

Cultural Competence and the Transfer of Science Literacy

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Abstract

This paper broadens the construct of cultural sensitivity to better fit current thinking about collaborative international development and the transfer of knowledge. The one-way north-south transmission of knowledge model has evolved into a multi-dimensional model. This new model requires more than just sensitivity to cultural differences. It requires a cultural competence that includes awareness, skills and knowledge in three areas; the culture of the group sending an advisor, the culture of the group receiving an advisor, and the cultural implications of the knowledge transmitted. These three areas are discussed in terms of a transfer of information on science literacy.

Introduction

This paper examines cross-cultural issues related to science educators' involvement in international development efforts. The North-South transfer of knowledge has been narrowly viewed as a one directional flow from countries with more developed economies to countries with less developed economies (Torres 1993). Others view this process as more complex, exemplifying a two-dimensional or even a three- or four-dimensional phenomenon (Fry & Thurber 1989). Associated with the "one-way transmission" model was a one-dimensional approach to cultural issues. Emphasis was placed on the advisor learning enough about the host country culture to function effectively. Those involved in this type of "transfer" know that it is far more complex than the older, one-way model implied. The transfer is not a one-way delivery of packaged knowledge but a multi-directional sharing of information and informed possibilities. The same issues that challenge an outdated deficit/transfer model in the science classroom are also evident at the national level when collaborative teams meet to reform science curricula and pedagogy.

The concept of cultural sensitivity is not new. However, in the more collaborative setting of information sharing, cultural sensitivity is just one aspect of cultural intelligence and cultural competence. Those involved in collaborative efforts need to broaden their awareness, sensitivity and knowledge of cross-cultural interactions beyond the limited country "area studies" of the past. The multi-dimensional model requires advisors to reflect on cross-cultural implications of their efforts in three interrelated cultural ecologies; the culture of the sending group, the culture of the receiving group and the culture of the content knowledge.

Culture of the Group Sending

Cultural baggage

International volunteers, consultants and advisors carry with them beliefs, customs, expectations, and history that will have an impact on their developmental efforts. They carry with them their cultural baggage, some of which impacts more strongly than others. Frey & Thurber (1989) are especially critical of the cultural baggage carriers they label as the “evangelists for western values”, or the “non-missionary missionaries.” Advisors who play the role of cultural missionaries, view development as a linear process where every society goes lock step through the same basic stages. They embody an ethnocentric approach, well described by Sinai (1964) as follows...

Before this new elite, however, can even begin to wrestle with the ponderous and sluggish social forces with which it will have to contend, it will have to absorb the spirit generated both by the Reformation and Enlightenment. Without assimilating these Western values, emotions, virtues and drives, no development of any sort will be possible. (p. 219)

Cultural baggage arrives in all sizes, from carry-ons to oversized trunks. While not all as egregious as the ethnocentric developmentalist, the carry-on forms often accompany imported curriculum programs and teaching strategies. The following vignette provides talking points between culturally responsive versus counter-cultural teaching styles.

We were part of an international volunteer program and assigned to the same region. I was visiting his village where he shared this story with me. He had been assigned to a remote rural primary school to help implement a new national science curriculum. He taught a class of fourth grade pupils. Most of his students would finish their formal education after grade six. A few might be able to attend high school if their families could afford the tuition and if they could find a place to board in the distant city. Teachers were held in high esteem in this culture especially so in these remote small villages. All of the teachers commuted to the school and stayed in either local homes or in the dormitory of the home economics building on the school grounds. They rode to the school in the back of trucks that used the river bed as a road. The rainy season forced teachers to stay in the village for weeks until the river fell low enough for the trucks to return. The head of the elementary school functioned as a leader in the community. I would often see him reading a newspaper to a group of men and women gathered on the steps of his rented house. As a greeting, students would commonly take the hand of a teacher and press the back of it to their foreheads as a sign of respect. I remember the honor I felt as my walk to the school was interrupted by children darting to grab my hand place it against their forehead and dash off.

