

Creative Storytelling and Choreography Lab for Senior Design

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Abstract

Creative Storytelling and Choreography Lab was a collaborative team effort between Colleges of Engineering and the Arts at the University of Florida that was offered as an experiential laboratory component for the capstone senior design course in the Department of Industrial and Systems Engineering (ISE). The objective of *Creative Storytelling and Choreography Lab* was to teach ISE engineering students some creative processes to help them develop engaging and informative presentations to communicate goals, execution, and results of engineering projects to engineering and general audiences. Throughout the semester, by a multi-disciplinary instructor team, the students were systematically introduced to a host of tools for creative processes in graphic and performance arts to help them develop engaging narratives in the form of graphic stories or dance works. At the end of the semester, design teams not only wrote graphic stories to convey the goals and the results of their senior design projects to engineering audiences, but also choreographed dance works to communicate them to general audiences.

Keywords

capstone design course, creativity, storytelling, choreography.

Introduction

Engineers need to be capable of communicating technical information effectively to both engineering and general audiences. To this end, the current curriculum in the Department of Industrial and Systems Engineering (ISE) at the University of Florida (UF) concentrates on the development of communication skills of engineers by focusing on different communication models and strategies as well as principles of various genres of technical writing relevant to engineering, including memos, letters, reports and presentations. An aspect that is overlooked in the existing curriculum is the use of storytelling as a means to communicate technical information. Stories can develop a common understanding between the storyteller and the audience. This shared understanding, in turn can, create lasting connections between the storyteller and the audience, and promote transformative experiences for the audience. In fact, stories can be instrumental for knowledge transfer in organizations¹. Furthermore, although technical presentations may seem to lack a narrative, storytelling can enhance improve knowledge transfer to engineering and general audiences².

Historically, storytelling has been an integral part of every culture as a means of entertainment, cultural preservation and education. Predating the development of written language and creation of written records, storytelling is an interactive art form that is aimed to convey an experience or an idea using gestures, physical movement, sounds and words. As a story is being told, the storyteller describes her visual imagery that relate to the story to the members of the audience.

The members of the audience, in turn, create their own visual imagery and details to complete the story. An engaging story that follows some basic structural rules can trigger the release of cortisol and oxytocin in the brain of the listener, thereby, changing brain chemistry and evoking a neurological response in the members of the audience. This neurological response, in turn, can change attitudes and behaviors³.

It is also important to note that people experience the world and develop internal representations of these experiences through a combination of four principal modes: (i) visual (relying on sight), (ii) auditory (relying on sounds), (iii) kinesthetic (relying on muscle feelings), and (iv) verbal (relying on words). Each person has a “most highly valued” or “preferred” internal representational system⁴, which, in turn, relates the learning style of the individual⁵. No one uses a single mode, and no two people have same preferences and strengths in these modes. Hence, it is important for the storyteller to have the ability to use multiple modes to effectively engage the audience to facilitate the transfer of experiences and ideas.

As storytelling is being increasingly recognized as an important professional skill in today’s competitive and innovative business environment, a multidisciplinary team from Colleges of Engineering and Arts at UF wanted to experiment with developing a curriculum component to enhance narrative skills of the ISE students. To this end, the team collaborated with the founding members of The Sequential Artists Workshop (SAW) to develop content for a one-hour lab supplement entitled *Creative Storytelling and Choreography (CSC) Lab* for the Senior Design course to incorporate creative processes and the basics of storytelling using narrative tools from graphic and performance arts. The lab provided an opportunity to learn about the utilization of the art of storytelling to deliver engaging and effective presentations to engineering and general audiences. The lab was offered in Fall 2013 semester to about 45 and in Spring 2014 to about 62 undergraduate students. The purpose of this paper is to provide a detailed description of the structure and the content of the lab along with a candid discussion of the lessons learned and some ideas for future offerings of the lab.

Educational Objectives and Creative Impacts of the CSC Lab

The primary objective of the CSC Lab was to teach ISE students on how to utilize creative processes in graphic and performance arts to develop and deliver an engaging presentation of their senior design projects. To this end, CSC Lab aimed to (1) teach ISE students the basics of drawing, storytelling and choreography; (2) introduce them to the creative processes in graphic and performance arts; (3) familiarize them with the fundamental narrative principles for developing engaging graphic or choreographic works; and (4) provide them with an opportunity to develop graphic or choreographic works to deliver engaging and informative presentations for engineering and general audiences.

