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ABSTRACT

Three social factors are related to the evolution of the discourse on teacher reflection: the role of educational researchers and teacher educators; the social and economic crisis and its impact on education; and the shift from behaviorism to cognitivism. By relating the discourse of teacher change through reflection to these social factors, it becomes apparent that telling teachers how and what to teach and asking them to reflect on their beliefs and practices serves the same social purpose: to produce effective teachers for effective schools for an effective society. Such requests for reflective practice become subtly regulating. Using a post-structuralist approach, four traditions of teacher reflection are defined and analyzed: an academic tradition, a social efficiency tradition, a developmentalist tradition, and a social reconstructionist tradition. A fifth tradition, the generic, advocates reflection in general, without defining the desired focus or outcome. For each of the first four traditions of teacher reflection identified, an example of staff development is described and criticized. A sample lesson and guidelines for peer coaching are appended. (Contains 51 references.) (JLS)

Reflecting on the History, Ethics, and Application of Teacher Reflection

Abstract

Why are educational researchers interested in teacher reflection? What are they hoping to accomplish by investigating this complex process of human thinking? Why is it that teachers' thinking appears to have been inconsequential to the majority of educational researchers prior to the last decade? Are there ethical issues to consider when researching teachers' thinking? Within this paper, an attempt is made to answer these questions by first investigating the topic through the lens of post-structuralist theory. After situating the topic historically and ethically, four types of teacher reflection will be defined and examples of staff development models incorporating each will be described.

Judith Elaine Hankes

Reflecting on the History, Ethics and Application of Teacher Reflection

In the last decade or so, the topic of reflection in teaching has attracted considerable interest within the research community. This interest is growing, as indicated by the increasing number of studies reported in educational literature. Why are researchers interested in reflection? What are they hoping to accomplish by investigating this complex process of human thinking? Why is it that teachers' thinking appears to have been inconsequential to the majority of educational researchers prior to this time? Are there ethical issues to consider when researching teachers' thinking? Within this paper, an attempt will be made to answer these questions by investigating them through the lens of post-structuralist theory. After situating the study of teacher reflection historically and ethically, four types of teacher reflection will be defined and examples of staff development models incorporating each will be described.

Why the interest in teacher reflection now?

When a topic is viewed through the lens of poststructuralist theory, it is positioned within a community or cultural group and

analyzed according to the discursive practices of that group. The theory proposes that community discourse both constructs and disseminates ideas and beliefs. Furthermore, the decision to reject an idea or belief is also determined through member discourse (Bowers, 1987). Perhaps the most important component of post-structuralist theory is the investigation of groups within groups for the purpose of understanding the power structure that determines what knowledge (beliefs and ideas) is to be accepted or rejected. Michel Foucoult (1980) labeled these forms of culturally constructed knowledge 'regimes of truth'. He proposed that each society has its 'general politics' of truth, that is, the types of discourse which it accepts and makes function as true.

Poststructural analysis of the concept (the regime of truth) known as teacher reflection positions the topic in the discourse of education, specifically in the community of teacher education researchers. Yet, before considering the structure of power that contributed to the current approbation of this form of inquiry into teacher behavior, it is important to understand that institutionalized education is the vehicle through which the larger society affirms and preserves its dominant culture. (Bourdieu, 1991). In other words, the organization and structure of schooling, advised by the research community, advances the ideas and beliefs of the most powerful discourse participants within the larger society.

Returning to the consideration of the structure of power as it relates to the current interest in researching teacher reflection,

it is important to note that prior to 1980 the process-product paradigm represented mainstream research and served as the focal point of most scholarly dialogues and debates. During the 60s and 70s process-product findings guided policy makers and teacher educators (Shulman, 1986). In this paradigm effectiveness was and still is assessed as a function of empirically demonstrable relationships, correlations, with some form of desirable performance. The effective schools studies of Brophy and Good (1986) are excellent examples of this type of research. However, validation of effectiveness was not novel to the post Sputnik era. Schooling efficiency was highly valued very early in the century, as suggested by the 'factory model' metaphor of schooling which grew out of the industrial revolution and paralleled the factory mentality of a growing industrial nation (Kliebard, 1987). It is clearly apparent that educational efficiency supported by research informed prescription has dominated and continues to dominate teacher education.

The comparatively recent shift in teacher education discourse from identifying prescriptive standards of practice to qualitatively interpreting practice reflects an ideological change, broadly speaking, a change from behaviorist to humanist ideology (Zumwalt, 1982). Humanists claim that technically oriented process-product research "de-skills" teachers and renders teaching merely technical rather than deliberate, limits decision making and devalues artfulness. Key features distinguishing these two perspectives is their relative emphasis on behavior or thought, on

observable and measurable actions or on stated and inferred intentions, reflections, reasons, attitudes, feelings, goals or other cognitive states (Shulman, 1986). However, it is important to realize that though the new humanist based paradigm may look different, the purpose served is still the same: inform the educational community of ways to effectively communicate socially valued knowledge and skills.

The shift in interest from correlational to meaning oriented studies wasn't the result of teacher educators conceding that teachers had been de-skilled. A major impetus behind this shift was and is social and economic crisis. The following quote from a recent document outlining national mathematics standards provides a background for understanding this crisis and lists goals for ameliorating the situation:

> Schools, as now organized, are a product of the industrial age. In most democratic countries, common schools were created to provide most youth the training to become workers in fields, factories, and shops. As a result of such schooling, students were also expected to become literate enough to be informed voters. Thus, minimum expectancies in reading, writing, and arithmetic were expected of all students, and advanced training was reserved for the select few. These more advantaged students attended the schools that were expected to educate the future cultural, academic, business, and government leaders.
>
> The educational system of the industrial age does not meet

the economic needs of today. New social goals for education include (1) mathematically literate workers, (2) lifelong learning, (3) opportunity for all, and (4) an informed electorate. Implicit in these goals is a school system organized to serve as an important resource for all citizens throughout their lives.

Common schools of today are filled with children and grand children of the field, factory, and shop workers described above. Yet, career options for these children have changed. Basic skills will not be enough to qualify them for technically competitive jobs. Another aspect of this crisis not often addressed is the consideration of how these future citizens will cope if they can't find work or if the only work available requires limited skill and is unhealthfully boring? To economically and psychologically survive, today's students must be able to analyze and evaluate their problems in order to make informed decisions; they must be able to reflect on their beliefs and values to critically understand their problems, decisions, and goals. Basically, they must be able to think, not merely parrot facts and perform routine procedures before the social and educational goals outlined above can be achieved.

