MOVING ANALOGIES

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Introduction

A group of students move around a standard classroom. After some visual exploration, each student stops in front of an object and then taps, scrapes, drops, pushes, and spins it to discover the sounds that might result. After a few seconds, the student moves on to another object to repeat the sound discovery process. After collecting the sounds of ten objects, students move back to their favorite and "practice" it. After a short silence, one student begins to play their discovered sound. Then a second student enters with their sound, adding to that of the first. One by one, students add their sounds, paying attention to how their sound contributes to the whole. At times, a sound may exit, but then reenter to contribute something new. After a few minutes, this symphony of found sounds begins to dissolve as one voice after another leaves. The group remains in silence for a few seconds, and then breaks into excited discussion.

The scene above is from an engineering classroom and its purpose is to teach entrepreneurship skills through moving analogies. In this case, follow-up discussion will focus on the importance of finding good resources, whether they are people, materials, locations, or partners. The instructor will help students map the activities and experiences of combining sounds onto how a venture might combine resources. However, it will be the students who will need to discover and explore the connections.

The purpose of this article is to demonstrate the power of moving analogies in distilling concepts to make them more tangible and memorable. The lesson of finding and combining resources could certainly have been approached from an academic perspective, perhaps with a *Harvard Business Review* case study. I will argue that students remember, internalize, and use moving analogies more readily than the traditional academic approach. In this article, I will pull apart how and why moving analogies work, where they are most valuable, and how to create them.

Motivation and Background
"The great aim of education is not knowledge but action." – Herbert Spencer

Moving analogies are simple, but their purpose and power are not obvious at first. In this section, the higher-level purpose will be laid out.

Learning Styles
Visual, auditory, and kinesthetic experiences are the primary ways we can reach our students. With the exception of a small handful of disciplines, however, kinesthetic learning is rarely seen in college classrooms. In fact, if the level of kinesthetic activity were plotted throughout the lifetime of a student, it is hypothesized that it would begin high in early learning and drop to nearly zero some time in middle school.

This trend is disturbing for a few reasons. First, the implication is that learning must be a rational process. The idea that rationality is the defining feature of humans has a long history in philosophy. The result is that traditional academic topics have been taught through lectures or through mentally active exercises. The more rigorous the topic, the more abstractly it would be

taught. Physical movement would be reserved only for the teaching of physical topics. Second, the traditional (going back hundreds of years) definition of the liberal arts included physical learning along side academic topics. Being a well-rounded person meant being physically educated as well. Third, when physical tasks are taught in the college classroom (e.g., soldering, drill press operation, benchtop experiments), they are to support a theoretical topic that exists in mental space.

Moving To Think

Many learning techniques that are labeled as "active learning" are not physically active but rather mentally active--placing the mental lifting in the hands of the students rather than the instructor. But the ultimate goal of teaching concepts is to help students *act.* Moving analogies are physical movements that are attached to intellectual concepts. They help students to *think* about and abstract a concept. It is this abstraction that will allow them to act in new situations.

Analogies as Tools for Thinking

There are philosophical debates on the mechanisms of learning. There are also many techniques that have been shown empirically to yield results. Learning through analogies spans from the philosophical to the practical, with some claiming that *all* true learning (as opposed to simple pattern matching) is at a deep level, the connecting of new information to old information (either previously learned or *a priori* knowledge). Analogy has even been implicated as the core of all human thought and creativity. Whether or not analogies are as fundamental to learning as some claim, they are clearly powerful.

There is always a paradox in teaching and learning. The enormous body of learning research supports the idea that students progress from concrete experiences to abstractions. Trying to begin with abstractions is therefore bound to fail, unless students already have significant experience. On the other hand, there is little time to repeatedly expose students to concrete experiences and wait for them to abstract the core concept.

In most traditional classrooms, concrete knowledge is introduced either in the historical area in which it was first discovered or in the area where the instructor assumes the students will most likely use it. For example, the concept of order and disorder will be introduced in a thermodynamics class because this is the first field to formally study such topics. The result, however, is that students are left with the perception that the concepts of order and disorder are only useful in thermodynamics. Such narrowly defined concepts are not abstract enough to be applied outside of the domain of first encounter. When a student reads a *Harvard Business Review* case study, there will be many examples, but they will all come from the realm of business. The implication is that resource management is a topic that is only relevant to the business world.

