores for the classroom climate scale. In each of these cases there were two sets of scores, one representing measures of inter-observer agreement and the other representing a measure of within-observer agreement over time. These measures of agreement were used to compute reliability scores for the instrument as a whole and for the classroom climate scale as a part of the instrument. These scores and the procedure followed in obtaining them are discussed in this chapter under the headings of inter-observer agreement, within-observer agreement and classroom climate scale. Also considered are suggested changes in the instrument.
Inter-Observer Agreement

The first step in the analysis of data to determine inter-observer agreement was the identification of pairs of observers. Since three different observers participated in the field test of the instrument it was possible to identify three different pairs of observers. These pairs were observers X and Y, X and Z, and Y and Z. Each pairing made possible the determination of a different degree of agreement score. Data generated by each pair of observers were examined to determine the specific number of agreements for the forty-five classifications on the instrument. This was done for each pair of observers across the series of sixteen observations. The result of this examination was expressed in a ratio which compared the specific number of actual agreements with the total number of possible agreements for each observation. For example, if a pair of observers agreed on forty of forty-five classifications for a particular observation, the degree of agreement was expressed in the fraction 40/45. Such ratio scores were determined for each pair of observers for all sixteen observations. The results of this procedure are presented in Table 1.
<table>
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<th>Observation Number</th>
<th>Observers X and Y</th>
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<th>Observers Y and Z</th>
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<tbody>
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<td>Total</td>
<td>637/720</td>
<td>585/720</td>
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To obtain measures of degree of agreement for each pair of observers the ratio scores for all sixteen observations were totaled. This resulted in a second ratio score which compared the actual number of agreements with the total possible number of agreements for all sixteen observations. Second ratio scores for observers X and Y, X and Z, and Y and Z, respectively, were: 637/720, 585/720, and 600/720. Converted into per cents the degree of agreement scores were: 88% for X and Y, 81% for X and Z, and 83% for Y and Z. These per centage scores and the ratios from which they were derived were labeled original scores.

The second step in analyzing the data involved the creation of a matrix for each pair of observers. Each matrix contained observation numbers from 1 to 16 on the horizontal axis and classification numbers from 1 to 45 on the vertical axis. The creation of matrices facilitated the identification of specific classification disagreements for each pair of observers. These matrices are found in Appendix B.

An analysis of these matrices made possible the creation of tables containing information on the classification disagreements. These tables are included in Appendix C. The presentation of matrix data in the tables expedited an analysis of specific disagreements. During the course of this analysis the following questions were raised:
(1) Which classifications were disagreed upon most frequently?

(2) What were possible reasons for this disagreement?

(3) Were the classifications functional, i.e., did they provide reliable data about reflective teaching?

(4) Was the wording in some classifications vague and or ambiguous?

(5) Did observers have different or unclear conceptions of key ideas in the classifications?

(6) If some classifications were judged to be non-functional, should they be revised or eliminated from the instrument?

A cursory examination of the tables containing information on classification disagreements provided a quick answer to the first question. The classifications most frequently disagreed upon were: numbers 4, 12, 13, 35, 38 and 40 for observers X and Y; numbers 4, 30, 10 and 35 for observers X and Z; and numbers 16, 15, 30 and 12 for observers Y and Z.

Once the most frequent classification disagreements were identified it became necessary to discover possible reasons for the disagreements. Among the many possible reasons the following seemed most probable:

(1) Key ideas in the classifications were not understood clearly by the observers. This may have been caused by vagueness or ambiguity in the wording of some classifications, or by a lack of clarity in the explanation of key ideas during the training session.

(2) Observers differed in their conceptions of these key ideas. A major factor in these different conceptions was probably an insufficient amount of attention given during the training session to an explanation of certain classifications.
(3) There were errors in the instrument itself. If certain classifications did not provide reliable data on reflective teaching or if they required observers to obtain information that was not available through observation, they could be considered errors.

Conversations with observers concerning possible reasons for disagreements revealed that different conceptions of key ideas and a lack of observer clarity in understanding these ideas were responsible for some disagreements. Classification number 4, disagreed upon by two sets of observers, is an example of a disagreement due to a lack of observer clarity in understanding a key idea. The classification required observers to make a judgment as to whether a problem was or was not "clearly defined." One observer used "clearly defined" as a synonym for "clearly stated," while a second observer based his judgment on whether the problem was "clearly understood" by students.

Classification number 12 is an example of a disagreement brought about by different observer conceptions of a key idea. The classification required observers to give a "yes" or "no" answer to the question, "Are hypotheses tested?" At issue in this classification was the meaning of the word "tested." In reflection testing is carried out both logically and empirically. A logical test of an hypothesis requires an individual to project the possible consequences of a proposed solution or to trace out its logical implications. Often this is done by casting hypotheses in the form of "if-then" propositions. For example,
to solve the problem, "Who broke the kitchen window?" an angered father might propose the solution that "Junior did it with his bare hand." This hypothesis could be tested logically by casting it in the following if-then form: "If Junior broke the window with his bare hand, then there will be cuts on that hand and pieces of glass in the cuts." The if-then proposition tells the father what to look for before he begins to look. Empirical testing comes into play as the father looks for, finds and uses evidence to confirm or cast doubt upon his hypothesis. The classification was responsible for disagreement because one observer used only the empirical conception of testing, another only the logical conception of testing and the third both conceptions of testing. A re-examination of the instrument revealed that logical testing was not explained explicitly in the introduction or specified clearly in the classifications. A revision in the instrument in the direction of greater explicitness and specificity of the concept along with precise explanations of both types of testing during training sessions would increase the reliability of the instrument by reducing the number of inter-observer disagreements caused by different conceptions of this key idea.

The third possible reason for classification disagreements was errors on the instrument itself. To identify possible errors the classifications most frequently disagreed upon were examined with two questions in mind. Did these classifications provide
unreliable data? Did they require observers to obtain information that was not available through observation?

A result of this examination led to the identification of three classifications that were errors on the instrument. These classifications were numbers 15, 16 and 30. Numbers 15 and 16 were questions concerning whether the teacher or the students did most of the testing. The word "most" was responsible for the error in both classifications. If the testing was split fifty-fifty, these classifications would contribute unreliable or inconsistent data. Faced with a situation in which testing was split fifty-fifty, one observer might answer both questions with a "no" and another observer with a "yes."

Classification number 30 was identified as an error because it required observers to obtain information that was not available solely on the basis of classroom observation. This classification requested observers to make a judgment about whether the conclusion reached by the class generated other problems which could be considered in the future.

Ultimately all classification disagreements were examined for the purpose of locating possible errors. One other classification, number 44, was identified as an error because it required observers to make a judgment on the difficult to observe phenomenon of teacher intention. Also, it was considered redundant. The information it provided was already available through questions
in previous classifications.

Once these four errors were identified, it was decided to eliminate these classifications from the instrument. They were eliminated because they were non-functional. They did not provide reliable data and the key ideas in them were not critical to the detection of the presence of reflective teaching in the classroom.

Although other classifications were responsible for as many disagreements as these four, they were retained because they contained ideas critical to the detection of the presence of reflective teaching. There were weaknesses in some of the remaining classifications but it was believed that these could be corrected.

