Critical Science Approach- A primer

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I want you to keep reading even when you feel like you are leaving your comfort zone. For the many practitioners in the age group of 40+, who attended undergraduate university in the early 1970's, adopting a critical science approach to practice was not even an option because it did not exist in our field until after 1979 (thanks to Brown and Paolucci). We have a heritage of a technical, I am the expert, fix the symptom so people can cope approach. A critical science approach enables us to deal with the changing complexity of daily life, moving beyond the customary approach that allows us to say things like, *"I was taught this way. This is the way it has always been done. This is all I know how to do. This is what the textbook says. I will get fired if I do not do it this way. This is what the curriculum says I have to teach."* A critical science approach simply does not leave any room for taking things for granted. Life is not stagnant, so our practice should not be either.

The critical science approach helps us probe beneath the surface meanings of words and symbols to comprehend root causes of problems instead of always treating the symptoms from a technical, quick-fix perspective. The first part of this primer will set out the main principles and insights comprising the critical science approach. The second section will discuss how classroom teaching changes from a critical science approach. The entire paper draws heavily on the awesome 1999 AAFCS Education and Technology Division Yearbook 19 on the critical science approach (Johnson & Fedje, 1999).

Conceptual Clarification

I know that some readers will argue with mixing the terms critical theory and critical science. As a caveat, scholars agree that the term critical theory is now used loosely to group all sorts of work related to the task of uncovering the cultural assumptions that dominate in a society; we know this as the *prevailing ideology* or world view - currently the scientific, neo-liberal, capitalistic world view. Each society needs critics to idealize a higher order of freedom than that which is currently attained under the prevailing ideology. In order to gain that freedom, critical theory holds that one must be conscious of how an ideology reflects and distorts reality and be conscious of what factors influence and sustain our false consciousness of who is in power and how that power dominates us and our daily life (Habermas, 1973). Critical theory has an overt political goal: that of a rational, free, and decent society (Young & Arrigo, 2000). A free society mediates freedom of the individual and freedom in the individual meditates freedom for society. For the individual to develop into an autonomous person, his/her sociocultural milieu must encourage such development (Brown, 1993).

This paper is about the critical science approach, stemming from critical theory. Gentzler (1999) provides the following useful distinction - while critical theory refers to the *outcome* - the improvement of human life - critical science refers to the *process* we engage in to get the desired result. The critical science approach unites science for observation (evidence) and philosophy for analysis and criticism (reason) (Yoo, 1999), resulting in improved living conditions for the human family. It is that process that will be expanded upon in Part One.

Part One - Overview of the Critical Science Approach

The basic tenet of the critical science approach is that people need to think about improving their living conditions rather than accepting and coping with their present conditions. That improvement is contingent upon people being conscious of social realities which exploit or dominant them and then demanding liberation from these forces. If people can be taught to recognize that their condition can be improved, they are more likely to work together to achieve this improvement, liberation, freedom. Otherwise, they continue in their passive, dependent

roles, blind to their power or any opportunity to change things to their benefit; they continue to accept their plight and find ways to adapt through conforming. The core of this idea is that if societal structures and conditions can be altered, then human happiness and social autonomy can be attained (individual happiness *within* the community rather than happiness at the expense of the community). Inherent in this process is examining the historical context that shaped the current reality (Gentzler, 1999). The following text provides some detail related to the process of engaging in practice from the critical science approach.

Critical Literacy in Practice

A critical science approach helps people gain: (a) personal freedom from internal constraints such as biases or lack of a skill or point of view, and (b) social freedom from external constraints such as oppression, exclusion, abuse of power relations. Removing these limitations to freedom and daily life involves the processes of emancipation, liberation, empowerment, and transformation. Critical science is concerned with power relationships, especially distorted power relations, that make it easy for the elite to oppress others by controlling knowledge, access to power, meanings, and daily practices. Uncovering this power imbalance entails finding out "what is" so you can determine "what could be" (Rehm, 1999).

Language of critique (unearthing *unspoken* assumptions, values, and ideologies)

critical consciousness -	Slow realization that people do have the power to change things that keep them down, marginalized, and exploited increases self-consciousness.
problem posing -	By telling one's own, and reading other's, stories, one can gain the skill to *name* the problem in one's life created due to abuse of power.
self-reflection -	Getting people to try to figure out "why you are doing what you do in your daily life" increases self-knowledge. These actions, or habits, that keep people down trodden or not liberated include: self-doubt, biases, resentment, compulsions, unthinking acceptance of popular ideas, dependence on experts, bad habits, and boredom. Reflecting on these things can lead to the creation of new labels and names for the things that happen in people's daily life. With this understanding, people can reframe things so they are not unthinking or destructive but rather true and moral.
social critique -	Unpeeling the beliefs, attitudes, and actions that contribute to subordination of most people by a very few (elite), reveals the current power relations. Once they are exposed, it is easier to challenge the patterns of domination and change the balance of power so people no longer "buy into" a false consciousness - their awareness can now be continually fed by ongoing exposure of the plot to keep them down so elite interests can be served.

Language of possibility and potential

Once people have unveiled the negative conditions that keep them oppressed, they can reframe their thinking so they can see the possibilities of breaking free of the oppression. This is achieved by giving people a voice - their personal voice - and by helping them see that this voice is valid and needs to be heard in the larger discussions of what society could be like.

