Presented at TIE'17, Canterbury UK, 11th Sept 2017

A Study of Digital Science Fiction Prototyping in an Elementary School Setting

Carrie Lane and Juliette Solis

School of Journalism and Media Studies, San Diego State University, 5500 Campanile Dr. San Diego, CA 92182
carrie2686@gmail.com, heartsjnm@gmail.com

Abstract: This paper will focus on a new approach to teaching that integrates digital literacy and science fiction into elementary school settings. The approach combines elements of constructivist teaching methods, Science Fiction Prototyping (SFP), the exquisite corpse model and social media to engage young learners. This paper includes background information gathered from previous literature on the effects of constructivist approaches and new technological advances within classroom environments and then analyzes the effects of a new platform called MySciFiStory.com that hopes to combine these approaches to benefit elementary students and educators.

Keywords: Science Fiction Prototyping, Exquisite Corpse Model, Social Media, Collaborative Learning

1. Introduction

Reaching and engaging elementary learners is often challenging because students are frequently distracted and resistant to learning unless content is presented dynamically and in multiple ways. Fostering collaboration and building technology-based skills among elementary students is critical in today's digital age, and if these skills can reinforce educational curriculum, their purpose becomes twofold. Understanding ways to reach elementary students is paramount to ensure effective and engaging teaching in the 21st century. According to previous literature regarding various approaches to education, implementing collaborative, active learning and dynamic curriculum into classrooms can foster increased understanding and student participation (McGlynn, 1999). Some such approaches include offering virtual experiences to help students connect with concepts, fostering peer interaction, having students construct their own meaning from the curriculum and offering interdisciplinary bridges between content areas.

The Creative Science Foundation (CSF) has utilized Science Fiction Prototyping (SFP) and technology with great results among college students and other populations, and they believe that similar results can be achieved if these constructs are translated into elementary classrooms. One possible implementation of the CSF ideas within elementary school classrooms is a digital platform called MySciFiStory.com (https://sites.google.com/site/myscifistorycom/), which will allow young students to

learn content about given instructional objectives by utilizing SFP, the exquisite corpse method and multiple constructivist approaches to create dynamic subject-matter instruction (Lane, Solis, von dem Hagen, & Gomez, 2017). This study will review literature on varied approaches to teaching content in today's schools and will preview the underlying theory behind SFP and the exquisite corpse method, which combine to provide the supporting framework for MySciFiStory.com. Additionally, the study will address background information about the overarching structure of MySciFiStory.com and will analyze data gathered during the implementation of the MySciFiStory.com prototype within elementary classrooms and among elementary educators and administrators.

2. Background Work

2.1. Innovative Approaches to Teaching Content in K-12 Classrooms

Over the years, the field of education has been altered greatly by cognitive psychology and the use of computers in the classroom. This has resulted in a shift toward alternative approaches to teaching, including student-centered learning, collaboration, virtual reality and constructivism (IADIS, 2012).

2.2. Constructivism and Student-Centered Learning

Constructivism is a theory by which students construct meaning actively through collaborative, process-based learning and focus on understanding (Crotty, 2012). The idea of constructivism came from a philosopher named Giambattista Vico who stated that humans must construct their own experiences in order to understand them. John Dewey later expanded on this theory by suggesting that to learn fully, students must be active in the learning process (Power, 1997). In 1993, Marjorie Chang conducted a study of 363 junior high school students to measure the effectiveness of constructivist teaching methods against traditional approaches to teaching. Students using constructivist approaches were asked to predict the outcomes of certain situations and were encouraged to interact with their peers to determine the likelihood of their predications. Conversely, students taught with a traditional approach were not encouraged to collaborate or predict the effects of certain situations. The posttest results of this study showed that students who engaged in a constructivist approach to learning did better on their explanation scores but showed only marginal differences in their multiple choice results (Chang, 1993).

Similarly, student-centered approaches to learning assume that students benefit from collaboration and meaningful engagement through peer interaction. In student-centered learning, students are designated engaging tasks and then search for resources to help them gain the skills to complete these tasks. They reflect on their final products and revisit their approaches after receiving meaningful feedback (Pederson & Williams, 2004). A study done by Carla Confer found that to successfully implement student-centered learning, teachers need to become learners and focus on interaction, socialization, language and meaningful interaction with the content (Confer, 2000).