The next step in data analysis after the elimination of non-functional classifications involved the computation of new degree of agreement scores for each pair of observers. These new scores were labeled corrected scores. The same procedures followed in computing the original scores were followed in computing corrected scores. The corrected ratio scores for observers X and Y, X and Z, and Y and Z, respectively, were: 583/656, 543/656, and 565/656. Converted into per cents these were: 89%, 83% and 86%. Each of the corrected scores was higher than the original scores. The net result of making computations for corrected scores was to increase the reliability of the instrument.

The fourth step followed in data analysis, however, pushed the reliability down. This step involved stringently correcting the new scores for chance agreement. The correction for chance
agreement was done statistically by applying the following formula:

\[
\frac{(A/A+B) - 1}{2} \times 100 = \frac{\% \text{ of Agreement} - 1}{2} = \text{corrected reliability}
\]

Where

- \( A \) = Number of agreed classifications correcting for instrument error
- \( B \) = Number of disagreed classifications correcting for instrument error
- \( A+B \) = Total number of classifications correcting for instrument error

The new degree of agreement scores, correcting both for instrument error and chance agreement were: .78 for observers X and Y, .66 for observers X and Z, and .72 for observers Y and Z. These degree of agreement scores constituted the final inter-observer agreement measures of instrument reliability. The mean reliability score for the three pairs of observers was .72.

The corrected reliability scores for any one pair of observers ranged from a high of 1.0 on one lesson to a low of .46 on another. The mean for these high-low scores was .73.

Although the .72 and .73 mean reliability scores were considered acceptable for an observational study, it was believed that they could be increased by modifying the instrument and by increasing observer training time. Suggestions for increasing these scores are discussed later in this chapter.

**Within-Observer Agreement**

The procedures followed in obtaining inter-observer agreement scores were also followed in obtaining scores for within-observer
agreement over time. These procedures included:

1. the identification of a pair of observers,
2. the tabulation of degree of agreement scores for each observation,
3. the totaling of degree of agreement scores for all sixteen observations,
4. the expression of these original scores in percent,
5. the creation of matrices and tables to facilitate data analysis,
6. the computation of degree of agreement scores correcting for instrument error, and
7. the determination of final reliability scores correcting for chance agreement.

A significant difference between the inter-observer and within-observer agreement scores was that the former included three different observers and the latter included only one observer. The inter-observer agreement score provided a measure of accuracy and consistency of the instrument. The within-observer agreement provided a measure of its stability.

The observers identified for this phase of field testing were observers \( Y_1 \) and \( Y_2 \). Actually one observer, designated observer \( Y \), used the instrument on two different occasions. This observer was designated \( Y_1 \) when he generated data for the first score and \( Y_2 \) when he generated the data for the second score. There was a time lapse of three weeks between the generation of data for these scores. Original scores for observers \( Y_1 \) and
were tabulated and compared to obtain a degree of agreement score. Of the 720 total possible classification agreements observer $Y_1$ agreed with observer $Y_2$ 662 times. Converted into a per cent, their degree of agreement score was 92%.

To facilitate the identification of specific classification disagreements for this pair of observers a matrix was created. A copy of this matrix is included in Appendix D. An analysis of this matrix led to the creation of a table which contained information concerning the classification disagreements. A copy of this table is also found in Appendix D.

An examination of this table revealed that the classifications most frequently disagreed upon by observers $Y_1$ and $Y_2$ were: classifications 43, 16, 30, 40, 39, and 44. Disagreements on classifications 16, 30, and 44 were not surprising in that these classifications had been identified previously as errors in the instrument. Disagreements on classifications 43, 39, and 40, however, were surprising. In considering possible reasons for these disagreements it was decided that the following were probably responsible:

1. Observer $Y_1$ was not consistent in his interpretation of the key idea "to have experiences" in classification 43. This suggested a need to define this key idea by example during any future training sessions.

2. Observer $Y_1$ changed his conception of what constituted the key idea "promote reflective thought" in classification 39. This change came about as he analyzed the data on inter-observer agreement. The
The former conception of "promote reflective thought" was rigid in that it required students to engage in all four phases of reflection before an affirmative answer was given in that classification. The later, or changed conception, required only that students engage in the second phase of reflection before an affirmative answer was given.

(3) The only explanation given for disagreements on classification 40 was simply variation in observer judgment. Although some variation in observer judgment is expected in observational studies, it must be kept to a minimum in order to achieve reliable results. Since this particular classification was responsible for only 5 of the 58 original disagreements, it was felt that variation in observer judgment in this case was kept to a minimum.

Since additional errors on the instrument were not identified after an analysis of the data generated by observers $Y_1$ and $Y_2$, the computation of a new within-observer degree of agreement score could be made. The new score, based upon the elimination of four non-functional classifications, was 615/656 or 94%. As was the case in computing inter-observer agreement from the original scores, this converted score indicated a higher degree of agreement. The net result of making computations for a corrected score was to increase the reliability of the instrument by two per cent, from .92 to .94.

When this new score was corrected statistically for chance agreement, the reliability score was pushed downward to .88.

Thus, the analysis of data on within-observer and inter-observer agreement indicated that it was possible to create a reliable observation instrument for reflective teaching.
Classroom Climate Scale

The classroom climate scale was included on the instrument for three reasons: (1) to help observers make judgments on classifications in which the term "classroom climate" was used, (2) to obtain a measure of the degree to which the climates of the classrooms were conducive to the promotion of reflection, and (3) to answer the question: "Can two or more observers obtain some degree of agreement concerning whether or not the classroom climates on taped lessons were conducive to the promotion of reflective thought?"

To obtain a measure of classroom climate a scaling technique known as the semantic differential was employed. Descriptions of aspects of classroom climate most conducive and least conducive to the promotion of reflection appeared at opposite ends of the scale. The scale contained seven categories each of which represented a different aspect of classroom climate. Observers were required to rate each of the categories on a seven point scale. A rating of 7, 6, or 5 for a given category indicated that it was conducive to the promotion of reflection. A rating of 3, 2, or 1 indicated that it was not. A rating of 4 indicated that it was neither conducive nor non-conducive to the promotion of reflection. Scores between 7 and 21 were placed on the non-conducive side of the scale and scores between 35 and 49 on the conducive side. Scores between 22 and 34 were considered to be neither conducive nor non-conducive to the promotion of reflection. The
highest possible score, 49, indicated a classroom climate most conducive to reflection. The lowest possible score, 7, indicated a classroom climate least conducive.

With four observers rating the climate of sixteen different classrooms the total number of classroom climate scores was sixty-four. These sixty-four scores ranged from a low of 25, given by one observer on one tape, to a high of 49, also given only by one observer on one tape. In measuring the degree to which the classroom climates of the taped lessons were or were not conducive to the promotion of reflective thought, the following information was obtained: (1) 46 of the sixty-four scores were placed on the conducive side of the scale, (2) none of these scores were placed on the non-conducive side of the scale, and (3) 18 of these scores were placed in the middle or neutral part of the scale.

