

An inspirational collection of essays

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El Sistema

Music for social change

The Benefits of Ensemble Music Experience

(and why These Benefits Matter so Much in Underserved Communities)

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To an alien scientist, music — and the desire to create it — might be one of the most puzzling aspects of humanity. — Gary Marcus, Guitar Zero, p.5

IF this epigraph holds any truth, then we want to know more about the puzzles surrounding what happens to those who create music. Specifically, how does learning music hold particular effects for those children who live in communities with few learning resources beyond their regular academic classes? Of particular significance for these questions is the emphasis of our alien scientist on the desire to *create* music and not on the effects of passive listening to music.

This chapter takes up implications of the epigraph in three parts. The opening section gives a brief historical overview of how beliefs about qualities of mind for those who create music came about during the European Enlightenment. Views about what learning music does for individuals encircled notions of what being “educated,” “cultured,” or “refined” meant. Music and other fine arts were believed to separate those with good tastes and financial means from those lacking in education and opportunities for wealth accumulation and pursuits of leisure. However, since the last decades of the twentieth century, this attitude has shifted to favor the democratic view that opportunities to learn ensemble music can and should be available for *all* children, including those living in impoverished communities around the globe (Higgins, 2012).

Following this opening section is the heart of the chapter. Here we consider the interdisciplinary research on what happens as individuals learn to create music within ensemble groups. What are the cognitive and social effects of sustained practice and group rehearsals? Research that addresses this question helps explain the neuronal, visual, and aesthetic effects of creating music.

The chapter closes with a brief consideration of what is gained through *research* into what happens within music learning as distinct from *evaluation* that attempts to prove functional school-related outcomes of learning music.

Artful Science

For more than two centuries after the Enlightenment, the view prevailed that creating and appreciating ensemble music (particularly instrumental music) marks individuals as financially secure and “well rounded.” During the Enlightenment, the view that auditory and visual experience contributed to knowledge formation accompanied the swell of emphasis on pedagogy for children and the public alike (Stafford, 1999). A leisure industry burst onto the scene in the late seventeenth century only to become widely accepted as normative by the mid-eighteenth century. What came to be known as a “middle class” developed rapidly as people traveled and sought out theaters, lectures, museums, and sites of musical performance. Literacy spread through these forms of public pedagogy, as well as through the broadening introduction of children’s literature and music books for children. Members of the merchant class as well as the intelligentsia and those of landed wealth ventured out to learn what travelers to faraway places had observed and collected.

Public pedagogies of these types seeped into the ideologies of middle-class parents. Handbooks of child-rearing, as well as the writings of pedagogues and philosophers that repeated and expanded the ideas of John Locke, Jean-Jacques Rousseau, and Johann Pestalozzi entered libraries and influenced parents wishing to amplify their children’s worlds of knowing. Pestalozzi planted the idea of learning by “head, hand, and heart.” Edification began at home with orientations to visual arts as well as through music lessons for girls and boys alike. Parents and the public prized work with the fingers and hands that resulted in products and performances that left no doubt of long hours of practice toward perfection. Proper posture disciplined the body during these pursuits, so that public

performances or presentations would be offered with a modest, albeit “proper,” bearing. Tools of arts production, ranging from easels and paint boxes to musical instruments, became normative household display items, along with artifacts attesting to literacy, such as bookstands, bookcases, and ceramic figures and paintings that portrayed individuals reading, painting, and playing music.

To take home the learning of music, whether in singing or playing musical instruments, became expected within middle-class families. Sales of instruments soared, as did demand for private lessons, especially for girls. Ensemble orchestras, including percussion, string, and brass sections, developed in eighteenth-century Europe, and chamber music groups proliferated. Behind this emergence lay the view that while churches had been primary sites for the performance of music during the Baroque period, such should not be the case looking forward. Composers such as Beethoven, Mozart, and Haydn became increasingly widely known to those whose Weekly schedules did not include either church attendance or attention to the scheduling of musical performances taking place in churches beyond worship service hours.

Recognition of the legitimacy of individual interpretational powers in music paralleled the eighteenth-century Protestant culture of reading and writing on “one’s own.” For musical interpretation, the idea of individual access and interpretation contributed to the distinctiveness of styles of interpretation claimed not only by individual performers but also by ensembles.