The *educational objectives* of the CSC Lab was to broaden the skillset of ISE students by (1) facilitating an improved learning of the content knowledge on the basics of drawing, storytelling and choreography; (2) achieving higher levels of transfer of content knowledge on drawing, storytelling and choreography for the development of engaging and informative technical presentations; (3) developing an ability to interact with and develop an understanding of how to create a common language with people from other disciplines to facilitate multidisciplinary and

interdisciplinary learning, teaching and creating; and (4) allowing them to utilize creative processes in visual and performance arts to development of engaging technical presentations.

The *creative impacts* of the CSC Lab was to encourage ISE students to think creatively by (1) giving them a time and a space during their educational experience on UF campus to develop and express their creativity; (2) inviting them to question the tried and tested methods of designing, developing and delivering technical presentations and empowering them to utilize alternative approaches using narrative tools from graphic and performance arts; (3) providing an opportunity for them to work with professionals from graphic and performance arts challenging their abilities and exposing them to different ideas, perspectives, and experiences; and (4) demonstrating how inspiring and invigorating multidisciplinary creative processes can be.

CSC Lab Structure

The lab was organized around three main components placing an emphasis on some key tools and fundamental principles that relate to drawing, storytelling and choreography. The drawing component concentrated on the development of a set of basic drawing skills by focusing on three important topics: Blind contour drawings, still life drawings and portrait drawings. The storytelling component aimed to instill an understanding of a set of basic principles for creating graphic stories by exposing the students to four critical topics: Narrative imagery, juxtaposition of images, the size and shapes of panels and page design. The choreography component concentrated on the introduction of a set of tools and approaches for developing choreographic works by emphasizing four essential topics: Exploring movement, creating dance phrases, modifying dance phrases and choreographing dance works.

The detailed lab schedule is shown in Table 1. A separate lab meeting was planned to address each of the topics for each of the three areas. Each lab meeting started with a brief discussion of the pertinent issues and fundamental principles that relate to the topic of interest, continued with a brief presentation of successful examples that demonstrate the successful application of the fundamental principle, presented an experiential exercise that required students to accomplish a particular task utilizing the fundamental principle and concluded with the showing accompanied by a brief critique of the outputs generated by the students for the experiential part of the lab meeting.

Table 1. Creative Storytelling and Choreography (CSC) Lab Topics.

Week	Topic
1	Introduction
2	Storytelling I: Narrative Imagery
3	Choreography I: Exploring Movement
4	Drawing I: Blind Contours
5	Storytelling II: Juxtaposition of Images
6	Choreography II: Dance Phrases
7	Drawing II: Fast drawing, Drawing with Planes, Shadows and Lines
8	Storytelling III: The Size and Shapes of Panels
9	Choreography III: Modifying Dance Phrases
10	Drawing III: Portrait Drawing
11	Storytelling IV: Page Design
12	Choreography IV: Final Performance

CSC Lab Content

The multidisciplinary nature of the CSC Lab provided a broad range of topics from graphic and performance arts that could be introduced in a variety of different ways into an undergraduate level experiential lab for non-majors. The topics chosen for exploration for each of the components captured a coherent subset of the fundamental principles that are most pertinent to the creative process for designing and developing works that tell a story. In what follows, we briefly discuss the class activities associated with each of these topics.

Drawing. The educational objective of the drawing component was to introduce ISE students to the making drawings to help visualize, to describe and to record an experience or an idea.

In Drawing I, students were asked to make some blind contour drawings where they were asked to draw an object without looking down at the drawing surface.⁴ This exercise forced the student to pay special attention to the lines that can help form an image of the object rather than the object itself. It also helped develop hand-eye coordination. Another exercise was to give each student a simple object (e.g., a toy, a baby shoe, or a fruit) in a paper bag and ask the student to draw the object by feeling it as opposed to seeing it. This exercise also helped develop hand-eye coordination.

In Drawing II, students were introduced to making drawings in different ways. In particular, they were asked to make still life drawings by recognizing and using shapes that can capture the essence of an object, by recognizing and using the contrast between the dark and light areas associated with the object, and by seeing and using inside and outside lines of the object⁶.

