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Reinventing Storytelling as a Management Training Tool for Scientists

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Abstract: *This point of departure essay brings into discussion the connection between storytelling, science and management. While the Biological Sciences field provides by default the technical training needed to acquire specific skills, the experts mastering these aptitudes are often faced in their career with challenges when transitioning to a managerial position. This is when scientists depart from the fascinating Biology realm to enter a world of soft skills needed to manage programs and lead teams. These management skills can be acquired by taking classes, learning from a mentor, or by other vetted academic means. There is however one seemingly long-lost resource that surpasses time, crosses continents, and overcomes language barriers as well as cultural differences. In this manuscript we reintroduce the art of storytelling as the most powerful tool of communication while we integrate examples used for management training of scientists. While the stories included are provided as examples in the context of learning management concepts in the work field, they can equally serve as effective teaching strategies in college classrooms. Storytelling fosters learning in a combined structured and improvisational setting that prepares students for real life situations encountered as they enter a continuously demanding work force.*

Keywords: Storytelling, learning in the workplace, management training, scientists

Introduction

Let us introduce the scientist

The classic view on scientists portrays individuals in a lab coat, deep in their thoughts, preoccupied with reasons why an experiment based upon weeks to years of work did not turn out as expected. How many (including the scientists themselves) would imagine that these individuals feeling comfortable among pipette tips, flasks and beakers would one day lead people and would rarely step foot back in a laboratory? Would that be a challenging or nearly impossible transition? Would it be a welcome change? Would it be an enjoyable experience? Appropriate managerial training for scientists is a very specific and narrow niche that is not

fully explored despite the obvious need. The scientists grown at the bench level only learn concepts outside their immediate field relatively late in their careers, when opportunities arise to become managers. One thing is certain: besides isolated or independent efforts made by professors (during college years) or mentors (during early years in the workplace), not much has been put in motion up to this point to prepare scientists based on an organized training program or system.

The exposure to management concepts depends greatly on workplaces: academia, government organizations, manufacturing or Contract Research Organization (CRO) industry, etc. In this regard, industry offers some advantages as scientists may have a decent number of opportunities to interact with purebred managers who have likely limited knowledge of scientific terms. Therefore, the two parties have a good chance to engage in battles that are often unfruitful, while trying to convince each other of what they may consider obvious arguments. There are educational solutions to this however: the scientist takes management classes and the manager learns basic science concepts. The reality demonstrates that the projects that perpetually take place in the fast-pace industry leave little room for such training. Occasionally, some employers identify the benefit to implement programs enforcing training in the workplace.

Under the circumstances and depending on the industry type, more often than desired scientists advance in their career and become managers and reach leadership positions for which they are almost totally unprepared. Having no basic knowledge or skills, they continue to struggle marking a single winning argument to the same management team they tried to convince before. This is almost a “language barrier” or “lost in translation” situation that needs immediate solutions. It is our opinion that when reaching this point without addressing these needs through school years, it is the duty of the employer to groom the scientist and to facilitate immersion into basic management and leadership skills. They need to be tailored and taught in such a way that the scientist preoccupied with conducting scientific experiments can afford the attention span to learn and apply them when needed.

Let us Remember

Long before working in a lab, the scientists were K-12 and college students, Master’s and PhD students or postdoctoral fellows. During this relatively long period of learning, the scientist-to-be was exposed to simple means of learning that were straight forward and focused on immediate applicability. Gradually, with more advanced academic exposure, the complexity of the scientific field replaced these seemingly simple concepts with technical skills that scientists need in their daily activities. One of those methods used particularly in the early years of school, is storytelling (Grayson, 2013; Watts, 2017). But what happened to this educational tool as scientists progressed in their careers?

Let us take a moment to think about the scientist as a storyteller. Contrary to what many may think, scientists enjoy a good story (in the real sense of a story) because it distracts them from numbers, stats and complex interpretations of data. They themselves tell good stories in

published manuscripts, but once in a while they feel the need to evade into some other space that would help them explore unchartered territories. Being curious is the first and foremost trait of a researcher after all.