Limitations and conflicts of the long standing teacher effectiveness research become apparent when framed within today's social and economic crisis. Researchers have noted that for high cognitive level learning less direct and controlled instruction is

more beneficial. In fact, studies indicate that the high level teacher structure and control of activities suggested in teacher effectiveness research has a negative impact specifically on students' problem solving ability (McFaul, 1983; Peterson, 1979; Rosenshine, 1986; Soar, Medley, and Coker, 1983; Corno, 1979). Lee Shulman, a leader in educational reform, claims to build his foundation for teaching reform on an model of teaching that emphasizes comprehension and reasoning, transformation and reflection. "This emphasis is justified," he writes, by the resoluteness with which research and policy have so blatantly ignored those aspects of teaching in the past."(Shulman, 1987).

It is important to situate the criticism of effectiveness research within the community of educational researchers and reflect on the relationship of this community with institutionalized education. Valuing teaching that emphasizes comprehension, reasoning, transformation, and reflection is not new, Dewey wrote extensively about reflective thinking early in the century, and the current interest did not evolve out of researchers' commiseration for textbook-driven teachers and teacher-driven students. It is a very real response to the very real societal crises of increasing and extreme poverty, national economic problems, and global ecological problems (Pollard, 1992). For society to survive, its members must become competent problem solvers. The challenge before the research community is clear: to revise curriculum and pedagogy so as to involve students with higher order thinking.

Dewey and Reflection

Returning to the topic of reflection, how does this cognitive act fit into institutionalized education and the development of problem solving skills within the populace? A brief history of the term will help answer this question. In the early part of the century John Dewey stressed the importance of reflective thinking. He directed much of what he had to say to classroom teachers. His purpose in focusing on this topic was to promote reflective thinking first within the teacher and, through the teacher, within the student. He explained that the need of straightening out a perplexity is the guiding factor in the process of reflection and cautioned that where there is no question of a problem to be solved or a difficulty to be surmounted, thinking becomes routine. According to Dewey, reflective thinking is always more or less troublesome because it involves overcoming the inertia that inclines one to accept suggestions at their face value; it involves willingness to endure a condition of mental unrest and disturbance (Dewey, 1910).

Dewey's linking of reflection to problem solving is clearly a primary reason for his popularity today, and it is this linkage that contributes to the current discourse regarding teacher reflection among education researchers. For, valuing what Dewey stated regarding the difficulty of overcoming inertia, teacher educators realize that before curriculum and pedagogy can be reformed to promote higher order thinking and problem solving,

classroom teachers must recognize traditional practice and curriculum as problematic. Furthermore, educational researchers propose that by promoting educational reform through regulating reflection, the teacher becomes both the messenger and the message, learns both to practice reflective thinking when making instructional decisions and to model reflective thinking when instructing.

A Shift in Learning Theory

The reemergence of interest in Dewey's writings on reflective thinking corresponds to the increased influence of constructivist learning theory and cognitive psychology in the educational research community. Beginning in the mid-1950s, the cognitive critique of behaviorism took hold in psychology through the efforts of information-processing psychologists (Miller et al., 1960; Newell & Simon, 1956), and psycholinguistics (Chomsky, 1957). During the same period, translation of Piaget's writings brought his views on cognitive development to the attention of American psychologists (Piaget, 1952). The shift from behaviorism to cognitivism was established by the 1970s. Interestingly, education researchers, preoccupied with behavior focused process-product methodology, remained immune to the cognitive revolution during this period (Shulman, 1986). The mental life of the student and teacher did not become a central topic of teacher research until the 1980s when the prescriptions of teacher effectiveness studies

were recognized as seriously inadequate.

From 1979-82, national education assessments implemented by the Education Commission of the States suggested that student achievement of higher order thinking skills was seriously declining, and in 1982 the nation was identified as academically at risk (Nation at Risk, 1983). Paralleling the educational troubles were the national economic, social, and environmental problems that have already been discussed. In 1982 the Federal Education Commission outlined the academic basics for the 21st century, basics for a nation at risk of becoming economically impoverished, socially ailing, and environmentally threatened. The basics outlined were: to develop evaluation and analysis skills, critical thinking, problem-solving strategies (with an emphasis on mathematical problem solving), organization and reference skills, to develop the ability to create, synthesize, and apply, to develop decision-making ability given incomplete information, and communication skills through a variety of modes. Effective instruction was defined as teaching for thinking: teaching academic content so as to strengthen students' cognitive abilities; teaching of thinking: teaching particular mental skills as the primary purpose of instruction; and teaching about thinking: helping students be more conscious of their own thinking processes (Costa, 1985). Teaching research quickly responded to the challenge of focusing on process not product, and the mental lives of students and teachers became a topic of interest among educational researchers. Resnick (1981) wrote of this shift in the Annual

Review of Psychology:

> There is a shift in studying more complex forms of cognitive behavior. This means that many of the tasks and processes of interest to cognitive psychologists are ones that can form part of a school's curriculum. . . . Today's assumptions about the nature of learning and thinking are interactionist. We assume that learning occurs as a result of mental construction of the learner. These constructions respond to information and stimuli in the environment, but they do not copy or mirror them. This means that instruction must be designed not to put knowledge into the learners' heads but to put learners in positions that allow them to construct well-structured knowledge (p. 660).

The shift from behaviorism to cognitivism when situated within the discourse of social and economic crisis, exemplifies Dewey's definition of reflective thinking: demand for the solution to a perplexity is the steadying and guiding factor in the entire process of reflection. Responding to societal crises of developing a problem solving populace and reflecting on the problems inherent in behaviorist based instruction, within less than a decade, teacher educators began to apply cognitive learning theory to their research, and investigation of the private thoughts of teachers became central to the study of teaching practice for the purpose of changing teachers from effectively teaching facts to reflectively

teaching thinking.

A knowledge of how cognitive constructivism has contributed to understanding the learning process is useful when attempting to make sense of the shift in teacher education from behaviorist based to cognitivist based, from regulation through telling to regulation through guiding reflection. Von Glasersfeld (1987) expresses the essence of the shift in a few brief words, "perceiving from a constructivist point of view, is always an active making rather than a passive receiving". The constructivist point of view assumes that human beings are knowing subjects, that human behavior is mainly purposive, and that humans have a highly developed capacity for organizing knowledge (Magoon, 1977). These assumptions suggest methods of instruction as well as methods of research: classroom methods that encourage students (whether children or teachers) to become actively involved with constructing understanding and research methods of ethnography, clinical interviews, overt thinking, methods designed to teach and study semi-autonomous systems (Noddings, 1990).