In Drawing III, students were asked to make quick sketches based on a series of photographic images projected on the screen. Each image was projected onto the screen for only about 15-30 seconds, after which students were given an additional 15-30 seconds to make a sketch from their memory of the image. This exercise forced the student to make quick decisions as to the lines that are essential to capture the image and be gestural, direct and quick in making marks and not to spend too much time on details. As a second exercise, students were also asked to draw a portrait of a person sitting next to them. Although portraiture is a challenging task, techniques associated with making portraits are useful in drawing complicated organic forms and shapes⁴.

Storytelling. The educational objective of the storytelling component was to introduce ISE students to some basic techniques that are essential for the creation of effective graphic storytelling to communicate an experience or an idea.

In Storytelling I, students were introduced to the concept of narrative imagery. Students were shown a number of classical paintings as well as comics to help them distinguish between denotative (i.e., literal) versus connotative (i.e., implied) meanings of images. In particular, students were asked to pay attention to and discuss about details of the image that contribute to the narrative of the image by depicting temporal, spatial or non-temporal relationships. Students were asked to work in their respective senior design groups. Each group was given a sketch of three people running off together and is asked to add as many details as possible to communicate the destination of these people. Then, the drawings were randomly swapped among the groups.

Each senior design group was then asked to guess the destination that the three people in the drawing appeared to be going to. Once the destinations were confirmed with the owners of the drawing, each senior design group were asked to make another drawing depicting the group of three returning from their destination. The purpose of this exercise was to build denotative and connotative meanings into an image to create a narrative.

In Storytelling II, students were introduced to the concept of juxtaposition of images. Students were shown several combinations of images to demonstrate how a side-by-side, sequential arrangement of images creates a narrative. Students were asked to work in their respective senior design groups. Each student was given a series of four images from *Nancy* by Ernie Bushmiller, and asked to make sketches on notecards so that when placed side-by-side with any one or a subset of the four images it would help them construct a narrative. After students worked individually for some time, senior design groups were asked to bring together their original images and drawn sketches together as a group to create a more complex and interesting narrative. The purpose of this exercise was to help students understand how the juxtaposition of images creates a context for a story and how a story can be developed in a collective manner using inputs from the individuals in the group.

In Storytelling III, students were introduced to how the size and shape of panels can be useful in creating a narrative. Students were shown several examples from a variety of comic series or books, including *Fountainhead* by Will Eisner, Robert Crumb's adaptation of the existential classic *Nausea* by Jean-Paul Sartre⁷, and *Cerebus* by Dave Sim's among others. For each page, students were prompted to note how the size and shape of the panels help create context for the story. As an exercise, a single page from a *Tin Tin and Land of Black Gold* by Hergé⁸ is considered. Each design team is given a packet of about 14 differently sized and configured photocopies of the page. Then, each team is asked to redesign the page to make it more dynamic by choosing the elements and the relationships that they as a team want to call attention to and create a narrative that they want to construct. The purpose of this exercise is to help students understand how the arrangement of panels on the page can create a rhythm and a structure that, in turn, helps create a narrative.

Storytelling IV builds on Storytelling III and challenges the students to think about the use of the available space on a page to tell a story. First, in order to generate panels, all of the students were asked to consider a stakeholder associated with their design project and make at least two sketches that depict the stakeholder before and after the project was implemented. Then, students were shown several full pages that create a narrative for a complete story using different approaches to space design, including the use of (1) a single panel, (2) a grid system with multiple panels where every panel carried the same weight, (3) a layout where some panels were stretched vertically whereas others are stretched horizontally such that all of them fit together like a puzzle, or (4) a layout that is composed as a relationship diagram. As a concluding exercise for the storytelling component, each design team was asked to use the sketches completed at the beginning of class to design a single page that created a narrative of their design project. The purpose of this exercise was to provide an opportunity for the students to create a graphic work that communicated the content of their design project to engineering and general audiences. The effort that was required to create such a page required them to utilize the fundamental principles that they were introduced to in an integrated manner.

Choreography. The educational objective of the choreography component was to introduce ISE students to some fundamental processes that are essential for the creation of interesting choreographic works based on an experience or an idea. Lab meetings for this component were conducted in a dance studio in the School of Theater and Dance on UF campus.

