



## **Tell/Make/Engage: Design Methods Course Introduces Storytelling Based Learning**

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### **Abstract:**

Finding personal stories is critical for teams to discover yet-to-be satisfied user needs in order to achieve their mission within any start-up or research group. This is particularly powerful in situations where a start-up team, or even a research group, has to respond to quickly changing circumstances. Our teaching and research in the Engineering Design Education community has not only affirmed that idea but also surfaced a few surprises about how teams can unknowingly misunderstand the meaning and intent of a story. This paper considers the relationship between active storytelling concepts and individual response. The method is taught at a private west coast university in the Department of Mechanical Engineering and applied to company settings. Audience engagement, based on previous work, is defined and evaluated by variations in response to an ineffective or effective story delivery. A mixed-method approach uses multiple strategy factors of social influence, along with self-reflective participant observation of student work. Preliminary results show that four core “rules” (also known as emotional and communication messages for success) may in fact lead to misinterpretations and can sidetrack productive engagement for creation and collaboration: a) Repeating for perfection: in fact, people report that they do not find flawless storytelling believable; b) Interacting one-on-one within a large audience: the opposite may be true when you apply a “planned spontaneous” and personally unique leadership approach in storytelling; c) Applying a template to tell and memorize one story: in contrast, there are reasons to start in the middle of the story to find a new and powerful beginning; d) Describing a generic user story so as to only present a stereotype of a persona: both young and well established entrepreneurs prefer hearing a personal and emotional story that invites them to step right into the storyteller’s shoes. Accurate storytelling techniques allow start-up teams to communicate the meaning and intent of their mission while being comfortable feeling uncomfortable. We find that genuinely expressed vulnerability in start-up storytelling amplifies engagement.

### **Introduction**

The authors begin with a letter and write, “*Dear policy maker, faculty leader, educator, academic administrator...*” It is all very logical and sound in theory. We educate students to become professionals in their chosen field and to do so in a way that provides them the needed knowledge and skill-sets that helps them to actualize that knowledge, together with others, in engineering challenges<sup>2, 5, 8, 10</sup>. In this way, novel, needed, and well-selling technologies are created and old ones developed. Engineers’ problem solving capabilities and systems thinking remain at the core of the engineering profession<sup>2, 3, 7, 11</sup> with emphasis moving little by little to adding skills and understanding through design thinking practices as a user centered approach, and with creative confidence<sup>3, 11, 23, 26, 34</sup>. The remaining and persisting question however, is *how* to make it happen. How do we coach and lead students to recognize their full potential as individuals and as team members to not only learn new knowledge and skills but also to help them transform as they lead, start-up, and become members of the global society? With this question, we introduce a specific approach to teaching—*storytelling*—that draws from socio-

cognitive theory from a course experience where students *Tell/MakeEngage* themselves and their audience of classmates that they are performing to, by using a mixed-method approach of validated tools and techniques<sup>31,32</sup>.

We define storytelling as the enactment of real or fictionalized experience, and raise the possibility that by making storytelling personal we provide students with a method to discover the needs of others. We use “storytelling” and “story” interchangeably and recognize the inclusion of both structured and interpretive individual narrative work, which is filtered through the engagement lens of the entire group. Further, we claim that by experiencing this storytelling process, both educators and engineering students will be supported and led to go through an experience that catalyzes their understanding of themselves because they learn together with others during structured activities within a curriculum that is modified based on the developing dynamics in the group. The storytelling approach offers the students the opportunity for a routine commitment during class, to raising self-perception, self-efficacy, and in turn, push creative boundaries. This paper considers the relationship between active storytelling concepts and individual response during start-up storytelling practice in the *Tell/Make/Engage* class. Tell refers to speaking, listening, and narrative writing. Make refers to both the making of their story and an engineering design project or start-up work. Variations in response by the participating student audience define Engage. Discussion details the self-reflective participant observation practices of the class and provides tangible tips on how specific emotional and communication messages for success get misinterpreted and can sidetrack productive engagement for creation and collaboration.