To answer the question concerning the achievement of some degree of observer agreement in the use of the classroom climate scale, the Pearson product-moment coefficient of correlation was computed from the classroom climate scores of observers X and Y, X and Z, Y and Z, and Y1 and Y2. The particular formula applied to the classroom climate scores for each pair of observers was:

$$\rho_{xy} = \frac{\Sigma xy}{\sqrt{(\Sigma x^2)(\Sigma y^2)}}$$

Where $\rho = \text{the correlation between } x \text{ and } y$

$x = \text{the deviation of any } x \text{ score from the mean score in text } x$
\[ y = \text{the deviation of any } y \text{ score from the mean score in test } y \]
\[ \Sigma x y = \text{the sum of all products of deviation, each } x \text{ deviation multiplied by its corresponding } y \text{ deviation} \]

The application of this formula resulted in the following coefficients of correlation: (1) .56 for observers X and Y, (2) .49 for observers X and Z, (3) .66 for observers Y and Z, and .77 for observers \( Y_1 \) and \( Y_2 \). These correlations indicated that some degree of agreement could be achieved by different observers using the scale to rate the classroom climates of the same lessons. The degree of agreement between observers, however, was considered low. Since the whole process of measuring classroom climate is rather imprecise, these low correlation scores were not surprising. They indicated that the results obtained from the use of this scale, while above the level of chance agreement, contained too much variation to be considered highly reliable. The original classroom climate scores and the computations which resulted in the above coefficients of correlation are found in Appendix E.

**Suggested Modifications in the Instrument**

As a result of field testing and data analysis it was decided that the reliability of the instrument could be increased by suggesting certain modifications in the instrument itself. The details of the suggested modifications are included in Appendix F. All that is required here is an explanation of the general
nature of these modifications.

Modifications are suggested in each of the three different sections of the instrument, the introduction, the classifications or questions, and the explanation of terms. In the first section modifications are designed: (1) to more accurately characterize the five broad categories of analysis, (2) to specify the meaning of key ideas "testing" and "warranted," and (3) to simplify directions to observers. In the second section, the suggestions are designed: (1) to clarify the meaning of key ideas, (2) to eliminate ambiguities in the wording of classifications, and (3) to reduce the length of the instrument by omitting items not essential to the detection of reflective teaching. One change is suggested for the final section. This involves adding and explaining a new term. The new term is "levels of reflective thought." It is added to help observers answer the question: "At what point in the process of solving a problem does thought become reflective?" This question occurred to all observers during the field test when they were required to make a judgment concerning whether the climate of a particular classroom was or was not used "to promote reflective thought."

None of the suggested modifications represents a major change in the overall form of the instrument or a major change in the key ideas in the classifications. It is believed that such modifications, because they serve an essential clarifying function, will increase the reliability of the instrument. (Appendix G contains
a copy of the instrument with modifications suggested as a result of field testing and data analysis.)

One other means of increasing reliability should be mentioned. This involves increasing the amount of observer training time and giving special attention during training sessions to the classifications most frequently disagreed upon during the field test conducted for this study.

For a summary of this study and a report on its findings, let us turn to the final chapter.
CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to answer a single question concerning the theory of reflective teaching. That question was: can a valid and reliable observation instrument be developed which detects the presence of reflective teaching in classrooms? The first step in securing an answer to this question involved the clarification of the concept of reflection as a teaching as well as a thinking process. The achievement of this clarification required extensive reading on the topic and the selection of certain sources for intensive examination. Once clarification was achieved the first steps in the creation of the instrument were taken. Several drafts of the instrument were written and critiqued and one was submitted to a panel of experts for the purpose of establishing the instrument's content validity. The final step in securing an answer to the question involved field testing the instrument to determine its reliability. The instrument was field tested by three observers on audio-tapes of sixteen lessons in which teachers were requested to employ the reflective method. The results of the field test were discussed in the previous chapter.
In the present chapter several conclusions concerning the instrument are drawn, findings concerning the presence of reflective teaching in the taped lessons are reported and discussed, and recommendations for future use of the instrument are made.

**Conclusions Concerning the Instrument**

1. Favorable judgments from the panel of experts and the findings reported in chapter four provide warrant for the conclusion that a valid and reliable observation instrument was developed which detects the presence of reflective teaching in classrooms.

2. After the instrument was field tested and the data analyzed conclusions concerning what it did and did not do were made. What it did was to provide data on the presence of selected aspects of reflective teaching. Since there were forty-one classifications on the instrument, it provided data on forty-one different aspects of reflective teaching.

What the instrument did not do was to make discriminations concerning the presence of reflective teaching. For example, it was effective in detecting the emergence of one or more problems, but it did not provide data on the number of students who identified and came to feel a problem. If the number of students identifying and coming to feel a problem varied from two to twenty-two, the instrument did not detect it. It detected only the fact that at least two students identified and felt a problem.
This conclusion also applies to the other three stages in the reflective process. The instrument did not provide data on the number of students who suggested solutions, tested hypotheses or drew conclusions.

Since the instrument did not require the enumeration of events, it did not provide data on the number of problems identified, solutions suggested, hypotheses tested or conclusions drawn.

The lack of discriminating power of the instrument was apparent in another way. The emergence of more than one problem in a particular lesson could give rise to the suggestion of many corresponding hypotheses. If students suggested hypotheses for some problems, but not others, this was not detected by the instrument. All that was detected was the fact that hypotheses were suggested.

These conclusions are made not to point out limitations in the instrument but simply to clarify what the instrument does and does not do. Since the instrument was designed to detect the presence of reflective teaching, the fact that it did not make the above discriminations was not considered a limitation.

3. There are at least two limitations in the use of the instrument. Since instrument reliability depends upon the skill of people using it, observers need a sound knowledge of the reflective process and a thorough familiarity with techniques for promoting it. A lack of such knowledge and familiarity presents tremendous problems for observer training and raises questions about the relationship between knowledge of the process and the
degree of reliability of the observer.

A second limitation in use is found in the length of the instrument. Even in its revised form it appears to be too long to be used reliably in live situations. The most reliable data probably are obtained by an observer taping a lesson live and later marking the instrument as he listens to the tape.

**Findings Concerning the Presence of Reflective Teaching**

Once the validity and reliability of the instrument had been determined, data collected on the sixteen lessons were analyzed for the purpose of securing information on the presence of reflective teaching in them. (These data are included in Appendix H.) The principal findings of this analysis are as follows:

1. The first stage of the reflective process was present in all sixteen lessons. Data from classifications one through six indicated consensus among observers on this. Negative responses, however, to classification number five indicated that in fifteen of the lessons a question such as "What do we need to know to solve this problem?" was not asked.

2. The second stage of the process also was present in all lessons. Data from classifications seven through eleven indicated a high degree of observer agreement on this. Negative responses, however, to classification number eleven indicated that hypotheses rarely were cast in the form of if-then propositions.

3. Responses to classification number twelve revealed varying degrees of observer agreement concerning the presence of the third
stage of the process. One observer felt hypotheses were tested in only three of the lessons, another observer in six of the lessons and a third observer in ten of the lessons. These variations probably were a function of a lack of specificity in the meaning of "testing" on the instrument and a lack of clarity in the explanation of the concept during the observer training session. Even with these variations, however, the data indicated that testing occurred significantly less often than did identifying problems or proposing hypotheses.

4. There was a moderate degree of observer agreement concerning the presence of the "conclusion" stage of the process. One observer felt that conclusions were drawn in ten of the lessons, another observer in twelve of the lessons and a third observer in fifteen of the lessons.

5. Although the conclusion stage was present in most of the lessons, the adequacy of conclusions was seldom evaluated. Data from classification twenty-six indicated that one observer felt conclusions were evaluated in none of the lessons, another observer in only one of the lessons and a third observer in three of the lessons.