Language of Action

Dialogue -	This involves talking, listening, sharing, perspective taking, questioning, responding, reframing, adapting, suggesting, and challenging even silence (which could indicate confusion, anger, discomfort, anxiety, serious contemplation)—consider carefully and at length.
Consensus building -	Through dialogue, people can learn from the opposing view, from contradictions to their own view, leading to *growth of their own social imagination* as multiple perspectives, the world experienced by others, are shared and assimilated.
Taking collective action -	As a result of focusing on power distortions and social contradictions (negative conditions), critical science allows people to end up in collective action to right the wrongs. This action is positive—cooperative, inclusive, and caring in nature (knowing people on a deeper level) - based on nurtured, helping relationships. People's worth, trust, and capabilities are nurtured—power is shared not hoarded or abused (Rehm, 1999).

Part Two - Critical Science in the Classroom

In the classroom, from a critical science approach, the teacher starts by teaching the nuances of a broad, universal concept (see Chart One) and then facilitates the students' selection of issues that can be analyzed from this broader level. For example, s/he would help the students appreciate the broad concept of exclusion (to keep from being admitted, included, or considered) and then the students could examine dimensions of the recurring problem of housing that are related to exclusion (homelessness, low income, presence of pets or children, etc). To that end, the teacher does not go in with a developed lesson plan for content but rather a description of the process to be used to ensure critical learning (Hauxwell & Schmidt, 1999).

Chart 1 Broad Concepts

accountability	diversity	exclusion
responsibility	common good	oppression
democracy	authenticity	dignity
justice	values and morals	security
freedom	critical thinking	practical reasoning
liberation	dialogue	moral value reasoning
wellness	equity	the work of families
connections	peace	family
power	conflict	system of actions
risk	oppression	change
caring	ideologies	relevance
perceptive taking	sustainability	
respect	marginalization	

Therefore, when teaching from a critical science approach, teachers do not use just lesson plans but rather learning plans wherein the students design their own relevant, meaningful learning experience so they can learn concepts and appreciate contexts related to a recurring problem in society (Williams, 1999). Traditional lessons planned by the teacher

perpetuate the “teacher as expert, student as empty vessel” mind set. These lessons usually contain content and procedures designed to create specific student behavior and outcomes. From a critical science approach, the lesson would be about constructing a concept rather than just transmitting knowledge/facts, which may be needed to construct the concept. Learning plans are a way to share power and foster a sense of ownership and commitment because they are developed with joint planning and participation.

Learning plans focus the lesson so that it builds understanding of a concept from today’s content standards (see the 1998 national standards for family and consumer sciences in the United States at http://doe.state.in.us/octe/facs/natlstandards.htm). Using these content standards, which set out what students *need to know and need to be able to do*, can create a tension because the critical science approach is about letting the learner decide what they need to know, do, and think based on what they already know. With guidance from the teacher and families, this tension can be relieved because students are intricately involved in the planning of their own learning, giving them a much larger stake in their education. Planning their own learning experience makes their education more meaningful, exciting, and a reflection on life outside of school. Learning plans provide a vehicle for sharing power - the central tenet of the critical science approach! Learning plans are sort of plans of actions for the learning process for the course. The student decides, at the end of the course, if they learned! This means that normative evaluation controlled by the teacher (true and false, fill in the blank, multiple choice, etc tests) has to be supplemented with authentic assessment tools controlled by the learner (portfolios, rubrics, project based learning, assessment mapping, service learning, student led conferences, alternative grading techniques, etc) (Olson, Bartruff, Mberengwa, & Johnson, 1999).

Several other aspects of classroom interaction and expectations change when teaching from a critical science approach. First, instead of going into the classroom with a set of complete objectives, students and the teacher set the objectives together so the learning is meaningful for them and relevant. Second, assigning students to groups, giving them pre-determined questions and telling them what issues will be addressed go against the critical science philosophies of relevance, personal meaning, and responsibility for one’s own learning. Third, the teacher has to learn how to relinquish authority to the students, who in turn have to be comfortable with assuming authority - control, making judgments, dealing with power, making and enforcing rules, etc. They need to see themselves as learners together and be aware of power relations and how this power arrangement affects the learning environment and process. Fourth, the objective of teaching from a critical science approach is to have “students go about **learning something**” rather than “going about teaching them something.” Fifth, the CS approach enables the learner to **perceive how they are affected by society** in addition to how they can affect society. There needs to be a balance of these two power positions or collective action will not occur in the absence of reflection on one’s ability to affect external constraints.

Finally, the critical science approach involves three **levels of questioning** - (a) the traditional technical questions (check for understanding of cause and effect, means, and ends); (b) conceptual questions (uncover how the student understands something - their mental images of an event, how their thoughts evolved); and (c) critical questions (examine the meanings and truths revealed from other two sets of questions - tease out “taken for granted stuff” - stuff that is often self-defeating, self-perpetuating, manipulative, controlling - that is revealed in inconsistencies, contradictions, inaccuracies, incompleteness) (Selbin, 1999).

I hope you continue on your journey towards learning to embrace the critical science approach to practice. I know from experience that this is an upward climb, but the view from the top is incredible!

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