## Overview

This paper is organized in three sections: we begin by assessing the goals and methods of the course through which storytelling is utilized as a tool. The class uses story as one dimension for considering ways to thrive across the developmental stages of a project, research, and life path. In the course, everyone’s story is filtered through one another’s, evolving with continuous feedback and transforming through a kind of social-proof. The class is the audience where engagement is defined as the group’s variation in response to an effective or ineffective story. The responsibility returns to the individual to pay attention and self-reflect to understand the group’s cues on crafting an engaging story. This is far from easy: every gestural response and eye flicker of the audience is keenly recognized by the very aware storyteller, providing cues for the storytelling to evolve and change in real-time, alongside their own internal voice. Students discover the characteristics of story as they experience it with the class. In this sense, storytelling is emotionally co-imagined.

Four misunderstood methods for communication are then presented, discussed, and amended to improve storytelling: repeating for perfection, interacting with individuals in a large audience, applying a memorized story template, and describing a stereotypical persona via a generic user story.

The final sections of the paper draw out the implications for our model of *Storytelling Based Learning*. The focus here is on preliminary applications within classes and curriculum for engineering education. We specify how our model for storytelling presents a powerful means for

improving engineering education where classroom focus is often on presentation of pure concepts without a story.

## Goals and Methods

The mixed-methods of socio-cognitive psychology and art used in this work fulfill a dual purpose. The process of finding personal stories is introduced with the intent to use active storytelling to surface responses that emerge during the developing levels of engagement in the class or start-up group. From the first moments, participants are encouraged to be vulnerable, also referred to as pushing their “comfort boundaries.” A related and important concept is that the class environment is one which students defer judgment and feel safe.

“How comfortable are you with feeling uncomfortable?” Posing this question demonstrates how the group is also encouraged to willingly take some emotional risks—connecting to the concept of vulnerability. Furthermore, they accept a class environment that includes some degree of unknowns, referred to as ambiguity. In other words, they test themselves on being genuinely open to not knowing what is going to happen next.

Individual participants act as both storyteller and audience member. In both of these roles, specific use of the concepts of mindfulness<sup>25</sup> and social proof<sup>6</sup> provide a theoretical foundation and draws from constructs in socio-cognitive psychology. In the context of mindfulness, the aim is to consciously create new categories and levels of awareness. In practice this is done by discussion through reflective questions from both facilitating teacher and the class. While there is a syllabus that includes organizing questions, short readings, and proven methods, the developing dynamics of each class impacts the curriculum. Therefore, as the class evolves, so does the curriculum, distributed in three iterations.

This offers the individual a way to be aware of how a routine is automatic and likely to interfere with finding new approaches for successful storytelling. We suggest some commands for turning off automatic pilot: think, pay careful attention in the moment, try not to rely on muscle memory for daily actions in your life—and in your story. Therefore, the individual becomes deeply aware of tangible ways of creating, recreating, and telling their story. The process introduced begins in the individual, and ends with the expectation that the group practices together: listening, observing, and leaning forward while connecting—engaging. Engagement is defined and evaluated by variations in response to an effective or ineffective story delivery.

Social influence strategies apply: consensus and social proof are persuasive appeals that speak to an individual’s social and conscious mind<sup>20</sup>. Internet examples of consensus often take the form of the number of “hits” or positive “star” ratings by other users or customers participating in the same beliefs or actions convincing people to believe and act in similar ways<sup>20</sup>. In the current work, we propose that the class ascribes the notion of conformity to the effectiveness of the consensus strategy, framed by their engagement as a factor of “storytelling influence” response—appearing as “social proof.” The class group is the audience, and provides implicit and explicit ratings to the storytelling. Thus, for the individual participant, developing levels of engagement occur in the group—in the form of spoken favorable and unfavorable

comments, silences, non-verbal cues, emotionally contagious outbursts, and specific responses to planned methods. All of these appear as a kind of “social-proof.” Yet, at every point, these are genuine, real-life moments, different from a programmed laugh track on a television comedy, or a thumbs-up on a professional network posting. This creates a real yet safe environment for vulnerability where the “storyteller” can expand the boundaries of vulnerability while the class learns how to share mindful and reflective feedback in addition to learning from the storyteller.