Beliefs surrounding the artful science of creating music that became normative during the Enlightenment held firmly into subsequent centuries and also among many upper- and middle-class families in modern economies today. This collective ideology embraces musical learning for its powers to further children’s learning of specific qualities of mind: individual interpretive creativity, development of mental and physical discipline, competence in reading into and beyond literate sources, acquisition and care of material objects, and practice and instruction leading to mastery. Those of the upper and middle classes holding these beliefs then and now look ahead to individual success for their children. They know that learning to play an instrument or to sing well enough to be included in a group requires many hours of practice as well as years of lessons. Much

valued is the belief that such learning within groups instills the value of working together to produce something beautiful and creative that audiences will appreciate.

Yet since the final decades of the twentieth century these opportunities, long cherished by those of substantial financial means, have become available for children living in some under-resourced communities in nations around the world. Democracy as an international ideal for all people and all nations led many to embrace goals of social justice and equity for children living in poverty around the world. As a consequence, the idea spread that music, and indeed all arts, should be available to all children, regardless of class background. This view accelerated along with the conviction that the arts, especially music, can change lives for the better (Tunstall, this volume, and Tunstall, 2012).

The United States is a modern economy that has no exemplary history of equitable distribution of non-school enrichment learning opportunities in music except to those involved in religious institutions. Moreover, the costs in time and financial outlay for under-resourced families as well as schools and communities have long seemed prohibitive. Music lessons, along with purchase or rental of instruments (and their storage and use in at-home practice sessions), have generally exceeded the discretionary incomes and spatial resources of working-class or working-poor families in the United States. Furthermore, as migratory labor patterns for immigrant families accelerated with agribusiness development, transport of large and fragile musical instruments for these families was entirely unrealistic.

Societal changes within churches also worked against the spread of opportunities to learn music. Particularly since the turn of the twenty-first century, sustained and professionally led choral or instrumental music provisions in churches and other religious institutions have declined along with decreasing church attendance across the United States. In the hope of retaining adolescents and young adults, some churches have “modernized” church music and introduced new instruments. However, professional leadership and sustained practice rarely characterize these changes.

Furthermore, as budgets for public education faced increasing cuts with the turn of the new century, access to music teachers or ensemble groups remained available primarily to students enrolled in private or independent schools. The only public schools able to retain the arts were those located in upper-income residential areas where parents formed

foundations to support art in their schools. Moreover, in these communities, parents carpooled to ensure additional practice and rehearsal time for their children's participation in arts programs.

Families living in communities of more limited means had no such opportunities. Moreover, even when public transport was available, working-poor parents were often reluctant to send their children across town to unfamiliar sites for long hours of practice and rehearsal. These parents often worked two jobs and only rarely in positions that offered flexible hours for transporting children to lessons or rehearsals or for attending afternoon or weekend concerts. Community centers, when present in under-resourced communities, tended to support sports opportunities, occasional short-term visual or dramatic arts programs, but more often homework "clubs" and volunteer tutoring. In short, especially since the turn of the twenty-first century, youngsters living in locations that could not offer music education either during or beyond school hours had little hope of growing up with sustained participatory experience in music ensembles.

When news of Venezuela's phenomenal success with its El Sistema programs reached the United States about this time, musicians and educators who had previously served primarily upper- and middle-class families wondered, "Why can't the Venezuelan phenomenon happen here in this country?" Debates and deliberations followed, with ample recognition of the many differences between the culture, geography, and economic patterning of leisure time in the United States and Venezuela. Yet as individual programs of what was initially termed "El Sistema USA" emerged in different parts of the United States, means of resourcing and promoting these opportunities arose through the efforts and resources of individuals from middle- and upper-income families, many of whom held the democratic and social justice views noted above. Moreover, as the realization of the declining effectiveness of US public education for children living in poverty became more widely recognized, enthusiasts for arts programs, including ensemble instrumental music programs, found motivation in the long-standing view that arts learning positively affects all learning. Moreover, many individuals felt that ensemble music could uniquely promote high learning demands for children and adolescents living in under-resourced communities unlikely to provide such arts learning for local children during afterschool hours.

