STEMming the Tide:
STEAMing Ahead By Including World Language Education

by Kathryn Murphy-Judy, Ph.D.

In my 45 years of teaching and researching on language education, I've concluded that collaboration yields far better results than competition. As I look around our world today, tensions run high. Yet, if there is anything we know as world language educators, people able to communicate and negotiate across troubled times and borders multilingually and multiculturally are the 21st century's greatest human resource, if not our best chance for survival. No matter how great our science and technology, if we can't communicate competently with our seven billion neighbors, we fail the human race. What I'd like to do here, then, is tease out threads of current discourses~America's language crisis, early childhood education, STEM and coding priorities, and technology enhanced language learning~to see if we can't weave them into a different, stronger cloth.

This past academic year, 2016-2017, the language education community produced reports based on comprehensive data collection about the state of the field. Please click this link to see the K-12 language face of our nation: https://www.americancouncils.org/FLEREPORT (ACIE, 2016). The American Association of Arts and Sciences (AAAS) published a statistical report of U.S. language study. In its preface, it noted that our country "has neglected languages in its educational curricula, its international strategies." (AAAS, 2016, p.3) It continues with a remark that "a dwindling number of the nation's schools offer any language education. In academic year 2007/2008, 25% of elementary schools taught languages other than English. This marked a six percentage point drop from 1996/1997, with the largest decline at public schools. " (p.9). In the ensuing AAAS report (AAAS, 2017), the commission contends that, "As children prove especially receptive to language education . . . instruction should begin as early in life as possible. Its primary goal, therefore, is for every school in the nation to offer meaningful instruction in world languages as part of their standard curricula" (p.viii). Contrary to this goal, however, the report shows that there has been a six percent decline, from 31% down to 25%, in the number of elementary schools teaching languages other than English from 1997 to 2008, even fewer among public elementary schools with only 15% (p. 33) to the extent that Americans today "risk being left out of any conversation that does not take place in English." (ibid.) Moreover, unequal educational access is particularly marked where it comes to world languages. The Commission warns, therefore, "This disparity of access and opportunity, mirroring other forms of systemic inequality, must be addressed immediately, beginning with a re-commitment by school administrators at public institutions in particular." (p.34) So, this is our current reality quotient: we know we need more and earlier language instruction to keep the USA great, but as a nation we continue to trend in the opposite direction.

All schools, public and private, should be offering languages. Yet, pressures from all around the educational community and within it are focussing on science, technology, engineering and mathematics, or STEM, as is it commonly known. The thinking is that the American economy is based on human capital versed in STEM, that what really counts is the next Facebook, Tesla or genetic advance. Yes, they are important. The AAAS report notes correctly, however, that "language must be seen as complementary to, rather than as competing with, STEM, " (p.34). With only so much instructional time, competing learning needs, and limited resources, the mantra has become STEM, STEM, STEM. This, to the extent that several school systems have attempted to substitute coding for the foreign language requirement (Florida, Texas, Oklahoma, Virginia, Michigan, Kentucky, New Mexico, Washington, among others). Still, even programmers like James Previti disagree with such a move, realizing that "Computer 'languages' are for creating instructions for the actions of computers. Spoken languages are for the communication of ideas ... a realm not likely to be occupied by computers anytime soon. The clear communication of ideas is much more important for our race than computer instructions." (Suhay, 2014) America faces different, necessary, and~in an ideal world~ non-competing, educational forces for the 21st century. Perhaps we need to remind those pushing STEM over all else that Darwin's theory of evolution began in the context of linguistic change and that DNA is structured like a language. Humans think, discuss and do science, math, engineering and technology through languages.

World languages should look to the arts for another model of working with STEM. The powerful STEAM movement, led by the Rhode Island School of Design (RISD) and widely adopted, recognizes that art and design are fundamental aspects of science, technology, engineering, and math advances. It lists its objectives as: (1) transforming research policy to place Art and Design at the center of STEM; (2) encouraging integration of Art and Design in K–20 education; and, (3) influencing employers to hire artists and designers to drive innovation. ACTFL's new movement, Lead with Languages, offers us a similar way to put languages in the heart of STEAMing forward. We might say, there is no STEAM without TEAM, and languages are central to teamwork. For the rest of this article, I'll refer to STEAM rather than STEM, since the A team is better!

