reminded Kahea that the bear was looking for a place to sleep, and she asked her to look at the word and the illustration once again. This time, Kahea guessed, “tunnel” and when that didn’t work she tried “rock.” Although these were off-target guesses, they undoubtedly demonstrated Kahea’s persistence in sustaining her efforts at meaning-making in her efforts to comprehend what she was reading.

Knowing that the child was not far off in her original attempt with “cage,” the teacher patiently explained, “You are right, this picture looks like a tunnel and a rock. You were very close the first time when you said ‘cage.”’

Once again, Mrs. Ho’ohuli placed her finger upon the word “cave,” and she explained: “This word looks like ‘cage’ and in fact, it starts the same way. You were so smart when you said /c/ and the long /a/ sound.” The teacher encouraged Kahea to reexamine the next letter: the “v” in “cave.” Slowly, the child phonetically verbalized /c - a - v/ and looked blankly at the teacher.

Sensing Kehea’s bewilderment, Mrs. Ho’ohuli asked, “Do you know what a ‘cave’ is?” The child blankly nodded, “No.” “Have you ever heard of the word ‘cave’?” The child shook her head, “No.”

This real life vignette illustrates how a five-year-old child demonstrated her intelligence by opting to substitute the words that did make sense to her, using appropriate clues and logical processes. However, the words “cage,” “tunnel,” and “rock” were part of her cultural knowledge rather than the unfamiliar word “cave” that she was expected to answer.

Kahea obviously did not have any prior knowledge about caves. She had never heard the word, nor had she any experiences with bears sleeping in caves during the winter. Not surprisingly, the concept was completely unfamiliar to her and not part of her prior knowledge about bears. Why should it be? And what are reasons for this absence of understanding?

Working class and professional families in America have a large and varied social capital to use as a foundation of rich and meaningful experiences in out-of-school contexts for their children. They can take them to museums, purchase educational toys for them, take frequent trips to Borders or Barnes & Noble, visit libraries, and travel to regions other
than their own. They also have the cultural capital to know how to use the world as a living laboratory or classroom to stimulate the cognitive growth of their children. They teach them colors, numbers, letters, and concepts through daily experiences whether it be in the supermarket, at the beach, or with books and daily read aloud experiences. Parents name objects in the experiential world of the child, build vocabulary, and interact with them through language.

A recent study by Hart & Risley (2003) found that by the age of four an average child in a professional family would have been exposed to a total of almost forty-five million words in the context of enrichment experiences, conversations with adults, and exposure to daily read aloud sessions. An average child in a working-class family, in contrast, would have been exposed to twenty-six million words, while an average child in a welfare family would have confronted a mere thirteen million words. This means that by age four, the average child in a welfare family might have over thirty million fewer words of cumulative experience than the average child in a professional family.

This relative lack of exposure to language puts young children from low socio-economic groups at a significant disadvantage. In addition, as readers mature and picture cues become less prevalent, the clues become even more difficult to decode. Reading comprehension involves the ability to visualize what is being read. If a child is unfamiliar with a word, and if visual clues are unavailable, it becomes even more difficult to make an educated guess at the meaning. Unconventional spellings within the English language further complicate the challenge of learning to read as children progress to ever higher grade levels.

The current federal solution to the literacy problem is to impose prescriptive phonics instruction as a way to remedy the situation. Often, reading programs using this approach entirely eliminate picture cues on the premise that they allow children to “cheat.” For schools who do not meet “adequate yearly progress” under the No Child Left Behind Act (2001), policy makers insist that students need a double-dose of reading or math instruction, crowding out time for daily read aloud sessions; art; music; physical education; enriching hands-on, experiential learning; and interdisciplinary inquiry projects. This approach sacrifices meaningful learning to drill and practice. In contrast, meaningful learning opportunities create a foundation to anchor language development to experiences that are available to students and that are part of their world.

In this article, I will share a two-part framework that the Kamehameha Schools Extension Education - Literacy Enhancement Department uses in an effort to serve Hawai’i Department of Education (HDOE) schools with enrollments of at least 50% Native Hawaiian children. Knowing that working-class and professional families offer many enrichment experiences to their children, we realize that children from lower socio-economic families need these experiences imbedded within their educational settings. We envision education moving towards a more interactive and language-rich experience that engages students in applying knowledge and hands-on experiences that connect students like Kahea to a culturally relevant curriculum. Our vision is to have students and families build upon what they know, starting with their own “funds of knowledge” (Moll, 1992) in order to connect their experiences to the broader, global context of learning. How can this be done?