Also relevant to the conclusion stage were data obtained from classifications twenty-five, twenty-seven and twenty-eight. Negative responses to these classifications revealed that in most of the lessons the principle of parsimony was not used, consequences
of holding conclusions were not projected into the future and nothing was said about the tentative nature of conclusions reached through reflection.

6. Observers agreed that in most of the lessons teachers used subject matter as a means for promoting reflection and as data relevant to the beliefs of students. They also agreed that most teachers did not use subject matter as an end in itself and that students in most of the lessons did not use subject matter as data relevant to the beliefs of other students.

7. Observers agreed that teachers in nine of the lessons directed their teaching toward the beliefs of students. They also agreed that in less than half of the lessons teachers did not encourage students to examine critically or help them to warrant their beliefs.

8. Observers agreed that classroom climate in three-fourths of the lessons was conducive to the promotion of reflection. They disagreed, however, on the number of lessons in which the climate was used to promote reflection. This disagreement probably was a function of different observer answers to the question: "At what point in the thinking process does thought become reflective?"

Perhaps the most significant conclusions to be drawn from these findings are the following: (1) The lower stages of the reflective process—identifying problems and proposing hypotheses--
receive adequate treatment in reflective classrooms. (2) The higher stages of the process--testing hypotheses and drawing conclusions--receive inadequate treatment.

It seems appropriate to note that these conclusions are consistent with a statement made by Alan Griffin in 1942. At that time he said,

The teacher in the secondary school must be satisfied to stimulate and promote a much lower level of reflection than is described in a complete act of thought. Indeed, he must be satisfied to inject any degree of reflection, at any level, into the ongoing experience of his students.\(^1\)

This statement seems to imply that the lower levels of reflection are more likely to occur or receive more adequate treatment in classrooms than are the higher levels.

These conclusions are also consistent with observer ratings of category "D" in the classroom climate scale. The key idea in this category was whether "opinions of students were rigorously analyzed." Observers rated this category on either the neutral or non-reflective side of the scale in fourteen of the lessons.

In an attempt to explain the inadequate treatment of the third and fourth stages of reflection in the sixteen lessons, the following possible reasons were proposed:

(1) The teachers did not have a clear understanding of all phases of the reflective process and this was revealed in their teaching.

\(^1\)op. cit., Griffin, p. 170.
(2) The teachers had a misconception of the reflective process. They viewed it primarily as a matter of asking questions, actively encouraging students to express their opinions without requiring evidence or support for them, and leading students to pre-determined conclusions.

(3) The teachers cut the reflective process short by giving students the "right answers" or by drawing conclusions for them. By doing this they denied students the opportunity to move through all levels of reflection.

(4) On the days in which the tapes were made, the last two phases of the process received inadequate treatment or were absent because the lessons had not progressed that far. Often it requires more than one day for a teacher to maneuver a class into a problem, get them to cast and test hypotheses and then to draw and evaluate conclusions. These teachers had a clear understanding and accurate conception of the process but a tape of only one lesson did not reveal this.

Perhaps all these reasons are valid explanations for the inadequate treatment. Whether they are or are not could be determined only by interviewing the teachers directly involved. Since the major purpose of this study was not to collect information on reflective teaching, but to develop an instrument to make such collection possible, interviews were not held. Without interviews it remains a matter of speculation as to the actual reasons for
the inadequate treatment.

Whatever the reasons for the inadequate treatment, the conclusions raise several significant questions. How prevalent is the inadequate treatment of the testing and concluding stages of reflection among teachers who aspire to promote it in their students? Does this inadequate treatment reflect a weakness, or a lack of emphasis, in the social studies education program of the teachers who were the subjects of this study? To what extent can these conclusions be generalized to other graduates of this program, or of any social studies education program where the primary goal is the teaching of this process? Answers to these questions await future research on reflective teaching as it occurs in classrooms.

Recommendations for Future Use

Since a valid and reliable observation instrument for reflective teaching has been developed, it seems appropriate to make recommendations concerning its future use. Among the most promising uses are the following:

1. The instrument can be used as a research tool to collect information on reflective teaching. If the conclusions in the preceding section are to be supported or rejected and if the significant questions raised by them are to be answered, further research on reflective teaching as it occurs in classrooms must be conducted. The instrument provides a valuable means for
collecting information relevant to those conclusions and questions. It should be noted, however, that thorough answers to these questions probably require the use of more than one tool. Interviews and tests designed to evaluate the thinking ability of students also should be used.

2. The instrument can be used as a research tool in studies comparing the effectiveness of reflective teaching with other types of teaching. In research on the effectiveness of different method of teaching the independent variable has been "teaching method" and the dependent variable "results in student achievement." One of the many problems with this research is the failure to confirm the existence or occurrence of the independent variable. Teacher opinions about the extent to which they succeeded in employing, or modeling, a particular teaching method have been considered unreliable. Thus, the role of this instrument in such research would be limited to confirming the occurrence of the independent variable. It should be noted that the instrument by itself cannot be used to answer the effectiveness question.

3. The instrument can be used as a teaching tool in pre- and in-service teacher education programs. In graduate or undergraduate courses it might be used as a class handout to provoke discussion. Students could compare their conception of the reflective process--this assumes they already have one--with that represented in the instrument. Such comparisons might lead to increased understanding of reflection as a thought process and
also suggest insights into it as a teaching process. Students in these courses might be supplied with audio or video tapes of reflective and non-reflective lessons and requested to use the instrument on the tapes. Engaging in the activity probably would sharpen their conceptions of the more complex phases of the process and cause them to consider some of the problems teachers face when attempting to promote reflection in their students. The results of the activity could be compared with those of fellow classmates and or the teacher. Disagreements could be identified and possible reasons for them discussed.

Similar activities could be pursued in in-service education programs. Participants in these programs might be supplied with video or audio-tapes of lessons in which teachers cut short the reflective processes of students by telling them the "right answers," drawing conclusions for them, or by indulging in personal attacks when students express unpopular ideas. The instrument could be used on these tapes, discussed in reference to them, or both.

4. The instrument can be used as a learning tool by individual teachers in their own classrooms. Teachers favorably disposed to the promotion of reflection in their students might tape themselves and use the instrument on these tapes. This recommended use can be of significant value to beginning or experienced teachers who have a fairly clear conception of
reflection as a thought process but are hindered by a rather foggy conception of it as a teaching process.
APPENDIX A

The Draft of the Instrument
Used During Field Testing
This instrument is designed to determine the presence or absence of reflective teaching in the classroom. The observations you make will focus on the following: (1) selected categories which constitute the basic characteristics of reflection and (2) questions within these categories which operationally define the process of reflective teaching.

The selected categories along with brief explanations of them are included here to give the observer an overview of the instrument's content. The categories are:

   The stages in the process are:
   
   A. Identifying and coming to feel a problem. (Stage #1) A topic or concept is not a problem. A problem exists when a person is puzzled, perplexed or doubtful about something.
   
   B. Suggesting possible solutions, or hypothesizing. (Stage #2) An hypothesis is a general statement which, if true, provides a solution to a problem. Hypotheses are sometimes referred to as "if-then" propositions.
   
   C. Testing. (Stage #3) Hypotheses, or suggested solutions, are tested by gathering data and using them as evidence to confirm, refute, or modify the hypotheses.
   