The cognitive constructivist position holds that all knowledge is constructed and that the instruments of construction are either innate (Chomsky, 1968) or neurologically developmental (Piaget, 1953). This active construction implies both a base structure from which to begin construction (assimilation) and a process of continual revision of structure (a process of accommodation) (Piaget, 1953).

An example of applied constructivism is the Conceptual Change

Teaching Model of Science (Posner et al., 1982). Conceptual change teaching recognizes knowledge as an integral part of the person who has it; using what s/he knows, the learner responds to new observations, problems, dilemmas or anomalies by inventing solutions, resolutions and explanations; the learner uses existing knowledge to construct new knowledge. This particular approach to teaching also recognizes that many incorrect and inadequate ideas constructed by students are surprisingly resistant to change (Champagne et al., 1982). Within this model, change of conceptions involves guided interaction between old ideas and new ideas. During such interaction, the learner is encouraged to use his/her existing knowledge to determine whether or not a new concept is understandable, true, and useful. If the new conception is all three, learning proceeds without difficulty. If, however, it conflicts with existing conceptions, then it is rejected and is not accepted until the learner becomes dissatisfied with the old conceptions (Tabachnick & Zeichner, 1992). Reflective thinking is obviously crucial to this form of teaching, since it is through private reflection that the learner evaluates personal conceptions for the purpose of acceptance, modification, or rejection.

There are obvious similarities between the use of learner reflection in the Conceptual Change Model described above and in the researcher's or teacher educator's use of guided reflection in teacher education and staff development. Both rely on knowledge of constructivist learning theory, a regulatory form of knowledge used to make ideas, concepts, beliefs, or practices problematic for the

purpose of promoting change, and both position the reflective participant as a learner to be regulated, either to revise a concept or to revise teaching practices. Each situation appears to be ethically benign. However, it is critical that we remind ourselves that ethical use of the knowledge of reflection as an instrument of cognitive regulation relies entirely upon who is asking the learner to reflect and upon what the learner is asked to reflect. The issue of ethics and reflection will be more thoroughly addressed in the following section.

Ethics and Reflection

The following quotations from recent articles written by teacher educators for teacher educators help formulate a case for positioning the topic of teacher reflection within the discourse of ethics:

> One must probe for meaning and teacher intentions, as well as observe how teachers act on their intentions .. . . The important issues are concerned with the particular kinds of reflection that we want to encourage in our teacher education programs. . . . We have become more explicit about what it is that we would like our students (teachers) to reflect about and how, and about the process of moral deliberation that is associated with this reflective process (Tabachnick & Zeichner, 1991).
>
> Learning may involve changing a person's conceptions in addition to adding new knowledge to what is already there. .

> . . Learning becomes a struggle to restructure existing conceptions, possibly even leading to new conceptions being exchanged for old ones (Tabachnick & Zeichner, 1992).

In fairness to Tabachnick and Zeichner, it is important to situate their quotations within the discourse of social reconstruction, scholarly discourse concerned with illuminating how institutionalized knowledge constrains, controls, and marginalizes populations. However, the forthrightness of their writing also illuminates the power that knowledge about reflection and control of thinking possesses. Researchers must become ethically aware of the fact that 'probing for meaning and teacher intentions and restructuring beliefs through reflection' risks becoming cognitively intrusive. The practice of providing teachers with prescriptions, directly telling them what good teaching is and what it is not was openly controlling; whereas, the practice of making instruction problematic by manipulating the teacher's reflection becomes subtly controlling. The shift in ideology from behaviorism to humanism discussed earlier might lead one to assume that humanism corresponds to humanness, but such an assumption is unfortunately incorrect. Knowledge of how individuals construct understanding can be used humanely or inhumanely. What is important is the critical analysis of what it means to be humane.

Dewey contributed to the discussion of ethics by identifying three attitudes that he felt necessary for reflective thought and action: open-mindedness, whole-heartedness, and responsibility.

Open-mindedness refers to freedom from prejudice, partisanship, and habits that close the mind and make an individual unwilling to consider new ideas; it is the active desire to listen to more sides than one, to give full attention to alternative possibilities, and to recognize the possibility of error even in the beliefs that are dearest to us. Whole-heartedness refers to the individual's thorough interest in some subject or cause. It triggers enthusiasm and produces the impetus to question, investigate, become involved. Responsibility is an attitude that is necessary to sustain consideration of an alternative point of view or consider the consequences of an act. Intellectual responsibility secures integrity; that is to say, consistency and harmony in belief (Dewey, 1933).

Within Dewey's definitions of attitudes necessary for reflective thinking rests the criteria for evaluating the ethics of research on teacher reflection. Teacher educators who structure learning experiences in which teachers reflect or who pose questions to direct reflection must evaluate their purposes open-mindedly, whole-heartedly, and responsibly. Researchers who are open-minded will continually examine the rationales that underlie what is taken to be natural and right and take pains to seek out conflicting evidence on issues of educational practice. Reflective researchers will continually ask themselves why they are doing what they are doing. Ethical researchers will wholeheartedly value what it means to be reflectively open-minded, and they will responsibly reflect on the consequences of their research.

Within recent years, a number of critical issues related to the ethical social relations of the research process have been raised (Noddings, 1986; Reinharz, 1988; Roman & Apple, 1988). Major points of concern deal with issues such as, whose perspectives are represented by the research and who benefits from the research? Teaching and teacher education research specifically has been criticized for being research on rather than for the people who are studied (Zeichner & Gore, 1991), and it is reasonable to predict that the use of teacher reflection as a means of promoting change will become suspect of teacher manipulation. Perhaps a more critical ethical issue, a more subtle one, deals with the knowledge on which teacher educators and researchers focus their attention and on which teachers are asked to reflect. All educators must become sensitized to the fact that institutionalized knowledge serves particular social, cultural, and political interests. School practice cannot be separated from the dominant culture's ideological realities (Beyer, 1989), ideological realities that appear to condone differential allocation of knowledge and school resources to marginalized groups. Awareness of this concern forces critical consideration of the knowledge upon which teachers are asked to reflect.

