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Barriers and Strategies to Increase Story as an Instructional Strategy

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Abstract

Story is an instructional strategy that is often forgotten or misused. Some mathematics educators believe they are using stories when in reality only utilizing word problems, which is very different from the story as an instructional strategy. When used properly, the story gets students emotionally invested in the story and their learning, this increases student achievement in mathematics. Despite the low scores on the Florida State Assessment (FSA) Algebra 1 End-of-Course (EOC), teachers are still not using stories as an instructional strategy. This study determines the barriers preventing the usage, along with strategies to increase the usage of stories as an instructional strategy.

Keywords: barriers and strategy, mathematics learning, story as an instructional strategy.

Abstrak

Cerita merupakan strategi pembelajaran yang sering dilupakan atau disalahgunakan. Beberapa pendidik matematika percaya bahwa mereka menggunakan cerita ketika pada kenyataannya hanya memanfaatkan masalah kata, yang sangat berbeda dari cerita sebagai strategi pembelajaran. Ketika digunakan dengan benar, cerita membuat siswa berinvestasi secara emosional dalam cerita dan pembelajaran mereka, ini meningkatkan prestasi siswa dalam matematika. Meskipun temuan skor rendah di Florida State Assessment (FSA) Algebra 1 End-of-Course (EOC), guru masih belum menggunakan cerita sebagai strategi pembelajaran. Studi ini melaporkan hambatan yang mencegah penggunaan, serta strategi untuk meningkatkan penggunaan cerita sebagai strategi pembelajaran.

Kata kunci: halangan dan strategi, pembelajaran matematika, cerita sebagai strategi pembelajaran.

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Introduction

Mathematics is a core subject area in K-12 schools because the basic skills are a requirement for student success post-graduation (Grabmeier, 2017). Students in the state of Florida take a variety of mathematics courses, including Algebra 1, and work to pass the associated state assessments. In Florida, high school students are unable to graduate without passing required standardized assessments, including the Algebra 1 Florida Standards Assessment (FSA) End-Of-Course (EOC) exam (Florida Department of Education [FLDOE], 2020). Without a high school diploma, students are unable to seek a college degree or certificate and would only be eligible to earn their general education diploma (GED). The importance of earning the high school diploma is paramount, as it is statistically proven that students without a high school diploma earn significantly less than their counterparts with a high school diploma (Jones, 2018).

As reported by Balakrishnan (2008), many students think mathematics is boring and do not enjoy these courses because they do not find the content relevant to their lives. Additionally, researchers (Burns, Henry, McCarthy, & Tripp, 2017; Rudnick, 2014) indicate that students often do not see the purpose of using these mathematics courses in their everyday lives, despite that there are real-world applications for every form of mathematics (Kitchen, 2016). The fact that mathematics does not resonate with these students indicates that perhaps teachers are struggling to provide a proper rationale. Current instructional methods may not include clear messaging for the relevance of mathematics to

students, as evidenced in their outcomes on FSA EOC exams (Li & Schoenfeld, 2019; Fergusen, 2010). Therefore, researchers have hypothesized that a change in instructional strategies may be needed (Li & Schoenfeld, 2019; Dennis & O'Hair, 2010; Devlin, 2000).

One such innovative instructional practice is called story, which is a process, or a way of thinking, internalizing, and learning that is based on a formulaic prescription (Junkin, 2019). Effectively developed stories differ from other non-story narratives because they position the reader's feelings and attitudes about the story content and become persuasive as a change agent. An effective story includes five elements: (a) time and place, (b) cause and effect, (c) character judgement, (d) communication of story, and (e) predictability (Branigan, 1992; Kintsch & van Dijk, 1978). These five elements essentially mirror a mathematical equation for effective stories. When mathematics is introduced in story format, the mathematical concepts are explained in a memorable fashion, and students are able to identify the mathematical operations in their memory (Sterenberg, 2013).

However, story is not a commonly accepted instructional strategy, especially in Algebra 1 courses (Junkin, 2019). In addition, there is limited research on why story is not widely implemented as an instructional strategy for teaching mathematical concepts in secondary education. Therefore, this study investigated why storying was not used more often as an instructional strategy and methods to increase its usage.

Literature Review

Story precedes the art of writing, with the earliest forms of story consisting of a combination of oral speech, gestures, and facial expressions (Gunter, Kenny, & Junkin, 2018; Haven, 2007). It is perhaps the oldest form of learning. Through earlier studies, researchers have found that story as an instructional strategy helps students make sense of the world; story presents real-world situations to provide meaning to academic content (Balakrishnan, 2008; Szurmak & Thuna, 2013).