In Choreography I, the students got comfortable with moving their body and being around each other and were invited to discover the beauty of ordinary movement by using improvisational games and instant choreography. To this end, students went through several different exercises. In the first exercise, they were given a restricted vocabulary of movements (e.g., walk, stand, jump, crawl, run and sit). The objective was to tune into the space and the entire group and to create different time signatures without the complications of dance vocabulary. Then, students were reminded that a movement could be made either in a slow or a fast mode. Also, each student was paired up with a partner, and one was designated as dancer A whereas the other as dancer B. In the next exercise, as the instructor gave prompts on the run as to the mode that each dancer was to be in, the dancers themselves had the liberty to choose to make any one of the moves from the limited vocabulary. The objective was to get accustomed to proximity and learn to explore negative space. In another exercise, the instructor named two body parts, 1 and 2, and students were asked to move such that body part 1 of dancer A had to move towards and come into contact with body part 2 of dancer B. The instructor created a sequence of 10 such pairings on the go (e.g., right hand (A) and right knee (B), head (A) and stomach (B), left foot (A), and right hand (B), etc.). The students were given time to practice to smooth out their phrase based on the 10 pairings. The objective was to help students get accustomed with touch, practice creating movement vocabulary and learn to remember a specific movement sequence.

In Choreography II, the students were asked to generate phrases based on their design project. To start, each design team is asked to come up with ten verbs (that represent movements) or nouns (that define space or shapes) that relate to their project. Then, each student is asked to work by her/himself to come up with a movement that provides an interpretation of each one of the words selected by the team. At the end of this process, each student has a *solo* piece. Then, the teams are asked to get together and practice performing their individually created phrases together as a group. The objective is to help students practice creating images based on group's design project.

In Choreography III, the students were introduced to basic approaches for modifying phrases to create interesting choreographic work. To this end, in the Fall 2013 delivery of the lab, a group of dance students were invited to join the class, the instructor asked the dancers to perform a particular phrase in different configurations, in different directions, at varying speeds, using repetition, level change or transposition to show how a dance phrase can be used within a larger choreographic work. In Spring 2014 delivery of the lab, the ISE students were asked to practice creating a dance work for their group, show it for the instructor and get constructive direct feedback on how to make it richer and more interesting.

Choreography IV was the culminating experience for the choreography component of the lab, for which design teams were asked to choreograph a dance work using all of the material they created throughout the semester and perform their work in a public setting. The Samuel P. Harn Museum of Art on UF campus generously agreed to share their space with the CSC Lab. This opportunity allowed students to visit an art museum, study the available space and select a particular place within the museum for the performance of their choreographic work. In Fall

2013 offering of the lab, each design team was matched with a team of dance students. These interdisciplinary teams of ISE and dance students were asked to collaborate for the selection of a performance site at the museum, music to accompany the performance along with props and costumes to support and stage their choreography. This experience provided two groups of students from different colleges on UF campus to get to know each other, invent a common language to create an understanding and create a choreographic work in a collaborative manner. In Fall 2014 offering of the lab, however, design teams were solely responsible for the development and performance of their choreographic works with no input from any dance students. The ISE students were also asked to provide a short essay describing their creative design process (including their approach to generation of movement phrases, organization of the phrases into a choreography, selection of music, selection of space for the performance, costuming and use of props).

Evaluation

At the end of each semester, surveys that include a variety of questions related to storytelling, drawing, choreography, teamwork, creativity and interdisciplinarity were used to assess students’ attitude towards the set of skills that were addressed by the CSC Lab. Students are presented a total of 22 statements and were asked whether they strongly agreed (SA) with, agreed (A) with, neutral (N) towards, disagreed (D) with, or strongly disagreed (SD) with the statement. A total of 27 and 61 responses were collected from the participants of the CSC Lab in Fall 2013 and Spring 2014 semesters, respectively. The tallies of the responses to a subset of 10 questions that relate to storytelling, drawing and choreography collected in Fall 2013 and Spring 2014 semesters are summarized in Tables 2 and 3, respectively. The last column in each of these tables show the weighted average of the responses, obtained by mapping the qualitative responses SA, A, N, D and SD to quantitative scores from 5 through 1, respectively.

Table 2. Survey Results from Fall 2013.