In the preceding sections of this paper, three social factors were briefly discussed and related to the evolution of the discourse of teacher reflection: the role of educational researchers and teacher educators within institutionalized education, the social and economic crisis and its impact on

education, and the shift from behaviorism to cognitivism. A careful analysis of the interaction of these factors helps to ideologically situate the following quotations taken from the 1992 Handbook of Research on Mathematics Teaching and Learning within the discourse of education researchers:

> The crucial point in our development of a collaborative relationship with the project teacher occurred when she began to realize that her current practice might be problematic (Cobb, Wood, & Yackel, 1990). Cobb et al. underscored the importance of teachers seeing their current practice as problematic as some sort of prerequisite mental state necessary for beneficial collaboration between teachers and researchers or staff developers. Cobb et al. used the teacher's classroom as an environment where the teacher learned by doing and reflecting on her actions. The researchers' role was to help the teacher "develop personal, experientially-based reasons and motivations for reorganizing her classroom practice" (Cobb et al., 1990) and to assist the teacher in doing so rather than to show the teacher how to teach in a specified way (Thompson, 1992).

> One student appeared to take in the new experiences and conceptual ideas by modifying them to fit into her original conceptions. This assimilation without accommodation has been observed among British mathematics teachers as well (Lerman, 1987). The phenomenon of teachers modifying new ideas to fit

> their existing schema is not well understood. Yet, understanding why teachers do this instead of restructuring their current schema is central to effecting change (Thompson, 1992).

It is not necessary to read between the lines of the preceding quotations to conclude that the researchers share a common purpose: to change practice. Cobb is very candid when explaining how the use of teacher reflection can be used to "reorganize practice", and Thompson displays the same candor when explaining that restructuring of schema is essential to change. The psychologized language regarding assimilating without accommodating becomes intelligible only when framed within the discourse of cognitive constructivism. Furthermore, the quotation reveals a psychoanalytic inclination to situate the learner within the therapeutic prescription of the 'more knowledgeable' researcher, the researcher who understands the role of reflection in the learner's restructuring or structuring of knowledge.

By relating the discourse of teacher change through reflection to the social factors summarized above, it becomes apparent that the intentions behind directly telling teachers how to teach or asking them to reflect on their beliefs and practices to problematize them serves the same social purpose: to produce effective teachers, for effective schools, for an effective society. When situated in this way, teacher reflection becomes as obvious an instrument of control as direct telling. However, freed

from the negative associations of open coercion, the practice of asking teachers to reflect on beliefs becomes much more subtly regulating.

Five Types of Reflection

The following quotation, taken from a paper presented at the 1991 American Educational Research Association convention, confirms the fact that teacher educators and researchers are sensitive to at least one of the ethical issues addressed in the preceding sections of this paper, the issue of what it is that teacher educators want teachers to reflect upon:

> There is no such entity as an unreflective teacher. Because all teachers are reflective in some sense about their work, we must be interested in more complex questions than whether teaching is reflective or not. The important issues are concerned with the particular kinds of reflection that we want to encourage in our teacher education programs, among ourselves, between ourselves and our students, and among our students (Tabachnick & Zeichner, 1991).

What are the particular kinds of reflection that teacher educators want to encourage and have encouraged in teacher education programs? In an attempt to respond to this question, four staff development programs, each including a component of reflection, will be described. Each program will be situated within

a framework designed to analyze types of teacher reflection. Liston and Zeichner (1990) based this framework on the historical traditions of teacher training practice and identified four major traditions of reflection : an academic tradition, a social efficiency tradition, a developmentalist tradition, and a social reconstructionist tradition. The framework was extended to include a fifth tradition of practice, a generic tradition (Zeichner, 1991).

Generic Tradition

The generic tradition advocates reflection in general without much comment about what it is that the reflection should focus upon or the criteria used to evaluate the quality of the reflection. The assumption is that teachers actions are basically better because they are more deliberate and intentional (Tabachnick & Zeichner, 1991; Cruickshank, 1987). Because of the generic quality of routine reflection, a teacher training program promoting the non-specificity of this type of reflection could not be identified.

Academic Tradition

The academic tradition emphasizes teachers reflecting on subject matter knowledge and how to promote pupils' understanding of that knowledge (Tabachnick & Zeichner, 1991; Shulman, 1987). The Conceptual Change Teaching of Science model discussed earlier provides a good example of such content specific reflection.
The particular teacher training program selected to represent this academic tradition is part of the science preservice program at the

University of Wisconsin-Madison. This training model uses action research to involve student teachers with Conceptual Change Teaching of Science. Before commenting specifically about the instruction of science through action research, a brief description of action research is needed.

During the last seven years, the use of action research at the university of Wisconsin-Madison has followed the self-reflective spiral model developed at Deakin University (Kemmis & McTaggert, 1988). This model is based on a self-reflective spiral of plan, act, observe, and reflect, a spiral that occurs naturally in the work of teachers; however, when observed through action research, a spiral that becomes useful for systematically examining and collaboratively analyzing classroom practice, an analysis and collaboration not on teaching as much as on viewing teaching itself as a form of inquiry or experimentation (Tabachnick & Zeichner, 1992). The following quotation taken from a speech entitled, "Using Action Research to support Conceptual Change Teaching of Science", reveals how the approaches are complementary. The speech was given at a conference for math and science educators.

> The choice of action research as a strategy to help enact a conceptual change approach to teaching science is a deliberate attempt to match teaching strategy to conceptual model. As in the conceptual change model, action research assumes that an observer-participant can infuse an observed event with meanings. What a teacher expects to happen is partly based on prior knowledge and experience and partly

based on learned conventions for interpreting the teaching-learning observed. action research encourages teachers to make conventional behavior (planning, teaching, interpreting pupil behavior) problematic. Teachers are invited to ask, "Why am I teaching this? What are the alternative or competing meanings for the pupil behavior I have observed? Are unplanned and unwanted results occurring along with those I aim for?" A variety of evidence is gathered systematically about what teaching leads pupils to say and do that reveals the extent of their understanding. When expectations are not met or when careful observations reveal unintended results that are judged to be undesirable, then teaching behavior is challenged and some kind of change is implied, just as scientific thinking is challenged to change when it is demonstrated that it does not explain observations as completely and as elegantly as competing alternatives (Tabachnick & Zeichner, 1992).

It is apparent that reflection on both content and practice are key components of this particular approach to teaching science. The teacher is encouraged to use reflective thinking to make unexamined beliefs about content and instruction of content problematic. Furthermore, s/he is encouraged to involve students with the same type of critical reflection.