   D. Drawing a conclusion. (Stage #4) The goal of this stage is the achievement of a warranted generalization. Warranted means based on logical and or empirical evidence. The best hypothesis, one that accounts for or explains the facts of the case in the simplest manner, is selected as the conclusion.

II. The Use of Subject Matter. In reflection subject matter is a synonym for content or data. It is the stuff from which problems originate and with which hypotheses are tested. It is used primarily as a means for promoting reflective thinking rather than as an end in itself.

III. Student Beliefs. The beliefs of students play a major role in reflective teaching. The following quotation reveals this and provides clues for the teacher's role
in initiating the process.

. . . the beliefs of students are central to the reflective process and . . . the grounding of these beliefs in relevant evidence is a method by which reflection is carried forward . . . It becomes the purpose of the teacher to alter these beliefs to the nature of hypotheses for the pupil. At that point, the reflective process can begin to operate.

IV. Classroom Climate. The classroom climate characteristic of reflective teaching is described in the following quotation:

An intellectually permissive atmosphere is essential for a worthwhile discussion and an important factor is gaining maximum student participation in the discussion. All that is meant by the term 'intellectually permissive atmosphere' is a classroom environment in which students feel free to express their opinions, knowing that their opinions will be courteously, fairly entertained, but rigorously analyzed. If an idea expressed by a student is met with sarcasm, that student and probably others will hesitate to participate in class in the future. If the teacher indulge in personal attacks rather than in an examination of the ideas presented by the students, he will dry up the flow of honest discussion. This does not imply that the teacher should praise or accept without critical examination an inane, thoughtless, irrelevant or inappropriate comment of a student. The purpose of establishing a permissive atmosphere is to promote a worthwhile discussion, not to stimulate participation for the sake of participation. The point is that the teacher should see to it that the ideas expressed by students in the course of a problem-solving discussion are energetically, carefully, but fairly examined.

V. Miscellaneous. This category contains items relevant to reflective teaching that are not present in the other categories.

To facilitate accurate recording of data, the observer should keep these explanations, and especially the quotations, in mind when answering the questions within the categories.
To further facilitate accurate recording of data, the observer should also become thoroughly familiar with the terms explained on the last page of the instrument.

DIRECTIONS: On the pages which follow you will find the selected categories and questions. As you observe the class, answer the questions in the categories by placing a check mark in the appropriate blank space or spaces. If you cannot decide if a check mark should be placed in a particular space, leave that space blank.

A. IDENTIFYING AND COMING TO FEEL A PROBLEM. (Stage #1)

yes no

1. Do one or more problems emerge in this class?
If yes, answer the remaining questions in this stage.

2. Are one or more of the following techniques used by the teacher to introduce the problem? The teacher:
   a. presents the problem to the students.
   b. encourages students to identify or discover the problem.
   c. ascertains the unexamined beliefs of students and converts these into problems.
   d. points up conflict within the students' patterns of belief.
   e. points up conflict within the course content.
   f. selects for discussion topics or ideas of interest to students and transforms these into problems.
   g. other. Specify: ______________________________

3. Do students make statements or ask questions which demonstrate that they have come to feel the problem?

4. Is the problem clearly defined by the teacher or students?

5. Is a question such as "What do we need to know to solve this problem?" asked by the teacher or students?

6. Do students respond to the problem in one or more of the following ways:
   a. doing written work
   b. asking questions to clarify ideas or terminology
   c. engaging in class discussion
   d. engaging in small group activity other than discussion
   e. introducing information relevant to the problem
   f. stating opinions or beliefs
   g. other. Specify: ______________________________

B. SUGGESTING POSSIBLE SOLUTIONS, OR HYPOTHESIZING. (Stage #2)

7. Are hypotheses, or possible solutions, to the problems suggested? If yes, answer the remaining questions in this stage.

8. Does the teacher suggest hypotheses?

9. Do students suggest hypotheses?
yes no

10. Does the teacher help students identify or state hypotheses in one or more of the following ways?
   a. by re-stating or paraphrasing student ideas
   b. by asking for clarification
   c. by asking students to re-state their ideas
   d. by asking students to make statements about data, opinions, or beliefs
   e. by giving examples of hypotheses
   f. by giving characteristics or rules of a good hypothesis
   g. by applying, or having students apply, these rules
   h. by altering student beliefs to the nature of hypotheses
   i. other. Specify: ____________________________

11. Are hypotheses cast in the form of "if-then" propositions?

C. TESTING. (Stage #3)

12. Are hypotheses tested? If no, answer questions 13, 20, 21 and 22.


14. Are one or more of the following activities or techniques used to introduce data relevant to the problem?
   a. lecture
   b. discussion
   c. combination of lecture and discussion
   d. audio-visual presentation
   e. textbook reading
   f. reading of dittoed handout
   g. role-playing activity
   h. game or simulation
   i. questions which call up information students already possess
   j. questions which direct students to sources available in room
   k. library work
   l. individual seat work
   m. small group activity
   n. other. Specify: ____________________________

15. Is testing done mostly by students?

16. Is testing done mostly by the teacher?
17. Does the teacher help students do the testing in one or more of the following ways?
   a. by asking questions
   b. by presenting relevant information
   c. by pointing up problems in logical reasoning
   d. by paraphrasing student statements
   e. by pointing out logical implications of hypotheses
   f. other. Specify: ________________________

18. Are statements made or questions raised by either teacher or students which indicate that some hypotheses are refuted by the data?

19. Are one or more hypotheses revised as a result of testing?

20. If there are insufficient data immediately available for testing, is the process temporarily suspended?

21. In cases where sufficient data are not immediately available, are sources where the data can be obtained identified?

22. Are plans made to obtain this data?

D. DRAWING A CONCLUSION. (Stage #4)

23. Are one or more conclusions drawn by the teacher or students? If yes, answer the remaining questions in this category.

24. Is a conclusion selected from the suggested hypotheses?

25. In cases where rival and equally valid hypotheses are suggested as possible solutions, is the principle of parsimony used as the criterion by which one of the hypotheses is selected as the conclusion?

26. Is the adequacy of the conclusion evaluated?

27. Are three or more of the following rules or criteria used to evaluate the adequacy of the conclusion? The conclusion is:
   a. clearly stated.
   b. supported by evidence.
   c. related to other conclusions reached by the class earlier in the course.
   d. logically sound.
   e. useful or fruitful in suggesting other conclusions.
   f. one that accounts for or explains the facts of the case in the simplest manner.
yes  no

___  28. Are probable consequences of holding the conclusion projected into the future?
___  29. During this stage is anything said, or suggested, about the tentative nature of conclusions reached through reflection?
___  30. Does the conclusion generate other problems which could be examined in future classes?

II. The Use of Subject Matter.

___  31. Does the teacher use, or attempt to use, subject matter as a means for promoting reflective thought?
___  32. Does the teacher use subject matter as an end in itself?
___  33. Does the teacher use subject matter as data relevant to the beliefs of students?
___  34. Do students use subject matter as data relevant to the beliefs of other students?