2.3. Virtual Reality and QR Codes

Educators have recently begun using virtual reality in the classroom to foster educational connections among K-12 students. Virtual reality can be used to help students understand difficult concepts, observe far away places, view past events or understand concepts that would be otherwise unsafe. Virtual reality is a 3-D computer program that encourages users to immerse themselves in an interactive computer environment that resembles a physical world. While virtual reality is highly engaging for students, some of the challenges to a purely virtual experience in the classroom include the initial navigation through the virtual reality world, accessibility to all learners, time constraints and planning difficulties (Abdelaziz, Riad, & Senousy, 2014).

In addition to virtual reality, teachers have also implemented Quick Response (QR) codes into their classrooms. QR codes were created in 1994 by a Japanese corporation called Denso and are square patterns that code information from web addresses. Teachers are using QR codes in the classroom to help students access information without the risk of incorrectly typing the wrong web address. According to Del Seigle, some benefits of QR codes are that they are easy to open, they limit the risk of accessing unsafe websites, they are quick and simple to use, they are free and easy to create, and they eliminate wasted paper. They can be used for supplemental information, as extension activities or as assessment tools on given classroom topics. Seigle suggests that some QR code challenges include the need for scanning technology and Internet access and the fact that they can be destroyed and unusable if not cared for properly (Seigle, 2015).

2.4. Social Media in the Classroom

Social media has been increasingly utilized in the classroom, and sites like Twitter and Facebook connect people worldwide. According to Abdul Qayyum Ch., Tariq Hussain, Zaid Mahmood and Shafqat Rasool, some benefits of social media include a fostering of collaboration and organizational skills across distances; some downfalls involve a reliance on easy-to-access information that is not always thorough or correct. Qayyum Ch. et al. conducted a study, which found that while elementary students who used social media spent the same amount of time studying as their counterparts who did not, those students were more prepared to access resources at home, to engage in shared discussions and to exhibit a positive attitude toward learning. Lastly, social media users showed better academic results on their final exams than non-users in this study (Qayyum Ch., Hussain, Mahmood, & Rasool, 2016).

2.5. STEM/STEAM

Another recent approach to education involves the use of STEM, Science, Technology, Engineering and Mathematics, within the classroom. According to Margaret Honey, Greg Pearson and Heidi Schweingruber, recent changes in educational curriculum, including the Next Generation Science Standards, attempt to make engineering concepts applicable in various disciplines, inside and outside of schools. This idea of

forming deeper connections with the content calls for interdisciplinary learning and has shifted the emphasis on STEM toward a focus on STEAM, which stands for Science, Technology, Engineering, Arts and Mathematics (Honey, Pearson, & Schweingruber, 2014). According to Christine Liao, integration of the arts into the classroom allows students to foster creativity, which is a vital skill in producing innovative, critical thinkers who can serve as productive and successful workers in society (Liao, 2016). Research about student achievement with both STEM and STEAM shows that the impact on students depends on the supports given and the level of integration of the concepts (Honey, Pearson, & Schweingruber, 2014). Honey et al. suggest that integration is paramount when utilizing these concepts because the human mind connects new concepts with ones previously understood; however, too much integration can cause overload to one's limited working memory. Therefore, collaborative learning, scaffolding, content relevance and peer conferencing must play a key role in order to create successful classrooms when implementing STEM or STEAM content (Honey, Pearson, & Schweingruber, 2014).

2.6. Science Fiction Prototyping

SFP provides a strong platform by which MySciFiStory.com is supported. SFP has become one approach to engaging students with academic content in educational environments and beyond. According to Brian David Johnson, SFP uses movies, comics and stories as a way to explore future technologies and the results of today's realities on the future. It attempts to offer platforms by which people can use their imaginations to generate ideas for the future while pulling information from the past and the present (Johnson, 2011). In an article by Donald Smith, a high-school physics educator, SFP was used to engage students. He found that using elements of science fiction stories was helpful in garnering enthusiasm among students and that the new concepts made physics more interesting and clarified the content (Smith, 2009).