Different features of what could be considered generic conceptual change teaching are listed below. The features are generic in the sense that they could be applied to any content

area. They reveal not only the specifics of what teachers are to reflect upon but also the type of reflection to be encouraged within students.

* Diagnosis or Elicitation - does the teacher use any diagnostic techniques to elicit students' existing conceptions and reasons why they are held?

* Status Change - does the teacher use strategies designed to lower the status of existing, problematic knowledge, and to raise the status of other, competing ideas?

* Metacognition - are students encouraged or able to "step back" from one or more ideas held by themselves or others in order to think about them and express an opinion about them?

* Classroom Climate - is there an attitude of respect by both teacher and students for ideas of others, even when they are contradictory?

* Role of Teacher - is the teacher able to provide opportunities to express themselves without fear of ridicule, and to ensure that s/he (the teacher) is not the sole arbiter of what counts as an acceptable idea in the classroom?

* Role of Learner - are students willing to take responsibility for their own learning, to acknowledge others' ideas, and to change their views when another view seems more viable to them?

* Evidence of Outcome - is there evidence that students' learning outcomes are based, in part, on an explicit consideration of their prior knowledge? (Hewson, et al., 1992).

Within this section, reflection typifying the academic tradition has been described. The identifying characteristic of this tradition is reflection on a particular content domain. In the conceptual change approach described above, the classroom teacher involves the student in reflective thinking about science concepts as well as practices analytic reflection when making instructional decisions specific to the instruction of science.

Social Efficiency Tradition

The social efficiency tradition emphasizes teachers' thoughtful application of knowledge about teaching generated through research on teaching (Tabachnick & Zeichner, 1991; Berliner, 1984). A staff development program for middle and secondary school teachers currently being disseminated through the National Diffusion Network for Teacher Training is Project IMPACT. IMPACT (Improving Minimal Proficiency by Activating Critical Thinking) clearly qualifies for inclusion within the efficiency tradition since it focuses on applying research based principles of effective teaching across content, principles that specifically promote critical thinking.

The program, designed by Lee Winocour (1980), is based on the belief that secondary teachers usually know their content field fairly well, but that they are not knowledgeable regarding how to encourage their students to think critically about the content. A major objective of the training program is to communicate to the participants ten teaching behaviors that promote thinking. The

behaviors, presented below, were taken from a handout distributed during the training.

1. Promoting Interaction: Cooperative learning has been shown to facilitate the high-level thinking of each group member. The classroom is structured so that students work in peer-groups engaged in problem-solving activities.

2. Sequencing Cognitive Skills: "The Universe of Critical Thinking Skills", a taxonomy of 22 critical thinking skills , is used by the teacher to identify the prerequisite and subsequent skills to those being taught and to select a lesson appropriate to the student. It is based on a diagnostic-prescriptive approach. (Through involving the student with metacognitive thinking, thinking and talking about one's thinking, the teacher gains an awareness of the student's cognitive level of understanding.)

3. Sequencing Modalities: Each thinking skill is taught first at the concrete level, then at the representational level, and last at the formal level of cognition.

4. Modeling/Demonstrating: Integral to every Project IMPACT lesson is the teacher's modeling of thinking behaviors which s/he seeks to elicit. The student imitates the assigned skill after it has been fully demonstrated by the teacher.

5. High-level Questioning: Open-ended questions are introduced and students are encouraged to generate and explore alternative solutions. High-level questions are posed as a model promoting student internal dialogue. Students are encouraged to ask one another questions and identify the assumptions and logic in the

responses they receive.

6. Cueing: A vocabulary of phrases which introduce or are embedded in high-level teacher questions become familiar sign-posts to students to respond at a more cognitively-sophisticated level.

7. Probing: Unlike most teacher questions which require brief, knowledge-level responses, probing involves a well-planned series of teacher questions leading the student to generate a rule of generalization.

8. Symbolizing Ideas: In order to effectively organize ideas, the teacher presents a series of graphic organizers, i.e. visual strategies that enable students to map and remember concepts in terms of their relationships.

9. Reflecting with Wait-time: Students require far more time to formulate a response to a teacher's high -level question than they are generally given. Project IMPACT provides strategies for promoting on-task wait-time.

10. Teaching for Transfer: Integral to every IMPACT lesson is the expectation that the student, at intervals during the lesson, will identify a broad range of applications of the skill to a variety of situations.

Project IMPACT situates the ten teaching behaviors within a curriculum of critical thinking skills lessons structured within a format incorporating the Hunter lesson design, Bloom's Taxonomy, and a hierarchy of critical thinking skills (see Appendix A). During a three day training, all aspects of the curriculum are thoroughly discussed, the research base presented, the behaviors

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10. Teaching for Transfer: Integral to every IMPACT lesson is the expectation that the student, at intervals during the lesson, will identify a broad range of applications of the skill to a variety of situations.

Project IMPACT situates the ten teaching behaviors within a curriculum of critical thinking skills lessons structured within a format incorporating the Hunter lesson design, Bloom's Taxonomy, and a hierarchy of critical thinking skills (see Appendix A). During a three day training, all aspects of the curriculum are thoroughly discussed, the research base presented, the behaviors

modelled, and participants are involved with practicing each behavior through role playing. Another important component of Project IMPACT is peer coaching. Winocur recognized the importance of providing teachers the opportunity to observe and be observed by non-threatening colleagues as a way to encourage reflection on practice. The following paragraph is taken from a section within the IMPACT trainer's manual, "When the coaching component (see Appendix A) is added and implemented effectively, most (probably nearly all) teachers will begin to transfer the new model into their active repertoire. However, coaching without the study of theory, the observation of demonstrations, and opportunities for practice with feedback will, in fact, accomplish very little." It is obvious that Winocur was aware of the fact that teachers had to reflect upon something in order for peer coaching to be of value, and that something, according to IMPACT, is the ten behaviors described above. However, reflection on practice encouraged through peer coaching is not the only form of reflection within IMPACT. Encouraging students to reflect on their own thinking, metacognition, as well as encouraging teachers to reflect on individual student's thinking are also important.

Within this section, the IMPACT program was presented as an example of the social efficiency tradition of reflection. This tradition emphasizes teachers' reflection on knowledge about teaching generated through research on teaching.

Developmentalist Tradition

The developmentalist tradition stresses reflection by teachers about their students, their current understanding of issues under study, and their developmental readiness for particular activities (Tabachnick & Zeichner, 1991; Duckworth, 1987). Cognitively Guided Instruction, a mathematics research project developed by Elizabeth Fennema and Thomas Carpenter at the University of Wisconsin-Madison, fits nicely into this tradition.