**Loko i`a: A Cultural Metaphor for Learning**

Along Hawai’i’s coastal shorelines lie protected ecosystems called *loko i`a* (fishponds), where *kai* (fresh water) from the mountains flows into the *wai* (salt water) of the sea. At one time, master caretakers regulated the stirring of these waters through ocean gates, which acted as locks in order to maintain a proper balance of salinity and oxygen. The delicate care and protection of these waters produced a rich and abundant supply of marine life such as shrimp, crabs, fish, seaweed, and plants to sustain a nutritious food supply for Hawaiian families.

My colleagues and I have proposed using the Hawaiian cultural metaphor of the *loko i`a* where two elements, (1) pedagogy and (2) culturally relevant curriculum are likened to the essential ingredients of *kai* and *wai*. Working together, these elements create the educational waters needed to produce a dynamic balance of nutrients for a thriving ecosystem of learning. Teachers and administrators now take on the role of the caretakers of these educational waters, maintaining a nutrient rich environment in children like Kahea can flourish.

**The Kai (Salt Water)**

**Teaching to the 4th Power**

Working within a school context where scripted reading programs are the norm and where teachers are required to limit their scope of practice and become more like technicians, we aim to enlarge the instructional approach and
create a more comprehensive learning environment for Hawaiian children—one based on their cultural understanding. This work has resulted in four broad categories of pedagogy, which we consider to be interdependent: TRANSMISSION \times TRANSACTION \times TRANSMEDIATION \times TRANSFORMATION or \textit{T}^4 — Teaching to the 4\textsuperscript{th} Power. Together these processes produce more than a mere additive result. Working in concert, they possess what might be termed a “multiplier effect.” In other words, each process is deeply interdependent with the others. Together, they produce results that exceed what each process might achieve independently.

The following matrix graphically illustrates the \textit{T}^4 processes, albeit in a linear format. Although depicted as a matrix, it is important to emphasize that the four processes are NOT linear in design. They are interdependent and inclusive like the currents of waters that flow together in Hawai’i’s loko i`a ecosystems.

**Teaching to the 1\textsuperscript{st} power: Transmission Teaching, and Learning as Consuming Knowledge**

Transmission teaching focuses on building a child’s foundation of basic skills. This includes facts and information such as letters, consonant sounds, and addition and subtraction facts. A brief illustration of transmission instruction in the classroom would be a skill lessons on blends and digraphs using practice worksheets. Other examples would include direct instruction on onset and rhymes; spelling; using a word wall; and lessons in grammar, paragraphing, and in the proper usage of capitals and periods.

Historically, the transmission position envisions learners as empty vessels to be filled. Learning is viewed as the responsibility of the individual whose goals are to master facts, memorize information, and acquire the requisite reading skills such as letter recognition and phonics. Students are tracked by ability and placed in competitive environments as determined by test scores.

Of course, these skills are important “tools” for students to acquire, and though tools in a toolkit may be necessary for students to succeed academically, they are not sufficient for them to succeed. Without a practical, working knowledge of how to use these tools, authentic learning cannot advance. Transmission, representing the “what” of teaching, therefore, should set the stage for the second eddy in the loko i’a—the process of transaction.

**Teaching to the 2\textsuperscript{nd} Power: Transactional Teaching, and Learning as Using Knowledge**

Transactional teaching is the application of knowledge
<table>
<thead>
<tr>
<th>T = TEACHING/LEARNING TO THE FOURTH POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>T³ransmission</td>
</tr>
<tr>
<td>LEARNER CHARACTERISTIC</td>
</tr>
<tr>
<td>TEACHING AND LEARNING PROCESSES</td>
</tr>
<tr>
<td>As a dynamic and interdependent system, TxTxTxT exponentially increases the power of teaching and learning.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>TEACHING &amp; LEARNING STYLE</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>TEACHING AND LEARNING CONTEXT</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>ASMT &amp; EVAL</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
within a social context of learning based on social constructivist theories of language and literacy (Wells, 1986; Vygotsky, 1978; Scribner and Cole, 1981). The transactional process fosters a fluid, collective relationship with others as well as encouraging self-reflective processes. The term is borrowed from Louise Rosenblatt’s transactional theory of reading (1978). Rosenblatt believed that any reading event is a back-and-forth transaction between a reader and text through which a “poem” is created in a process of personal meaning-making. Transactional teaching and learning foster social engagement, dialogue, and communities of practice (Lave & Wenger, 1991) and lie at the heart of the processes that create a culture of learning in the classroom.