Creating Music: How Does Learning Happen?

With the spread of El Sistema-inspired programs, both within and after school in the United States, researchers increased attention to the question of how ensemble music participation advances learning. Simultaneously, more researchers gave their attention to the learning contexts — studios and rehearsal zones, for example — for the arts. Moreover, some researchers addressed the issue of voluntary expertise development (sometimes termed “informal learning”) by young and old. In these instances, individuals or small groups determined the need or desire to learn something and set about finding combinations of ways to learn and work together. Some researchers wanted to know, in particular, the effects of voluntary expertise development opportunities for children living in communities with few resources of time, space, material goods, or local experts in highly specialized art forms.*

What follows are brief summaries of five primary features of the learning environment of ensemble music that have increasingly drawn the attention of researchers in the learning sciences. These contexts seem to account for the depth and retention of learning that lie at the center of creating music for mastery. The affordances offered by such contexts are generally invisible and lie outside the awareness of accomplished musicians. Working within an ensemble environment forces individuals to hone their memory for details. The context demands as a matter of course visual attentiveness, mental quickness, and collaborative skills. Such skills are the same as those required in an information-based and technology-driven world where academic advancement, employment, medical care, and other critical aspects of daily life rely on quick and ready use of them.

Research on voluntary expertise development points repeatedly to the effectiveness of learning contexts devised by local individuals in collaboration with experts in the targeted field. In some afterschool clubs and community centers, small groups pursue interests from choral music to wild flowers that motivate them to practice and to seek out information

* Community arts organizations and local arts advocates, as well as the National Science Foundation in the United States and the Crafts Council in the United Kingdom, stepped forward to support and spread information about what some termed the “pro-am” (or professional amateur) movement and its potential for local learning. See, for example, journals such as *Community Literacy* and works such as Crawford, 2009; Leadbetter 85 Miller, 2004.

in order to improve skills and to gain knowledge. Working with others in a common pursuit fosters self-directed learning that benefits the full group as well as the individual (Heath, 2012).

Within the actual work of groups dedicated to music, the need to learn structured symbol systems such as musical notation means some private study and practice as well as focused attentiveness within group practices. Such is certainly the case for both choral and instrumental ensembles. Noted below are some of the key features of learning that pertain in general to *both* types of music ensembles.

- (1) Rehearsal zones that support kinesthetic and haptic exploration (exploration through movement and touch) as well as accumulation of information and skills that encourage self-monitoring.
- (2) Consistent need and call for visual attentiveness to multiple cues and sources of cues within the immediate environment, plus development of the ability to tune out visual distractions.
- (3) Evidenced need to develop tolerance and understanding of the need for repetition and redundancy, both in the music itself and in routines of practice.
- (4) Consistent need to pay attention simultaneously to several structured symbol systems.
- (5) Acceleration of empathy and a sense of caring — for others within the ensemble, as well as for instruments and about relations between the music and the audience.

1. Rehearsal zones

One of the first vehicles for learning to create music is space — rehearsal zones and studios in particular (Heath, Paul-Boehncke, & Wolf, 2007; Hetland, Winner, Veenema, & Sheridan, 2007). Close examination of these spaces brings to our attention not only the visual and auditory nature of rehearsals, but also two distinctive forms of learning: the kinesthetic and the haptic.

In *kinesthetic* learning, individuals observe the body in motion — their own and others'. Alignment of the individual body as well as positioning in relation to others in the group conveys critical information in ensemble music. This information indicates whether or not individuals are mutually attending to the same stimulus, working in rhythm and with synchrony

when called for, and anticipating future moves of either specific members or sections of the full group.

Haptic learning is generally thought of as learning that derives from touching or gaining information through the “eyes of the skin,” particularly with the hands and forearms, as well as the fingers. In some art forms, such as dance, haptic learning involves several portions of the body at once. Architects consider in their designs the haptic learning that derives from the “feel” of the entire body within particular spaces, where walls or divisions differ in their exterior surfaces (Pallasmaa, 2009, 2012). Musicians echo this sentiment when they speak of the “feel” of certain concert spaces as well as the acoustics of these venues.