Art offers the aesthetic element<sup>9</sup> of considering storytelling beauty—knowingly and sometimes unknowingly, as to attract or repel the group. Storytelling is the art of engaging.

Participants are afforded 100% artistic license in their story focus and personal approach. As a result, there are times when one may even decide to use dance or a musical instrument, to help the audience hear the song beneath their words<sup>17</sup>.

The course manifests openness and lateral thinking, making students’ latent needs and storytelling wishes explicit through the exercises. One student engaged the group to work on an art and visual perception focused activity. He genuinely believed in the power of art to change his chosen field, medicine, and tested out his theory with a survey he offered before and after a planned campus gallery viewing of Pollack’s “Lucifer.” He constructed a design interaction with the intent to find the unspoken story of art’s impact on mood. Results and more detailed examples of exercises and responses will be provided in the next section, Story Messages.

For students with backgrounds mainly in natural sciences, the artistic element and 100% artistic license can be close to a life-changing experience. Instead of offering one-way right or wrong solutions to a task or a prompt, which are so common in natural sciences, there is a plethora of possibilities where to go. This approach is essential in the transformation process of engineering students who learn how to “dance with ambiguity”<sup>26</sup> and find new ways of perceiving both problem and solution spaces<sup>30</sup>. They become more self-aware, more engaged and more engaging. Through using and encouraging the use of artistic license, engineering students perception of problem defining and solving turns “from black and white into having the whole spectrum of colors.” From the perspective of engineering education, the *Tell/Make/Engage* course uses an interdisciplinary, structured and coached learning process, which enhances especially the communication skills that are deeply reflective and self-reflective. It also catalyzes the individual growth process of the engineering student.

#### **Four Story Messages: Misinterpreted Emotions and Communications**

This section details what we do know about the design and class communication management through specific cues in storytelling. We provide four core examples, and offer the results with action guidelines for structuring and supporting change through the storytelling methods. The following four examples, uncovered from our teaching, demonstrate how story messages fail engineering students both with respect to their understanding of their own motivations and their ability to mobilize and engage others. The four core “rules” (also known as emotional and communication messages for success), may in fact lead to misinterpretations and can sidetrack productive engagement for creation and collaboration:

*1. Repeating for perfection and predictability.* Many assume that the best story is practiced and rehearsed for perfection in delivery. In fact, such an approach may produce the opposite response.

During one class, John, a charming and experienced company founder, shared his latest venture story to the class. He was unprepared for a classmate's diplomatically delivered response, "You sound too practiced and perfect. When there is no flaw in your storytelling, I have a hard time believing you." When the Instructor asked, "Have you told this story before John?" He replied, "Many times!" John's unwillingness to craft his story in a way that was designed specifically for the class audience, led to a missed opportunity for the group to hear it for the first time. By assuming that his tried and well-rehearsed story was true, he did not elicit emotion that showed a personal connection with his story. He alienated himself from his audience, and missed a valuable moment for creative growth.

*2. Interacting one-on-one within a large audience.* Many avoid interacting one-on-one when the class or audience is large fearing that it might be an awkward interruption in the group dynamics. Perhaps any group size over thirty persons includes an assumption of anonymity by the participants; therefore, it is in fact useful to develop "planned spontaneous" moments to develop audience engagement. When is it useful to interact with individuals as a point of intervention in large classes? The following scenario illustrates the potential for what might occur:

Speaking to a Dynamic Systems class of 105 students, the Instructor planned a series of short questions and exercises to decipher motivations in the class. She began with one question, "What is the title of your engineering story?" Distributing Post-Its to the entire class, she waited while they wrote on the small pieces of paper. One male student, Hans, sitting in the third row, of the curvilinear amphitheater-type room appeared quizzical. With a half-smile on his face, he dramatically draped his football player sized frame over the side of the chair. He appeared non-participative, and did not write a response on the Post-It. The Instructor called on him with a kind smile and appeared to spontaneously query, "Might you pretend to participate and write the title?" He firmly articulated, "Oh I have a title in my head. And, may I go first? My title is "Scraping By." Immediately the eyes of many of the other students flickered with agreement, fear, and recognition. Why? What did it all mean? Were they worried that they, too, were "Scraping By?"