People often distinguish and preserve the connection of events and concepts that would otherwise be disconnected over time through the art of storytelling. One of the reasons people want to hear and tell stories is so they remember its content, including gossip, movies, and television shows, for example. Schank (1990) found that stories tend to trigger memories from the listener. They are a powerful learning tool because content is communicated in a memorable form and shapes the listener's feelings about the information, while also creating vivid and powerful images (Egan, 1989; Haven, 2007; Skoumpourdi & Mpakopoulou, 2011). Through story, imagination and visualization are created, which allows students to learn and understand complex concepts they would normally struggle to grasp through logical, factual, or argumentative presentations (Tater, 1992). The use of story creates context and relevance for new material. It is effective for teaching theorems, facts, concepts, and tacit information across the curriculum (Haven, 2007, 2014).

Furthermore, story allows the reader to suspend their disbelief about they think will happen in the book, which changes attitudes and beliefs. Readers become emotionally engaged with the story, which promotes remembrance and recollection of the information presented (Haven, 2007, 2014; Mallan, 1997). Balaskrishnan (2008) and Haven (2014) discussed the correlation between the strength of the emotional state of the audience and the magnitude of influence the story can carry. When story is used as an instructional strategy, students gain an emotional connection to learning, which plays a significant role in establishing meaning (Balakrishnan, 2008). The use of story as an instructional strategy brings evidence to life, which is ultimately the essence of meaning and relevance to students.

Moreover, students want personal involvement in their learning experience (Rose, 2011), which story promotes. It creates a common perspective and context to make information personal and relevant, while also focusing on student ideas and experiences (Wright, Diener, & Kemp, 2013). Story as an instructional strategy is a useful tool to make sense of the world and one's experiences of problem-

solving and individual perspectives and insights. Researchers (Bruner, 1990; Kaminsky, 1996; Mello, 2001; Polkinghorne, 1988; Schank, 1990; Tannen, 1999) concluded that story is one of the main ways people interpret the world around them.

Incorporating story constructs into instruction can engage and encourage students to make connections with mathematical concepts (Haven, 2007, 2014). The characters within the story are used to pose mathematical problems to engage students' imagination and create excitement (Casey, 2004; Skoumpourdi & Mpakopoulou, 2011). Story enhances critical thinking and problem-solving skills while also expanding pedagogical repertoire. The use of story increases student awareness of the relationships between visual, auditory, and verbal representations, while also promoting critical thinking and problem-solving in mathematics (Walters, Green, Walters, & Wang, 2014). Story presents challenges for students to think and apply mathematical content in different situations that are not apparent, while providing a meaningful context for connecting mathematics and literature. Unfortunately, story has been considered an outdated instrument, with value only for the amusement and entertainment of young children. Essentially story is being replaced with scientific inquiry (Bradt, 1997; Gunter et al., 2018), which makes the use of story as a knowledge acquisition tool decline significantly. The decline in use of this tool is contradictory to what is known of how people learn and remember (Haven, 2007).

Method

Research Design

A phenomenological research design was used in this study, in which qualitative interviews were conducted about the phenomenon of story as an instructional strategy (Neubauer, Witkop, & Varpio, 2019; Groenewald, 2004; Creswell, 2013). The interview questions were developed based on the idea that Algebra teachers were not using nor did they have knowledge of story as an instructional strategy, as noted through a previous study (Junkin, 2019). The data from the interviews were analyzed by the lead researcher, which provided a general picture of the overall context of the entire set of research questions (Creswell & Plano Clark, 2007). The purpose of this study was to gain insight regarding why Algebra 1 teachers were not using story as an instructional strategy and how to increase their usage. The following research questions guided the study:

1. What barriers prevent Algebra 1 teachers from adopting story as an instructional strategy?
2. What potential strategies do Algebra 1 teachers believe could be useful in encouraging the use of story as an instructional strategy?

Sample Population

A random sampling design was used to select the participants for the study. The participants were selected randomly from Algebra 1 teachers in a large school district in southwest Florida. Random sampling eliminates bias by giving all individuals an equal opportunity to be chosen (Moore, McCabe, & Craig, 2006). The results from the varied sample provided an accurate capture of the barriers and implementation strategies for story in the school district as a whole.