But beyond this general sense of “feel” in a space are the minute aspects of haptic understanding (see especially Chapter 11 of Wilson, 1998, on the hands of musicians). Advances in fMRI (functional magnetic resonance imaging) technologies now permit neuroscientists to see what happens to internal visual images in the brain when individuals grip, hold, or touch what they see. The haptic or hand-guided feedback that young musicians gain when they grip an instrument such as a bow, drum stick, or the neck of a violin, viola, or cello enhances the act of mentally visualizing, of envisioning what lies beyond the current moment. Gripping with the hand sends what neurologists call “force patterns” to those portions of the brain that enable individuals to envision what lies ahead (Reiner, 2000, 2008). As children learn to verbalize this sense of “nextness” when gripping objects in their hand, they learn to think before they act. The question: “What am I to do now that I have this object in my grip?” becomes operative as children mature beyond their own initial assumptions about possible actions to take with gripped objects. With maturity and linguistic abilities comes the verbal exploration of “What should I do with this?”

With such maturation, children move into more complex powers of seeing and interpreting. Guided practice is essential, however, for individuals to continue to improve visual (as well as auditory) perception of multi-layered details; all of this often in the midst of seeming chaos — messages and signals to different sections of the ensemble, and demonstration by the conductor that may seemingly be directed toward only one section. Visual discernment by young learners reduces the number of struggles the cognitive system faces in attempting to sort out irrelevant cues from those pertaining directly to one section or another, one portion of a page of

music, or one part of an instrument. Being attentive and alert comes not only through practice but also maturity.

Researchers who examine rehearsal zones give particular attention to how spaces become “instrumental” to the creative work of musicians as well as dancers and actors. The acoustics of spaces enhance the listening possibilities for members seated in various parts of the ensemble (as well as audience members). However, musicians also need to have within their spaces of rehearsal a sense of the mutual tuning in by others to the sounds in the immediate space. Joint attention of the group has to grow for individuals to achieve mastery. Thus, no individual player or singer can “zone out” or lose focus, for if they do so, the sense of togetherness is lost for others.* This attentiveness to space receives considerable practice in different settings, since travel for performances in various kinds of spaces comes about for groups as they develop mastery.

The importance of space to learning goes largely unnoted for many sites other than those in which the arts take place. Similarly, when assessing resources for young children’s growth, developmentalists rarely note the importance of spaces — both indoor and outdoor. Young learners living in crowded housing conditions and neighborhoods without either open spaces or buildings suitable for music rehearsals have few opportunities to learn how to “listen to space.” Families without discretionary income or time to learn within dedicated spaces (in either their homes or local neighborhoods) can rarely attend to their children’s interpretive skills for either spatial knowledge or awareness of tactile, haptic, or kinesthetic cues.

2. Visual attentiveness

Perhaps the most obvious fact about ensemble music is that learners who want to become members must develop habits of sustained attentiveness and observational awareness to what seems to be everything. Observers of youth working in ensemble music sometimes ask: Does holding visual gaze on matters of detail to be found in pages of sheet music aid the mental attentiveness of young people who live in a world of constant distractions? The unequivocal answer is a resounding “yes.” Much of the work

* For further understanding of how relationships of listening and observing work in music, see Black, 2008 as well as Schutz, 1964. Turino, 2008 illustrates the extent to which creativity in music around the world relies very much on nonns of interaction and interplay that are rarely voiced but rather attended to through listening and looking.

of learning in music comes through imitation. As musicians new to an ensemble settle in, they spend much of their time observing and watching others around them look and pay attention. Novices want to do what others do, and they need to do as others do in many ways. Highly critical, however, is learning which players to imitate and when.