“I began my science class about weather” he said, “and taught it using the inquiry

approach.” “However, I decided to add a twist to the lessons. Whenever I mentioned the sky, I referred to its color as green. I kept it up though out the unit telling the class the sky was green and asking them to repeat after me the sky is green.” He said the class responded just as he expected. They repeated after him in choral fashion that the sky was green. “What color is the sky?” he would ask, “green” would come the response” Yes, “the sky is green” he would repeat. He gave the students a test at the end of the unit and one of the questions asked what color the sky was. Every one of the thirty students selected green. He told me he did not have to feign disappointment with their response to the question. He was upset that the students could go through an inquiry unit making observations, collecting and recording temperature data, drawing conclusions and not question his comments about the color of the sky. He berated them for knowing that the true color of the sky was blue and not questioning his repeated assertions that the sky was green.

It is as easy to understand the teacher’s rationale for this type of lesson as it is to question its appropriateness. One might question it on the grounds of village cultural norms of respect and authority of elders in general and teachers in particular. Many from the culture of the sending group might advocate this “question authority” approach. The lesson reflects a spirit of emancipatory pedagogy. This approach to curriculum is reflected in the titles of popular professional literature at the time of this episode, such as *Teaching as a Subversive Activity* (Postman & Weingartner 1969) and *Pedagogy of the Oppressed* (Freire 1970). Many of the educational writers of the 60’s advocated a counter-culture approach to education. The teacher in this vignette could be accused by some of running rough shod over local cultural traditions in order to challenge students to think like he thinks. He might also be singled out for praise as an agent of change, one who stirs things up in order to challenge students to think outside of their cultural boundaries.

Research in science education has examined teacher beliefs through analogies. Teachers who view themselves as a captain of a ship and their learners as crew evoke one picture of learning while an analogy of a guide assisting learners along a mountain path evokes another. What analogies do development personnel have for their role in development? How will one who views his or her role as a catalyst for change respond in a culture that values tradition? How will those who view themselves as conservators of indigenous traditions respond to changes required in a development project’s memorandum of agreement?

It appears no one nation has a monopoly on unpacking their cultural baggage on foreign shores. Educational writings of the late fifties and sixties included such titles as, *The Ugly American* (Lederer & Burdick 1958), *The Ugly Russian* (Lasky 1965) and *Japan Unmasked* (Kawasaki 1969). All documented some notable lapses in cross cultural sensitivity and communication. These books should be part of the required readings for those in international development so that sins of the past are not repeated with each successive wave of consultants, volunteers and advisors.

Cultural change

Are there times when cultural differences should be challenged? What if the cultural belief of the receiving group is undoubtedly harmful to learning or blatantly discriminatory? Are there times when a consultant should challenge the culture of the receiving group? I believe there will be times when such challenges must be made. I think the question is how it should be made. Science educators believe that changes called for in the implementation of curriculum reform will require what amounts to cultural change. Rogan and Grayson (2003), as part of an emerging theory on curriculum implementation in developing countries, offers a proposition that, "Changing teaching and learning practices should be viewed as a change of culture rather than merely a technical matter." They go on to say:

The implication here is that those from the outside who are attempting to promote innovation in a school need to assist in the development of a community of practice which possesses both the influence and the authority to question existing practices and to adopt and promote new and shared cultural values. (p.1200)

I believe it is here in the educational setting where an outside consultant has the right, and perhaps obligation to confront cultural issues, including those that may have roots beyond the classroom. Cultural sensitivity should not mean loss of voice in issues central to expertise. However as Rogan and Grayson suggest this is best done through a community approach. Cultural competence in these cases follows the lines of an old prayer asking for the patience to accept what cannot be changed, the courage to change what can be changed, and the wisdom to know the difference.

Cultural competence

The developing multicultural literature on diversity and cultural differences within countries could contribute to better cultural understanding across countries in international collaboration. Wittmer and Myrick (1989) describe cultural competence as the ability to work successfully in other cultures. While their focus is on working with minority cultures within the United States, their competence model could be adapted for use in international settings. The model summarizes components of cultural competence in what he terms the ASK model, Awareness, Skills and Knowledge. Here is a modified list of their elements of cultural competency.

1) AWARENESS and ABILITIES - Consultants must be aware of self and others. They must understand their own values, biases and stereotypes. They must be willing to discuss cultural issues openly. They must be able to respond to cues. Consultants must be willing and able to work with qualified interpreters or willing and able to learn a new language.