In Florida, all secondary-level students were required to take Algebra 1 as a graduation requirement (FLDOE, 2020). To receive the high school diploma, students must pass the high-stakes FSA EOC upon completion of the Algebra 1 coursework. In Florida, FSA EOC results for mathematics are categorized within one of five levels, with Level 3 being satisfactory. At level 4, students are deemed proficient, while Level 5 is considered mastery. The Algebra 1 FSA EOC results for the school district studied were 27% of student scored a Level 3, 17% obtained a Level 4, and 16% reached a Level 5 (FLDOE, 2020). Approximately 40% of the students scored below proficiency, which indicates that they did not pass the Algebra 1 FSA EOC, and were therefore ineligible to graduate with a high school

diploma if their proficiency level did not increase to Level 3 on a future testing attempt.

The sample was obtained and selected through the Institutional Review Board (IRB) committee at the school district. The school district IRB committee sent the electronic survey requesting interview participation on the researcher's behalf, and the secondary school principals then sent it to Algebra 1 teachers. Algebra 1 teachers were required to leave their contact information if interested in participating in the interview.

The sample population in the study were Algebra 1 teachers who currently taught at least one section of Algebra 1. The participants were required to be employed at the school district and hold a professional certificate from the Florida Department of Education (FLDOE). No long term or daily substitute teachers were part of this study.

Qualitative Data

The lead researcher gathered the qualitative data. The sample included Algebra 1 teachers who were interviewed to describe the barriers and strategies to encourage the use of stories as an instructional strategy (Creswell, 2013; Husserl, 2012; Moustakas, 1994; van Manen, 1990). Before the interview began, the participants answered a question about whether they had knowledge of the story as an instructional strategy. All participants lacked knowledge of the story and therefore watched a short self-narrated PowerPoint that the lead researcher developed about the story and how to use it as an instructional strategy in secondary mathematics. This included the five elements of the story, along with examples of how to use the story as an instructional strategy in the classroom. The interviews were then conducted by asking open-ended questions, which produced candid information (Allen, 2017). Themes from the interviews emerged and were analyzed separately

Data Analysis and Validation

Before the interviews were conducted, an expert panel was used to analyze and validate the appropriateness of the interview questions. The expert panel consisted of 12 Florida Gulf Coast University (FGCU) education doctoral students. This panel was chosen, as they each had expertise in implementing instructional strategies. The panel was given the opportunity to explain or express any concerns with the questions and the study. Interview questions were then amended to address their feedback.

All interviews were voice recorded and transcribed after. While the interviews were being conducted, field notes were taken to confirm the accuracy and credibility of the results. Field notes are those notes and comments collected by the researcher while in the field conducting interviews and are intended to be read by the researcher as evidence to produce meaning and an understanding of the phenomenon being studied (Schwandt, 2015). These notes are descriptive and reflective of the actions, behaviors, and conversations that are observed, as well as the researcher's thoughts, ideas, questions, and concerns while in the field. In this study, the field notes were collected as prescribed and validated the research findings (Emerson, Fretz, & Shaw, 2011).

Results and Discussion

Participants completed a one-question survey about their perspectives of story as an instructional method for teaching Algebra 1. Data from this question reported that all teachers had no knowledge of story and how it could be used as a teaching strategy. A short PowerPoint presentation about the five key elements of story, along with examples, were provided to the interviewees prior to the interview sessions so they would have a basic understanding of story as an instructional method in mathematics.

The format for the interview sessions was calculated and assessed using individual, semi-structured, two-way interviews (Keller & Conradin, 2018). Some of the questions required specific responses such

as those associated with barriers that prevent teachers from using story as an instructional strategy. Other questions were open-ended and were used to collect information about participants' general knowledge of potential strategies that might encourage them to implement story as a method of teaching Algebra 1. After the interviews were conducted, the data were then analyzed and three themes emerged: (a) teachers' perspectives about story use as an instructional method, (b) barriers preventing the implementation of story, and (c) strategies to increase the use of story as a vehicle for learning Algebra 1.

Teachers' Perceptions of Story

Data from the one-question survey reported that teachers' perception of the use of story in the classroom would be the same as using word problems to teach Algebra 1, word problems are not stories. However, after learning about story from the PowerPoint presentation, their perspectives changed. One participant stated, "I had no idea what story was to begin with." A few participants clarified how learning about story opened their eyes to a new way of teaching mathematics. One participant noted, "I was not looking at math and math instruction from this angle." Others explained how story bridges the gap between interest and math, while making it relatable to the student's life. All participants stated how story can successfully connect mathematics to other subject areas, making it a beneficial cross-curricular tool. One participant explained, "story could connect to [various] concepts in different ways." Similar ideology was noted by Haven (2007, 2014) in that story promotes the opportunity for teachers and students to make connections across various subjects, which has the potential to result in increased learning.