2.7. Exquisite Corpse

Another cornerstone of the MySciFiStory.com program is the exquisite corpse model, which was initially created by the Surrealists as a means for making collective collages among multiple individuals (McShane, 2004). In 1925, Andre Brenton brought the idea of the exquisite corpse game to education. He had each of his students create the head, torso, hands, legs and feet of a character, which would later be used in the student's creative writing. The students would then describe the exquisite corpse's physical and emotional characteristics. Brenton found that this challenge helped to inspire students (Wilson, 2001). This exquisite corpse method was later utilized in a science fiction documentary that focused on the use of accidental juxtapositions as a means for creating new worlds and fantastic combinations of various disciplines. The documentary combined scenes from fictional movies and was performed by scientific authors and actors. It focused on the interaction between the future and the present and suggested that visionary concepts can emerge organically from combinations of random ideas (Cynn, 2011).

2.8. How These Approaches Relate to MySciFiStory.com

The MySciFiStory.com platform attempts to use elements of STEM/STEAM, collaborative and student-based learning and constructivism to promote interest and understanding among elementary students. Furthermore, the program's main foundations are based on a combination of SFP ideology and the exquisite corpse method set forth by the Surrealists. Because these methods have been successful in the K-12 classroom setting and beyond, the platform hopes to combine various elements of each construct as a means to activate student engagement and learning in the K-12 classroom (Lane et al., 2017).

2.9. Overarching Themes

One key theme the researchers found was that while recent innovative approaches to teaching content appear to have benefits among students, proper training for teachers and administrators is necessary. Additionally, the researchers discovered that additional research is needed about the effects of these approaches on elementary students and on the long-term effects of these methods on learning in general.

3. Background Behind MySciFiStory.com

As a means of combining SFP, the exquisite corpse method, collaboration, technology and constructivism, The MySciFiStory.com attempts to make classroom instruction and assignments accessible and relevant to elementary learners. The program begins with students watching online videos on given instructional topics. Then, using other features of the website, students build story introductions based on the guidelines and objectives set forth by their teacher. Within the same page, students can like their favorite story starters using a variety of social media tools. From there, students collaborate to write the middle part of their favorite creative story. In the end, students use the platform to individually type a story resolution and print a QR code that can then be scanned by their classmates using a QR scanner (Lane et al., 2017).

The platform allows teachers and their students to communicate through social media, no matter where they are worldwide. Students like their favorite story introductions by using WhatsApp, Facebook Messenger, Snapchat, Instagram, Twitter or other social media platforms as designated by their teacher. This feature of the platform encourages collaboration and fosters technology use among elementary students. These 21st century learning focuses are further implemented during the collaborative writing stage of the program and in the sharing of final products via QR codes (Lane et al., 2017).

Learning within the platform can take place at home or in school and is fast-paced but allows students time to fully engage with the content and their peers. The environment facilitates the performance of the intended course outcomes by encouraging

content synthesis, competition and application of factual information (Lane et al., 2017).

The primary audience for MySciFiStory.com is elementary students, ranging in age from six to 12. The program benefits student learning because it fosters innovation, information synthesis and knowledge application. MySciFiStory.com encourages students to delve deeper into the content at hand and fosters competition, thereby increasing their learning and motivation. Another primary audience of the platform is elementary school teachers. MySciFiStory.com allows teachers to translate content to students in a highly effective and engaging manner via the InstructionalContentPage. Toward the beginning of the program, teachers set up the learning experience, provide the topic to be studied from a set of pre-developed content and designate the duration of the lesson. Because the content is already created, teachers will not need to be deep subject matter experts to set up and manage a session but will take ownership of the lesson implementation. However, teachers can also create and add their own story outlines if they choose to do so (Lane et al., 2017).

Throughout the module, MySciFiStory.com allows students to reach advanced categories of Bloom's Taxonomy, an organizational system set up in 1948 by Benjamin Bloom and other educators to facilitate higher-level thinking in education by promoting application-based knowledge and synthesis of ideas (Ulum, 2016). By the end of a MySciFiStory.com module, students will use shared creativity to create a science fiction story, gain subject-matter understanding of a given concept, demonstrate communication skills by collaborating on social media and write a science fiction story with a beginning, middle and end (Lane et al., 2017).

