Culture, instruction, and assessment

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PLEASE SCROLL DOWN FOR ARTICLE
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Instruction and assessment need to be understood and thought about within the cultural context in which they occur. Educators and educational researchers may make assumptions that apply in their home culture but not elsewhere. And even different subcultures within an overall mainstream culture may have different views on instruction and assessment, and what constitutes intelligent performance in each. In this article, I consider the relevance of culture to instruction and assessment. I describe studies that show the importance of understanding instruction and assessment in their cultural contexts, and conclude that education and its goals must be understood in such contexts.

There are many lessons to be learned about optimal instruction and assessment by studying how they interact with cognition, in general, and intelligence, in particular, in diverse cultures. In this article, I describe some of what we have learned in our own cultural studies.

What is culture?

Because the topic of this article is culture, instruction, and assessment, it is important to define at the outset what is meant by culture.

There have been many definitions of culture (e.g., Kroeber & Kluckhohn, 1952; Brislin et al., 1973). I define culture here as ‘the set of attitudes, values, beliefs and behaviors shared by a group of people, communicated from one generation to the next via language or some other means of communication (Barnouw, 1985)’ (Matsumoto, 1994, p. 4). The term culture can be used in many ways and has a long history (Boas, 1911; Mead, 1928; Benedict, 1946; see Matsumoto, 1996). Berry et al. (1992) described six uses of the term: descriptively to characterize a culture, historically to describe the traditions of a group, normatively to express rules and norms of a group, psychologically to emphasize how a group learns and solves problems,
The theory motivating much of my colleagues’ and my culturally-based work is the theory of successful intelligence (see Sternberg, 1985, 1997, 1999, for more details), which proposes its own definition of intelligence. I use the term *successful* intelligence to refer to the skills and knowledge needed for success in life, according to one’s own definition of success, within one’s sociocultural context. One acquires and utilizes these skills and this knowledge by capitalizing on strengths and by correcting or compensating for weaknesses; by adapting to, shaping, or selecting environments; through a balance of analytical, creative, and practical abilities.

Of course, there are many alternative theories of intelligence as well (e.g., Spearman, 1927; Thurstone, 1938; Cattell, 1971; Gardner, 1983; Carroll, 1993; Ceci, 1996), many of which are reviewed in Sternberg (1990, 2000). Some of these, such as Ceci’s and Gardner’s, are like the theory of successful intelligence in arguing for a broader conception of intelligence than typically has emerged from psychometric research. I do not claim that these theories are incapable of accounting for any or even many of my colleagues’ and my results. I find the theory of successful intelligence particularly useful, however, because of its specification of a universal set of information-processing components complemented by culturally defined contexts in which these components are enacted.

Now, here are the lessons learned.

**Lesson 1. The very act of assessing cognitive and educational performance affects that performance differentially across cultures**

We tend to assume that an assessment is an assessment is an assessment. Not quite. The cultural meaning of an act of assessment can vary from one place to another. For example, Greenfield (1997) found that it means a different thing to take a test among Mayan children than it does among most children in the United States. The Mayan expectation is that collaboration is permissible, and that it is rather unnatural not to collaborate. Such a finding is consistent with the work of Markus and Kitayama (1991), suggesting different cultural constructions of the self in individualistic versus collectivistic cultures.

A study done in Tanzania (see Sternberg & Grigorenko, 1997, 2002; Sternberg *et al.*, 2002) points out the risks of giving tests, scoring them, and interpreting the results as measures of some latent intellectual ability or abilities. We administered to 358 school children between the ages of 11 and 13 years near Bagamoyo, Tanzania, tests including a form-board classification test (a sorting task), a linear syllogisms test, and a Twenty Questions Test (‘Find a Figure’), which measure the kinds of skills required on conventional tests of intelligence. Of course, we obtained scores that we could analyse and evaluate, ranking the children in terms of their supposed general or other abilities. However, we administered the tests dynamically rather than statically (Vygotsky, 1978; Feuerstein, 1979; Brown & Ferrara, 1985; Lidz, 1991; Haywood &
Dynamic testing is like conventional static testing in that individuals are tested and inferences about their abilities made. But dynamic tests differ in that children are given some kind of feedback in order to help them improve their performance. Vygotsky (1978) suggested that the children’s ability to profit from the guided instruction they received during the testing session could serve as a measure of children’s zone of proximal development (ZPD), or the difference between their developed abilities and their latent capacities. In other words, testing and instruction are treated as being of one piece rather than as being distinct processes. This integration makes sense in terms of traditional definitions of intelligence as the ability to learn (‘Intelligence and its measurement’, 1921; Sternberg & Detterman, 1986). What a dynamic test does is directly measure processes of learning in the context of testing rather than measuring these processes indirectly as the product of past learning. Such measurement is especially important when not all children have had equal opportunities to learn in the past.