III. Student Beliefs.

___  35. Does the teacher direct his/her teaching toward the beliefs of students?
___  36. Does the teacher encourage students to examine their beliefs?
___  37. Does the teacher help students achieve warranted beliefs in one or more of the following ways?
   a. by getting students to state beliefs clearly.
   b. by getting students to support beliefs with evidence.
   c. by relating a belief under consideration to other beliefs.
   d. by getting students to consider if a belief is logically sound.
   e. by projecting the probable consequences of holding a particular belief.
   f. by tracing out the logical implications of a belief.
   g. other. Specify: ________________________________

IV. Classroom Climate.

Rate the items below that accurately describe the climate of this classroom by placing check marks in the appropriate blanks.
### Questionnaire on Classroom Climate

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<th>A. teacher actively encourages student expression of ideas</th>
<th>teacher actively discourages expression of ideas</th>
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<td>B. student opinions are courteously entertained</td>
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<td>C. student opinions are fairly examined</td>
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<td>G. students freely express their opinions</td>
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**V. Miscellaneous.**

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<th>38. Based on the above rating, is the climate of this classroom conducive to the promotion of reflective thought?</th>
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<td>39. Is the climate of this classroom used to promote reflective thought?</td>
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<th>40. Does the teacher keep, or attempt to keep reflection moving forward in the experience of students?</th>
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<td>41. Does the teacher present and withhold information and hypotheses when necessary?</td>
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<td>42. Does the teacher involve the class in a critical examination of the reflective process itself?</td>
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<td>43. Does the teacher provide opportunities for students to have experiences which generate problems?</td>
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<td>44. Is reflection deliberately promoted?</td>
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<td>45. Is teaching related to present or past experiences of students?</td>
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Explanation of Terms

1. concept: analogous to "a basket into which we put those objects that belong together because of the attributes they are said to share under a given system of classification;" (Hunt and Metcalf, 1968, pp.84-85); near synonyms are category and definition.

2. generalization: a general statement which expresses a relationship among and or between concepts (Hunt and Metcalf, 1968, p.84).

3. characteristics of a good hypothesis:
   a. it explains and or accounts for all the known fact of the case;
   b. given certain conditions, it enables the prediction of outcomes or consequences;
   c. it is clearly stated;
   d. it is useful, or fruitful, in suggesting other hypotheses or in predicting other facts. (Columbia Associates in Philosophy, 1923, pp. 51-61).

4. principle of parsimony: "If two hypotheses each account equally for all the observed facts, the simpler one—that is, the one which makes the fewer assumptions—is to be preferred to the more complex." (Columbia Associates, p. 23).

5. criteria to evaluate the adequacy of a conclusion or belief:
   a. "Clarity. A good belief is unambiguous. We know unmistakably what it means. (It is clearly stated.)
   b. Consistency with other beliefs. There is a presumption against a belief that conflicts with other beliefs well certified by experience. Sometimes, however, it is the latter beliefs rather than the former that need to be revised. (It is related to other beliefs.)
   c. Utility. A good belief is often distinguished by its usefulness in suggesting further good beliefs. (It is useful.)
   d. Consistency with facts. A good belief is founded on extensive and accurate observation. It is not contradicted by experience. (It is supported by evidence.)
   e. Simplicity. Other things being equal, that belief is best which makes the fewest assumptions." (This is the principle of parsimony.) (Columbia Associates, p. 53; parentheticals added.)
APPENDIX B

Matrices Locating Classification

Agreements and Disagreements for

Observers X and Y, X and Z, and Y and Z
AGREEMENTS AND DISAGREEMENTS FOR OBSERVERS X AND Y

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**AGREEMENTS AND DISAGREEMENTS FOR OBSERVERS X AND Z**

- ✓ indicates a disagreement
- x = classification number
- y = observation number

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APPENDIX C

Tables Containing Information on Classification

Disagreements for Observers

X and Y, X and Z and Y and Z
### TABLE 2

DATA CONCERNING CLASSIFICATION DISAGREEMENTS FOR OBSERVERS X AND Y

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APPENDIX D

Matrix and Table Containing Information
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indicates a disagreement  

$x =$ classification number  

$y =$ observation number
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APPENDIX E

Classroom Climate Scores and Computations

Of the Pearson Product-Moment Coefficient of Correlation for Observers

$X$ and $Y$, $X$ and $Z$, $Y$ and $Z$, and $Y_1$ and $Y_2$
## TABLE 6

**CLASSROOM CLIMATE SCORES**

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\[ N = 633 \quad N = 570 \quad N = 577 \quad N = 585 \]

\[ M = 39.5625 \quad M = 35.625 \quad M = 36.0625 \quad M = 36.5625 \]
### TABLE 7

**COMPUTATIONS OF COEFFICIENT OF CORRELATION FOR OBSERVERS X AND Y**

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<th>( y )</th>
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\[ \text{r}_{xy} = .56 \]
### TABLE 8

COMPUTATIONS OF COEFFICIENT OF CORRELATION FOR OBSERVERS X AND Z

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$r_{xy} = .49$
## Table 9

**Computations of Coefficient of Correlation for Observers Y and Z**

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$r_{xy} = .66$
### TABLE 10

**COMPUTATIONS OF COEFFICIENT OF CORRELATION FOR OBSERVERS Y₁ and Y₂**

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\[ r_{xy} = .77 \]
APPENDIX F

Modifications in the Instrument

Suggested as a Result of

Field Testing and Data Analysis
Modification in the Introduction

1. On page one change lines 3 and 4 from "categories which constitute the basic characteristics of reflection" to "categories which contain the basic characteristics of reflective teaching."

2. On the same page clarify the explanation of "testing" in the following manner: "Hypotheses are tested logically and empirically. They are tested logically in one or more of the following ways: (1) by casting them in the form of if-then propositions, (2) by tracing out their logical implications, and (3) by projecting the possible consequences of selecting them as solutions to problems. They are tested empirically by gathering and using data as evidence to confirm, reject or modify them."

3. Also on the same page, change the explanation of "warranted" from "... means based on logical and or empirical evidence" to "... means logically sound and based on evidence."

4. On page two simplify directions to observers by substituting the following: "Directions: When answering questions on this instrument, the observer should keep these explanations clearly in mind. Also, before using the instrument the observer should be thoroughly familiar with the terms explained on the last page."
Modifications in the Classifications

1. Omit the word "specify" and the blank lines which follow it whenever they occur.

2. Change the key idea in number 4 from "clearly defined" to "clearly stated."

3. Remove number 11 from the hypothesizing stage and place it in the testing stage.

4. Change number 12 to: "Are hypotheses tested logically in one or more of the following ways: (1) by casting them in the form of if-then propositions, (2) by tracing out their logical implications, and (3) by projecting the possible consequences of selecting them as solutions to problems?"

5. Add the following question as a separate classification: "Are hypotheses tested empirically?"

6. Change number 13 to read "Are data immediately available for testing hypotheses empirically?"

7. Add the following sub-categories to number 17: (a) "by guiding students to sources where relevant data can be obtained?" (b) "by projecting possible consequences of proposed solutions?"

8. Change the wording in number 20 from "If there are insufficient data" to "If data are not immediately available."

9. Change the wording in number 21 from "In cases where sufficient data" to "If data are not immediately available."

10. Change the wording in number 23 to read "Are one or
more conclusions which are solutions to the problem(s) drawn by
the teacher or students?"

11. Change the wording in number 24 from "Is a conclusion"
to "Are one or more conclusions."

12. Clarify the meaning of number 39 by adding the following
as a parenthetical: "moving forward means moving through the
different levels of reflective thinking."