Learning is enhanced when information and factual knowledge are applied and used. Therefore, the knowledge gained from transmission processes is nested within transactional learning. The approach is also culturally appropriate for Hawaiian children and societies in which community is valued over competition.

The writing conference provides an example of transactional teaching and learning. In one classroom, where writing workshops are held each day, Kristi, a first grade student, shares a single sentence story she had written about her new puppy with a peer in her class named Joshua. Kristi had written, “I love my dog and his chest is pure white.”

Immediately after sharing this sentence, Joshua asks, “What’s your dog’s name and does he do tricks?” This interaction between writer and audience enables Kristi to revise her work and write a more detailed and interesting piece with her audience in mind. Later that morning, she adds, “His name is Kea because Kea means white in Hawaiian. He plays with me and my sister and sometimes I hold out a biscuit and make him bark three times and roll over. He is very smart.” Her writing and her illustration are eventually published and displayed in the classroom library. This interactive process of peer conferencing enhances writing quality and encapsulates the dual relationship of the process of transmission nested within that of transaction because Kristi has used her emerging skills and concepts of print to write a more descriptive story to be shared with her classmates.

Transactional learning may include literature circles. Students may work in groups to write a class play, compose an anthology of family stories, write letters or send e-mails to pen pals in another state or country, or interview elders for a community oral history project. Transactional learning within a social context frequently includes hands-on experiences, engagement with problem-based inquiry, goal setting, dialogue journals, reflections, and peer debriefing/feedback loops for the purposes of evaluation. In this way, transactional teaching and learning provides access to learning communities and networks established through experience-based, reflective processes that open pathways for creative and collaborative innovation. Transactions expand teaching and learning into contexts ranging from individual to communal processes of expression which are culturally congruent with Hawaiian values and many other non-Western educational settings.

Teaching to the 3rd power: Transmediational Teaching, and Learning as the Interpretation of Knowledge

Transmediation occurs when knowledge is reconstructed by learners in order to take personal ownership of their learning based upon their potential, strengths, and multiple intelligences (Gardner, 1993). Transmediation can be expressed in a variety of forms that connect meaning-making processes to personal experiences. Hawaiian Cultural Arts Educational Specialist Meleanna Meyer employs a characteristically Hawaiian transmediation process which incorporates a sixth sense, the na’au or intuition/emotion, to bring forth an invigorated spirituality in student learning—one that is not always objective, tangible, or easy to measure. In many ways, it is more powerful than numbers or words because it liberates creative imagination and exemplifies the core nature of education. Like the Greek word, edos, meaning to educe or draw out the potential and strengths of learners, na’au also implies a sense that learning lies within and must be drawn out of the student.

Transmediation is an interdisciplinary concept and suggests a third location of operation—one that doesn’t take place exclusively in the mind. It is more embodied and multifaceted, and includes the na’au or “gut” feelings, particularly in dealing with music, art, dance, and bodily kinesthetic activities such as sports. Mihaly Csikszentmihalyi (1990) has shown that learners enter into a mental state of “flow” where they lose track of time when fully engaged in certain activities requiring focused concentration. The concept of “flow,” like that of na’au, is a heightened form of activity linked to emotional fulfillment whether it is in the creative arts, athletic competition, spiritual practice, or work. Inherent in flow is a deep motivation to excel and overcome limitations. It is what truly brings happiness to a learner through a continual process of challenging oneself in an area of interest.
For example, fourth grade students at Kamehameha Schools produced a play on endangered Native Hawaiian birds for an integrated science and social studies unit. Students researched information and “transmediated” the information into a story creating their own mele (song), hula (dance), and hula ki`i (puppetry). During this period of planning and script writing, where students were actively engaged in designing costumes and props, the language arts and social studies blocks were combined to provide open time and space for flow. In this way, the learning was not fragmented into discrete disciplines. The power of teaching was exponentially increased because transmission and trans-action were nested within tasks that encouraged transmediation. By assisting young people to make connections and by creating open opportunities for pleasure and creativity, we encourage real communication to take place beyond words and numbers, and amongst diverse groups.

Another example of the use of transmediation is in the use of interdisciplinary learning, which incorporates culture, nature studies, and real-world problem solving in the curriculum (Smith, 2002; Gruenewald, 2003)—an approach employed by several Native Hawaiian charter schools. Biology, physics, reading research on the Internet, and mathematics are seamlessly woven together to create units of learning with larger blocks of flexible time for inquiry and study.