In the assessments, children were first given the ability tests. Experimental-group children were then given an intervention. Control-group children were not. The intervention consisted of a brief period of instruction in which children were able to learn skills that would potentially enable them to improve their scores. For example, in the twenty-questions tasks, children would be taught how a single true–false question could cut the space of possible correct solutions by half. Then all children—experimental and control—were tested again. Because the total time for instruction was less than an hour, one would not expect dramatic gains. Yet, on average, the gains from pre-test to post-test in the experimental group were statistically significant and significantly greater than those in the control group.

In the control group, the correlations between pre-test and post-test scores were generally at the .8 level. One would expect a high correlation because there was no intervention and hence the retesting was largely a measure of alternate-forms reliability. More importantly, scores on the pre-test in the experimental group showed only weak although significant correlations with scores on the post-test. These correlations, at about the .3 level (which were significantly less than those in the control group), suggested that when tests are administered statically to children in developing countries, they may be rather unstable and easily subject to influences of training. The reason could be that the children are not accustomed to taking western-style tests, and so profit quickly even from small amounts of instruction as to what is expected from them.

Of course, the more important question is not whether the scores changed or even correlated with each other, but rather, how they correlated with other cognitive measures. In other words, which test was a better predictor of transfer to other cognitive performances on tests of working memory, the pre-test score or the post-test score? We found the post-test score to be the better predictor of working memory in the experimental group. Children in the dynamic-testing group improved significantly more than those in the control group (who did not receive intervening dynamic instruction between pre- and post-tests).
In work in Jamaica (Sternberg et al., 1997), we had failed to find effects of an anti-parasitic medication, albendazole, on cognitive functioning. Might this have been because the testing was static rather than dynamic? Static testing tends to emphasize skills developed in the past. Children who suffer from parasitic illnesses often do not have the same opportunities to profit from instruction and acquire skills that well children do. Dynamic testing emphasizes skills developed at the time of test. Indeed, the skills or knowledge are specifically taught at the time of test. Would dynamic testing show effects of medication (in this case, albendazole for hookworm and praziquantel for schistosomiasis) not shown by static testing?

The answer was yes. Over time, treated children showed an advantage over children who did not receive treatment, and were closer after time had passed to the control (uninfected) group than were the untreated children. In other words, conventional static tests of intelligence may fail fully to reveal children’s intellectual potentials. Thus, when tests are modified in different environments, one may wish to modify not only their content, but the form in which they are administered, as we did in our dynamic testing.

**Lesson 2. Individuals in different cultures may think about concepts and problems in different ways. The result is that teachers of one culture teaching students of another culture may not understand how their students think about concepts and problems**

Nisbett (2003) has found that some cultures, especially Asian ones, tend to be more dialectical in their thinking, whereas other cultures, such as European and North American ones, tend to be more linear. And individuals in different cultures may construct concepts in quite different ways, rendering results of concept-formation or identification studies in a single culture suspect (Atran, 1999; Coley et al., 1999; Medin & Atran, 1999). Thus, groups may think about what appears superficially to be the same phenomenon—whether a concept or the taking of a test—differently. What appear to be differences in general intelligence may in fact be differences in cultural properties (Helms-Lorenz et al., 2003). Helms-Lorenz et al. (2003) have argued that measured differences in intellectual performance may result from differences in cultural complexity; but complexity of a culture is extremely hard to define, and what appears to be simple or complex from the point of view of one culture may appear differently from the point of view of another.