*3. Applying a fixed and memorized story template.* In contrast, it may be counter-productive to have a specific, beginning, middle and end. In fact, there are reasons to start in the middle of your story to find a new and powerful beginning:

Ron, previously an aeronautics engineer and leader at a well-known company located on the west coast, was a first year student in a graduate design program. Frustrated by why his perfectly articulated story did not receive the responsive impact he hoped for during a presentation, he explained, "I told the group everything, with a clear beginning, middle and an end. None of the faculty appeared engaged by my story. One even said, 'I am not convinced.'" Ron asked, "Am I just horrible?" His frustration immobilized him. Ron's application of a linear and concrete template sidetracked productive engagement and the opportunity for an artful solution.

4. *Describing a generic user story.* Presenting a generalization of a person results in a descriptive stereotype. This is limiting and misleading. In fact, both young and well established entrepreneurs prefer hearing a personal and emotional story that invites them to step right into the storyteller's shoes. Consider these comments offered by different students during class: "You know civil engineers care about making things that last..." Or, "Oh, is that the Asian male stereotype of someone who drives a muscle car?" And, "When females are in the class, guys behave better." All of these statements, during design methods discussions, received audible surprises and gasps from the group. Some students even looked visibly hurt. How might the story response vary if the students replaced the generic story statements of, "You know when 'someone'..." with the specific and personal, "I." An Instructor ignoring these comments misses potential learning moments that will promote student growth.

We hypothesize that by teaching engineering students to create compelling stories, we will be able to make dramatic improvements in the effectiveness and efficiency of the creation of artifacts that will engage users and other designers, engineers and stakeholders. Compelling stories promote and manifest a user-centric approach often forgotten especially in the engineering world when focusing only to the technical approach of the problem. Here is how effective storytelling addresses the four story message problems described above:

1. The in-the-moment response to the perfectly rehearsed narrative articulated by engineering and business students, such as John, can serve to help them identify moments when they lack empathy. He heard that his approach was ineffective because of explicit comments by the students in the class. As a result, he will try other, not so practiced approach that can encourage true social connection with a group. Through the storytelling approach, John described how the realization that he was telling the same story over and over again, led him to rethink his assumption that through practiced perfection he was engaging the group. Instead, by hearing the responses of genuine social consensus, also referred to as the social proof in the group, it forced him to reconsider.
2. Other students participate by observing as Hans was able to articulate his worry in his engineering story title, "Scraping By," the non-verbal cues, like eye-movements and facial expressions of many of his classmates showing the same worry can serve to help all of them identify coping mechanisms and approaches that can encourage self-confidence and persistence in engineering. By using a "planned spontaneous" prompt, the Instructor engaged him and multiple individuals, who otherwise might not find a common point of connection. Through the storytelling approach, other students described similar feelings about the demands of engineering, and their expectations that they could never do enough. Modeled by the Instructor, they interacted one-on-one within a very large class, and found a passionate connection to others through story.
3. Ron's confusion misled him to apply a fixed and memorized story template that included a beginning, middle, and an end. Through the storytelling approach he was encouraged to jump into the middle of his story. Initially resisting, he said, "But that was not my plan." Encouraged by the class, he found a new beginning. The initial hurt

associated to not receiving an engaging response by the Instructors and the class, was replaced with a new lens: Ron recognized that it was an art to leave gaps. Three tangible tips inform:

- a. Do not give the audience the beginning, the middle, and the . . . .
- b. Additionally, the Instructor included a blank slide in her teaching PowerPoint as a tangible teaching reminder for the storyteller to pause, take a time-out, and leave a gap, so that the audience might catch up with her and her story.
- c. In considering Ron's first approach, to craft a story by applying a linear template, changing circumstances may indicate times when this might also be effective. While in the case of the design critique it did not allow him to fully engage the audience, there are times when it may be effective. This suggests the importance of the storyteller's willingness to not adhere to a fixed template and to be open to receiving feedback from the audience's responses. These communication cues are critical for altering storytelling strategy in real time.