2) SENSITIVITY and SKILLS Consultants must demonstrate genuineness, warmth

and empathy toward the community. They must accept ethnic differences. A culturally competent consultant will have the willingness to go the extra mile for people of different cultures in order to achieve outcomes.

3) **KNOWLEDGE** Consultants must be knowledgeable of the community's culture, history and traditions. Consultants must be aware of community resources available to them such as community leadership groups and institutions that cater to the community. Consultants must also know if personal or professional values conflict with the needs of the community.

It is helpful to view cultural competence as a developmental process that evolves over an extended period. Individuals are at various levels of awareness, skills and knowledge along a cultural competence continuum.

Culture of the Receiving Group

Customs and politics

The day I arrived at my host's house was hot and humid. This was my first overseas assignment and I was still adjusting to the tropical heat. After being greeted at the door and shown my accommodations, I was invited to sit and have refreshments. A tall glass appeared in front of me and filled to the brim with boiling water. I noticed the others were served ice water. I thought this might be a local custom, a sign of welcome. Not wanting to offend, I smiled, thanked the host and reached for the glass. It was too hot to touch. The children of my host around the table watched intently while the adults seemed to wait expectantly for me to take a drink. I continued conversation while waiting for the water to cool enough to lift it and take a sip. I drank what I thought was a sufficient amount to appear culturally sensitive. Later I asked my host about the boiling water. He showed me a letter that had arrived a few days before I arrived. It was a general letter of introduction and contained information about cultural differences between our two countries. It also included practical tips on how to make a foreigner feel at home. Among the recommendations was that I preferred to drink boiled water. We both thought we were being sensitive to cultural differences, he in serving the boiling water, me in drinking it. We had a good laugh and thankfully the glasses of boiling water stopped.

While cultural misunderstandings may provide opportunities for humor, successful international collaborations often hinge on cross-cultural understandings of the host country. Cultural competence means understanding among other things, a country's, customs, history, current political issues, food restrictions, language, and non-verbal communication. Non-verbal behaviors are to a large extent culturally determined. In some cultures, avoidance of eye contact by some might be regarded as rude, inattentive, passive-aggressive or

disinterested. In others, it may be considered a sign of respect. In the United States, for example, avoidance of eye contact is often viewed as a sign of hiding something or guilt.

In addition to these more obvious cultural adjustments comes the less obvious need for sensitivity to tensions associated with politics, language, and education reform. It is difficult to separate politics from development work. While most advisors realize the importance of a neutral stance in host country politics, Benveniste (1977) points out that sometimes subtle legitimization functions that advisers often provide just by their presence. Their successful development efforts, no matter how non-political, tend to support or shore up the existing government structure. The introduction of locally unpopular ideas may get a boost because it is perceived as part of an international movement. Awareness of political issues and agendas into which one might be drawn make up another component of cultural competence that can tax one's cultural intelligence quotient.

Language

“We are illiterate in three languages, our native language, our national language and our language of instruction.” He laughed at his own joke, but my host colleague identified a major curriculum problem in his and many other nations striving to educate their citizens for tomorrow’s world. Science and math education hold center stage in these debates. They are frequently the first primary content courses taught outside the vernacular. Science education consultants may not be involved in language of instruction decisions, but they do carry influence in their recommendations and support for or against existing school practice. This is another area where cultural competence requires awareness, knowledge and sensitivity of language-related issues in a rapidly changing world. Language is both an expression of culture and the chief means of cultural transmission. Decisions regarding what language of instruction will be adopted must be sensitive to the impact on indigenous culture. Thomson (2003) summarizes the challenge;

To date the official language in most sub-Saharan countries is an imported European language and education policies have excluded the use of indigenous languages beyond primary school. The educational liabilities of imported languages use only policies impacts on poor performance, school drop-outs rates, inappropriate and culturally irrelevant materials, and exclusion from participation in national decision making. (p.91)

A no less important aspect of indigenous languages, especially in Africa, is the threat of extinction. Africa has at least 1,000 distinct indigenous languages (Bamgbose 1991) with as many as 200 of them facing extinction (Sommer 1992). Thomson (2003) points out that these endangered languages include the potential loss of indigenous knowledge systems in science and that several thousand years of this science knowledge may be lost in their passing. Thomson believes science educators have a major responsibility in this area.