**Lesson 3. Behaviour that is viewed as smart in one culture may be viewed as not so smart or even stupid in another**

People in different cultures may have quite different ideas of what it means to be smart. One of the more interesting cross-cultural studies of intelligence was performed by Michael Cole and his colleagues (Cole et al., 1971). They asked adult members of the Kpelle tribe in Africa to sort terms. In western culture, when adults are given a sorting task on an intelligence test, intelligent people will...
typically sort hierarchically. For example, they may place names of different kinds
of fish together, and then the word ‘fish’ over that, with the name ‘animal’ over
‘fish’ as well as ‘birds’, and so on. Less intelligent westerners will typically sort
functionally. They might sort ‘fish’ with ‘eat’, for example, because we eat fish, or
‘clothes’ with ‘wear’, because we wear clothes. Members of the Kpelle tribe gener-
ally sorted functionally even after investigators tried indirectly to encourage them
to sort hierarchically.

Finally, in desperation, one of the experimenters directly asked one of the Kpelle
to show how a foolish person would do the task. When asked to sort in this way, the
Kpelle had no trouble at all sorting hierarchically. He and the others had been able to
sort this way all along. They just had not done so because they viewed it as foolish.
Moreover, they probably considered the questioners rather unintelligent for asking
such foolish questions. Why would they view functional sorting as intelligent? In ordi-
nary life, we normally think functionally. When we think of a fish, we think of catching
or eating it. When we think of clothes, we think of wearing them. However, in western
schooling, we learn what is expected of us on tests. The Kpelle did not have western
schooling. They had not been exposed to intelligence testing. As a result, they solved
the problems the way western adults might do in their everyday lives but not on an
intelligence test.

Thus, what North Americans might think of as sophisticated thinking—for
example, sorting taxonomically (as in a robin being a kind of bird)—might be viewed
as unsophisticated by the Kpelle, whose functional performance on sorting tasks
corresponded to the demands of their everyday life (as in a robin flying). In a related
fashion, Bruner et al. (1966) found that among members of the Wolof tribe of
Senegal, increasingly greater western-style schooling was associated with greater use
of taxonomic classification.

Lesson 4. Students do better on assessments when the material on which they
are assessed is familiar and meaningful to them. But items on cognitive test
batteries are differentially meaningful to individuals from different cultures

Cole’s work built, in turn, upon earlier work, such as that of Luria (1931, 1976),
which showed that Asian peasants in the Soviet Union might not perform well on
cognitive tasks because of their refusal to accept the tasks as they were presented.
Indeed, people in diverse cultures are presented with very diverse tasks in their lives.
Gladwin (1970), studying the Puluwat who inhabit the Caroline Islands in the South
Pacific, found that these individuals were able to master knowledge domains includ-
ing wind and weather, ocean currents, and movements of the stars. They integrate
this knowledge with mental maps of the islands to become navigators who are highly
respected in their world.

In related work, Serpell (1979) designed a study to distinguish between a general-
ized perceptual-deficit hypothesis and a more context-specific hypothesis for why
children in certain cultures may show inferior perceptual abilities. He found that
English children did better on a drawing task, but that Zambian children did better
on a wire-shaping task. Thus, children performed better on materials that were more familiar to them from their own environments.

Wagner (1978) had Moroccan and North American individuals remember patterns of oriental rugs and others remember pictures of everyday objects, such as a rooster and a fish. There was no evidence of a difference in memory structure, but the evidence of a lack of difference depended precisely upon using tests that were appropriate to the cultural content of the individuals being studied. Moroccans, who have long experience in the rug trade, seemed to remember things in a different way from participants who did not have their skill in remembering rug patterns. In a related study, Kearins (1981) found that when asked to remember visuospatial displays, Anglo-Australians used verbal (school-appropriate) strategies whereas aboriginals used visual (desert nomad-appropriate) strategies.

Goodnow (1962) found that for tasks using combinations and permutations, Chinese children with English schooling performed as well as or better than Europeans, where children with Chinese schooling or of very low income families did somewhat worse than did the European children. These results suggested that form of schooling primes children to excel in certain ways and not others (see also Goodnow, 1969).

Children from non-European or non-North American cultures do not always do worse on tests. Super (1976) found evidence that African infants sit and walk earlier than do their counterparts in the United States and Europe. But Super also found that mothers in the African cultures he studied made a self-conscious effort to teach their babies to sit and walk as early as possible. At more advanced levels of development, Stigler et al. (1982; see also Stevenson & Stigler, 1994) found that Japanese and Chinese children do better in developed mathematical skills than do North American children.