4. Student statements describing a generic user story present stereotypes and generalizations. Learning opportunities emerge for distinguishing a stereotype from a persona. Using the storytelling approach, the teaching assistant, Tom, acted on the emotional contagion "gasps" he heard in response to the statement about the Asian male driving a muscle car. He calmly questioned the class, "What is the difference between a stereotype and a persona? Can a stereotype inform a persona?" Showing how a stereotype might inform a persona, he told his personal story, "Reborn in Detroit." In reverse chronological order, he spoke in the first person about an internship for an automotive company, his love for the muscle car, and when he was a little boy, growing up as an Asian male with a single mom. Tom got to the heart of his story and mesmerized the group by turning a stereotype into a personal experience.

In each of the four transformed message examples, vulnerability amplified engagement. A willingness to not be too rehearsed or practiced, afforded a believability and acceptance of showing a flaw or fear for a positive audience response in John and Hans' storytelling. "Planned spontaneous" prompting by the Instructor, made her approachable to a large audience, amplifying the potential for high individual and group responsiveness. Like recognizing Ron's limitations using a story template or formula, his willingness to be comfortable with ambiguity, and open to not knowing what might happen next, similarly sets the stage for Tom to confront the sensitive and hurtful dangers of stereotyped statements with a genuine, personal story for memorable class engagement.

## **Storytelling Based Learning**

This section introduces the design and management of storytelling as the focus in an engineering class, reflects on a preliminary description of the approach, and provides suggestions for further work with essential course learning outcomes.

We introduce *Storytelling Based Learning*, a novel approach to an entrepreneurial and reflective path, where story is one dimension for the overall teaching approach to create the curriculum, review the readings, structure the exercises and craft the work, provide feedback,

leading and coaching, and include the students in the entire developmental process.

*Storytelling Based Learning* is intended to assist both the students taking a course and the instructors teaching and creating the curriculum. Specifically, it guides and assists participants because it fills the gap between disciplinary engineering learning, which is a cognitive process and embedded in logics of natural sciences. Storytelling is a socio-cognitive process. Yet it is more so an experiential learning process where the hands-on or theoretical engineering learning is replaced by hands-on socio-cognitive experiential process of *Tell/Make/Engage*, a structured and coached course process of reflection to one's own identity and personality, while within a team setting. The rationale for presenting this learning method and practice is that the process does not happen by itself; therefore, by definition, it is more based on social rather than natural science and hence, cannot be typically coached by engineering educators without solid structure and a step-by-step process description with rationale included. Methods introduced in this paper shed light on this matter and we argue that if implemented accordingly, they can be used by a variety of educators. *Storytelling Based Learning* is a context driven approach that borrows from interpersonal psychology, organizational psychology, social psychology, design thinking, and art, developed through more than a decade of practice with engineering students and industrial practitioners. The core motivation is to create surroundings for engaging the students in a more efficient learning experience and better prepare them to meet the versatile needs and challenges of today's start-up, industrial, and even everyday societal life.

*Storytelling Based Learning* proposes a model that potentially fills the gap between deductive and inductive reasoning, because it builds intuition through storytelling practice and teaching. In other words, storytelling based learning encourages paying attention to intangible cues for tangible communication results and features how to examine and discover the methods of engagement inquiry from the class and apply them to how individuals behave in everyday situations, on start-up projects, with friends, and within organizations.

The four emotional and communication messages for success presented in this paper are a novel and cross-disciplinary representation of user needs and user centered thinking through a variety of socio-cognitive approaches. We replace misunderstood messages like: 1) repeating for perfection, 2) avoiding interacting one-on-one with a large audience, 3) applying one template, or 4) describing a generic user story with a layered process for making and engaging compelling stories. *Storytelling Based Learning* is a method where clear entrepreneurial and engineering transferable working skills are mapped into methods that invite the student not only to engage the audience with skills in communication and teamwork but also seduce the student to go through a transformation process from a conservative bystander to a more reflective practitioner<sup>31</sup> who can engage the audience with storytelling methods using the storytelling based approach.