The CGI project was initiated in order to study the impact of researcher based knowledge on teacher's instructional decisions. The knowledge shared was drawn from cognitive research on primary age children's developmental solution strategies (see Appendix B) as well mathematics research on the structure of addition and subtraction problems (see Appendix b).

Currently, the research project is in its seventh year and has involved over forty teachers and hundreds of children. For the past four years CGI trainings have advanced the project beyond the research site, and CGI has now become a national mathematics staff development program for primary grade teachers.

The following quotations taken from a CGI brochure succinctly communicate key principles of the program, and the principles clearly reflect the characteristics of the developmentalist tradition of reflection:

* The goals for the CGI teacher are to facilitate the children's active mental involvement by listening to children's thinking and to then make decisions regarding the children's mathematics program according to the information

learned by listening to children.

* If children are given time to think about how they solve problems, they will become successful problem solvers.

*In order to develop understanding, mathematical ideas need to be connected to one another and children's existing knowledge must be built upon.

* Children, using a variety of strategies, can solve many different types of problems. They may choose to use manipulatives, fingers and/or tally marks. Children also apply many of the same strategies to solving computational problems. Their choice of strategy is usually dependent upon their level of development.

CGI applies constructivist learning theory to the instruction of adults as well as primary age children. The program developers recognize teachers as thoughtful professionals whose knowledge and beliefs influence their decisions about what to teach, how to teach and whom to teach (Fennema, Carpenter, & Loef, 1990). In a CGI four day workshop, instead of having authorities prescribe instruction or provide instructional activities, teachers are helped to acquire a highly structured body of knowledge about children's learning in mathematics through discussions, simulations, and guided reflection. It is assumed that each teacher will take the new knowledge and integrate it with what s/he already knows as well as account for his/her own teaching style, teaching situation and students. The primary purpose of the workshop is to help teachers

learn about children's mathematical thinking and specific math content and to support them as they learn how to make instructional decisions based on that knowledge (Franke et al., 1992).

Within this section, Cognitively Guided Instruction was presented as an example of the developmentalist tradition of reflection. This tradition stresses reflection by teachers on what it is that students understand and to make instructional decisions based on that understanding. This tradition is based on the teacher's awareness of students' developmental readiness.

Social Reconstructionist Tradition:

The social reconstructionist tradition emphasizes reflection by teachers about the social and political implications of their actions and the assessment of those actions and the context in which they are carried out, for their contribution toward greater equality, justice, and humane conditions in schooling and society (Tabachnick & Zeichner, 1991; Beyer, 1989). An action research study completed by an experienced classroom teacher will be described to exemplify this tradition. The teacher, Bob Fecho, shared his action research study at the 1992 AERA Conference. Below is an outline of his study.

Project title:

Language Inquiry and Critical Pedagogy:

Co-investigating power in the Classroom

Learning theory:

This project is based on the belief that reflection is an ongoing process that enables teachers to continually learn from

their own experiences by considering alternative interpretations of situations, generating and evaluating goals, and examining experiences in light of alternative goals and hypotheses.

Critical social constructivist theory focuses on the deconstruction and reconstruction of curriculum and instruction within this particular action research project.

The school:

The project school is urban, primarily black, and located in Philadelphia. The school has been involved with massive restructuring for the past four years, and part of the restructuring process has been to involve teachers with action research that promotes critical social discourse. The Philadelphia Writing Project has been very influential with establishing action research within the school.

Research procedure:

Participants select a topic of interest related to classroom practice, school social structure, etc. and investigate the topic throughout the school year. Meetings are scheduled for research project discussion. Participants gather data that might consist of class transcripts, interviews, student work, journals, etc.

The research teacher:

Bob Fecho is a high school English teacher and one of seven teachers who are involved in action research.

The research project:

Fecho involved his students with sociolinguistic and ethnographic studies as a way of deconstructing language to

determine its cultural, political, and economic value.

The following questions focused his research: What were my students' conceptions of language? What was important to me about the teaching of language? How could power code and personal literacy exist within the same classroom?

Researcher's comments:

The idea of sharing power, defining power, and discussing power with my students became key to my creating a course of study where issues of language and access to power could be raised.

I am a teacher who is emersed in a context of reform which stresses reflective practice. . . consequently, I read and discuss with other teachers . . . I see my classroom as a site for inquiry. . . I made an investment in my practice which now resonates through seven other teachers voluntarily partnered to me.

From this study, I have decided that part of my role is to present options to students.

Rather than searching for a quick fix, teachers in my program will generate discussion that will enhance how they view their own classrooms . . . instead of relying upon knowledge to trickle from the outside in, we will be constructing our own knowledge to further refine practice and spark new questions.

What we need to do , as a research community, is to find ways to broaden these discussions to those within our local context and to the wider discourse community as a whole.

(Comments were made by Bob Fecho during the 1992 AERA Conference.)

Within this section, four types/traditions of teacher reflection have been discussed: the academic, social efficiency, developmentalist, and social reconstructionist (the generic excluded from this discussion). An attempt was made to identify and describe a representational teacher training from each of the traditions. During this attempt, it became apparent that within each training program teachers were asked to reflect on various types of knowledge: content knowledge as well as the student's developmental understanding of the content; the social and political construction of content as well as the content itself; the efficient management of a lesson as well as the metacognition of the student. However, considering the complex thinking required during teaching and the relatively new application of constructivist learning theory, the reality of staff development programs involving teachers with multiple types of reflection during training is not surprising. It is reasonable to predict that future teacher programs will incorporate all four traditions of reflection.

Summary

In an attempt to summarize, I will relate the title of this paper, "Reflecting on the History, Ethics, and Application of Reflection", to a quotation by John Dewey: "As long as our activity glides smoothly along from one thing to another, or as long as we permit our imagination to entertain fancies at pleasure, there is

no call for reflection. Difficulty or obstruction in the way of reaching a belief brings us, however, to a pause. In the suspense of uncertainty, we metaphorically climb a tree; we try to find some standpoint from which we may survey additional facts, and getting a more commanding view of the situation, may decide how the facts stand related to one another" (Dewey, 1910).

I have used this paper to construct a tree from which to view the topic of reflection, to situate it historically, problematize it ethically, and investigate its use within teacher training programs. In doing this, I have learned a lot.