Moving analogies take a very different tack. They are concrete in a physical sense but abstract at the level of the intellectual concept. For that reason, they are stored in memory in a way that is useable by many intellectual domains. In other words, they can be used outside of the domain in which they were first encountered. For example, encountering resource management through the exercise described at the beginning of this article will be useful within business, but also useful in many other fields.

The Stickiness of Moving Analogies

Movement has a powerful effect on a learner. It is perhaps our first way of learning, typified by a baby eventually realizing that those "pink things" waiving in front of its eyes are actually a part of itself. In this way, movement is the source of some of our most basic concepts: correlating our actions with results, the concept of causality and even the perception of a self.

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There is evidence that movement, especially new movement, results in an emotional response. In separate studies, emotion is a sort of heuristic that flags new information as important and worth remembering. When putting these two findings together, moving analogies prime the mind to learn.

Moving analogies are very sticky in the way outlined in the book Made to Stick (Heath and Heath 2007). The Heath brothers' hypothesis is that a person's attention is gained and retained by consciously or unconsciously gauging six dimensions of an experience. In Table 1, I have mapped their six attributes to moving analogies.

ATTRIBUTE	MOVING ANALOGIES ARE…
Simple	Easy to explain and execute and nearly everyone can participate.
Unexpected	Not expected because students are unaccustomed to moving in class.
Concrete	Real physical experiences that are later tied to an abstract concept.
Credible	Not tied to any particular disciplinary expertise. There are no experts.
Emotional	Physical and often social, both powerful generators of emotional response.
Stories	Generators of stories. Students often reenact them with their friends.

Table 1: Mapping of Made to Stick Attributes to Moving Analogies

Example Activities

The example activities below are meant to address three aspects of moving analogies. First, the activities may be used as explained in classrooms. May of the activities below have been used in technical classes to teach technical concepts (e.g., system stability, mechanical alignment, electrical propagation down a cable), as outlined in previous published works (Tranquillo 2008). Second, they are meant to demonstrate the deeper mechanisms addressed above. Third, and perhaps more importantly, they are offered to stimulate more ideas for moving analogies.

Unbendable Arm

Aikido is a Japanese martial art that uses a number of basic physiological "tricks" to redirect the energy of an attacker. One of the very first Aikido lessons is the idea of alignment, demonstrated by the unbendable arm exercise. Two people stand facing one another. Person A places their right arm, outstretched, on the left shoulder of person B. Person B then places both of their hands on the elbow of person A and applies pressure. The goal of person B is to collapse the arm of person A, while the goal of person A is to keep their arm from collapsing. If person A relaxes but has their arm in alignment, it is nearly impossible for person B to bend their arm. This counterintuitive result (the two arms of person B not being able to bend the single arm of person A) can be used to spark a discussion about how organizations that are in alignment can meet the challenges they face. The follow up discussion can focus on the challenges a group might face and how to align their team through vision statements, missions, goals, policies, and tactics.

Circle Sync

A simple movement warm up involves all participants creating a large circle with all their shoulders touching. Everyone pairs off (there must be an even number) and claps together their outside hands (right hand of person on the right to left hand of person on the left). The second clap is a person using their own two hands (in the middle). The third clap is with the neighbor who was not the original pair. These three steps are repeated – clap with your partner, clap with

yourself, then clap with your other neighbor. With a little practice, the group will develop a rhythm and become synchronized. After maintaining synchronization for about ten seconds, the group can be asked to close their eyes and continue the synchronized clapping. This exercise can be mapped to communication within a group or company. It brings up the idea of how to bring about efficient communication, and that it will often involve consistent and multiple forms of communication. In the exercise, even when one form of communication has broken down (closing the eyes), there was still another form of communication (sound of clapping) that allowed the group to stay synchronized.

As a faculty member working with long-term teams, I use this exercise at the first meeting. Later if I need to send the signal to the team that they are becoming inefficient and unsynchronized, I only need to make the motion of clapping hands. It is powerful and unspoken. A second way to map the exercise is to discuss what happens when one person purposely does not go along with the group (this could also be another demonstration). The discussion can range from the idea that this person is a dissident and should be removed from the group (fired) to the idea that perhaps synchronization is only good for regular activities in a company. The dissident can in fact be very useful for breaking out of established patterns.