Children’s popular culture represents an untapped area in which transmediation can occur. A kindergartner at a local elementary school learned his initial consonant sounds through his fascination with a chart of 50 Pokemon characters and their defensive/offensive combat techniques. Unfortunately, transmediational processes are frequently unacceptable as a sanctioned approach to literacy and, in fact, are often censured. In spite of this, Cope and Kalantzis (2000) explain transmediation as “crossing linguistic boundaries” (p.6) to draw upon a broader range of literacies through sports, computer technology, and other specialized interest groups. They argue that it is important that educators expand their traditional notions of literacy in order to build bridges that are relevant and engaging to today’s learners. Transmediation, however, is not the final step in the process. T4, the next stage, aims to engage learners in relevant educational experiences that support them in moving towards a transformative process so that the learners are empowered to create new knowledge and become agents of social change.

Teaching to the 4th Power: Transformative Teaching, and Learning as Producing Knowledge

Children are often socially conditioned to believe that Goldilocks was a “naughty girl” because she entered the home of the three bears without permission. To make matters worse, she ate their food, broke Baby Bear’s chair, and went to sleep in his bed. But other interpretations of the story are possible. A recent case of child abuse in Puna on the Big Island has received much media attention in the news and stirred a first grader to suggest that perhaps Goldilocks had “bad parents” and ran away from home to escape abuse. Another child suggested that Goldilocks could have been homeless. The class brainstormed reasons for homelessness and ways to help the homeless and combat this societal problem. A student in one class offered to donate her teddy bear to the child in Puna. These astute and varying interpretive spaces allow students to explore alternative perspectives about story characters, pose questions of their own, think critically, and seek possible solutions.

The example above of transformative pedagogy, based on the work of Paulo Freire (1970), connects the classroom to the political, economic, historical, cultural, ecological, and societal issues of the real world. At heart, the purpose of teaching and learning is to produce an educated citizen who can “read the world,” think critically, question relationships of power, and become an agent of social change.

Prime opportunities for transformative teaching and learning occur during responses to read-alouds or in small group reading instruction. Students discuss various perspectives in fairy tales and are encouraged to offer a variety of opinions about characters and propose solutions to problems in the story. This is where teachers can help children question biases such as who benefits, who does not benefit, whose voice is and is not represented and for what reasons.

The recent work of Vasquez (2004) has shown that preschoolers are naturally inclined to raise issues of gender equity and animal cruelty, and to question conditions in their neighborhood or school when given the opportunity to do so. Engaging our youngest children in these types of conversations allows them to make sense of disparate points of view and foster educationally democratic principles that engender and support diverse worldviews.

Transformative practices urge us to examine cultural biases, particularly negative stereotypes about Hawai‘i, and identify and reconstruct them by researching, interviewing, reading, writing, publishing, and illustrating positive
representations of Hawaiian culture as it exists today. This approach positions children like Kahea as a producer of knowledge and not just as a consumer of dominant culture.

Third grade teachers frequently testify that by the end of the year, 80% of the students in their class are able to decode and functionally read words on a page, but it is their limited experiential base that prohibits maximizing their comprehension potential. This is not to say that children should not be exposed to dominant culture such as bears, snowsuits, moose bogs, raccoons, mittens, barns, hay, and tractors. Such exposure is important, but it is not sufficient. Beginning readers need to start with what they know and, with the assistance of teachers, build upon their “funds of knowledge” through a process of scaffolding that helps to broaden their schemas. It is also important to introduce children to local literature so that they are not psychologically positioned as “invisible” and are exposed to positive images of their culture, language, Hawaiian identity, and sense of place—the `āina (land) in which they live.

Teaching to the 4th Power is exponentially powerful because it incorporates the full range of transmission, transaction, and transmediation processes within a dynamic, interdependent system that reaches beyond the walls of the classroom. T`i represents the kai (salt water) of the loko i`a ecosystem. I will now describe the second element required to flow with the kai: the wai (fresh water), to create a nutrient-rich learning environment. The wai represents a culturally relevant curriculum. What would this look like?

The Wai (Fresh Water)
Culturally Relevant Curricula: Home Culture, Host Culture, Local Culture, and Global Culture

Because of Hawai`i’s isolated geographic location, it is important to engage young children in culturally relevant educational experiences. Yet all too frequently, children like Kahea are taught with textbooks and curricula that represent an unfamiliar world of sugar sapping maple trees, brooks, sleet, seedlings dispersing in forest fires, behaviors of mating cranes, beaver dams, hedgehogs, and bears sleeping in caves.

