

STEM Curriculum - Storytelling for Teaching Science, Technology, Engineering and Math

Jo Tomalin



Iroko Theatre - Shakespeare's *Ájè* "The Witches" at the Barbican, London with Alex OMA-PIUS playing drums (second left). Photo by Jo Tomalin

Jack Maguire, the author of two important books about storytelling: *Creative Storytelling: Choosing, Inventing, & Sharing Tales for Children* (Yellow Moon, 1992) and *The Power of Personal Storytelling* (TarcherPerigee, 1998), suggests that stories invite the listener in, to stay, and then return. Surely this is what we all desire as teachers, that our students are welcomed into our class, to learn about our subject, to stay a while, and to want to return later, motivated to learn more.

Why focus on Storytelling and STEM curriculum?

My work as a teacher of performance subjects including acting, storytelling, voice, and movement for actors, plus my passion for education and how theatre can be an effective tool in the classroom, led me to develop a new course at San Francisco State University in 2006 about integrating theatre into the K-16 curriculum.

Based on this work, I was invited by the University

of London to develop and teach a storytelling course in 2015. Participants were faculty and doctoral students from departments including: biochemistry, engineering, urban studies, anthropology, physics, mathematics, dentistry, and neuroscience. The storytelling activities in the course helped participants develop storytelling skills and a way to apply them to their own teaching in their wide range of subject areas. I discovered how concepts of these STEM subjects could be taught through storytelling and could motivate students of all ages to learn.

Initiative of the US Department of Education and STEM

According to the US Department of Education, STEM is a recent initiative in US K-12 education to focus on Science, Technology, Engineering, and Math education for Global Leadership:

"In a world that's becoming increasingly complex, where

success is driven not only by what you know, but by what you can do with what you know, it's more important than ever for our youth to be equipped with the knowledge and skills to solve tough problems, gather and evaluate evidence, and make sense of information. These are the types of skills that students learn by studying science, technology, engineering, and math—subjects collectively known as STEM. Yet today, few American students pursue expertise in STEM fields—and we have an inadequate pipeline of teachers skilled in those subjects." (www.ed.gov/stem)

All students do not assimilate information in the same way. For example, people gravitate towards—or away from—certain types of learning experiences, such as lecture, reading or writing reports, hands-on activity, working in groups, working alone, aural, bodily kinesthetic, spatial, logical, or linguistic. There is also a dearth of girls and women educated in STEM topics. Teachers need to be aware of how their students learn and to follow a Universal Design-for-Learning model to be inclusive—which means being equally motivating to all students of all subjects, offering different ways to connect with subject matter, and letting their students show their understanding through a variety of assessment methods.

Importance of Storytelling Now

Storytelling is becoming recognized as an important method for encouraging students to become interested in STEM at a young age and to continue to study STEM subjects. A KQED article asks, "Could Storytelling Be the Secret Sauce to STEM Education?" (kqed.org/mindshift/2015/06/05/could-storytelling-be-the-secret-sauce-to-stem-education/)

Storytelling and Iroko Theatre, London, UK

In the spring of 2016 I spent three months on a creative research project to learn more about storytelling in the UK. During my time in London, I met with Alex OMA-PIUS, Artistic Director of the Iroko Theatre Company, to discuss the use of stories as a way to teach STEM subjects. I attended several performances by Iroko Theatre and a full-day storytelling workshop for undergraduate students at the University of Canterbury, Kent. The Iroko Company is winner of the Guardian Charity Award for "its innovative approach to

education applying storytelling, drama, music, dance, and arts and crafts as a vehicle to enhance the education, skills, health, and general wellbeing of people of all ages and backgrounds."

Alex OMA-PIUS studied acting and directing at the National Academy for Theatre and Film Arts (NATFA) in Sofia, Bulgaria, and has worked with the BBC and the Royal Shakespeare Company. Recently he was director, deviser, curator, and storyteller with Iroko for "Our Shared Heritage Project" a performance connecting culture through stories, objects, and artifacts, and an accompanying exhibition at the British Museum.

OMA-PIUS established Iroko Theatre in 1996. He is passionate about using "traditional African theatre art forms as a vehicle for facilitating learning and self-development particularly amongst children and young people." He is one of the few people in the UK who trains teachers in schools to



Above left: Iroko Theatre Storytelling Training for Teachers. Above right: Iroko Theatre Storytelling Training for Librarians. Left: Alex OMA-PIUS All photos courtesy of Iroko Theatre

integrate storytelling into education. There are subjects in the K-16 curriculum which lend themselves to storytelling naturally, such as literature or history. However, Alex and Iroko Theatre go one step further and show

teachers how to integrate stories into both their teaching style and STEM subjects, particularly science.