Carraher et al. (1985) studied a group of children that is especially relevant for assessing intelligence as adaptation to the environment. The group was of Brazilian street children. Brazilian street children are under great contextual pressure to form a successful street business. If they do not, they risk death at the hands of so-called ‘death squads’, which may murder children who, unable to earn money, resort to robbing stores (or who are suspected of resorting to robbing stores). Hence, if they are not intelligent in the sense of adapting to their environment, they risk death. The investigators found that the same children who are able to do the mathematics needed to run their street businesses are often little able or unable to do school mathematics. In fact, the more abstracted and removed from real-world contexts the problems are in their form of presentation, the worse the children typically do on the problems. For children in school, the street context would be more removed from their lives. These results suggest that differences in context can have a powerful effect on performance. (See also Saxe, 1990; Ceci & Roazzi, 1994; Nuñes, 1994, for related work.)

Such differences are not limited to Brazilian street children. Lave (1988) showed that Berkeley housewives who successfully could do the mathematics needed for comparison-shopping in the supermarket were unable to do the same mathematics when they were placed in a classroom and given isomorphic problems presented in
an abstract form. In other words, their problem was not at the level of mental processes but at the level of applying the processes in specific environmental contexts.

In sum, a variety of researchers have done studies that suggest that how one tests abilities, competences, and expertise can have a major effect on how ‘intelligent’ students appear to be. Street children in Brazil, for example, need the same mathematical skills to solve problems involving discounts as do children in the United States about to take a high-stakes paper-and-pencil test of mathematical achievement. But the contexts in which they express these skills, and hence the contexts in which they can best display their knowledge on tests, are different. My colleagues and I have also done research suggesting that cultural context needs to be taken into account in testing for intelligence and its outcomes.

Lesson 5. Children may develop contextually important skills at the expense of academic ones. So they may have developed adaptive skills that matter in their environment, but that teachers do not view as part of ‘intelligence’

Many times, investigations of intelligence conducted in settings outside the developed world can yield a picture of intelligence that is quite at variance with the picture one would obtain from studies conducted only in the developed world. In a study in Usenge, Kenya, near the town of Kisumu, we were interested in school-age children’s ability to adapt to their indigenous environment. We devised a test of practical intelligence for adaptation to the environment (see Sternberg & Grigorenko, 1997; Sternberg et al., 2001). The test of practical intelligence measured children’s informal tacit knowledge for natural herbal medicines that the villagers believe can be used to fight various types of infections. Tacit knowledge is, roughly speaking, what one needs to know to succeed in an environment, that is usually not explicitly taught, and that often is not even verbalized (Sternberg et al., 2000). Children in the villages use their tacit knowledge of these medicines an average of once a week, in medicating themselves and others. More than 95% of the children suffer from parasitic illnesses. Thus, tests of how to use these medicines constitute effective measures of one aspect of practical intelligence as defined by the villagers as well as their life circumstances in their environmental contexts. Note that the processes of intelligence are not different in Kenya. Children must still recognize the existence of an illness, define what it is, devise a strategy to combat it, and so forth. But the content to which the processes are applied, and hence appropriate ways of testing these processes, may be quite different.

Middle-class westerners might find it quite a challenge to thrive or even survive in these contexts, or, for that matter, in the contexts of urban ghettos often not distant from their comfortable homes. For example, they would know how to use none of the natural herbal medicines to combat the diverse and abundant parasitic illnesses they might acquire in rural Kenya.

We measured the Kenyan children’s ability to identify the medicines, where they come from, what they are used for, and how they are dosed. Based on work we had done elsewhere, we expected that scores on this test would not correlate with scores
on conventional tests of intelligence. In order to test this hypothesis, we also administered to the 85 children of the study the Raven Coloured Progressive Matrices Test (Raven et al., 1992), which is a measure of fluid or abstract-reasoning-based abilities, as well as the Mill Hill Vocabulary Scale (Raven et al., 1992), which is a measure of crystallized or formal-knowledge-based abilities. In addition, we gave the children a comparable test of vocabulary in their own Dholuo language. The Dholuo language is spoken in the home; English in the schools.