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I have used this paper to construct a tree from which to view the topic of reflection, to situate it historically, problematize it ethically, and investigate its use within teacher training programs. In doing this, I have learned a lot.

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Appendix A

Project IMPACT: lesson sample and guidelines for peer coaching

IMPACT

LESSON 2.9.1 *JACK AND JILL*

CRITICAL THINKING LEVEL
PROCESSES

SKILL
INFERRING
Assumptions

OBJECTIVE(S)
Given a problem, students will eliminate incorrect answers based on assumptions about the operations of +, −, ×, and ÷.

PREREQUISITE SKILL(S)
Comparing/contrasting
Categorizing
Relevant/irrelevant information
Cause/effect relationships

TAXONOMY LEVEL(S)
Analysis

MATERIALS/EQUIPMENT
Study Sheet 1

INTRODUCTION

Have you ever looked forward to going to a school dance, a vacation, a field trip, or a friend's house? What was it that made you expect or assume that those events would be fun? Did you have previous experiences that led you to believe that this special occasion would be as enjoyable as past experiences had been? Using past experience or evidence to predict something new is called "making assumptions." In this lesson we will use our past experiences and the evidence given as a basis for analyzing statements and math problems to determine assumptions.

TEACHING STRATEGY

The teacher will:

A. Discuss the concept of "making an assumption."
- supplying missing information.
- predicting from past experiences and applying conclusions, without checking, to a new situation (e.g., turning a water faucet on and expecting water to come out because it always has in the past).
- thinking in a learned pattern even though nothing is stated directly or indicates that it is true this time.

B. Demonstrate "making assumptions" with a nursery rhyme.
1. Write on the board. Jack and Jill went up the hill
   To fetch a pail of water.
   Jack fell down and broke his crown.
   And Jill came tumbling after.
2. Tell students that certain assumptions can be made about what happened. Read the following assumptions and have students indicate whether the statements are true, false, or uncertain. Have them support their answers.
   a. There was water at the top of the hill. *(True)* (Allow for divergent responses if supported.)

TEACHING STRATEGY, CONTINUED

   b. Jack and Jill are related. *(We can't tell.)* What prior assumptions have you made about their relationships? (Some students may have assumed that they were brother and sister without thinking about it.)
   c. Jill pushed Jack down the hill. *(False: he fell.)*
   d. Jack was a prince. *(False. "Crown" has more than one meaning.)*
   e. They were using the water to make lemonade to sell. *(We can't tell.)*
3. Ask if students can think of other true assumptions. Discuss their responses.

C. Expand concept of "making assumptions" to mathematical operations.
1. Write on the board:*

a	b	c	d
367	4,963	98	
+ 198	− 1,179	× 79	23 ⟌ 1196

2. Ask what you can assume about the sum of the first problem. *(It will be larger than either of the numbers in the problem.)*
3. Write under the problems: a) 227 b) 378, c) 9,489, d) 565
4. Ask students which of these answers we can assume to be incorrect. *(a − smaller than either number; b − only slightly larger than top number; c − much too large; d − much too large)* Point out that, by identifying assumptions about answers, we can often automatically eliminate wrong answers on a test.
5. Repeat this process for each operation.

   Subtraction *(The difference is smaller than the top number.)*
   Multiplication *(The product is larger than either of the numbers.)*
   Division *(The quotient is smaller than the dividend.)*

D. Distribute Study Sheet 1. Have students cross out the answers they can assume to be false, then write why they assumed so.

*Note: Only whole numbers have been used. If your class is sophisticated enough, you may want to include fractions and decimals. The assumptions will be different.

CONCLUSIONS AND APPLICATION

In this lesson we analyzed some statements and problems and made some assumptions about them. Let's review: What are 3 criteria that clue you that you're making assumptions? *(expecting, predicting, identifying a pattern even though nothing is directly stated)* What assumptions can you make about the answer of $\times$? $+$? $-$? $\div$?

VARIATIONS

Homework:

1. Select a nursery rhyme. (Humpty-Dumpty, for example.) Make up 5 assumption statements about the rhyme. Tomorrow we'll see if the class agrees with your assumptions.
2. List 3 assumptions that you make when you come to the math section on a test.

Directions — In the following problems, cross out the answers that you can assume to be false. Next to the answer, write why you assumed it was false.

1. $\begin{array}{r} 72 \\ \times\ 39 \end{array}$
   a) 66 _____
   b) 272 _____
   c) 2.798 _____
   d) 856 _____

2. $4\overline{)72}$
   a) 18 _____
   b) 70 _____
   c) 16 _____
   d) 144 _____

3. $\begin{array}{r} 146 \\ +\ 372 \end{array}$
   a) 298 _____
   b) 376 _____
   c) 598 _____
   d) 518 _____

4. $\begin{array}{r} 9.673 \\ -\ 4.536 \end{array}$
   a) 6.117 _____
   b) 13.709 _____
   c) 5.037 _____
   d) 1.927 _____

5. $\begin{array}{r} \$128. \\ +\ \$\ 63. \end{array}$
   a) $97 _____
   b) $191 _____
   c) $121 _____
   d) $201 _____

(continued on next page)

Teacher Participant_____

Peer-Coaching: The following coaching model is research based and very specific. Two colleagues agree to observe one another for a particular teacher behavior. The behavior is selected by the partner to be observed at a pre-observation conference. At this session, consensus is reached as to what the identified behavior "looks like" and "sounds like." They also agree on the notation system they will use to record the observation. In addition, five students are identified for observation and, finally, the days, dates and times for the four observations are scheduled.

The twenty minute observation may occur during the introduction, instruction, guided practice, or closure phases of the lesson. What is important is that the identified teaching behavior is exhibited on one or more occasions during the phase of the lesson that is selected. This takes planning.

For the first ten minutes of the observation, the coach takes notes whenever the identified behavior is observed. Notes are kept by completing the sentence, I observed "_____" when my partner said/did "_____". Then, for the remaining ten minutes, the observer concentrates on apparent effects of the teacher behavior on the five identified students and records their reactions.

At the close of the twenty minutes, the observer leaves all the observation notes with the teacher and quietly leaves. Subsequently, the teacher reads and interprets these notes for answers to the following questions:

--Was the identified behavior observed?
--Did it look/sound as I had anticipated?
--If so, how frequently?
--Was what I said/did appropriate?
--What was the effect on students? Did it enhance or detract from the learning moment? If so, in what way?
--Am I confident in the application of this skill or do I need more practice?