To the experienced musician, it is obvious, for example, that reading a sheet of music differs for those who play different instruments. This distinction is learned as novice musicians sense their own belonging within a section or as an alto or tenor within a choral group. Timing, interpretation, and much else about performance relies then on imitation as a starting principle. Yet mastery relies on depth of understanding of distinctive roles, parts, and styles. As individuals gain mastery, they also grow more sensitive to nuances of coordination of these differentiated contributions from various parts of the ensemble (Levitin, 2006; Zbikowski, 2005, 2006). Thus, individuals within the string section must attend to what others in this section do with specific parts of the body, but they must also pay attention to notes, rhythm, pace, and the conductor's movements and detect these as cues that must be met with action in order to bring about desired outcomes for their section. Both direct and peripheral vision matters for beginners as well as for the most accomplished musician. Cues to be followed seem to be everywhere all at once.

With maturity and experience, young musicians gain in their ability to “think” with and through the complementarity of being visually attentive to what goes on around them and also controlling their own hands and body for purposeful actions. Cognition becomes grounded as children gain practice in motor-dependent production from what they see, anticipate, or envision. They also learn to assess their own actions as they do so. Cognitive neuroscientists use the term “grounded cognition” to refer to the extent to which the brain's modal systems ground internal representations of what others refer to as “concepts” (Barsalou, 2008). In ensemble music, this grounding or conceptual understanding comes about through simultaneous input from the environment, body, situational emotive stimuli, as well as through the work of the brain's modal systems.* For ex-

* See Barsalou, 2010. Such ideas have been around among neuroscientists and others since 2001, though specified in different terminology; see Schlaug, 2001 and the “speculations” of Benzon, 2001.

ample, the combination of visual perception, spatial sensing, and the work of the hand and forearm creates what some have termed “the thinking hand” (Pallasmaa, 2009).

3. Habituated tolerance of redundancy

Within instrumental and choral ensembles, learners repeat, repeat, repeat. They see within their music an order that is created by repeated patterns within particular segments of a set of lyrics or stretch of notes or portions of a fugue or sonata. With practice comes repetition of these patterns in multiple attempts to improve and to “get it right.” Individuals become accustomed to hours and hours during which they must tolerate repetition. They thereby become habituated, albeit subconsciously, to the practice it takes to improve and move toward mastery and the fact that this practice is vital.

As young learners gain familiarity with hearing and foreshadowing in their heads repetition of notes as well as bars and stretches of musical scores, they internalize stretches of this patterning. Only through hearing and taking part in stretches of music again and again will this habituation enable learners to move to a level of automaticity in recall, as well as recognition of how one repetition differs from another. Such is the case in many fields of intellectual mastery. Learners move into an unfamiliar space with dissimilar language uses, material items, and individuals playing roles that seem highly disparate. With practice, the environment becomes familiar. Habituation must be achieved in order to master the skills needed to compare these dissimilar items and roles, identify patterns, grasp the meaning of metaphors, understand particulars in relation to a whole, and figure out order and system (Rothstein, 2006).

As noted above, this kind of mastery applies in any type of engagement with the worlds of information or technology. For example scientists in all fields, just like musicians, rely on sorting out patterns and order as they carry out their work (Heath, Paul-Boehncke, 81 Wolf, 2007). Repetitive movements of any phenomena studied by scientists carry meaning (whether of celestial beings or geophysical structures). But to know these phenomena, both scientists and musicians look repeatedly, try to work out patterns, and determine how trying again may bring new results. The frequent question as to why so many scientists have also studied music has numerous answers. One certainty is that those who have participated in

the sustained work of ensemble music as youngsters know the meaning of repetition and patterning. They also understand the value of looking and listening closely to detect segments of phenomena that differ from time to time or under varying circumstances in only one element or detail (such as the vitality of one note or the shaping of a single molecule).

4. The layering of structured symbol systems

Learning the vital role of repetition enables even very young musicians to identify parts and to grasp the ways in which parts contribute to the whole. The arrangement of the many parts or elements involved in the production of music, whether choral or instrumental, amounts to layers of structured symbol systems, with notes, sounds, and numerals being only the most obvious of these. A page of music presents several systems (arrangement of lines and spaces along with musical notes, indications of time through both words and numbers, and, for choral groups, the words to be sung).