4. Methodology

To test the digital website MySciFiStory.com, the researchers showed a working prototype of the website and a slideshow to nine teachers and one administrator. They conducted qualitative interviews to gather information about what educators felt were the strengths and weaknesses of the prototype. Additionally, the researchers showed the prototype to 38 students, who engaged in the basic activities of the program. The students took a pretest to assess their prior knowledge about the content. They continued by watching an educational video, writing introductions to a science fiction story related to the instructional content and sharing their introductions. Students then voted on their favorite introduction and collaborated to create a middle section of the story. Afterwards, the students individually drafted and shared endings to the story with their fellow classmates. To conclude, students took a posttest and filled out a survey based on their experiences. The researchers analyzed the pre- and posttest data, which is included in Figure 8, and used this to help test their hypothesis. The researchers also took educator and student feedback into account when testing their hypothesis and analyzing the effectiveness of MySciFiStory.com.

Figure 1. Gravity Prototype Sample Page: One page of the sample prototype shown to teachers, administrators and students.

Figure 2. Website Sample Page: A sample of the MySciFiStory.com website shown to students.

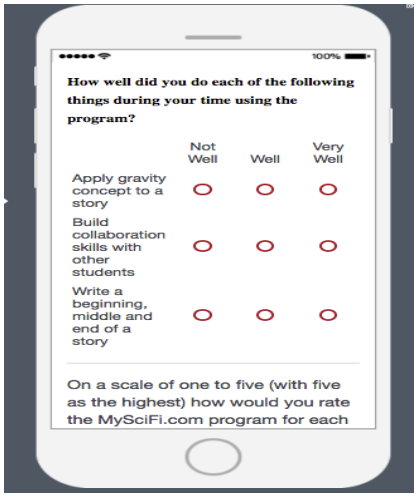
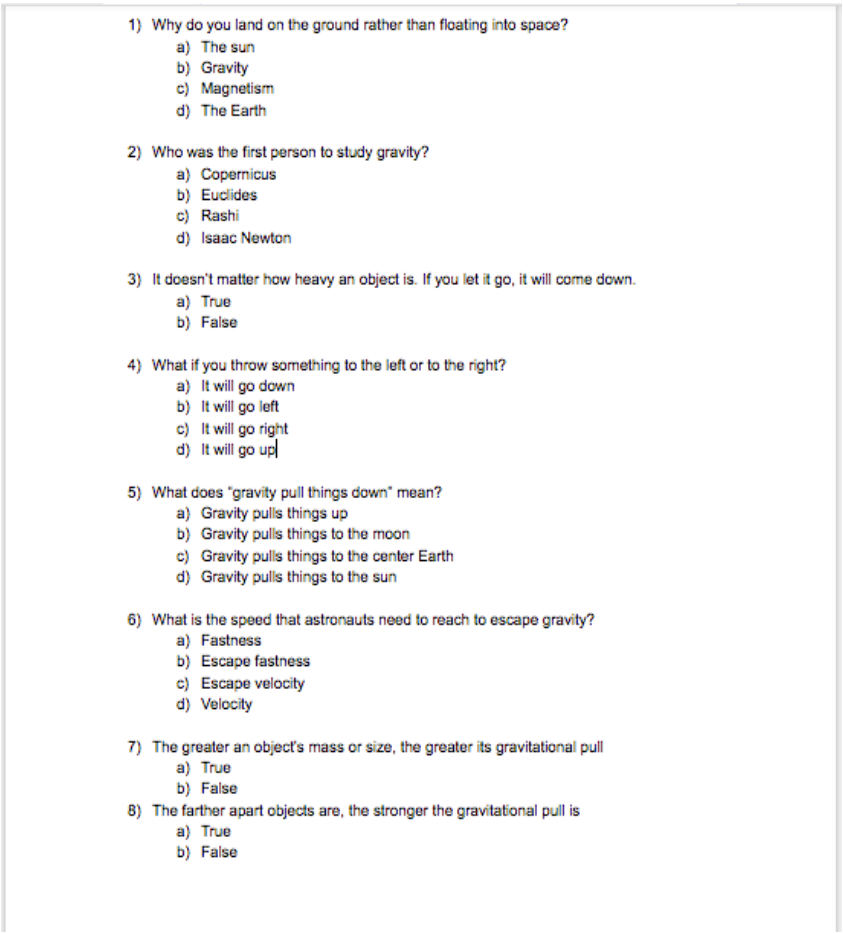


Figure 3. Survey Preview: A screenshot of the survey given to students after viewing the prototype and the website.