Alex OMA-PIUS is a dynamic storyteller with vibrant eyes, warm facial expressions, and a beautiful resonant voice. Originally from Nigeria, he starts by calling out "Story, story!" in his workshops and training sessions. He uses rhythms from the beat of African drums—played by him, actors in his company, and audience members. It is impressive how he gets people involved so quickly!

“Teachers gain confidence standing in front of an audience from storytelling training, which helps in all aspects of teaching, such as delivery, voice projection and physical presence, interactions, and how to relate to students.

“An example of a storytelling technique using rhythm is times tables in math, using the rhythms of two times two, etc. In geography you can sing names of rivers in countries. Telling stories of animals having human attributes is a very effective way for young people to learn. Storytelling is good at describing difficult subjects.

“I think it’s a great idea to use storytelling to teach STEM subjects, because the content can be broken down to arouse the interest of students, who may not normally be interested. Someone asked me how is it that children achieve so much from our storytelling workshops in classrooms settings, it’s because they have the opportunity to express themselves, there is no boundary, they can make mistakes. It’s more about the opportunity to be free and explore. And I am sure that type of atmosphere brought into the classroom is a way to enable young people to make mistakes! In storytelling you need to allow the young people to use their imagination rather than invade the stage with sets and props etc. Use mime and movement!”

Storytelling Workshop in London

In Summer 2016 I presented storytelling workshops to teachers at the University of London. They were shy or reticent about integrating stories into their teaching at the beginning, but as they acclimated and joined in telling group or individual stories, they gained confidence and learned to value stories as a teaching tool.

Storytellers can take this approach, too. For example, when beginning to tell a STEM story, a simple way to begin is with a very brief personal story to say why they are interested in the topic. The opening need only be a few sentences, but it may draw in listeners who would typically tune out. These are simple examples, but when a teacher or storyteller shares a personal point of view with

authenticity, the audience relaxes, focuses, and uses their imagination.

More Examples

In my own teaching I have learned many ways to use storytelling, physical storytelling, theatre, and games that can be applied to teaching STEM subjects for K-16 teachers. Examples include: guiding students to do movement demonstrating the process of electricity, the behavior of cells, or the patterns made by atoms.

A variation is to do group work where participants demonstrate equation order or chemical compound interactions with the teacher as a director who begins the session by telling a story about these scientific concepts. Student groups can recreate these interactions after reading about them, with a narrator telling the story while others act it out.

These are wonderful strategies to encourage interactive teaching and learning, while discovering physical and oral storytelling and presentation skills. A group of people of any age may need some simpler warm-up activities to prepare them to participate constructively. It is a good idea to start small and build complexity as the semester progresses. Always aim to set your participants up for success, which means the leader’s directions must be very clear, succinct, and encouraging. Teach them to take a breath, connect with their topic, use their imagination, and collaborate.

Additional storytelling examples for the STEM classroom include:

“Hot seat” - where a student researches an important person and pretends to be that person, telling about the life



Above: Alex OMA-PIUS teaching workshop for students at Canterbury University, UK. Photo by Jo Tomalin
Right: Alex OMA-PIUS teaching workshop for students at Canterbury University, UK. courtesy of Iroko Theatre.



and times, challenges and achievements, then participates in a question and answer session.

Augusto Boal’s forum theatre is where students act out a real situation as a group, the leader pauses the improvisation to request suggestions from the audience for a new viewpoint, a new participant narrates their position to the audience and joins the scene. This becomes like a live action debate where participants are immersed and not seated at desks like a formal debate. This technique can be applied to STEM scenarios where participants act out and compare theories and processes from past to future. Examples include: engineering projects based on conflicting bridge designs; the ethics of using stem cells in medicine; and security in cyberspace.

Based on a STEM topics suggested by the leader, physical storytelling as characters (real or imagined) plants, chemical elements, animals, objects, etc. can stimulate students’ imaginations and understanding.

All these examples can be adjusted for age and topic, it’s up to the storyteller’s and teacher’s imagination to adapt and create storytelling and theatre activities that motivate learning, especially of STEM subjects so that students enter, stay, and return, wanting to learn more.

Additional Resources:

Boal, A. (2013). *Theatre of the Oppressed*. Pluto Press.

Iroko Theatre <<http://www.irokothatre.org.uk>>

Norfolk, S., Lieberman, S., Stenson, J., & Williams, D. (2006). *The Storytelling Classroom: Applications Across the Curriculum*. Westport, Conn: Libraries Unlimited.

Schiro, M. (2004). *Oral Storytelling and Teaching Mathematics: Pedagogical and Multicultural Perspectives*. London: SAGE.

Smith, C., & Pottle, J. (2015). *Science Through Stories: Teaching Primary Science with Storytelling*. Stroud, Gloucestershire: Hawthorn Press.



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