13. Change number 39 by inserting the phrase "at least some
level of" after the word "promote."

Modification in the Terms Section

1. Add the phrase "levels of reflective thought" and explain
it as follows: "the mere presence of a problem to be solved does
not constitute reflective thought. Thought begins to take on a
reflective flavor when alternative solutions to a problem are
suggested. The diagram below illustrates the different levels:

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<td>➔ reflection continues</td>
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<td>selection of conclusion as a solution to problem</td>
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APPENDIX G

The Instrument with Modifications

Suggested as a Result of Field Testing and Data Analysis
This instrument is designed to determine the presence or absence of reflective teaching in the classroom. The observations you make will focus on the following: (1) selected categories which contain the characteristics of reflective teaching and (2) questions within these categories which operationally define the process of reflective teaching.

The selected categories along with brief explanations of them are included here to give the observer an overview of the instrument's content. The categories are:

I. The Teacher as a Guide in the Reflective Process. The stages in the process are:

A. **Identifying and coming to feel a problem.** (Stage #1)
   A topic or concept is not a problem. A problem exists when a person is puzzled, perplexed or doubtful about something.

B. **Suggesting possible solutions, or hypothesizing.** (Stage #2) An hypothesis is a general statement which, if true, provides a solution to a problem. Hypotheses are sometimes referred to as "if-then" propositions.

C. **Testing.** (Stage #3) Hypotheses, or suggested solutions, are tested logically and empirically. They are tested logically by: (1) casting them in the form of if-then propositions, (2) tracing out their implications and or (3) projecting the possible consequences of selecting them as solutions to the problem. They are tested empirically by gathering and using data as evidence to confirm, reject or modify them.

D. **Drawing a conclusion.** (Stage #4) The goal of this stage is the achievement of a warranted generalization. Warranted means logically sound and based on evidence. The best hypothesis, one that accounts for or explains the facts of the case in the simplest manner, is selected as the conclusion.

II. The Use of Subject Matter. In reflection subject matter is a synonym for content or data. It is the stuff from which problems originate and with which hypotheses are
tested. It is used primarily as a means for promoting reflective thinking rather than as an end in itself.

III. Student Beliefs. The beliefs of students play a major role in reflective teaching. The following quotation reveals this and provides clues for the teacher's role in initiating the process.

... the beliefs of students are central to the reflective process and ... the grounding of these beliefs in relevant evidence is a method by which reflection is carried forward ... It becomes the purpose of the teacher to alter these beliefs to the nature of hypotheses for the pupil. At that point, the reflective process can begin to operate.

IV. Classroom Climate. The classroom climate characteristic of reflective teaching is described in the following quotation:

An intellectually permissive atmosphere is essential for a worthwhile discussion and an important factor is gaining maximum student participation in the discussion. All that is meant by the term 'intellectually permissive atmosphere' is a classroom environment in which students feel free to express their opinions, knowing that their opinions will be courteously, fairly entertained, but rigorously analyzed. If an idea expressed by a student is met with sarcasm, that student and probably others will hesitate to participate in class in the future. If the teacher indulged in personal attacks rather than in an examination of the ideas presented by the students, he will dry up the flow of honest discussion. This does not imply that the teacher should praise or accept without critical examination an inane, thoughtless, irrelevant or inappropriate comment of a student. The purpose of establishing a permissive atmosphere is to promote a worthwhile discussion, not to stimulate participation for the sake of participation. The point is that the teacher should see to it that the ideas expressed by students in the course of
a problem-solving discussion are energetically, carefully, but fairly examined.

V. Miscellaneous. This category contains items relevant to reflective teaching that are not present in the other categories.

DIRECTIONS: When answering the questions on the instrument, the observer should keep these explanations clearly in mind. Also, before using the instrument, the observer should become thoroughly familiar with the terms explained on the last page.

On the pages which follow you will find the selected categories and questions. As you observe the class, answer the questions in the categories by placing a check mark in the appropriate blank space or spaces. If you cannot decide if a check mark should be placed in a particular space, leave that space blank.

A. IDENTIFYING AND COMING TO FEEL A PROBLEM. (Stage #1)

yes no

1. Do one or more problems emerge in this class? 
   If yes, answer the remaining questions in this stage.

2. Are one or more of the following techniques used by
   the teacher to introduce the problem? The teacher:
   a. presents the problem to the students.
   b. encourages students to identify or discover
      the problem.
   c. ascertains the unexamined beliefs of students
      and converts these into problems.
   d. points up conflict within students' patterns
      of belief.
   e. points up conflict within the course content.
   f. selects for discussion topics or ideas of
      interest to students and transforms these into
      problems.
   g. other.

3. Do students make statements or ask questions which
   demonstrate that they have come to feel the problem?

4. Is the problem clearly stated by the teacher or
   students?

5. Is a question such as "What do we need to know to
   solve this problem?" asked by the teacher or stu-
   dents?

6. Do students respond to the problem in one or more
   of the following ways?
   a. doing written work
   b. engaging in class discussion
   c. asking questions to clarify ideas or terminology
   d. engaging in small group activity other than
      discussion
   e. introducing information relevant to the problem
   f. stating opinions or beliefs
   g. other

B. SUGGESTING POSSIBLE SOLUTIONS, OR HYPOTHEORIZING.
   (Stage #2)

7. Are hypotheses (or possible solutions) to the
   problem(s) suggested?

8. Does the teacher suggest hypotheses?

9. Do students suggest hypotheses?

10. Does the teacher help students identify or state
    hypotheses in one or more of the following ways?
a. by re-stating or paraphrasing student ideas
b. by asking for clarification
c. by asking students to re-state their ideas
d. by asking students to make statements about data, opinions, or beliefs
e. by giving examples of hypotheses
f. by giving characteristics or rules of a good hypothesis
g. by applying, or having students apply, these rules
h. by altering student beliefs to the nature of hypotheses
i. other.

C. TESTING. (Stage #3)

Yes  No
___  ___ 11. Are hypotheses tested logically in one or more of the following ways:
a. by casting them in the form of if-then propositions?
b. by tracing out their logical implications?
c. by projecting the possible consequences of selecting them as solutions to problems?

___  ___ 12. Are hypotheses tested empirically?

___  ___ 13. Are data immediately available for testing hypotheses empirically?

___  ___ 14. Are one or more of the following activities or techniques used to introduce data relevant to the problem?
a. lecture
b. discussion
c. combination of lecture and discussion
d. audio-visual presentation
e. textbook reading
f. reading of dittoed handout
g. role-playing activity
h. game or simulation
i. questions which call up information students already possess
j. questions which direct students to sources available in room
k. library work
l. individual seat work
m. small group activity
n. other.

___  ___ 15. Does the teacher help students do the testing in one or more of the following ways?
a. by asking questions.
b. by presenting relevant information.
c. by pointing up problems in logical reasoning.
d. by paraphrasing student statements.
e. by pointing out logical implications of hypotheses.
f. by guiding students to sources where relevant data can be obtained.
g. by projecting possible consequences of proposed solutions to problems.
h. other.

16. Are statements made or questions raised by either teacher or students which indicate that some hypotheses are refuted by the data?