1) Why do you land on the ground rather than floating into space?
   a) The sun
   b) Gravity
   c) Magnetism
   d) The Earth

2) Who was the first person to study gravity?
   a) Copernicus
   b) Euclides
   c) Rashi
   d) Isaac Newton

3) It doesn't matter how heavy an object is. If you let it go, it will come down.
   a) True
   b) False

4) What if you throw something to the left or to the right?
   a) It will go down
   b) It will go left
   c) It will go right
   d) It will go up

5) What does "gravity pull things down" mean?
   a) Gravity pulls things up
   b) Gravity pulls things to the moon
   c) Gravity pulls things to the center Earth
   d) Gravity pulls things to the sun

6) What is the speed that astronauts need to reach to escape gravity?
   a) Fastness
   b) Escape fastness
   c) Escape velocity
   d) Velocity

7) The greater an object's mass or size, the greater its gravitational pull
   a) True
   b) False

8) The farther apart objects are, the stronger the gravitational pull is
   a) True
   b) False

Figure 4. Pre- and Posttest Page: A copy of the pretest and posttest that was given to 38 sample students.

5. Contextual Factors

One contextual factor in the study was limited access to technology among certain teachers. The researchers worked around this by giving teachers access to other classrooms to utilize the technology. Another factor was a lack of technology training among certain teachers, which was mitigated by giving teachers a tutorial on how to use the program. One additional factor involved a lack of time within the instructional day to test the program, which was solved by breaking the module up into subsequent class periods.

6. Teacher and Administrator Reflections on the Program

Strengths of the Program	Suggestions for Improvement
"I like how it scaffolds it for people so kids can work at their own pace but it builds on each other."	"It should be linked to standards. There should be a place where the standards are portrayed"
"It's pretty self-guided for the kids and they would probably be engages because of all the digital and social media elements of the program."	"Is there anyway for the social media to be private?"
"I like that they need to put the effort in yo create the story by themselves. We don't feed it to them. They will learn a lot."	"How do teachers get results from the forms if they are not the owners of the forms?"
"It takes what most teachers already do(combining two subjects), and organizes it in a way that makes planning easy for the teacher, and in a way that will get students excited about the project!"	"I would use a story that's well known to the kids and have them add in their narratives to portray the characters in a real-life setting."
"I believe this program will allow students to be creative while learning the material. I believe students will enjoy learning the subject manner, as this will allow them to personalize their learning and share their knowledge with their friends."	"I would like to ensure that all students work could be saved to be reviewed and completed at a later date. As a teacher who teaches multiple subjects, I would like to be sure that I can use the program for all the subjects I teach.
"It's set up really will to promote a scope and sequence for learning and for the students to be able to write a comprehensive story that is clear, informative and entertaining. The use of social media adds a layer of communication that is very much a part of children's lives these days and therefore of how to use them appropriately,but it will also engage them."	"Sometimes it would be nice for the teacher to able to change the format of the writing. This way we can see how individual kids could be creative by writing the middle and the end of the story individual after the like section. It would be great to put the platform in different languages to expand the teachers it can work for and the subjects."
"I love the flexibility of the program. You can take it where you want to go. I love the QR coded. It makes it hands-on and allows them to appreciate classmates' work n a fun manner. I love the embedded assessment. I love the creativity it affords whether individually, collaboratively or conferencing. It opens so many doors. I would love to see it in my classroom."	"I would be interested in being able to chose various prompts for one class to meet the needs of students who are on different levels of learning."

Figure 5. Teacher Reflection Table: This table shows teacher reflections on the strengths of the MySciFiStory.com program and suggestions for improvement.

7. Student Survey Data and Reflections

According to survey participants, on a scale of 1 to 5, their mean enjoyment of the program was a 4.33 with a standard deviation of .82. The mean learning effectiveness of the program was 4.33 with a standard deviation of .47 and the mean collaboration enhancement was a 4.67 with a standard deviation of .67.