Storytelling is one of the world's most powerful tools used to communicate and learn and the most fundamental art of listening (Green, 2004). It is organically happening anywhere people meet, whether in a formal or informal setting. While continuously used by humans in their personal lives or as part of home education, it seems to be a long-lost art that could have a tremendous impact in an organized setting, primarily integrated but not limited to management programs. The reality shows that formal interpersonal skills training is rarely included in American undergraduate and graduate training programs (Read et al., 2016), and much less acknowledged or rewarded at later career stages (Goring et al., 2014). Emerging ideas surfaced in recent years integrating unique approaches in college classes or Masters in Business Administration (MBA), and leadership courses teaching critical skills to equip the students with tools allowing them to address unique and complex situations (Buffo, 2015; Bartelheim, 2016; Osborne, 2021; Hughes et al., 2022; Norris, 2022). The unfortunate overshadowing of the storytelling as a teaching strategy with almost unlimited potential has a cumulative effect on how scientist enters the workplace: unprepared for interpersonal skills even though the work in research requires a great deal of those traits. While some management programs promote storytelling as part of curriculum, this is not the case as part of a scientists training even though storytelling is applicable through college and post-college years. In organizations, storytelling is a powerful tool to facilitate communication of complex ideas and to support changes (Brown et al., 2005). For a functional society in the scientific world, this lost art should be promoted throughout school years and in the workplace. One of the characteristics of scientific work is that is almost never possible in isolation, maybe with the exception of Ph.D. years. Most scientists are active as part of inter-disciplinary, collaborative scientific teams and thus they are in need of a greater focus on teamwork, with the goal to successfully create, lead and participate in high-performing teams. The most successful, effective and productive collaborations are those based on open communication, and where conflict resolution, time and project management skills are integrated into research activities (Cheruvelil et al., 2014; Cheruvelil and Soranno, 2018). Unfortunately, these efforts of formal training are ultimately left in the care of the workplace as the primary focus is on the technical skill set during the school years.

To the best of our knowledge, there are no studies reported to have researched the effectiveness of storytelling for scientists' training. Some data are available from the Martin and Power's (1982) study that compared the effectiveness of four different methods to persuade a group of M.B.A. students of the unlikely hypothesis that a company really practiced a policy of avoiding layoffs. In one method, only a story was provided to the students to substantiate the hypothesis. In the second method, the researchers provided statistical data. In the third, they used a combination of statistical data and a story. In the fourth, they offered the policy statement made by a senior company executive. According to this study, the most effective method of all turned out to be the first alternative, presenting the story alone. It would be of interest to use this or a similar approach to investigate the

response of scientists to education or investigational tools of various complexity levels, further evaluating the most effective one for their decision process.

While writing this manuscript, two tales came to mind, that were used to teach Project Management in Clinical Trials as part of a Master's Program. Each of them is short, and has a moral related to principles of management. The first one is the classic story of the tortoise and the hare (Detlor, 2001): the hare is very confident of winning, so he stops during the race and falls asleep while the tortoise continues to move very slowly but without stopping and finally wins the race. The moral of the story is that one can be more successful by doing things slowly and steadily than by acting quickly and carelessly. The second story is from Stephen R. Covey's book "The 7 habits of highly successful people" (Covey, 1989). In this story, two men in the woods are given saws and ask to cut down as many trees as they can before nightfall. One man cuts down one tree after another without any rest period, while the other stops after cutting every few trees to sharpen his saw. As time goes by, the man who stops to sharpen his saw is able to continue cutting trees at a rapid rate. In the meantime, the other man ends up with a saw that continues to get duller and duller and therefore having to exert more energy for him to cut down each successive tree. The lesson here is about preserving and enhancing the greatest asset you have – you, by having a balanced program for self-renewal and longevity. Presented in the right context, these stories provide the audience with a wider perspective on approaches to increase efficiency.