Space Sculptures
In making a shape with the body, dancers will divide spaces into *closed* (form a closed boundary with the body and floor or wall) and *open* (do not form a closed boundary). This basic vocabulary can be introduced simply by having a student make a shape with their body. After defining open and closed spaces, the instructor can have small groups (up to eight in a group) create space sculptures. One person making a shape creates a sculpture. Then another person adds to that shape by entering some closed space. Then the next

person enters, again adding to a closed space. Once everyone has entered, the sculpture can dissolve away and the process is repeated again. Then the group can experiment with adding only to open spaces. The restriction of only open or closed can be lifted to allow groups to improvise their own sculptures. To increase the difficulty, the instructor can ask the groups to come up with a word or phrase that they want to represent with their sculpture. They then need to prepare their sculpture in private and practice it. Each group then must show their sculpture and have the other groups try to guess the word or phrase.

Interpreting this activity can take many forms. First, there are takeaways about team dynamics that this activity can initiate. Second, there is information about how some simple rules (open and closed spaces) can open up possibilities. The mapping to entrepreneurship here is that a simple mission or change in a business model can open up new possibilities. Lastly, the final exercise can highlight how a group with a good idea, and good execution, can capture the attention of an audience.

Triangle Game
A movement warm up involves everyone walking randomly around a space. Instructions are given to keep moving but to follow the location of someone just with their eyes. The goal is to not let the target know they are being watched. After 10-20 seconds, instructions are given to continue following that person but to add a second person--now to keep track to two people. While everyone is moving, the instructions are given for each person to try to form an equilateral triangle, with the two targets being vertices and the person completing the triangle. After the instructions are explained, a loud clap is given to start the process. The result is everyone simultaneously and dynamically trying to create equilateral triangles.

There are several analogies here that can be mapped back to entrepreneurial thinking. In

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tracking two people at once, the message can be that often an entrepreneur needs to be able to keep track of competitors, suppliers, market numbers, finances, and other internal and external forces. As in the exercise, it is easy to lose track of the most important items to track due to the noise in the environment. And if you cannot keep track of these items, you will not be able to play the game. A second analogy is that being an entrepreneur is about being in a dynamic environment, where your targets are constantly changing and shifting in response to their own goals. Lastly, there are some trials in the game where the group will reach a static point. Other times the activity never settles down. This is an opportunity to discuss equilibrium and non-equilibrium in the marketplace.

Unliftable Body

A second key lesson in Aikido is the idea of having your weight under you--essentially to maintain your balance while throwing your attacker off. The idea is to be as heavy as possible. This can be contrasted with the idea of being light that is often taught to ballet dancers. The post-modern dance form Contact Improvisation draws from both Aikido and ballet and uses both being heavy and light (for a demonstration see http://www.youtube.com/watch?v=jcrbIdY3HZc) to allow dancers to alternatively lift one another (InterkinectedInc 2013). As a demonstration of this principle, groups of two are formed that are approximately equal body weight/strength. The task is to pick up your partner. The partner will first try to be very light--spreading their arms and legs to mimic a ballet dancer. Next, the partner will try to be very heavy--like a sumo wrestler preparing for impact. The difference is often surprising. The message can be connected back to dance, where the lifter should be a heavy support, while the lifted should be light and display flourishes. In entrepreneurship, the mapping can be that there are times when an individual must be heavy--bringing their

area of expertise to be the solid center of the team. But there are also times when that same person uses their area of expertise to add flourishes. It is important to be able to dynamically shift between these two modes of thinking and acting when working on an entrepreneurial team.

Interpretations and Variations

Like all analogies, there are different ways to interpret and expand upon the activities above. For example, the unbendable arm activity can be used to explain the pedagogy of assigning open-ended problems: "I am giving you a challenge that seems hard, but if you are aligned in the way you approach it you will be able to apply what you learned to rise to later challenges." This is a way to communicate to my students that I am trying to bend them and they are learning how to respond. A variation to the space sculptures can also bring out risk-taking in a group. After practicing creating a sculpture based upon a word or phrase they have chosen, they can then improvise a sculpture--the audience offers a word or phrase and the team must (without talking) create a representative shape. A trick here is to allow the groups to add dynamics to their sculptures (e.g., waving hands and feet or even motion of the whole group). Because of the possible variations, moving analogies can be used at any point in the curriculum.