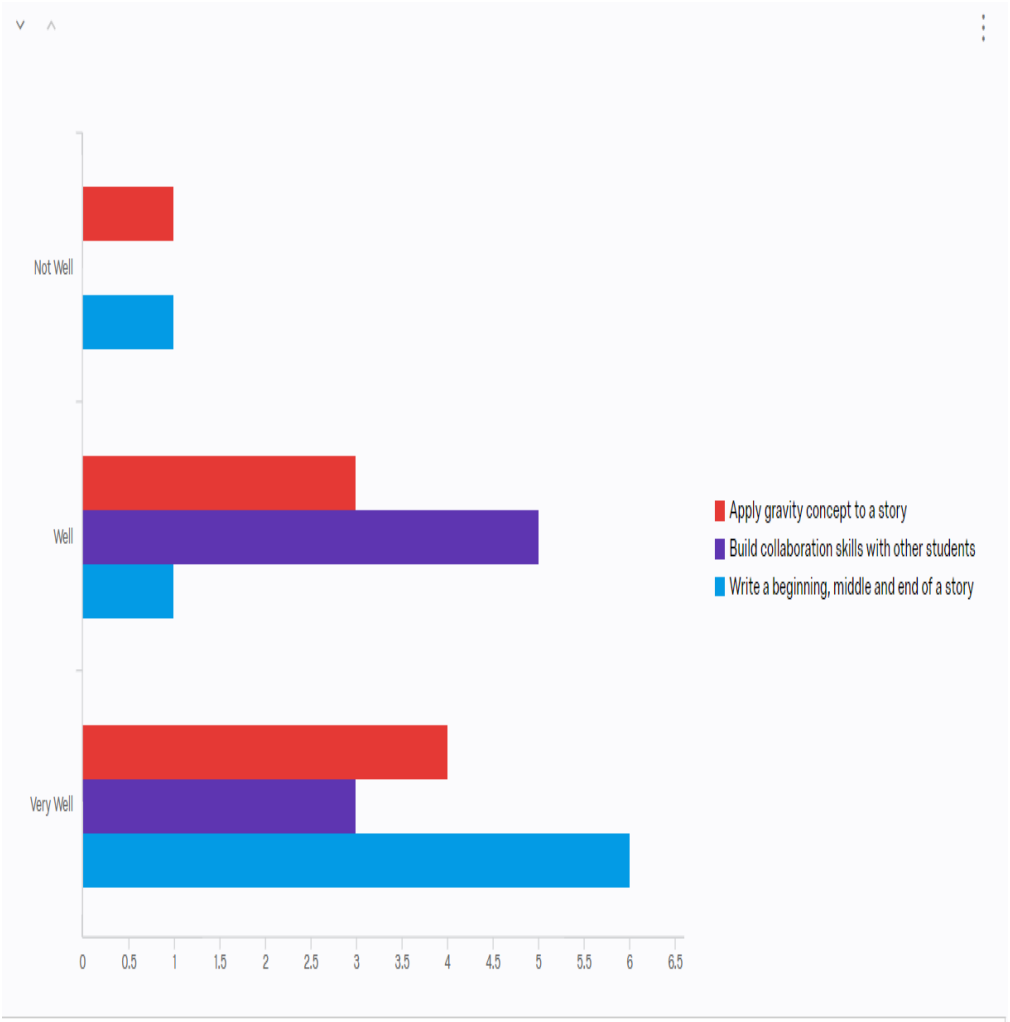


Figure 6. Student Engagement Outcomes: The above graph represents responses of student survey participants about how well they learned to apply concepts to a story, build collaboration skills and write a beginning, middle and end of a story while using the MySciFiStory.com prototype. It is calculated on a scale of 0 to 6.5 and broken into three categories—not well, well and very well.

Favorite Elements of the Program	Would You Use This Program Again?
"Applying gravity concepts to a story."	"You because it makes kids smarter."
"Teaching the students to be smarter, gravity, and to work with others."	"Yes because it was fun learning about things I didn't know."
"When I wrote the story and the test."	"Yes because it was fun to use."
"The video, the composition, and the story."	"No."
"Learning who Issac Newton was, learning more about space and learning that every planet has the same gravity pull."	"I would use it again because it was educational. We got to write a story that was fun."