In the next section of our manuscript, we provide three examples of short stories that can be used in the workplace while training scientists how to become a managers or leaders. The characteristics, components and qualities necessary for an impactful story have been covered in books and other published manuscripts (Kuyvenhoven, 2009; Denning, 2010; Bostenaru Dan & Kauffmann, 2013). In Table 1, we provide a summary of those aspects alongside the benefits of storytelling in the workplace (Merla, 2009; Mackay, 2014). There are multiple sources and types of stories (Table 1) that can be grounded in reality or fiction. One type of story that is probably most impactful in the workplace is sharing a real-life event, a failure or success, because it provides the audience with the lesson learnt while overcoming challenges or by planning and executing a task or project.

Table 1. Stories and storytelling as training tools in the workplace. The term "storytelling" covers all types of stories to be told, from all sources as used throughout the manuscript.

Types of stories			
Folktales	Fairytales	Myths	Story tales
Fables	Anecdotes	Historical events	Sport stories
Examples	Explanations	Case studies	Personal experience
Sources of stories			
Movies	Television	Sports	Magazines
Novels	Biographies	History	Military
Seminars	Classes	Peers	Society

Key components of a story			
People/characters	Place	Problem to solve/purpose	Progress/solution
Characteristics of stories			
Salient	Succinct (attention span)	Motivational	Structured/improvisational
Relatable	Current/classic	Personal	Grounded in reality
Advantages of storytelling as training tool			
Works for all types of learners	Risk-free learning approach	Provides a safe environment for learning	Allows vulnerability and uncertainty in the training process
Provides change of pace	Attention catching	Easy to remember	Easily transmissible (retelling the story to a new/wider audience)
Management aspects learnt through storytelling			
Building relationships	Forging strong connections	Building trust	Reducing conflict
Providing good understanding of real-world applications	Facilitating effective leadership communication strategies	Facilitating information exchange	Facilitating change
Fostering interpersonal skills	Inspiring reciprocity	Supporting cohesiveness within and across teams	Forging pathways to create strategic competitive advantage in a global working environment

Let me tell you a story

> ***Learnings from Biochemistry - the Fascinating Hemoglobin Molecule. Teaching Flexibility, Opportunistic Approaches and Adaptation to Change.***

This story is about giving up on stubbornness and learning to change our ways.

Once upon a time, in a big city, there lived Bio. Bio was a penguin with dreams of becoming a biochemist. She went to university and had to learn about cells, molecules and other very complex concepts. In one of the classes, the Professor talked about a molecule that Bio found fascinating: the hemoglobin. What an intriguing and intricate protein that changes its structure all the time, whilst also transporting another essential, yet simpler molecule in the blood stream, the oxygen. Hemoglobin changing shapes while catching and releasing oxygen, had come to life in pictures drawn on the board with colored chalk by the Professor (Figure

1). The function and how the structure supports the activity of the protein made a lot of sense then. But what Bio did not truly appreciate was the main property that hemoglobin has, put in simple words: flexibility. At that time, Bio was a very strict young scientist, with her days properly scheduled to the minute, with virtually no room for error and you guessed it, no flexibility.

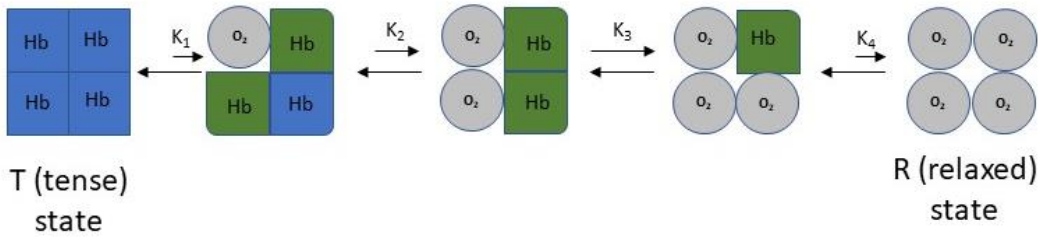

Figure 1. The Koshland (KNF) sequential model of cooperativity – hemoglobin. *Figure adapted from: Lehninger Principles of Biochemistry.*