Exposure to some of this is important, but too much exposure to alien ideas in reading material, when children have yet to encounter these experiences in their lives, requires too great a cognitive leap. Too much unfamiliar detail quickly estranges them. It creates difficulties for them in making appropriate connections and in drawing on meaningful associations with the instructional content. This section of the article, therefore, argues for a more culturally relevant curriculum to engage children in educational experiences that build connections to the wider world and prepare them for success in the 21st century.

Culture originates from the Latin root, cultus, meaning to care or cultivate. Culture is fundamental to our human need to interact with others and to develop healthy relationships with one another. In an effort to cultivate a democratic understanding of local and global systems of interdependence, Educational Cultural Arts Specialist, Meleanna Meyer (Sumida & Meyer, in press), contributes a holistic view of four cultural layers—home, host, local, and global—that ripple through the T`i waters.

Home Culture

A child’s home culture is the compelling source of who the learner is and where she or he comes from. This immediate connection to the child is to their `ohana (family): their mother, father, grandparents, sisters, brothers, aunts, uncles, cousins, hanai (adopted) family members, and pets. The home culture represents their ethnic identity, cultural heritage, genealogy, family background, and home language. It creates their sense of identity. Every child carries with them family stories and cultural resources that are richly endowed with a unique cultural and social capital. This knowledge offers opportunities to teachers and schools that recognize that each learner comes to the educational conversation fully able to participate.

Host Culture

Curriculum should also honor the host culture, or the native/indigenous culture of a particular geographic location. The original people or “hosts” of a geographic locale may be contrasted to those newcomers, and not-so-new-comers, who are “guests” of the host culture. Host cultures possess a strong interdependent relationship to and sentient knowledge of their land, bodies of water, and the heavens above. They are mindful of sustaining resources for future needs and they respect their natural assets. Resources are never wasted or exploited. They are used, recycled and returned to the land in a way that respects and reciprocally replenishes their environment. We have much to learn from host cultures.

Local Culture

Local culture sets the stage for curriculum to celebrate and value the dynamic association of people of various
ethnicities who have been brought together in a particular location. The context for this curriculum is within our neighborhoods, schools, workplaces, churches, team sports, and halau. There are a myriad of ways in which people come together in one locality. Local cultures are multi-faceted and hybrid. They establish the foundation for understanding our interdependence. They help to build relationships that cultivate respect and teach us how to make compromises and work together.

Global Culture

Curriculum must also aspire towards knowledge of global culture as we are tied to what lies beyond our shores. Global culture is about the inter- and intra-dependent relationships that connect us to the world at large. This is where transformative pedagogy connects the classroom to the political, economic, historical, and social issues of real life where children must learn to “read the world,” think critically, question relationships of power, and develop a voice.

There are numerous cultures within our global community. It is critical to honor each distinct culture as possessing value—neither more nor less than any other. Each contributes to the rich tapestry of the world. Rather than privileging one culture as better than another, a wider lens that frames home, host, local, and global cultures envisions an educational center that is not dominated by any one group but held open—where discussion is invited and where all are asked to participate.

Conclusion

Children enter this world from their mother’s womb ready to explore and engage in life. Within seconds of emerging, their voices can be heard, screaming and crying to announce their arrival. From the outset they are curious, they explore, they taste, they touch and like sponges absorb every sound, word, and nuance from their caretakers.

Where does this determination go as they become socialized to the ways of the school? Our educational waters are currently being rerouted to the detriment of our keiki. Government mandates drain the rich nutrients needed for healthy learning environments that would benefit children like Kahea. Schools are being forced towards a factory model of education. Monitored by testing and accountability, curriculum has shifted towards “teaching to the test.” We must avoid the fast-food assembly-line “McDonaldization” of schools which primarily benefit corporate producers of textbooks, scripted reading programs, and tests. Creating sterile, imbalanced educational environments is inhumane and encroaches upon the innate human potential that lies within every child. We must not box-in learners like Kahea into scripted programs lest we become unwittingly complicit in stifling and thwarting the growth of our children. Education must not mirror the fast-food industry so that students turn out as uniform fillet-o-fish sandwiches packaged in styrofoam boxes.

Much like the loko i’a, educational contexts are complex ecosystems requiring a dynamic capacity for change and response relative to learners’ needs and their unique strengths. Educators must recognize and advocate for a relevant educational system that restores an intricate balance between pedagogy and a culturally relevant curriculum—one that creates healthy, thriving learning environments for children like Kahea to survive in a rich and diverse global future.

Pseudonyms have been used in order to protect the privacy of students and teachers in this article.

References
Sumida, A., & Meyer, M. in press