A powerful argument for early language instruction has been made over and over again in our field: bilingualism produces better brains. Moreover, these brains perform math and science better! As far back as 1989, studies were showing that elementary students taking languages scored higher on cognitive skill tests (Foster, K. M., & Reeves, C. K., 1989). Foreign Language in the Elementary School (FLES) improves cognitive skills. (FLES News, 2(3), 4.) ACTFL traces what these skills mean for all kinds of performance. "These cognitive benefits of language learning have been shown to enhance student performance producing:

Higher standardized test scores

Higher reading achievement

Expanded student vocabulary in native language (English)

Higher academic performance at the college level" (ACTFL, 2017)

Given these enhancements, it stands to reason that language learning, especially if it starts early and is ongoing, will positively impact STEAM studies, too. Standardized testing, as we know, runs the math, sciences, language, logic gamut.

The AAAS report looks at the nexus of early language learning and technology. It states that, "Young children have proven especially responsive to programs that alternate between personal instruction and online enrichment" (p.35). Working with software and apps, young learners intuit interface logics, data structures, and logical routines without so much as a coding class. This is the beauty of our digital world and the fact that they are growing up in it as "natives". Just think, though, how much deeper this digital experience is for children engaged in global apps across national and linguistic borders. For the technology and engineering part of STEAM, our young charges sitting in front of their iPads in language class are discovering new worlds of tech, ones that a series of all-English, all-American coding can never open. The incursion of big data, neuroscience, artificial intelligence and deep learning, all kinds of scientific and technological advances, impact the field of second language acquisition. Research in our field brings progress to our classroom practices, thus improving student learning, regardless of subject matter. Our fields need each other for all to benefit. So, what if we show STEAM proponents how much our global dimension added to their endeavors would bring to everyone? If we were to all collaborate, we would all advance so much more quickly and productively!

Finally, let's talk about teachers. The AAAS 2017 report underscores the critical lack of language teachers across the country. "But even if language learning becomes a national priority parallel to the emphasis on STEAM education, we do not have enough certified language teachers at any level to meet the demand. According to the U.S. Department of Education, forty-four states and the District of Columbia currently report a shortage of qualified k–12 language and/or bilingual teachers for the 2016–2017 school year. Indeed, more states report a teacher shortage in languages than in any other subject. And since this count depends entirely on the states' self-reporting, the shortage may be even more significant than it appears." (pp.34-35) Here, too, STEAM and languages need to collaborate. Again, new technologies, online learning, and digital apps can help supply teacher training. By sharing pedagogical knowledge, all of our teacher education programs can benefit. High-leverage teaching practices, for example, came to world language teacher education from math teacher educators. We have so much to share, here, too. From our side, in that we induct novices into the inception of language use, we are clever and adept at ushering youngsters into not just new words, but the entire conceptual world that underpins it. We know how to use listening, speaking, reading, writing together to introduce, scaffold, differentiate and deliver new knowledge. We have a lot to share with our colleagues in STEAM.

To address the critical needs we have in America today for a globally STEAM literate 21st century, all of us must come to the table to discuss, share, innovate. Let the world language field cross the Sciences/Humanities divide, as we are trained to do, by using our world of words and our cornucopia of strategies. After all, we're the ones who teach others to communicate and collaborate, whoever and wherever they may be.

Since we already connect globally to enrich student learning, why can't we use similar media, techniques and technologies to connect across the hall to engage with our STEAM colleagues, connecting our forces and exciting learners? Here are a few suggestions for creating healthy linkages:

1. Your language day in math: a French example, Descartes, Pascal, Fermat, Mandelbrot, Germain.

2.The impact of languages on Darwin's notion of evolution.

3. Tracing zero from India, across the Islamic/Arab conquests, to Italy and the European Renaissance.

4. Leonardo da Vinci, need I say more!

5. Ibn Rusd (a.k.a., Averroes) in physics and astronomy

6. The new Chinese engineered San Francisco-Oakland Bay bridge.

What ideas do you have? Let's share them here: (I can make an open Google doc for us). Most, importantly, let's start the dialogues with our STEAM colleagues to help all of us move forward together, a single voice that calls for the best 21st century education for all the children.

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