Since extinction is forever, a concern, responsibility, and role for science education researchers is to join this effort to preserve and promote indigenous science knowledge in Africa. The challenge is especially important for those science educators who recognize that meaningful learning is best constructed through children's lived experiences. And, given that there is international agreement that indigenous culture, cultural identities, and self-determination are recognized fundamental human rights (Ayton-Shankar 1995); it has become a challenge and responsibility for science educators to become active advocates in promoting indigenous science education. (p.91)

Cultural competence requires examination and sensitivity to intended and possible unintended ramifications of development plans. Advocating English or any foreign language as the language of instruction must be done with an awareness of the threats to these larger issues of participatory governance and self-determination.

Culture of the Transmitted Content Knowledge

I spent a few months in a remote rural village far from any medical services. The purpose of my visit was to assist teachers to implement the new national curriculum with its emphasis on science inquiry. The teachers participated in a week-long workshop before the school year started and I was now doing a site-based follow-up. One evening I was invited to have dinner with one of the teachers and her family. The teacher had a college degree and was very knowledgeable about science. During the course of the meal, a fish bone caught in my throat. It was a small bone and somewhat flexible so while it didn't cause any immediate danger it refused to dislodge. My host offered to have someone come to the house to help me. I declined, thinking the bone would soon work its way loose. After some time had passed and the bone still stuck I asked the teacher who she had in mind to help me. She mentioned that a young girl in the village could come and that she had a special power to correct this type of problem. I asked why this particular girl had such power. "This girl was a breech-birth baby and that gives her the power to turn things around". I was surprised that this experienced science teacher held such strong belief in this non-science remedy. The teacher's voice had a strong tone of conviction. I decided not to chide her about being a "superstitious" science teacher. The bone worked its way loose on its own but the apparent failure of science education to weaken or dislodge "non-science" ideas stuck with me.

This rather minor incident represents a major problem in the larger, local community. Medically trained doctors and health care professionals were available and affordable, but were often not consulted until after traditional medicinal efforts failed. Often this delay would make early diagnosis impossible and treatment more difficult if not impossible. The role of science literacy in attempting to challenge indigenous science beliefs is part of a larger debate on the very nature of science.

Science as cultural phenomena

Until relatively recent times, a positivist philosophy dominated our view of the nature of science and, indirectly, science education. Positivism describes science as objective, universal (not culturally influenced), empirical, quantifiable, a body of knowledge, and a search for truth. This traditional view of science has come under increasing attack over the past thirty years. It is being challenged by what many term a postmodern or social constructivist view of science. Part of this reasoning developed out of the work of cultural anthropologists who applied their research methodology to study the work of scientists. These researchers identified a number of attributes that science held in common with culture. These included language, rules, traditions and a well defined system of norms, values, beliefs, expectations, and conventional actions. (Kelly, Carlsen & Cunningham 1993; Pickering 1992; Rose 1994). This postmodern view of the world originated in the arts and later spread to disciplines of sociology and spawned the field of cultural studies called cultural or social constructivism. It then, according to Gross and Levitt (1998), “infested” science.

Constructivism views science as a cultural phenomenon, a set of conventions generated by the people conducting science and influenced by historical context. Cultural constructivists label science as Western science and describe aspects of this science as: mechanistic, materialistic, reductionist, empirical, decontextualized, mathematically idealized, communal, ideological, masculine, elitist, competitive, exploitive, impersonal and violent.

Science as cultural imperialism

The postmodern view of science holds that Western science is inherently inaccurate and incomplete by its failure to incorporate a full range of cultural perspectives. As a result of being a product of Western thought, science is believed undeserving of a higher position on an epistemology hierarchy than other ways of knowing. This leveling of Western science with other ways of knowing gives rise to accusations that acculturation of science as part of development initiatives threatens indigenous cultures. Western science becomes demonized as a hegemonic icon of cultural imperialism. Clay (1996) questions the appropriateness of any one definition of science and any one definition of literacy. He argues that traditional forms of knowledge, utilized by nomadic groups such members of families in traveling circuses, should be considered forms of scientific and technological literacy. The arguments for a more inclusive view of science echo in creationist and intelligent design debates in the U.S. In India, the claim that science is locally owned has been used to justify the development of a nationalistic/religious “Vedic Science” (Nanda 2003). There have been some attempts to thwart the perceived cultural imperialism of Western science by incorporating indigenous science into the existing curriculum. McKinley (1996) documents the difficulties encountered in one such attempt to equate Maori Science with Western science in New Zealand’s national curriculum.