The structuring of symbol systems, and that alone, allows humans to detect meaning. As infants and toddlers learn to recognize and produce language(s), they do so only because the symbols (sounds) of every language make meaning through their structuring. Later children learn to read and count because they come to understand the structuring within their particular script system, whether alphabetic or otherwise. Each language of the world differs in its patterns of structuring. Though different languages contain many shared sounds (consider, for example, Spanish and Portuguese), nearly every language includes sounds that may not appear in other languages (for example, the five clicks of Xhosa, a South African language). The same is true for the musical systems of different cultures of the world. In learning to read the different script systems or alphabets of the world's languages, individuals must recognize how the lines, circles, and other segments of marks used relate to the sounds of the language. The same is true in reading the musical notation of cultures around the world. It is therefore no surprise that research in music learning continues to emphasize the extent to which the "language" areas of the brain work during the creation of music (Levitin and Menon, 2003).

Youngsters involved in ensemble music must learn to read the several layered structured symbol systems simultaneously — a stronger cognitive demand than when reading only alphabetic letters or the written script

system of any language. Beyond the page, children must also learn to interpret the movements of the conductor's baton. Musicians must read, encode, and translate all of these symbol systems to produce sounds that reflect timing, pace, emotional interpretation, and physical and musical coordination with the conductor's wishes, as well as with the actions of others in one's section and the ensemble group as a whole.

A further point is often overlooked when researchers talk about the layering of different symbol systems in music. Young musicians must learn to grasp the meaning of highly abstract terms that conductors use to refer to aspects of interpretation that cannot be rendered directly in symbol systems or literal language. This demand has been termed "cross-domain" learning.* For example, characterizations of musical pitch as "falling" or "rising" have no necessary relation to the actual vertical placement of notes on the printed page or the vertical orientation of the page. Essentially, much that happens in music relies on metaphorical interpretation and the suspension of belief in the literal. Other domains must then be called up to interpret music. Musicians have to "map" what they know about the real world onto specific usages in music of words and phrases and learn to act accordingly. "Text painting," or mapping the semantic meaning of words of lyrics onto notes, is familiar to those in choral groups as well as to instrumentalists who play such music. In such "painting," melodies "ascend" and "descend" often in relation to semantic meanings of accompanying words of the lyrics. In particular, musicians have to translate into specific actions metaphors reflecting concepts used in music such as "beauty," "mystery," and other "emblems" of what some have termed the "inner life" of music.

This "inner life" of music is often expressed by conductors and aficionados alike in terms of emotion or aesthetic quality using verbs such as *ascend*, *descend*, and *lift* as well as nouns such as *texture*, *integrity*, *truth*, etc. Moreover, conductors sometimes urge young musicians to create an aesthetic effect by providing analogies or metaphors, asking them to "play that feeling you get when you run in the wind" or "show here the release you get when you achieve something you struggle hard to do." Again, just

* Zbikowski (2005, 2006) developed this tema to account for the fact that musicians must map meaning across many domains. On related points, see Halwani, Riiber, 84 Schlaug, 2001.

as scientists must sometimes use words or phrases that rely on metaphorical interpretation, so must musicians.

5. *Empathy and caring work*

This environmental feature often seems too obvious to merit mention in treatises on the life and meaning of learning music. Yet being within a space that becomes familiar over time and involves the same group of people in the act of creating music brings a sensual reality to the meaning of words such as collaboration or cooperation. Staying attuned to others through having to be mindful of their movements and actions at all times brings about a sense of cohesion over time. Being in a group where one person's error, absence, or lapse of attention has consequences for specific others, as well as for the group as a whole, builds empathetic responsiveness.

Children who participate within ensemble groups must learn to care not only for their instruments, but also for others within the group. This type of caring refers to attention-giving, as when coordinating movements of bows in the string section. *Caring* in this sense refers to "being alert." This meaning is the same as that we convey in the caution to "take care." The further sense of "care about" also applies in ensemble music. The need for continuous care that comes with *playing* musical instruments is unique. Some musicians speak of their particular instrument in animate terms and see life stories revealed — especially within instruments made of wood.