Barriers Preventing the Implementation of Story

Three major barriers for story implementation were revealed from the interview analysis: (a) current teaching practices, (b) time constraints, and (c) current state curriculum. One obstacle that participants emphasized was the resistance to change current teaching habits. A participant stated that "math teachers can be rigid;" and as such, they struggle to try new instructional methods. Another interviewee explained that veteran teachers struggle with changing their routine, thus feeling hesitant to try something new. Another participant stated the biggest barrier to altering their teaching method was fear because it is something new and different and not the typical 'I am going to give you a problem then we are going to go over it.' To overcome this barrier, teachers must be open to changing current instructional methods and thinking outside of the box. According to Glickman, Gordon, and Ross-Gordon (2015), school leaders must create the capacity for change that these participants mentioned resisting by promoting experimentation and risk taking for the ultimate improvement of teaching and learning.

Moreover, eight of the ten participants referenced time constraints as a major barrier that would prevent them from using story. Teachers must maintain a swift pace established by the FLDOE and supported by the school district to cover required course content of 25 standards before administering the FSA EOC in the beginning of May (FLDOE, 2020). The curriculum is mapped out in detail for teachers to ensure that all standards are taught in lock-step fashion. To implement story, teachers would need reassurance that the implementation would not require additional class time in an already time constrained year.

As a result, many participants indicated that they felt pressure to stay on pace and merely 'expose' their students to all the materials. Most participants indicated that they did not have ample time to utilize storying because they felt it would take too long to implement. One participant stated, "The curriculum we have now is very structured and [with] the pressure of the EOC, you need to finish [the] materials by a certain date. You need to get through all the standards and have them see everything

before the EOC." This individual also noted that they felt a considerable amount of pressure for standardized testing and needed to expose students to all the different types of questions they would possibly see on the FSA EOC. Because the FLDOE does not release previous test questions, the teachers noted that they must use the standards to guide lesson planning.

Based on the district curriculum implementation plan, teachers are required to teach a particular topic by a set time, leaving minimal time to relate the curriculum to students. One teacher explained that trying to get all of the standards covered in one year "is a time crunch and I do not like it." A participant further explained the time constraint this way: "I think the barrier that would automatically come to mind is that it would take a little bit more time." Another participant explained, "there is so much to get through and I am worried I would not be able to get through everything." Another added, "The biggest one [barrier] is that we are teaching EOC courses, we have a lot of material. For instance, I am covering parallelograms, actually quadrilaterals, in one or two days so if I implemented story then I would have to take something else out, whether it is the time, my direct instruction, or take out my regular bell work and do this. The barrier would be to make it concise enough [to fit] within time constraints."

Some teachers even considered not teaching some of the standards based on time constraints. While the interviews were conducted individually, the field notes support the notion that all the interviewees universally were frustrated because they did not have enough time to teach all of the required mathematical concepts. Unfortunately, due to the lack of time, teachers battled teaching all standards in the year versus ensuring student proficiency of the concepts. For teachers to overcome this barrier, the school leader's support in encouraging teachers to embrace top instructional strategies is paramount (Woolfolk Hoy & Hoy, 2021). Leadership support extends to encouraging Algebra 1 teacher teams to collaborate to find the optimal balance between covering the content and content mastery with the goal of decision making that benefits the student.

Finally, aligning mathematical story to curriculum state standards was the third barrier noted through data analysis. Teachers know that instruction should be standards-based; however, six individuals professed their lack of ability to align curriculum and standards. One participant explained, "It might take a lot of time to come up with the lessons itself and then trying to find different stories to go with the different standards." Another noted, "Creating curriculum and aligning them to the standards. Knowing there is not something else like this out there that I know of, that aligns with the Florida standards that we teach, I think it would take a lot of time." These teachers appeared to be very concerned with not only developing or finding an appropriate set of lessons, but also ensuring they aligned to the FSA EOC standards.

Even though developing a story-based curriculum could be a daunting task, some did suggest that it might be worth the trouble, if researchers could demonstrate its effectiveness as a learning tool. A participant explained, "developing curriculum is extra work but I think the payoff is worth it in the end." Although this would be a time-consuming task, teachers find value in the product itself (Nevenglosky, Cale, & Aguilar, 2019).