Figure 7. Student Reflections on the Program: The above figure shows student reflections on their favorite elements of the program and responses to reuse of the program.

8. Pretest and Posttest Data and Findings

The researchers gave students a pretest about the concepts involved with gravity and, after facilitating the MySciFiStory.com prototype and all elements of the gravity module, the researchers gave students a posttest with the same questions. The mean of student scores on the pretest was .71, while the mean of student scores on the posttest was .84. This created a mean score difference of .13. The researchers ran a t-test on the data sets and found that the p-value was .002. This p-value was smaller than the level of significance, which was .05. Therefore, the researchers were unable to accept the null hypothesis, which stated that using MySciFiStory.com would not influence students' academic improvement (a=0.05).

9. Data Analysis

Student #	Pre-Test Scores	Post-Test Scores	Mean Difference
1	0.75	0.875	0.125
2	0.75	0.75	0
3	0.25	0.875	0.625
4	0.75	0.875	0.125
5	0.625	0.75	0.125
6	0.75	0.875	0.125
7	0.375	0.625	0.25
8	0.625	0.75	0.125
9	0.625	0.875	0.25
10	0.875	0.75	-0.125
11	0.75	0.5	-0.25
12	0.5	0.75	0.25
13	0.75	0.625	-0.125
14	0.125	0.875	0.75
15	0.75	1	0.25
16	0.875	0.875	0
17	0.5	0.5	0
18	0.625	0.875	0.25
19	0.875	0.625	-0.25
20	0.5	1	0.5
21	0.75	0.75	0
22	0.75	1	0.25
23	1	1	0
24	0.625	0.625	0
25	0.625	1	0.375
26	0.75	0.75	0
27	0.625	0.875	0.25
28	0.875	1	0.125
29	0.875	1	0.125
30	0.875	1	0.125
31	0.75	1	0.25
32	0.875	1	0.125
33	0.875	0.75	-0.125
34	0.625	0.75	0.125
35	0.875	0.75	-0.125
36	0.875	0.875	0
37	1	1	0
38	0.75	1	0.25
Average for Pretest and Postest=	0.7105263158	0.8355263158	0.125

Figure 8. Student Achievement Scores: The above spreadsheet shows the student scores for the pretest and posttest. These scores were averaged and then used to calculate a p-value, which can be seen in Figure 9 below.

T-Test P Value:	
0.002001162396	
Since this is smaller than level of significance (p=0.05)	**Fail to accept the null**

Figure 9. T-test Results: The above screenshot shows the p-value gathered from a t-test garnered from Figure 8's data.

10. Researcher Hypotheses

MySciFiStory.com Null Hypothesis: Using MySciFiStory.com will not influence students' academic improvement (a=0.05).

MySciFiStory.com Alternative Hypothesis: Using MySciFiStory.com will influence students' academic improvement.

11. Researcher Conclusions

Based on interviews with educators, MySciFiStory.com potentially meets the needs of primary school classrooms and could serve as a useful platform by which students can engage with academic content while collaborating socially and gaining technology-based skills. Many teachers suggested helpful changes that can be implemented into the program to enhance its usability and effectiveness in the classroom. Students who engaged with the MySciFiStory.com example module stated that they gained valuable collaboration skills and enjoyed writing the science fiction stories based on the concept of gravity. The majority of students felt they would like to use the website again and that it was a fun-to-use program that gave them additional subject-matter knowledge. The paired t-test done on the MySciFiStory.com data generated a p-value that was .002. Therefore, the researchers were unable to accept the null hypothesis that using MySciFiStory.com will not influence students' academic improvement.

To conclude, student responses, teacher reflections and data-driven information collected and analyzed by the researchers suggest that MySciFiStory.com has the potential to be a useful tool in elementary classrooms. However, further research on the program and its implementation in elementary classrooms should be done before making a decision on whether to adopt the platform.

12. Areas of Further Study

Some areas of further study include the amount of time needed to implement the MySciFiStory.com program from beginning to end, how demographics impacted outcomes and how teacher and student training influenced results. Another area of study that needs to be addressed further is what, if any, type of technical glitches existed during testing of the program and how they affected the results.