Hemoglobin exists in two conformational states: T-state (tense) and R-state (relaxed). The T-state is also known as deoxyhemoglobin and has less affinity for oxygen compared to the R-state known as oxyhemoglobin. In Koshland's hypothesis of sequential mode of cooperativity, the conformation state of the monomeric unit changes as it binds to oxygen and signals the message to the other monomeric units, thus increasing the affinity of the entire molecule to oxygen with more units being able to bind it.

Years had passed and Bio had her own family, and even gave birth to her son. The baby penguin required all the attention any baby would need and more. The well-structured days Bio had before then went out the window. There were no boundaries between days and nights, and what she needed to learn fast and the hard way was to be(come) flexible, to adapt and to be(come) opportunistic. In other words, if there were 10 activities that needed to be done in a span of 24 hours, they could be done when the opportunity presented itself, rather than following a prescribed schedule. Yes, this was the first lesson that Bio learned from her son: flexibility.

After another two decades, Bio started to work in a very fast paced environment. In another big(ger) city, in another community, far, far away from where she went to school. She handled in the same time many projects, of various sizes and complexity levels, while now having to train other penguins in science, and to teach them about her work. And one day, while sharing about a day in the life of Bio as a scientist, she heard herself saying: "whether you're a scientist or a manager you need to know how to be as flexible as the hemoglobin, the molecule that transitions in a fraction of a second from a tensed to a relaxed state, because otherwise a body would not function without the oxygen it transports". There, after several decades, a lesson learned in college, put in practice through personal experience, was transferred to the next generation of scientists. This is how Bio gave back.

Learnings from Driving – the Impossible Right-to-Left Turn. Teaching Adaptability to Navigate the Maze of Milestones and Deadlines.

This story is about driving. Driving literally on the road, while figuratively navigating the maze of deadlines and milestones, and driving yourself or others crazy in the process.

In a galaxy far, far away, there lived Bio, a scientist who loved her job but who disliked driving. What does one have to do with the other? Quite a lot, believe it or not. When Bio learned how to drive, she drove from work to home and to the grocery store occasionally, simple enough. Some streets seemed more mysterious than others and some turns were more challenging than what Bio thought they could be. To give an example: imagine that you want to come into a street and turn right onto another street that has 3 lanes, but your end goal is to reach the farthest left lane from where you enter the street (Figure 2). There are several options: in a rush, take the closest lane as you turn right and then change lanes when you have the opportunity to reach the farthest one. Or wait, and wait, until eventually there is no oncoming traffic, and take your time to cross all the way to the farthest lane to the left. This is what Bio considered the "impossible right-to-left turn". Most of the time she waited and waited for traffic to pass by. But eventually, however, through many years of trial and error and time wasted she learned how to take the first opportunity to enter the street and change lanes. This was an accomplishment in driving and was just that for a very long time; but looking back, she realized that waiting for the perfect scenario would either take a lifetime or never come at all. Bio had indeed learned flexibility before, but it took the ability to re-learn it with any new task ahead of her.