Benefits and Strategies to Increase Story Usage

Participants were eager to express ideas of how to overcome the barriers that prevent the use of story in an Algebra 1 classroom. Ideas such as modeling story lessons and conducting professional development were discussed. All participants expressed the need for an "increased awareness" of story in all subject areas because it can provide an emotional connection to facilitate student interest to learn new concepts. One participant specified, "If we could get them (students) emotionally invested into a math course, then they can latch onto the task they need to do in terms of math and might be invested in the math

with the story that is behind the problem." The learning benefits of such emotional investment was also echoed by Balakrishnan (2008). When students can relate to and find meaning in the content of study, they have a higher likelihood of retaining the information, leading to greater rates of proficiency.

Likewise, the majority of participants agreed that the use of story would foster an increased interest in mathematics (i.e. engaging and motivating students to learn the mathematical content). Seven participants in particular noted that story could be used to assist struggling students. In fact, one participant thought the use of story could "capture their interest and make mathematical connections." The participant explained how the story was a part of her culture and was something they used often in informal learning environments. A different participant noted that the story would be an engaging way for students to learn mathematics without realizing it. Another participant noted that, "Story is something out of the mathematical context and something relatable, giving them a storyline to buy in." A participant suggested, "I would want to use it with concepts to make it more engaging and fun. If it is interesting for them then that would be productive." The sentiments of these interview participants support the perceptions and benefits of story found in existing literature (Haven, 2014, 2007; Dracup, 2012; Skoumpourdi & Mpakopoulou, 2011).

Nonetheless, there is a recognizable need for a pre-made curriculum aligned to state standards that embeds the use of story as a teaching strategy. Some explained that provided story lessons and resources would increase the implementation. For example, a participant commented, "the best way to increase use is having a set of prepared resources." Four participants agreed with this statement. Several participants further explained, "having the story out there already made that is easy for implementation," would be of great assistance. Many implied that if the curriculum was readily available it would be a strong factor to break down this particular barrier. Another participant explained, "I would say the best is having a set of prepared resources, so if there are some out there or you have created some, you obviously have this example, have some where to start, and not having to start from scratch would be the best way to have people try and use it." This participant also noted that they were intrigued by the PowerPoint, and felt it would be important to make it generally available. Even further, one participant asked to receive an individual copy of the PowerPoint to assist them with implementing story in their classrooms.

Conclusion

Despite such positive feedback, the barriers preventing story implementation were overwhelming. Resistance, teacher rigidity, feelings of discomfort and fear, and creative alignment to state standards seemed to outweigh teacher plans of implementing story. The interviewees all noted that they were consistently stressed about the time pressures of covering the material and the time it takes to prepare for classes. Teachers indicated reluctance to implement new strategies with the current curriculum implementation plan that seemingly covers the standards without regard for mastery, a sentiment also supported by existing literature (Klingner, Ahwee, Pilonieta, & Menendez, 2003; Edwards, 2015). Implementing story into the curriculum was perceived by teachers as an unconscionable feat influenced by an already heavy work load, a lack of quality planning time, inconsistent student behaviors, resistance from their peers, and the pure volume of standards required for the high-stakes testing.

The lack of understanding of story and teacher discomfort with implementing story make up the content-based barriers. As explained previously, teachers must understand the core story construct to be motivated to implement it properly. Because participants were never taught about story, they were very reluctant to use it. Once the selected participants watched the PowerPoint slides that introduced the five core elements found in storying, however, they noted how it opened their eyes and fostered an intrinsic desire to think outside of the box. Many participants discussed possible implementation of story as an instructional strategy. However, several participants shared that leaving their comfort zone

would be overwhelming because it would require them to try something new. They added that they often relied on the same way of teaching because it ensured that the entire curriculum would be covered before the FSA EOC. There is an intense focus on accountability through state standardized assessments (simply covering all the standards), which resulted in feelings of pressure to stay within their comfort zone and apprehension to implement a new strategy (Edwards, 2015; Johnson, 2006; Richards & Skolits, 2009; Wood, 2004).

The consistent theme that emerged throughout the conversations about the barriers preventing implementing story was the need to 'cover the standards'. Although the interviews were conducted individually, every participant noted the need to cover the standards in sequential order before the FSA EOC. Few, if any, teachers mentioned the need to have their students master those standards. It seemed as if the interviewees felt the pure numbers of standards that needed to be covered in a year became a barrier to being able to teach mathematics effectively. While they did not go so far as to say that the number of standards could easily be cut back, they did say that finding new ways to become more efficient in covering them would be beneficial. Using story could help the integration of the standards and allow time for more in-depth coverage of all the standards. The next steps to create a standards-based story curriculum for implementation. This would be in conjunction with professional development trainings offered at the school district for all teachers using the curriculum. The study will then be conducted to determine the use and success of the curriculum.

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