17. Are one or more hypotheses revised as a result of testing?

18. If data are not immediately available for testing, is the process temporarily suspended?

19. If data are not immediately available, are sources where the data can be obtained identified?

20. Are plans made to obtain this data?

D. DRAWING A CONCLUSION. (Stage #4)

21. Are one or more conclusions which are solutions to the problem drawn by the teacher or students?

22. Are one or more conclusions selected from the suggested hypotheses?

23. In cases where rival and equally valid hypotheses are suggested as possible solutions, is the principle of parsimony used as the criterion by which one of the hypotheses is selected as the conclusion?

24. Is the adequacy of the conclusion evaluated?

25. Are three or more of the following rules or criteria used to evaluate the adequacy of the conclusion?
   The conclusion is:
   a. clearly stated.
   b. supported by evidence.
   c. related to other conclusions reached by the class earlier in the course.
   d. logically sound.
   e. useful or fruitful in suggesting other conclusions.
   f. one that accounts for or explains the facts of the case in the simplest manner.

26. Are probable consequences of holding the conclusion projected into the future?
yes no

27. During this stage is anything said, or suggested, about the tentative nature of conclusions reached through reflection?

II. The Use of Subject Matter.

28. Does the teacher use, or attempt to use, subject matter as a means for promoting reflective thought?

29. Does the teacher use subject matter as an end in itself?

30. Does the teacher use subject matter as data relevant to the beliefs of students?

31. Do students use subject matter as data relevant to the beliefs of other students?

III. Student Beliefs.

32. Does the teacher direct his/her teaching toward the beliefs of students?

33. Does the teacher encourage students to examine their beliefs?

34. Does the teacher help students achieve warranted beliefs in one or more of the following ways?
   a. by getting students to state beliefs clearly.
   b. by getting students to support beliefs with evidence.
   c. by relating a belief under consideration to other beliefs.
   d. by getting students to consider if a belief is logically sound.
   e. by projecting the probable consequences of holding a particular belief.
   f. by tracing out the logical implications of a belief.
   g. other.

IV. Classroom Climate.

Rate the items below that accurately describe the climate of this classroom by placing check marks in the appropriate blanks.

A. teacher actively encourages student expression of ideas ___________________________ teacher actively discourages student expression of ideas

B. student opinions are courteously entertained ___________________________ student opinions are not courteously entertained
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<tr>
<td>E</td>
<td>student ideas are not met with sarcasm</td>
<td>student ideas are met with sarcasm</td>
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<td>F</td>
<td>teacher does not indulge in personal attacks</td>
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<tr>
<td>G</td>
<td>students freely express their opinions</td>
<td>students do not freely express their opinions</td>
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yes  no

35. Based on the above ratings, is the climate of this classroom conducive to the promotion of reflective thought?

36. Is the climate of this classroom used to promote reflective thought?

V. Miscellaneous

37. Does the teacher keep, or attempt to keep, reflection moving forward in the experience of students?

38. Does the teacher present and withhold information and hypotheses when necessary?

39. Does the teacher involve the class in an examination of the reflective process itself?

40. Does the teacher provide opportunities for students to have experiences which generate problems?

41. Is teaching related to present or past experiences of students?

---

Explanation of Terms

1. concept: analogous to "a basket into which we put those objects that belong together because of the attributes they are said to share under a given system of classification;" (Hunt & Metcalf, 1968, pp. 84-85); near synonyms are category and definition.

2. generalization: a general statement which expresses a relationship among and or between concepts (Hunt & Metcalf, 1968, p. 84).

3. characteristics of a good hypothesis:
   a. it explains and or accounts for all the known facts of the case;
   b. given certain conditions, it enables the prediction of outcomes or consequences;
c. it is clearly stated;

d. it is useful, or fruitful, in suggesting other hypotheses or in predicting other facts. (Columbia Associates in Philosophy, 1923, pp. 51-61.)

4. principle of parsimony: "If two hypotheses each account equally for all the observed facts, the simpler one—that is, the one which makes the fewer assumptions—is to be preferred to the more complex." (Columbia Associates, p. 23.)

5. criteria to evaluate the adequacy of a conclusion or belief:

   a. "Clarity. A good belief is unambiguous. We know unmistakably what it means. (It is clearly stated.)

   b. Consistency with facts. A good belief is founded on extensive and accurate observation. It is not contradicted by experience. (It is supported by evidence.)

   c. Consistency with other beliefs. There is a presumption against a belief that conflicts with other beliefs well certified by experience. Sometimes, however, it is the latter beliefs rather than the former that need to be revised. (It is related to other beliefs.)

   d. Utility. A good belief is often distinguished by its usefulness in suggesting further good beliefs. (It is useful.)

   e. Simplicity. Other things being equal, that belief is best which makes the fewest assumptions." (This is the principle of parsimony.) (Columbia Associates, p. 53; parentheticals added.)

6. levels of reflective thought: the mere presence of a problem to be solved does not constitute reflective thought. Thought begins to take on a reflective flavor when alternative solutions to a problem are suggested. The diagram below illustrates this idea.

   - presence of a felt problem \(\rightarrow\) pre-reflective
   - suggestion of alternative solutions \(\rightarrow\) reflection begins
   - logical and empirical testing \(\rightarrow\) reflection continues
   - selection of conclusion as a solution to problem \(\rightarrow\) reflection ends

   lower levels
   higher levels
APPENDIX H

Data Concerning the Presence of Reflective Teaching in the Sixteen Tapes
TABLE 11

DATA CONCERNING THE PRESENCE OF REFLECTIVE TEACHING IN THE SIXTEEN TAPES

Category I - The Teacher as a Guide in the Reflective Process

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**Category III - Student Beliefs**

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**Category IV - Classroom Climate**

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### TABLE 11 -- CONTINUED

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Note: This table does not include classifications 15, 16, 30, and 44. Since they were judged errors in the instrument, they were not included in data analysis.
BIBLIOGRAPHY


* _____________. Teaching High School Social Studies. 2nd ed.,

*Hullfish, H. Gordon and Smith, Philip G. Reflective Thinking:
The Method of Education. New York: Dodd, Mead and

*Horn, Ernest. Methods of Instruction in the Social Studies.
Report of the Commission on the Social Studies,

Hyman, Ronald T. Contemporary Thought on Teaching. New Jersey:

__, ed. Teaching: Vantage Points for Study.

*Indiana Experiments in Inquiry: Social Studies," Bulletin of
the School of Education, Indiana University, Vol. 39,
No. 3 (May, 1963).

Jackson, Philip W. Life in Classrooms. Chicago: Holt, Rinehart

*Jewett, Robert E. "The Use of Historical Evidence in Grounding
Civic Beliefs." Unpublished doctoral dissertation,
The Ohio State University, 1947.

Kaplan, Abraham. The Conduct of Inquiry: Methodology for
Behavioral Science. California: Chandler Publishing

*Lewis, Gertrude. "Problem-Solving Opportunities in Fifth Grade
Social Studies: An Observational Study," Dissertation

*Marsh, Colin J. "A Comparative Study of Preservice Teacher
Attitudes to Selected Inquiry Teaching Techniques in
Social Studies at The Ohio State University (United
States of America) and the Secondary Teachers' College
(Western Australia)." Unpublished Ph.D. dissertation,
The Ohio State University, 1973.

*Massialas, Byron G. and Zevin, Jack. Creative Encounters in
the Classroom: Teaching and Learning Through Discovery.