Statement	SA	A	N	D	SD	Mean
Storytelling is important for engineers.	22%	74%	4%			4.19
I am a good storyteller.	11%	41%	33%	15%		3.48
I want to become a better storyteller.	30%	63%	7%			4.22
More emphasis should be placed on teaching storytelling in engineering curriculum.	4%	67%	26%	4%		3.70
A complex idea can be communicated by a single drawing.	30%	67%		4%		4.22
A complex idea can be communicated by a dance work.	4%	41%	44%	4%	7%	3.30
Ability to draw is important for storytelling.		33%	37%	30%		3.04
Ability to dance is important for storytelling.		11%	30%	44%	15%	2.37
I want to learn more about how to draw better.	4%	44%	22%	30%		3.22
I want to learn more about choreography.		11%	52%	19%	19%	2.56

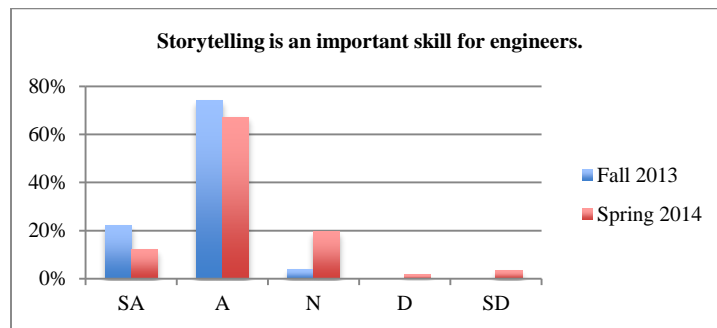
Table 3. Survey Results from Spring 2014.

Statement	SA	A	N	D	SD	Mean
Storytelling is important for engineers.	8%	67%	20%	2%	3%	3.75
I am a good storyteller.	5%	44%	36%	11%	3%	3.36
I want to become a better storyteller.	10%	48%	28%	7%	8%	3.44
More emphasis should be placed on teaching storytelling in engineering curriculum.	7%	25%	38%	25%	7%	3.00
A complex idea can be communicated by a single drawing.	10%	56%	16%	18%		3.57
A complex idea can be communicated by a dance work.	3%	36%	30%	18%	13%	2.98
Ability to draw is important for storytelling.	2%	10%	39%	36%	13%	2.51
Ability to dance is important for storytelling.	2%	3%	21%	46%	28%	2.05
I want to learn more about how to draw better.	8%	26%	36%	15%	15%	2.98
I want to learn more about choreography.	8%	67%	20%	2%	3%	2.43

The responses collected in Fall 2013 and Spring 2014 are reported separately due to the differences as to the delivery of the lab as well as the collection of survey responses. In Fall 2013, ISE students collaborated with dance students. Specifically, each design team was matched with a group of dance students to perform the dance work that the design team choreographed using the phrase generation ideas that they were introduced earlier in the semester. However, the write-ups collected from teams clearly demonstrated that dance students were heavily involved with choreography as well. Hence, in Spring 2014, ISE students were asked to choreograph and perform their dance works themselves with no input from any dance students. Consequently, they had one more contact hour with the dance professor. In Fall 2013, the survey was distributed during the final project presentation of the Senior Design course, and as it was optional, only 27 out of 45 students responded. In Spring 2014, the survey was distributed during the showing of the dance works, and 61 out of 62 students responded. Furthermore, during both semesters, the survey responses were collected anonymously. Hence, gender and ethnicity breakdowns of the survey data are not available.

A careful examination of the weighted average columns in Tables 2 and 3 reveal that there was a clear decline in the percentage of students who expressed strong agreement and agreement to all the research variables from Fall 2013 to Spring 2014. In both semesters, there was a subset of students who were deeply engaged with the CSC Lab whereas the others had reservations. Since the survey was mandatory in Spring 2014, it is likely that more of the students who had reservations about the lab participated in the survey. Furthermore, in Spring 2014, ISE students had to choreograph and perform their dance works themselves with no input from dance students. Consequently, a lot of the ISE students were self-conscious during all showings throughout the semester, which seemed to have influenced their perception of the CSC Lab negatively.

Figure 1. An Illustration of the Comparison of the Percentage Distribution of Responses to in Fall 2013 and Spring 2014 Semesters to the Statement “Storytelling is an important skill for engineers.”