To our surprise, all correlations between the test of indigenous tacit knowledge and scores on fluid-ability and crystallized ability tests were negative. The correlations with the tests of crystallized abilities were significantly so. For example, the correlation of tacit knowledge with vocabulary (English and Dholuo combined) was $-0.31$ ($p < .01$). In other words, the higher the children scored on the test of tacit knowledge, the lower they scored, on average, on the tests of crystallized abilities (vocabulary).

This surprising result can be interpreted in various ways, but based on the ethnographic observations of the anthropologists on the team, Prince and Geissler (see Prince & Geissler, 2001), we concluded that a plausible scenario takes into account the expectations of families for their children. Many children drop out of school before graduation, for financial or other reasons, and many families in the village do not particularly see the advantages of formal western schooling. There is no reason they should, as the children of many families will for the most part spend their lives farming or engaged in other occupations that make little or no use of western schooling. These families emphasize teaching their children the indigenous informal knowledge that will lead to successful adaptation in the environments in which they will really live. Children who spend their time learning the indigenous practical knowledge of the community may not always invest themselves heavily in doing well in school, whereas children who do well in school generally may invest themselves less heavily in learning the indigenous knowledge—hence the negative correlations.

The Kenya study suggests that the identification of a general factor of human intelligence may tell us more about how abilities interact with cultural patterns of schooling and society and especially western patterns of schooling and society than it does about the structure of human abilities. In western schooling, children typically study a variety of subject-matters from an early age and thus develop skills in a variety of skill areas. This kind of schooling prepares the children to take a test of intelligence, which typically measures skills in a variety of areas. Often intelligence tests measure skills that children were expected to acquire a few years before taking the intelligence test. But as Rogoff (1990, 2003) and others have noted, this pattern of schooling is not universal and has not even been common for much of the history of humankind. Throughout history and in many places still, schooling, especially for boys, takes the form of apprenticeships in which children learn a craft from an early age. They learn what they will need to know in order to succeed in a trade, but not a lot more. They are not simultaneously engaged in tasks that require the development of the particular blend of skills measured by conventional intelligence tests. Hence it is less likely that one would observe a general factor in their scores, much as we discovered in Kenya.
From the standpoint of an academic test, the rural Kenyan children would not look very bright. But, in fact, they had learned knowledge that was important in their own cultural context. A teacher might be inclined to ‘write off’ such children because of their underdeveloped academic skills, without appreciating that the children had developed other skills that were, arguably, more important for adaptation in their own cultural milieux. Ideally, the teacher would attempt to capitalize on what the children do know, using it as a starting point or scaffolding upon which other knowledge could be built. But certainly, the children could not be faulted for lacking learning skills. They merely had applied these skills to content other than that sanctioned by the schools.

Lesson 6. Children may have substantial practical skills that go unrecognised in academic tests

We have found related although certainly not identical results in a study we have done among Yup’ik Eskimo children in south-western Alaska (Grigorenko et al., 2004). We assessed the importance of academic and practical intelligence in rural and semi-urban Alaskan communities.

This research was motivated by an observation we made while working both with the Eskimo children and with their teachers. The teachers made it clear that they considered the children not to be particularly bright. And indeed, in terms of the knowledge and skills emphasized in traditional schooling, the children did not fare well. But at the same time, the children had developed superior skills of other kinds. They possessed knowledge about hunting, fishing, gathering, herbal treatments of illnesses, and other topics that their teachers did not possess. For example, they could take a dog sled from their village to another village in the dead of winter and find their way. Their teachers, in contrast, if they tried to do the same in the dead of winter, would end up dead. They would not be able to discern the landmarks the children can use to find their way. They quickly would get lost. So the children had adaptive skills relevant to their own environments that the teachers did not have. But of course, it is the teachers whom society sanctions to do the evaluations, not the students.