Key aspects of sociodramatic play are found in the learning ecology of instrumental music ensembles. Individuals who are fully engaged also care about what and how others express meaning and respond to one another (Damasio 1999, 2005). Those who spend time simply observing others work out a portion of a score identify with the meaning or emotion the singers or players wish to convey. Picking up cues, interpreting emotion through sounds and action, and responding appropriately constitute core aspects of singing a part as well as playing an instrument. These skills cannot come through solitary practice. They can evolve only through observing and being with other singers or players whose expertise grows through years of practice in "taking care" and "caring about." Both uses of care point to the potential to make a difference in the state or condition of something or of someone else.

Moreover, the need to care for an instrument conveys special meaning for children of families living in small spaces, communities with high

crime rates, or in neighborhoods without reliable public transport. Each time a youngster picks up his or her musical instrument, that instrument requires attentive care — whether tuning and adjusting or checking on alignment of components. The interdependence between player and instrument is established at the moment a child is given responsibility for an instrument. Learning to care about it comes along with learning to play.

Families who move their households often and live in temporary or small spaces rarely accumulate expensive material items that require constant care. Therefore, when children from these families enter the study of instrumental music within a group, being entrusted with a material item that requires care may be a unique experience. Learners must:

- tune the instrument
- maintain its components
- pack it within a case for transport
- ensure that it is not damaged as they carry it about
- learn to distinguish one particular instrument from others similar in appearance.

Without this care, the instrument will fail them, and they, in turn, will fail both *to take care* and *to care about* the instrument as well as the ensemble.

Conclusion: Reflections on Research and Evaluation

Education reforms after the opening of the twenty-first century intensified the need for schools to take responsibility for student and teacher performance as measured through standardized tests of academic achievement. Moreover, within the United States, “learning” in the public’s mind slimmed down in definition to refer primarily to scores on academic achievement tests. Justification for expenditure in support of supplementary learning opportunities for children living in under-resourced communities needed to include evidence of gains on standardized test scores, particularly in reading and mathematics. From 2000 forward, learning of skills linked with science, technology, engineering, and mathematics (STEM) became a national focus, along with improved rates of growth in language and reading achievement.

Federal and national bureaucracies, as well as private funding sources, called increasingly for “evaluation” of any learning opportunity offered

to children both within and after school. Consulting firms and evaluation teams collected school scores and attendance records, surveyed parents and educators, and often asked children for self-reports of satisfaction with their learning experiences. Priorities in funding centered on programs of tutoring to eliminate deficiencies and raise standardized test performance. As a consequence, afterschool programs that promoted pursuits in the arts fell out of favor. Ensemble music programs suffered in particular ways when urban centers (such as Syracuse, New York) saw major arts centers close or symphony orchestras disband for lack of funding.

Thus, ensemble music programs faced increasing pressure to provide evidence that learning music benefits performance on academic tests and grades in school. This emphasis came to overshadow attention to the numerous specific fundamentals of learning gained by children who take part in sustained, professionally led ensemble music throughout their youth. Most of the features of learning environments of music and other arts easily pass unnoted by evaluators (as well as artists and musicians). The former generally know little about child development and the need, for example, to provide guidance and extensive practice in the “head, hand, and heart” work available only through the arts. Musicians and artists typically come to think of what they do as they create art or sing and play as being “only natural” or “just the way we do it.” However, these fundamentals of behavioral, visual, auditory, haptic, and interpretive practices that learning ensemble music demands give youngsters much more than an ability to create and make art.

Research carried out by scholars in several disciplines of the learning sciences, such as cognitive psychology, anthropology, and the neurosciences, continues to identify the complex ways in which practices central to the arts make differences in learning. The general goal of these scientists is to understand what happens in different types of learning environments that reinforce behaviors possible at certain maturational levels. At what age, for example, can young children translate into action highly abstract metaphors or read the intention of a conductor? This area of research by learning scientists tends to center on contexts of voluntary expertise development in which participants must meet high demand, take risks in performance, and undergo regimens of practice in order to acquire even mid-level mastery. Researchers in the learning sciences do not offer judgments on conditions or claim causal factors that figure in certain

patterns of behavior unrelated to the learning context studied. To be sure, they compare learning environments, but they do so primarily to identify specifics of certain environments that occur together with patterns of observed behaviors. They also compare the extent and nature of learning by individuals as behavioral changes take place over time. These changes are, in many instances, compared with data on maturational changes. In other words, learning science researchers can indicate the extent to which patterns of behavior *differ* in pace for children Working in ensemble situations from the developmental trajectory human developmentalists regard as “normal” for children who have no ensemble experience.