### **Implications from the perspective of engineering education**

For decades engineering educators have been looking for a stone of wisdom on how to educate engineers to excel in both working life and as members of society<sup>2, 7, 10, 14, 15, 24</sup>. Criteria are defined and re-defined constantly during different times<sup>1, 7, 8, 29</sup> and at an abstract level they share characteristics, goals, and in many cases the more in-depth focus. The aim is to ensure working life readiness with both disciplinary knowledge and transferable skills through different

phases of working life<sup>8, 12, 13, 24</sup>. Skill-sets typically address areas such as teamwork capabilities, general problem solving skills, capability to communicate across disciplines and different boundaries effectively. The list is long. In addition, an engineer should have the ability to conceive, design, implement, and operate engineering systems, be able to analyze problems analytically and critically yet at the same time, creatively and from a users perspective<sup>16</sup>, to design systems or interventions accordingly. In addition, engineers should possess the ability for lifelong learning, understand engineering ethics, and generally apply sustainable approach for past and present action<sup>7, 8, 18, 19, 32, 33</sup>. *Storytelling Based Learning* offers a way to approach and creatively manage the long list of skill-sets required for effective engineering education.

We suggest *Storytelling Based Learning* as a type of disciplinary knowledge creation. There are several levels, categories, and taxonomies of knowledge that vary from learning syntactical knowledge to semantic understanding and to pragmatic approach where disciplinary knowledge can be applied to new situations where knowledge boundaries are spanned across different disciplines assuring a holistic view and approach to complex engineering systems<sup>4, 5, 27, 28</sup>. Making all this happen calls for new ways of teaching, coaching and leading learning. Perhaps, we show respect for traditional engineering education by adding a new, generational twist. Methods and practices include, such as active and aligned learning approaches, problem based learning, project based learning and a reflective approach to teaching<sup>3, 26, 30, 31</sup>. In the case of *Storytelling Based Learning*, we offer potential implications from one course to other engineering courses.

## **Implications from Learning Outcomes to Curriculum Applications**

Implications from the class for teaching and building curriculum fit essential learning outcomes that are not only informative for this one particular course but also fit technical courses in engineering. Future work might detail specific functional, learning, and attitudinal course goals.

For example, we suggest that after taking this course students should:

- Be able to identify and model effective personal and team storytelling.
- Have experienced an interaction design experience.
- Communicate effectively about real and fictionalized stories.
- Develop abilities to analyze diverse and complex problems during and beyond the academy.
- Qualitatively and quantifiably define engagement by approaching and co-building methods.
- Engage through a shared vision on a team and develop ways to pivot and change.
- Be inspired to pursue life-long learning by approaching storytelling from an analytical and entrepreneurial mindset.

We also believe that the methods in the course and the conceptual process found in *Storytelling Based Learning* will provide students learning skills in:

- Developing a deeper understanding of others through creative story expression.
- Designing models that inform methods that predict engagement responses to effective works.
- Designing engineering design prototypes that test and validate a story model.

- Representing opposing design goals such as change through intervention and profitability.
- Creating expression of past, present, and future real and fictionalized experiences.

All this considered, the work continues with a call for more student-centered approaches in teaching and emphasis on disciplinary knowledge and transferable skills<sup>1, 14, 34</sup>. In addition, there is a growing trend to see the importance of the students' socio-cognitive transformation process where the student learns a degree of comfort with ambiguity; in other words, they go through a process where self-efficacy for engineering problem solving is increased considerably<sup>26, 32, 33, 34</sup>. The *Tell/Make/Engage* process contributes to this area and invites students to learn transferable skills such as presentation and communication skills, teamwork capabilities, and inspires them to pursue life-long learning by pursuing storytelling skills from an analytical mindset. More importantly, students go through a socio-cognitive process where they learn to engage the "audience" by spanning their boundaries of vulnerability and knowledge. They reflect on their actions, genuine to their personalities and individual styles, resulting with an increase in understanding self and others, and enhanced confidence for perceived self-efficacy<sup>4, 5, 27, 31</sup>. A better storyteller makes a more emphatic listener and a better need-finder; leading, finally, to a better engineer. *Storytelling Based Learning* leads to a transformative process where students become more aware of themselves, more emphatic, that is capable of feeling "with" others, and more mindful<sup>21, 23</sup>. This does not only contribute to their transferable working life skills and thinking as engineers and entrepreneurs but also as members of the society.

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