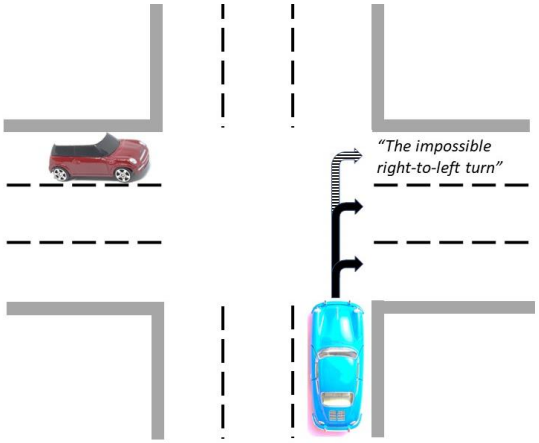

Figure 2. The impossible right-to-left turn. According to the California Department of Motor Vehicles (DMV) driving manual (https://dmv-permit-test.com/california/drivers-handbook), this driving maneuver is defined officially as the right turn from a one-way street into a one-way street. The driver is instructed to start the turn in the far-right lane and if safe, to end the turn in any other lane. *Pictures courtesy of:* https://pixabay.com/photos/car-mini-couper-red-tires-toy-2660433/ *and Photo by DS stories:* https://www.pexels.com/photo/blue-miniature-car-on-purple-background-10215984/

Many years after Bio learned how to drive, she had coworkers who had what she called "signature fright" fueled by "perfection paralysis". To explain: any project needs to have an end and that is represented by its signed final report. Imagine that the signature is the farthest left lane in the driving scenario described herein. To get there, one either waits and waits for things to happen in a particular sequence, or they could take the opportunities available at any given moment and eventually reach the destination on the lane desired. Many of Bio's coworkers had this hesitancy "to cross lanes" in a particular order while keeping the end goal (farthest lane on the left) in mind. They preferred waiting for an opportunity to drive straight toward the destination which delayed their work indefinitely. Bio made it her mission to teach them how to cross the Ts and dot the Is in this process. Allowing any sequence of operations if the order was not particularly important while making sure they were reaching the final destination as fast as possible. She explained to them about "the impossible right-to-left turn" which was another lesson of how to become flexible, opportunistic and malleable, all critical attributes as a scientist and as a manager.

Learnings from Marketing Campaigns-Derived Goals - the 10,000 Steps. Teaching Innovative Systems to Increase Efficiency

This story is about capacity, being open minded and gaining efficiency in a very twisted way.

We are confident that you have heard about the concept of the 10,000 daily steps (Bedowsky, 2022). Not sure how many of us investigated where it is coming from or what scientific basis it has. But it's a number, a goal, a reference, all three of these being important in the mind of a scientist or manager.

Once upon a time, there lived Bio, a penguin who became a scientist. Bio was not athletic, spent her day mostly on her chair, in the lab or at a computer. Bio mastered however a perfect system of efficiency at work and at home: say, if she had to carry three different objects to be distributed in three different rooms, she would carry them all at once and distribute them on her way to the farthest room. Least amount of time spent walking and getting every object delivered most efficiently. Fio, Bio's husband, had a different tactic: because he loved walking, he would carry each object separately, which Bio interpreted as a lack of efficiency, a waste of time and was terribly aggravating to her. Of course, she gave him a hard time with each opportunity. Several decades into Bio's well-structured, validated and mastered efficiency system with minimal physical effort or expenditure, she reached a point of no return where she became evermore sluggish, and her tummy didn't smile back. Physical activity had now become imperatively necessary. Around this time, Bio's son Sio was a fan of athletics and introduced to her the idea of walking literally anywhere, at any time. However, Bio did not really take into account the walking suggestion, claiming all sorts of reasons for not having the time to walk during the day.

Several years went by, and the walking idea Sio introduced was back on the table. As a scientist, Bio needed a number, a target, something to achieve, and that is how the classic 10,000 steps/day mark became just that (Figure 3). She caught herself carrying three items in

three different rooms one at the time. The steps started to add up and it became a rather rewarding game (Neculai & Costin, 2023). At work, she did the same and realized that her productivity was actually higher than before because her body was better oxygenated (ah, our friend the hemoglobin!). Bio learned how to be efficient by being open-minded and accepting a new system of efficiency. The "reverse mentoring" concept now applied by her son was known to Bio in theory, but her "inefficient" strategy went against every fiber in her scientific being, deeming this new strategy as a waste of time. But through trial and error, and reversing the effects of what she taught herself for years, she learned one more thing: to give credit where due. Like they say, "Give Cesar what belongs to Cesar". Yes, she vindicated her son and her husband by giving them all the credit. Learning through all three of these stories the important concepts of flexibility and adaptability.