Implications for Science Literacy

Debates over the nature of science between postmodern (constructivists) and traditional

(positivists) have moved out of academic circles and into public forums on science education reform.

In the United States, the debate played itself out in the writing of the National Science Education Standards. Participating scientists were unhappy with the first drafts of the standards that included the statement; “The National Science Education Standards are based on the postmodernist view of the nature of science”. According to one reviewer, “the pages were soaked in phrases centering on “constructing”-- as many as five references on some pages” (Holton 1996, p.554). Apparently the participating scientists’ views prevailed and the final draft of the Standards dropped the reference to a postmodern view of science. One would be hard pressed to find the word “construct” anywhere in the final document.

Postmodern criticism of science has not gone unchallenged by scientists. *The Flight from Science and Reason* (Gross, Levitt & Lewis 1996) and *Higher Superstition: the academic left and its quarrels with science* (Gross & Levitt 1998) both defend a post positivist view of science and attack the “muddleheadedness” of the postmodernist views of science. Mathews (2003) provides a philosophical defense of positivism, arguing that “we have thrown the baby (science) out with the bath water (positivism).”

Development consultants in science education need to be familiar with postmodern views of science and the cultural damage arguments of those who view science as Western and as a post colonial weapon of cultural hegemony. They need to be clear, going into a project, what their own views are about the nature of science and science education and be able to present their positions with reason and logic. They need to be aware, sensitive and knowledgeable about these issues related to the culture of science. If they promote constructivist pedagogy, they need to “tread with caution” between its radical and naïve forms. (Toh, Ho, Chew & Riley 2003).

With so much expectation and promise on the role of science in development, some suggest that the “cultural baggage” of science be put aside before entering a project.

The gulf between rich and poor and between developed and undeveloped countries widens, the environment is destroyed and the threat of annihilation looms. The social and political problems facing us are urgent and vital. I do not think this cause is helped by construals of science as a capitalist, male conspiracy or as indistinguishable from black magic or voodoo. (Chalmers 1991, p.125).

Implications for science literacy

Cultural competence in science literacy should provide development advisors confidence to address these issues rather than pretend they do not exist. With rare exceptions, advisors do not step into a *tabula rasa* environment in international curriculum development work. Within even the most centralized educational systems, there are competing ideas regarding curriculum development, implementation and assessment. In a multi directional flow of information, advisors should be less directive than in the one-way model. They are more likely to be one voice among many. The strength of their contributions lie in the

groups they align with, as illustrated by a personal anecdote. I was disappointed to find that despite being assigned to one of the more remote provincial offices in my host country, the new ideas I thought I was bringing had preceded me. The curriculum center staff were offering teacher workshops that reflected what I considered “best practices.” I mentioned to the director that I was pleased and a bit disappointed that I was not bringing him anything new. He responded that I brought him something he really needed, validity. He explained that the teachers would see that what he had been advocating aligned perfectly with what I came so far to share. Cultural competence in this multi-directional setting may well be knowing which groups to validate.

Conclusion

The one-way, North-South “transfer of knowledge” paradigm has evolved into a multi-directional model of development. This change requires those involved in collaborative efforts to broaden their awareness, sensitivity and knowledge of cross-cultural interactions beyond the limited “area studies” of the past. Advisors’ reflections on cross cultural implications of their efforts should include three cultural ecologies, the culture of the sending group, the culture of the receiving group and the culture of the content. The multi-directional model requires collaborative decision-making. Science and science education are not culturally free. Science education advisors should have awareness, sensitivity and knowledge of the culture of science. They should be aware of the academic arguments of the left and right in the “science wars” and the possible influence and implication of these positions on their own thinking and recommendations. Whose science and whose science literacy are not questions with easy answers. A collaborative effort in the development of a rationale for science literacy should be inclusive where it can be, as in the opening of science for all, and exclusive as it must be, as in the omission of ideas that owe their allegiance to authority rather than inquiry.

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