In fact, learning scientists have pointed out that much of what happens in these learning environments promotes lifelong habits beneficial for gaining skills and acquiring information in any field. Moreover, the interdisciplinary research of learning scientists leaves no doubt that claims of specific functional outcomes, such as performance on standardized academic tests, tell us very little about what actually happens in the brains, bodies, and emotions of youngsters involved in ensemble music or any of the other arts so long as professional guidance and sustained practice are provided.

Creating music reaches much deeper into the lives of young musicians than the scores on their next set of reading or mathematics tests. As indicated above, young musicians gain, among other vital skills, visual and auditory perception, interpretive skills, and practice vital to processing multiple sources of information simultaneously. As We study rehearsal zones in which ensemble music is created, We deepen our understanding of how much practice it takes for young people to automate the cognitive processes necessary to read and respond to messages that come from the layered symbol systems that characterize ensemble music. In addition to these particular cognitive and linguistic abilities, young musicians also gain practice essential to the automaticity necessary for response to simultaneous and fast-moving visual, kinesthetic, haptic, and auditory cues. Social growth in empathy and various modes of caring become deeply embedded Within the interactions of music ensembles. Cognitive, linguistic, and social learning support numerous other types of learning, from self-regulation to facility in interpreting abstractions and metaphors through cross-domain mapping.

Evaluations that rely primarily on standardized test scores cannot

capture what learning sciences researchers are rapidly documenting and analyzing about the differential effects on learning of various types of environments. When evaluators and educators go after only functional, surface-level, often temporary and contingent kinds of learning gains, they short-change what happens in any deep learning, such as that of ensemble music. To be sure, this learning takes place subconsciously and only with professional guidance and sustained practice over years. Yet changes in levels of mastery can be observed, noted, and analyzed together with shifting development of musical knowledge and skill. These research findings are supported through annual administration of specific tests that measure growth in visual perception, detection and memory of patterns, categorization and language processing skills, and interpretation of metaphors and abstractions related to emotional responses. In time, ensemble music groups and their financial supporters will come to value the research that documents growth in musical mastery as well as changes in the above-noted abilities. Validation will come for the expanding research on music learning from all the disciplines included in the learning sciences.

The learning that results from participation in ensemble music brings life-long and life-wide consequences (Young, 1999). The skills and concepts acquired through sustained music practice and rehearsal carry value in academic and career-preparation settings. Moreover, these skills increasingly appear at the top of lists of characteristics predicted to be essential to successful participation in the twenty-first century economy. Such skills have been identified by employers and researchers working in the worlds of wellness and health, as well as industries linked with information technologies. In list form, the skills sound so simple as to be unworthy of notice in the everyday world. Yet the cumulative effects are what matters: seeing and hearing patterning of parts in relation to the whole, reliable interpreting of multiple symbol systems as well as metaphors and abstract references, maintaining interpersonal and intrapersonal behavior in accordance with situational circumstances, and developing and sustaining mentally challenging activities that call for visual and auditory perception as well as long-term memory for details and patterning.

In short, the very skills and concepts that become manifest with extended participation in the learning ecology of ensemble music are central to effective learning, now and into the future, not only for children living

in under-resourced communities but for all young learners. However, those from poorly endowed communities are less likely than their wealthier counterparts to live in symbol-rich environments with regular intense cognitive and linguistic demands that call for highly specific listening, interpretive, and motor skills. Moreover, impoverished families can rarely provide their children close supportive sustained association with experts and other learners working toward the same goal of mastery in performance.

If El Sistema as it plays out in communities across the world survives as more than a passing fad among the current approaches to social justice, its supporters must invest in research. Moreover, a first step to giving more attention to ensemble music is the need to re-socialize parents across all social classes as well as educators and public and private funders. They need to be made aware of what happens as their children work and learn within ensemble music. Knowing that, they will know more of what lies within creating music that makes it an eternally valued — and ever puzzling — aspect of humanity.

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