A total of 261 children were rated for practical skills by adults or peers in the study: 69 in grade 9, 69 in grade 10, 45 in grade 11, and 37 in grade 12. Of these children, 145 were females (74 from the rural and 71 from the semi-urban communities) and 116 were males (62 were from the rural and 54 were from the semi-urban communities). We measured academic intelligence with conventional measures of fluid (the Cattell Culture Fair Test of g, Cattell & Cattell, 1973) and crystallized intelligence (the Mill-Hill Vocabulary Scale, Raven et al., 1992). We measured practical intelligence with a test of tacit knowledge of skills (hunting, fishing, dealing with weather conditions, picking and preserving plants, and so on) as acquired in rural Alaskan Yup’ik communities (the Yup’ik Scale of Practical Intelligence, YSPI). The semi-urban children statistically significantly outperformed the rural children on the measure of crystallized intelligence, but the rural children statistically significantly outperformed the semi-urban children on the measure of the YSPI. The test of tacit
knowledge skills was superior to the tests of academic intelligence in predicting practical skills as evaluated by adults and peers of the rural children (for whom the test was created), but not of the semi-urban ones.

This study, like the Kenya study, suggests the importance of practical intellectual skills for predicting adaptation to everyday environments. Here, as in Kenya, the processes of intelligence do not differ from those in the environments in which most readers of this article live. The Eskimo children need, for example, to plan trips, just as you or I do. But the constraints of planning these trips, often by dog sled in environments with no landmarks you or I would recognize, are very different, and hence different tests are needed.

Lesson 7. Failure of children to thrive in school may reflect ill health, not lack of ability. Teachers need to know children’s health status before assuming their performance reflects a lack of cognitive or educational skills

In interpreting educational outcomes, whether from developed or developing cultures, it is always important to take into account the physical health of the participants one is testing. In a study we did in Jamaica (Sternberg et al., 1997), we found that Jamaican school children who suffered from parasitic illnesses (for the most part, whipworm or Ascaris) did more poorly on higher level cognitive tests (such as of working memory and reasoning) than did children who did not suffer from these illnesses, even after controlling for socio-economic status. The children with parasitic illnesses did better on fine-motor tasks, for reasons unknown to us.

Thus, many children were poor achievers not because they innately lacked abilities, but rather, because they lacked the good health necessary to develop and display such abilities. If you are moderately to seriously ill, you probably find it more difficult to concentrate on what you read or what you hear than if you are well. Children in developing countries are ill much, and even most, of the time. They simply cannot devote the same attentional and learning resources to schoolwork that well children have to devote. Here, as in Kenya, their health knowledge would be crucial for their adaptation to the environment. Testing that does not take into account health status is likely to give false impressions.

Lesson 8. Children may fail to do well in school not because they do not understand the material, but because they do not understand the instructions regarding what to do with the material

In our work in Zambia (Grigorenko et al., 2003), we investigated following of instructions. Children in school and outside it continually need to be able to follow instructions. Often they are not successful in their endeavours because they do not follow instructions as to how to realize these endeavours. Following complex instructions is thus important for the children’s success. A test of following instructions has dynamic elements, in that one learns the instructions at the time of test.
Yet, it is not a complex instructional intervention. Indeed, all tests require test-takers to follow instructions.

The Z-CAI (Zambia Cognitive Assessment Instrument) was designed to measure children’s ability to follow oral, written, and pictorial instructions that become increasingly complex. It is also designed to be simple to implement, so that teachers can easily be trained to administer the instrument. We further created a test that would be sensitive specifically to any improvement in cognitive functioning that was a result of improved health status. And finally, we needed the test to be psychometrically sound (valid and reliable) in Zambia.

The Z-CAI measures working memory, reasoning, and comprehension skills in the oral, written, and pictorial domains. We found that among children tested on the Z-CAI, those who were treated for parasitic illnesses ($N = 1000$) outperformed children who were not treated ($N = 1000$) relative to baseline performance.

Lesson 9. When children are taught in culturally appropriate ways, their achievement increases

We have shown that when children are taught in a way that better matches their culturally acquired knowledge, their school performance improves (Sternberg et al., in press). Grade 6 students from seven communities in three school districts in Alaska participated in a mathematics curriculum project. Eight classes of students containing a total of 196 students were taught the concepts of area and perimeter using an Alaskan culturally-based, triarchic curriculum and 5 classes containing 55 students were taught the same subject-matter using a conventional textbook-based curriculum. Both groups contained students from rural regions with a population that was almost 100% Alaskan Native (predominantly Yup’ik) and urban regions with a population that was approximately 71% ethnically white and 12% Alaskan Native. (The urban settings were ‘urban’ in the context of remote regions of Alaska, where cities tend to be relatively small and isolated.)