During a follow-up debriefing session, the teaching partner requests clarification of the notes, as well as feedback about conclusions he/she has reached. The coach asks questions, probing the rationale as to why the teacher behavior as appropriate and effective. A decision is then reached as to whether or not the same behavior will be the focus of the next session.

Observation #1

Teacher to be observed: _____

Date of observation: _____

Time of observation: _____

Students to observe:
_____
_____
_____
_____
_____

Skill observed: _____
_____

Observation #2

Teacher to be observed: _____

Date of observation: _____

Time of observation: _____

Students to observe:
_____
_____
_____
_____
_____

Skill observed: _____
_____

Observation #3

Teacher to be observed: _____

Date of observation: _____

Time of observation: _____

Students to observe:
_____
_____
_____
_____
_____

Skill observed: _____
_____

Observation #4

Teacher to be observed: _____

Date of observation: _____

Time of observation: _____

Students to observe:
_____
_____
_____
_____
_____

Skill observed: _____
_____

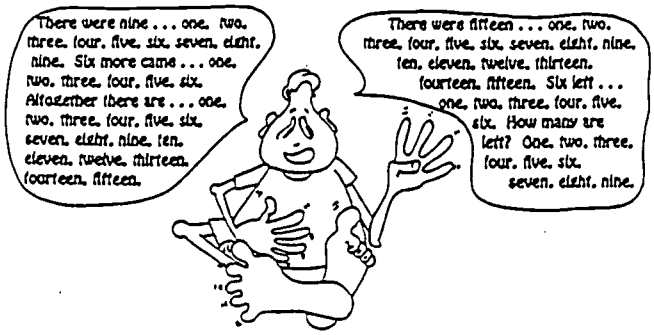
Appendix B

Cognitively Guided Instruction: examples of children's solution strategies and addition and subtraction problem types

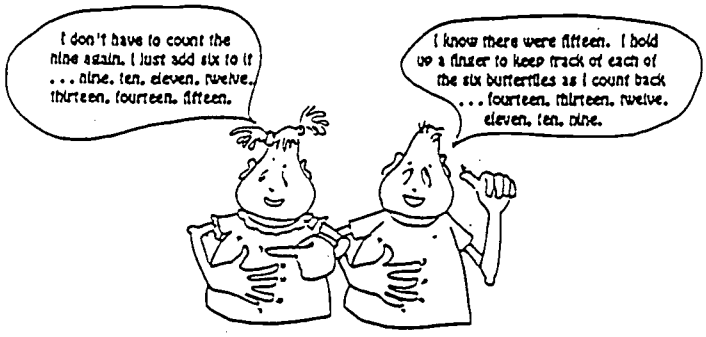
SOLUTION STRATEGIES

Joining Problem	Separating Problem
There were nine butterflies in the garden. Six more fluttered in. How many butterflies are there altogether?	There were fifteen butterflies in the garden. Six fluttered away. How many are there now?

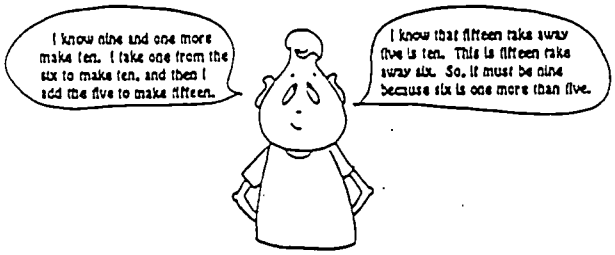
DIRECT MODELLING



COUNTING STRATEGIES



DERIVED FACT



FACT RECALL

JOINING PROBLEMS

Result Unknown

There were five butterflies fluttering in the garden.

Three more fluttered in.

Now how many are in the garden?

How many butterflies are in the garden?

Change Unknown

There were five butterflies fluttering in the garden.

Some more fluttered in.

? ?

Now there are eight fluttering butterflies.

How many butterflies fluttered in?

Start Unknown

There were some butterflies fluttering in the garden.

Three more fluttered in.

Now there are eight fluttering butterflies.

How many butterflies were in the garden at the beginning?

SEPARATING PROBLEMS

Result Unknown

There were eight butterflies fluttering in the garden

Three fluttered away.

Now how many are in the garden?

How many butterflies are left fluttering in the garden?

Change Unknown

There were eight butterflies fluttering in the garden.

Some fluttered away.

? ?

Now there are five fluttering butterflies.

How many butterflies fluttereed away?

Start Unknown

There were some butterflies fluttering in the garden.

Three fluttered away.

Now there are five fluttering butterflies.

How many butterflies were in the garden at the beinning?

PART - PART - WHOLE

Whole Unknown

There were three yellow butterflies and five red butterflies fluttering in a garden.

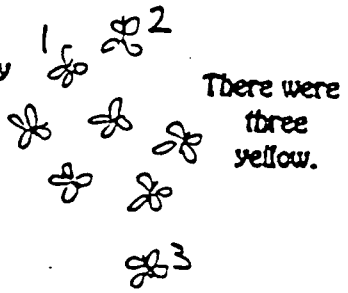
How many butterflies were fluttering?

There were eight altogether.

Part Unknown

There were eight butterflies fluttering in a garden. Five were red. The rest were yellow.

How many were yellow?

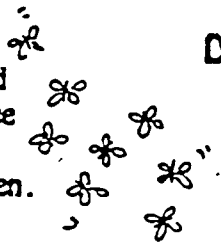


There were three yellow.

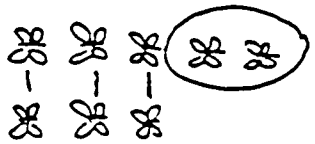
COMPARE PROBLEMS

Difference Unknown

There were five red butterflies and three yellow butterflies fluttering in a garden.



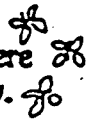
How many more red than yellow butterflies were there?



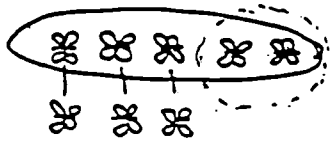
Compare Quantity Unknown

Red and yellow butterflies were fluttering in the garden.

Three were yellow.



There were two more red than yellow. How many red were there?

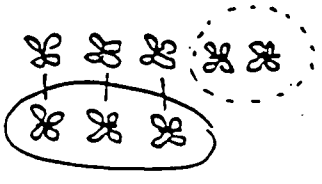


Referent Unknown

Red and yellow butterflies were fluttering in the garden.

Five were red.

There were two more red than yellow. How many yellow were there?



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