As shown in Figure 1, the survey results indicate the presence of an awareness among the ISE students towards the significance of storytelling as an important skill for engineers. In Fall 2013, an overwhelming majority (about 96%) of the students agreed or strongly agreed with the statement that storytelling is important for engineers. In Spring 2014, about 75%, still a majority of the students, agreed with the statement. In Fall 2013, about 52 percent of the students expressed belief towards possessing good storytelling skills already, and about 92 percent of the students stated that they wanted to improve their storytelling skills. Similarly, in Spring 2014, about 49 percent of the students stated that they possessed good storytelling skills already. However, only 57 percent of these students stated that they wanted to improve their storytelling

skills. Interestingly, in Fall 2013, while 70% of the students agreed or strongly agreed with and about 26% were neutral towards the need for placing more emphasis on teaching storytelling in engineering curriculum, only 31% of the students agreed or strongly agreed with and about 62% were neutral towards this need in Spring 2014.

Figure 2. An Illustration of the Comparison of the Percentage Distribution of Responses to in Fall 2013 and Spring 2014 Semesters to the Statement “A complex idea can be communicated by a single drawing.”

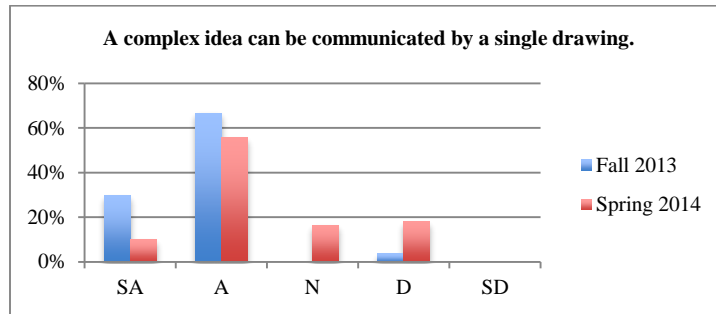
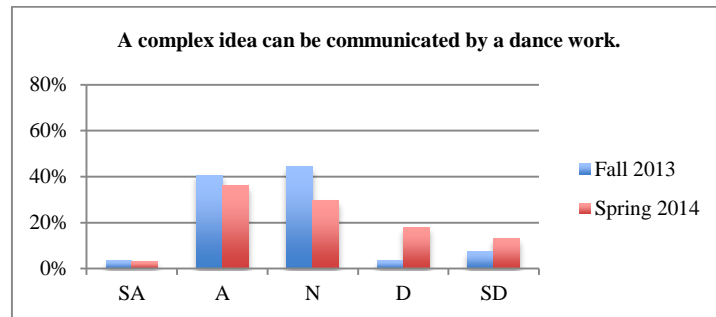


Figure 3. An Illustration of the Comparison of the Percentage Distribution of Responses to in Fall 2013 and Spring 2014 Semesters to the Statement “A complex idea can be communicated by a dance work.”



It is also interesting to observe the students’ attitude towards the role that drawing and dancing can play in storytelling as illustrated in Figures 2 and 3. In Fall 2013, about 96% students, an overwhelming majority, strongly agreed or agreed with the statement that a drawing could communicate a complex idea, whereas, in Spring 2014, only about 65% of the students, still the majority, strongly agreed or agreed with the same statement. Students expressed a weaker agreement with the statement that a dance work could communicate a complex idea. In particular, about 44% of the students in Fall 2013 and about 38% of the students in Spring 2014 strongly agreed or agreed with the statement. However, a note scribbled by a student on the side of a survey that stated “Not by dancers of our skill.” raised the question whether the lack of a formal training and/or sufficient skill in dance among ISE students influenced the perception of the students, and thereby their response to the question. Similarly, the students expressed a weaker agreement in regard to the importance of the ability to draw for storytelling. In particular, in Fall 2013, about 33% of the students strongly agreed or agreed with the statement, whereas about an additional 37% of the students were neutral towards it. In Spring 2014, only about 11% of the students strongly agreed or agreed with the statement, whereas about an additional 40% of the students were neutral towards it. Similarly, the importance of ability to dance for storytelling was perceived less favorably among the survey participants in both semesters. In particular, in Fall 2013, only around 11% of the students strongly agreed or agreed

with the statement and only an additional 30% of the students were neutral towards it. In Spring 2014, only about 5% of the students strongly agreed or agreed with the statement, whereas about an additional 21% of the students were neutral towards it. In both semester, a majority of the students (about 60% in Fall 2013 and 73% in Spring 2014) expressed disagreement with the importance of ability to dance for storytelling.