Due to absenteeism a total of 17 students did not complete the pre-test and 30 students did not complete the post-test. This resulted in a total of 158 students (35 rural and 123 urban) in the culturally-based triarchic curriculum group and 46 students (29 rural and 17 urban) in the conventional curriculum group being included in the analysis.

Pre- and post-test measures of the ‘area and perimeter curriculum’ were collected for all the students. Only students who completed both the pre- and post-test measures were included in the study sample.

Teachers in the culturally-based curriculum group received a maths unit entitled ‘Fish Racks’ as part of the NSF sponsored curriculum ‘Adapting Yup’ik Elders’ Knowledge’ (Lipka, 2000). The unit addressed the National Council of Teachers of Mathematics (NCTM) standards for the topics of area and perimeter using both native content (building of fish racks) and native teaching strategies (demonstrations by Yup’ik elders). The building of fish racks is a native tradition and requires everyday, practical mathematics to build racks that will be stable, strong, and have sufficient area
for placing salmon on them. The maths unit comprised two complex problems, each involving a number of different activities revolving around the building of fish racks and the concepts of area and perimeter.

Teachers in the control group used their mathematics textbooks to teach the concepts of perimeter and area. The approach used in these textbooks is a procedurally based approach for teaching perimeter and a formula based approach for teaching area. The perimeter and area unit covered approximately the same material and began and ended at approximately the same time as the treatment group.

Prior to and following the intervention, students completed a test designed to capture their knowledge of area and perimeter concepts. The tests were each composed of 15 questions involving a combination of multiple-choice, short-answer, and open-ended items.

The intervention for students lasted between three and four weeks; approximate time for instruction was an hour a day. The training session for teachers lasted two days.

The results were simple. There were no pre-test differences. At the post-test, the treatment group outperformed the control group on all indicators. In other words, teaching in ways that capitalized on cultural knowledge enhanced student performance.

**Lesson 10. What it means to be smart may vary from one culture to the next.**

In trying to act intelligent in their school performance, therefore, students may think differently as to what intelligent performance means

Intelligence may be conceived in different ways in different cultures (see reviews in Berry, 1984; Sternberg & Kaufman, 1998; and Serpell, 2000). Such differences are important, because cultures evaluate their members, as well as members of others' cultures, in terms of their own conceptions of intelligence.

Yang and Sternberg (1997a) reviewed Chinese philosophical conceptions of intelligence. The Confucian perspective emphasizes the characteristic of benevolence and of doing what is right. As in the western notion, the intelligent person spends a great deal of effort in learning, enjoys learning, and persists in lifelong learning with a great deal of enthusiasm. The Taoist tradition, in contrast, emphasizes the importance of humility, freedom from conventional standards of judgement, and full knowledge of oneself as well as of external conditions.

The difference between eastern and western conceptions of intelligence may persist even in the present day. Yang and Sternberg (1997b) studied contemporary Taiwanese Chinese conceptions of intelligence, and found five factors underlying these conceptions: (a) a general cognitive factor, much like the g factor in conventional western tests; (b) interpersonal intelligence (i.e., social competence); (c) intrapersonal intelligence; (d) intellectual self-assertion; and (d) intellectual self-effacement. In a related study but with different results, Chen (1994) found three factors underlying Chinese conceptualizations of intelligence: nonverbal reasoning ability, verbal reasoning ability, and rote memory. The difference may be due to different
subpopulations of Chinese, to differences in methodology, or to differences in when the studies were done.

The factors uncovered in Taiwan differ substantially from those identified in US people’s conceptions of intelligence by Sternberg, et al. (1981)—(a) practical problem solving, (b) verbal ability, and (c) social competence—although in both cases, people’s implicit theories of intelligence seem to go quite far beyond what conventional psychometric intelligence tests measure. Of course, comparing the Chen (1994) to the Sternberg et al. (1981) study simultaneously varies both language and culture.