Figure 3**.** The 10,000 steps daily goal – one step at a time. *Photo by Taryn Elliott*

Let Us Conclude – Acquiring Management and Leadership Skills in the Workplace Through Affordable and Classic Means

Training full rounded scientists requires both interpersonal and technical skills that support them in the workplace. While undergraduate and graduate science programs provide the foundation to prepare scientists for their jobs, not the same can be said about the acquisition of management and leadership skills. While management-focused college and university programs prepare managers for their respective jobs, there is no introduction of such courses for students in Biological Sciences. Interpersonal skills, problem solving, time management and sound leadership are consistently identified as a must for the scientist to have when entering the workplace. Being almost entirely unequipped for managerial or leadership positions, scientists struggle to adapt to change that is inherent in science. While academic institutions need to properly integrate management and leadership courses in science majors, it remains the responsibility of the workplace to prepare scientists as they enter the job market.

While researching what possibilities exist for the scientist to acquire management and leadership skills (see Appendix 1). This is by no means a comprehensive list, but rather a start and a foundation to build upon. While we encourage the use of these resources, we also consider it absolutely necessary for the employers to build their own customized training that will support scientists to become managers and leaders. Customization is likely the most efficient approach to achieving results that are pertinent to a given workplace, characterized by its own culture, needs, demands and challenges. To accomplish this, it is necessary to ensure the transfer of institutional knowledge, not only in the form of technical skills, but also as managerial and leadership skills. This stemming from the plethora of possibilities to share knowledge that exists in each workplace, we identified one that is immediately available in the form of storytelling. Of all resources that exist in this realm, the most impactful and fit for purpose are the ones grounded in the experience of coworkers and supervisors. The key for success is to involve in brainstorming those who would ultimately benefit from it: the scientists aspiring or being tasked to becoming managers and leaders. Their contribution to the design of such training programs is paramount, as it will provide the insights needed to create a library of stories as training resources for their own use. Thus, providing them a leading edge in the competitive scientific world.

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Appendix 1

Resource	Availability	Key notes
Carl M. Cohen and Suzanne L. Cohen Book	Lab Dynamics. Management and Leadership Skills for Scientists	This book is a unique guide addressing the interpersonal side of scientific research and management. The book provides practical solutions to some of the toughest problems that working scientists and science managers face on a regular basis.
HHMI: Training Scientists to Make the Right Moves Book	https://www.hhmi.org/sites/default/files/Educational%20Materials/Lab%20Management/Training%20Scientists/training-scientists-fulltext.pdf	This book provides ideas for planning, delivering, and evaluating a multisession training program that prepares postdoctoral fellows in scientific management.
NIH/HHS: Collaboration Team Science Field Guide	https://www.cancer.gov/about-nci/organization/crs/research-initiatives/team-science-field-guide/collaboration-team-science-guide.pdf	This guide is a valuable resource for scientists participating in or leading a research team and is based on examples inspired from real-life events.
EMBO: Laboratory Leadership Course	https://lab-management.embo.org/dates/pd-2023-online	The course provides tools, techniques and insights tailored specifically to the laboratory/research setting for the management of teams, to support good communication, healthy conflict resolution and the management of workloads and responsibilities.
NCI: Strategic Management Training Course	https://www.cancer.gov/grants-training/training/resources-trainees/courses-fellowships/scientific-management-training	The goal of this course is to develop the skills needed to successfully lead a scientific research laboratory.
Science Management Associates Portfolio of multiple types of resources	https://www.sciencema.com/resources	This company provides workshops, scientific, management and organizational consultation, coaching, individual assessment and training, diligence assessments in support of training scientists as managers.

Resources to support the training of scientists as managers and leaders.

EMBO, European Molecular Biology Organization; HHMI, Howard Hughes Medical Institute; HHS, Human Health Services; NCI, National Cancer Institute; NIH, National Institutes of Health

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