Figure 4. An Illustration of the Comparison of the Percentage Distribution of Responses to in Fall 2013 and Spring 2014 Semesters to the Statement “I want to learn more about how to draw better.”

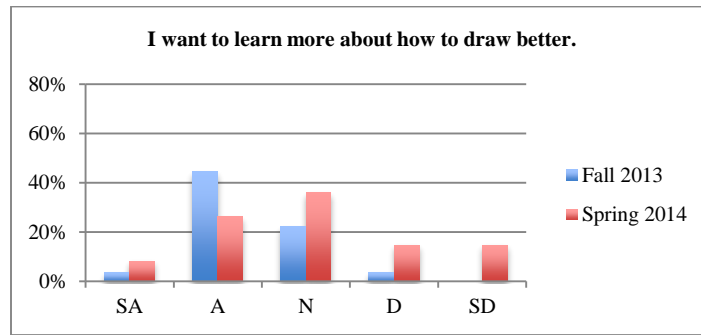
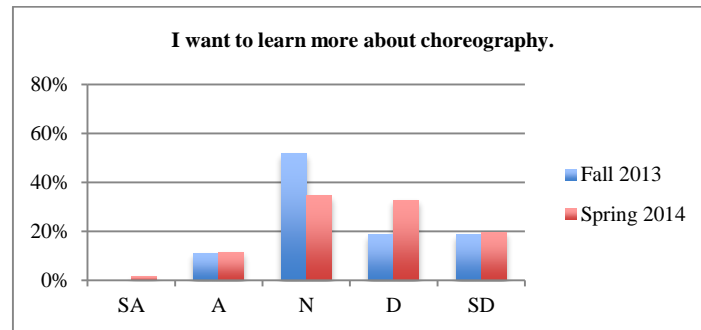


Figure 5. An Illustration of the Comparison of the Percentage Distribution of Responses to in Fall 2013 and Spring 2014 Semesters to the Statement “I want to learn more about choreography.”



Last but not least, it is worthwhile to investigate the students’ willingness towards learning more about drawing and choreography, as shown in Figures 4 and 5. In Fall 2013, about 48% of the students, about half, strongly agreed or agreed that they want to learn more about how to draw better, whereas in Spring 2014, only about 34% of the students expressed strong agreement or agreement with such a willingness. Similarly, gaining further knowledge about choreography was received less favorably. But, in Fall 2013, about 11% of the students, strongly agreed or agreed that they want to learn more about choreography, whereas in Spring 2014, a similar percentage, about 13% of the students expressed strong agreement or agreement with such an interest.

Lessons Learned

CSC Lab was well received by a majority of the ISE students that were enrolled in Senior Design course in the Department of ISE at the University of Florida. However, throughout the course some of the ISE students questioned the purpose of the exercises done in class and how they contributed to the overall objective of the lab. Hence, it would be a good idea to spend some time

at the beginning or end of each lab meeting discussing as to the relevance of the topic of interest to help students map the relevance and the usefulness of the art-based content to their current engineering education and future engineering practice. The lack of sketchbook training of engineering students posed some barriers as well. Having little or no experience with sketchbooks, the students struggled with what to enter in their sketchbooks and how to make entries in their sketchbooks. Hence, it would be a good idea to show pages from sketchbooks to students and give them some pointers on how to make rich entries in their sketchbooks that can later be used to create a narrative for their project. Another important challenge related to the size of the class. An increase in class size necessitates the need to allocate more time to the showing and the critique of the work developed during the lab meeting, reducing the time available for discussions, demonstrations and the experiential elements. An increase in class size also limits the time that an instructor can spend with the students to provide the crucial immediate feedback that the (visual and performance) arts education necessitates. Last but not least, the physical capacity of the facilities that are conducive to arts education typically are not designed to accommodate the large class sizes that are typical of engineering. UF ISE has been observing an upward trend in class sizes. This trend influences the number and size of senior design teams in the Senior Design course. Due to the highly experiential content of the CSC lab, managing the lab proved to be an easier task when the class size was smaller in Fall 2013 semester. Hence, it would be good idea to have multiple sections for the lab experience where the class size is limited to 25-30 students.