Studies in Africa in fact provide yet another window on the substantial differences in conceptions of intelligence across cultures. Ruzgis and Grigorenko (1994) argued that, in Africa, conceptions of intelligence revolve largely around skills that help to facilitate and maintain harmonious and stable inter-group relations; intra-group relations are probably equally important and at times more important. For example, Serpell (1974, 1996) found that Chewa adults in Zambia emphasize social responsibilities, cooperativeness, and obedience as important to intelligence; intelligent children are expected to be respectful of adults. Kenyan parents also emphasize responsible participation in family and social life as important aspects of intelligence (Super & Harkness, 1982, 1986, 1993). In Zimbabwe, the word for intelligence, ngware, actually means to be prudent and cautious, particularly in social relationships. Among the Baoule, service to the family and community and politeness toward and respect for elders are seen as key to intelligence (Dasen, 1984).

It is difficult to separate linguistic differences from conceptual differences in cross-cultural notions of intelligence. In our own research, we use converging operations in order to achieve some separation. That is, we use different and diverse empirical operations in order to ascertain notions of intelligence. So we may ask in one study that people identify aspects of competence; in another study, that they identify competent people; in a third study, that they characterize the meaning of ‘intelligence’, and so forth.

The emphasis on the social aspects of intelligence is not limited to African cultures. Notions of intelligence in many Asian cultures also emphasize the social aspect of intelligence more than does the conventional western or IQ-based notion (Lutz, 1985; Poole, 1985; White, 1985; Azuma & Kashiwagi, 1987).

It should be noted that neither African nor Asian notions emphasize exclusively social notions of intelligence. These conceptions of intelligence emphasize social skills much more than do conventional US conceptions of intelligence, at the same time that they recognize the importance of cognitive aspects of intelligence. In a study of Kenyan conceptions of intelligence (Grigorenko et al., 2001), it was found that there are four distinct terms constituting conceptions of intelligence among rural Kenyans—rieko (knowledge and skills), luoro (respect), winjo (comprehension of how to handle real-life problems), paro (initiative)—with only the first directly referring to knowledge-based skills (including but not limited to the academic).

It is important to realize, again, that there is no one overall US conception of intelligence. Indeed, Okagaki and Sternberg (1993) found that different ethnic
groups in San Jose, California, had rather different conceptions of what it means to be intelligent. For example, Latino parents of schoolchildren tended to emphasize the importance of social-competence skills in their conceptions of intelligence, whereas Asian parents tended rather heavily to emphasize the importance of cognitive skills. Anglo parents also emphasized cognitive skills more than Latinos. Teachers, representing the dominant culture, also placed greater emphasis upon cognitive than social-competence skills. The rank order of children of various groups’ performance (including subgroups within the Latino and Asian groups) could be perfectly predicted by the extent to which their parents shared the teachers’ conception of intelligence. In other words, teachers tended to reward those children who were socialized into a view of intelligence that happened to correspond to the teachers’ own.

In sum, people have different conceptions, or implicit theories, of intelligence across cultures. From a practical point of view, one may still try to draw restricted comparisons of scores on given tests across cultures. For example, western tests may still be predictive in other cultures (Vernon, 1969), even if their appropriateness varies according to the culture and the use to which they are put. Comparisons need, however, to be conditional ones that take into account the context of the individuals’ development (Laboratory of Comparative Human Cognition, 1982; Sternberg, 1990). The scores may not mean the same thing across the cultures.

Conclusion

When cultural context is taken into account, (a) individuals are better recognized for and are better able to make use of their talents, (b) schools teach and assess children better, and (c) society utilizes rather than wastes the talents of its members. Instruction and assessment can only be improved by taking cultural context into account.

Curiously, many educators tend to assume that whatever kind of education they had, or that they are accustomed to provide, is the best kind. They are like carpenters who have a tool—a hammer—and then look for ways to use it. The message of this article is that one hammer just won’t do it. Neither will multiple hammers of different sizes (corresponding to different levels of pounding material into children’s heads). We need a whole range of tools, and the tools must be made appropriate for the cultural context of the children we are teaching. This means first understanding that cultural context, and then tailoring instruction and assessment so that they are appropriate for the context. Students may be cognitively and emotionally in very different places from where we expect them to be, just as they are physically in very different environments. We can adapt ourselves, or we can dismiss students who do not fit our prototype of a ‘bright’ student. Such dismissal of students hurts their futures, and impugns our own teaching skills. We need to teach to who the students are, not some idealization of who we might want them to be. In that way, we make instruction culturally relevant rather than culturally blind, deaf, and dumb.
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