13. References

Abdelaziz, M. A., Riad, A. E., & Senousy, M. B.: Challenges and Issues in Building Virtual Reality-based e-Learning System. In: International Journal of e-Education, e-Business, e-Management, and e-Learning. Iss. 4, vol. 4, pp. 320–329 (2014)

Beas, D. R.: Do We Really Need Virtual Reality (VR) in Education? In: Express Computer (2016)

Chang, M. M.: Role of Explanations and Student-centered Interaction in Science Learning: An Applied Constructivist Approach to Instructional Design. Doctoral dissertation, Syracuse University (1993)

Confer, C.: Student Participation in a Process of Teacher Change: Toward Student-centered Teaching and Learning. Doctoral dissertation, State University of New York at Albany (2000)

Crotty, K.: Educational Theory Constructivism (2012)

Cynn, C.: Forest of Stories: An Experimental Science Fiction Documentary of Stories. Documentary, United States (2011)

Honey, M., Pearson, G., & Schweingruber, H.: STEM Integration in K-12 Education: Status, Prospects, and an Agenda for Research. National Academies Press, Washington D.C. (2014)

International Association for Development of the Information Society: Proceedings of the International Association for Development of the Information Society (IADIS) International Conference on Cognition and Exploratory Learning in Digital Age (CELDA). In: International Association for Development of the Information Society, p. 308. Madrid, Spain (2012)

Johnson, B. D.: Science Fiction Prototyping: Designing the Future with Science Fiction. Morgan & Claypool Publishers (2011)

Lane, C., Solis, J. von dem Hagen, P., & Gomez, A.: MySciFiStory.com Internal Design Document (2017)

Liao, C.: From Interdisciplinary to Transdisciplinary: An Arts-integrated Approach to STEAM Education. In: Art Education. Iss. 69, vol. 6, pp. 44-49 (2016)

McGlynn, A. P.: Strategies: Motivating the Disengaged Student; Part One: Challenging Passivity and Resistance to Learning. In: The Hispanic Outlook in Higher Education, Iss. 9, vol. 24, (1999)

McShane, M. C.: Exquisite Corpse: The Surrealist Practice of Collective Drawing, 1925–1941. Unpublished doctoral dissertation, Emory University, Atlanta (2004)

Pedersen, S., & Williams, D.: A Comparison of Assessment Practices and Their Effects on Learning and Motivation in a Student-centered Learning Environment. In: Journal of Educational Multimedia and Hypermedia. Iss. 13, vol. 3, pp. 283-306 (2004)

Power, S. P.: Constructivism Defined and Implications for the Classroom. Master's thesis, Memorial University of Newfoundland (1997)

Qayyum Ch., A., Hussain, T., Mahmood, Z., & Rasool, M. S.: A Comparative Study Between the Learning Style of User and Non User Students of Social Media at Elementary School Level. In: Bulletin of Education and Research. Iss. 38, vol. 2 (2016)

Siegle, D.: Using QR Codes to Differentiate Learning for Gifted and Talented Students. In: Gifted Child Today. Iss. 38, vol. 1, pp. 63-66 (2015)

Smith, D. A.: Reaching Nonscience Students Through Science Fiction. In: Physics Teacher. Iss. 47, vol. 5, pp. 302–305 (2009)

Ulum, Ö. G.: A Descriptive Content Analysis of the Extent of Bloom's Taxonomy in the Reading Comprehension Questions of the Course Book Q: Skills for Success 4 Reading and Writing. In: The Qualitative Report. Iss. 21, vol. 9 (2016)

Wilson, P.: Not So Exquisite Corpses: Character Invention and Development in the Creative Writing Class. In: English in Education. Iss. 35, vol. 3, pp 7–12 (2001)

14. Acknowledgements

The researchers of this paper would like to thank Victor Callaghan for his guidance and support throughout the creation of MySciFiStory.com and this paper and CSF for their innovative and creative approaches to teaching content. They would also like to thank Dr. Minjuan Wang for her support and guidance throughout this research project and the original concept development process. Many thanks are given to Peter von dem Hagen for his help developing the initial MySciFiStory.com concept, design document and prototype and to Angeles Gomez for her help creating the initial MySciFiStory.com documents. Lastly, the researchers would like to thank all the students, teachers and administrators who participated in the testing of the prototype of MySciFiStory.com.