Designing and Executing Moving Analogies

There is no formula for creating and executing moving analogies, but there are some tricks that can lower barriers and give a higher probability of success. The attributes from the Heath brothers' *Made to Stick* (2007) are one framework to keep in mind. Below is an operational framework for executing moving analogies and methods of creating (or discovering) your own moving analogies.

Classroom Execution

Moving analogies have a beginning, middle, processing, and ending. There is no prescribed duration for each, but often processing has the largest time allocation. The instructor should plan out the transitions between the four states of an activity, often with some signal to the students that a transition to the next step is being made. For example, there should be a signal to begin (the clap in the triangle game), and a signal that an activity is over (the sculpture dissolves), and another signal that the post-processing is beginning.

The beginning is focused on the instructions needed to physically participate. In general it is best to keep the instructions and execution as simple as possible: students will not tolerate a long buildup or lengthy instructions. The analogy itself is purposely hidden at this time so students can focus on doing. This tactic builds tension that can be released later.

The middle is the activity itself and should be given enough time for exploration, improvisation, and forging an emotional connection. It is also good to make the physical portion as inclusive as possible. The more the students can experience the lesson, the better--there is a difference between the instructor demonstrating the unbendable arm and students feeling it for themselves. Laughing, puzzlement, questions, and socialization are all signs that the physical portion is working.

The processing is the most important portion of a moving analogy, because it is where the connection between the activity and concept are made. Post-processing should occur right after the activity. Until this point, the activity is simply a physical break, and it is during post-processing that the activity takes on meaning. Care should be taken to address any misconceptions or places where the analogy doesn't quite line up. These can be further topics for discussion.

In the ending, there can be further thoughts to consider, reading assignments, homework questions, or even suggestions on how to modify the moving analogy to extract even more learning. This is the moment to assign or discuss a case study. When students read an article, they will naturally map the topics back to the activity.

Designing Moving Analogies

From an instructor's point of view, there are at least two phases to a moving analogy: 1) the execution, as outlined above, and 2) the design of the activity. Often the design takes place in the mind of the instructor as they weigh the benefits and drawbacks of using class time to execute a moving analogy. Sometimes preparation is also needed to enable the activity. Perhaps most important, however, is finding a source for new moving analogies.

Moving analogies may come from many different sources, but are often best if they connect to something that is familiar to the instructor, the students, or both. Many of the examples above are derived from the author's experience with improvisational dance, jazz, and martial arts. With this familiarity comes the ability to tell stories that will make the activity even more sticky and credible. Moving analogies could easily come from some other domain, such as sports.

Children's games are another excellent source of inspiration. The added benefit is that they will often be games known to the students. For example, the game of Ninja (http://www.youtube.com/watch?v=F-B0IjpRsGw) involves a group taking turns trying to "slice" one another with their "ninja" hands (Rodriguez 2009). One at a time, a player will try to quickly slice the hand of one of their neighbors, while that neighbor tries to move their hand out of the way. But, after a chop, that ninja needs to leave their hand where it is, and potentially in a vulnerable state. The game of Ninja brings up the idea of taking calculated

risks, but also being mindful of how this move will set up events in the future.

A third source of moving analogies is previously used activities. The same activity can often be reused in another class simply by reinterpreting the activity. For example, the sound sculptures exercise that began this article was interpreted to be a lesson in using resources. It could have just as easily been a lesson in listening to others. In another class, the same activity could be about knowing when to contribute and when to move out of the way. This author has even used the sound sculptures exercise to demonstrate the principles of networks, most especially the idea of network hubs when one sound drives the contributions of the other sounds. Perhaps the most powerful benefit from the instructor point of view is that there are many ways to reinterpret an activity.

The timing of moving analogies can also influence how they are received. The social psychologist and Nobel Prize winner Daniel Kahneman (2011) has conducted studies on what people remember about an experience. His results demonstrate that on a long time scale, we remember beginnings, endings, and the extreme highs and lows. Moving analogies can be used with great power to start or end a class or entire course. They can also be used in the middle to make a topic "stickier."

Conclusions

The purpose of this paper was to demonstrate the potential power of using moving analogies with older populations of learners. They have the advantage of being portable and can therefore be used in isolation in a single course, spread throughout a curriculum, or contained all in one class. A framework for moving analogies was provided to enable others to improve upon the activities outlined here and to create their own. It is hoped that the innovation and entrepreneurship community will embrace and expand on the ideas presented here.

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