Concluding Remarks

In order to impart storytelling skills to ISE students at UF, an experiential lab component for the capstone design course was developed. The purpose of the CSC Lab was to teach ISE students some creative processes to help them develop engaging and informative presentations to communicate goals, execution, and results of engineering projects to engineering and general audiences. Throughout the semester, a number of tools and creative processes from graphic and performance arts were presented to the students to help them develop of engaging narratives in the form of graphic stories or dance works. At the end of the semester, design teams not only wrote graphic stories to convey the goals and the results of their capstone design projects but also choreographed and performed dance works as well.

References

- 1 Anderson, David. V. "Storytelling – The Missing Art in Engineering Presentations," *IEEE Signal Processing Magazine*, March 2011, p 109-111.
- 2 Monarth, Harrison. "The Irresistible Power of Storytelling as a Strategic Business Tool," *Harvard Business Review*, 2014.
- 3 Denning, Steve. *The Springboard: How Storytelling Ignites Action in Knowledge-Era Organizations*. Butterworth Heinemann. 2000.
- 4 Grinder, John and Richard Bandler. *The Structure of Magic II: A Book about Communication and Change*. Science and Behavior Books, 1976.
- 5 Friedman, Bruce D. *How to Teach Effectively: A Brief Guide*. Lyceum Books, Inc., 2013.
- 6 Edwards, Betty. *Drawing on the Right Side of the Brain*, Jeremy P. Tarcher, Inc., 1989.
- 7 Sartre, Jean-Paul. *Nausea*. Amereon Ltd., 2012.9
- 8 Herge, The Adventures of Tin Tin and the Land of Black Gold, *Le Petit Vingtième*, 1950.

Elif Akcali

Elif Akcali is an Associate Professor in the Department of Industrial and Systems Engineering at the University of Florida. She holds a B.S. in Industrial Engineering from the Middle East Technical University as well as M.S. and Ph.D. in Industrial Engineering from Purdue University. Her research interests lie in the mathematical modeling and analysis of closed-loop and reverse supply chain design and operation problems. As a classically-trained, avid piano player and a mixed-media artist, she is curious to explore the interplay between arts and engineering to understand how artist engineers address engineering problems and how engineering artists develop installations and performances.

Tzveta Kassabova

Tzveta Kassabova is an Assistant Professor of Dance at Middlebury College. Tzveta is a Bulgaria born independent choreographer, costume designer and installation artist named the ‘top 25 to watch’ for 2012 by Dance Magazine. At different times she has been a gymnast, physicist, and meteorologist. She holds three Masters degrees. She received five MetroDC Dance Award (2008, 2011), the Prince George’s Arts Council Grant (2009, 2012) and Maryland State Arts Council Award (2010 and 2011). Tzveta believes that dance is a visual art form. She has always been fascinated by the concept of space, and is constantly trying to address it, both in her choreography and design.

Tom Hart

Tom Hart is a cartoonist and the Executive Director of The Sequential Artists Workshop in Gainesville, Florida. He is the creator of the Hutch Owen series of graphic novels and books, and has been nominated for all the major industry awards. His *The Collected Hutch Owen* was nominated for best graphic novel in 2000. He was an early recipient of a Xeric Grant for self-publishing cartoonists, and has been on many best-of lists in the *Comics Journal* and other comics publications. He has taught comics and sequential art at schools and institutions all around New York City for more than 10 years, and has conducted week-long workshops from Maine to Hawaii. He also teaches sequential art in the School of Art and Art History at UF.

Leela Corman

Leela Corman is an illustrator, cartoonist, and dancer. She is the co-founder of The Sequential Artists Workshop in Gainesville, Florida, and is also an adjunct professor at the University of Florida, teaching illustration. She has illustrated many books on subjects ranging from urban gardening to the history of the skirt, and has worked with many editorial clients, including the *New York Times*, *BUST Magazine*, *Stocks & Commodities*, and more. Her graphic novels include the Xeric Grant-winning *Queen's Day* (2000), *Subway Series* (2002), and *L.A. Times Book Prize* finalist *Unterzakhn* (2012). She is also an accomplished performer and instructor of Middle Eastern dance, specializing in the theatrical and folkloric styles of Egypt.