

Enabling Space Cadets: Quality Science Fiction for Children under 12 Years Old

A Dissertation
SUBMITTED TO THE FACULTY OF
UNIVERSITY OF MINNESOTA
BY

Emily Ann Midkiff

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Adviser Marek Oziewicz

May 2017

© Emily Midkiff 2017

Acknowledgements

To start at the beginning, I am forever grateful to my mother, Maria Midkiff, and my sister, Janice Hoagland, who have modeled the joy of reading books for me my whole life. Thanks are also due to my father, Chris Midkiff, who taught me that humor and a little impertinence has a place in all facets of life, even work. I wouldn't have believed it possible to pursue such a fun dissertation topic otherwise!

I am also grateful for other family members and friends who have supported me along the way, such as Carol Roman's book suggestions and interviews for this project. I deeply appreciate how Holly Midkiff called me often just to check in, and how Amanda Midkiff reminded me to take joy in my work. I am also grateful for my sympathetic fiancée, Chris Clark, who read drafts and drove to the library with giant stacks of picturebooks. Our cats are also due thanks for their restorative study snuggles, though I doubt they will read this.

I would like to give a special mention to Megan McDonald Van Deventer, Sara Sterner, and Laura Lemanski. It was fantastic to work with you ladies over the last few years, and I deeply appreciate all your support, both personal and professional! You each have many little impacts in this document.

I would also like to extend my gratitude to Marek Oziewicz for all his extensive editing, encouragement, and guidance. It was fortuitous that we arrived at the U together; I think our literature infiltration went well. To my committee members Deborah Dillon, David O'Brien, and Bhaskar Upadhyay: I appreciate your warmth and guiding expertise in the dissertation process as well as in prior advising and classes. I would also like to thank a few of my myriad unofficial mentors for keeping me going and thinking: Joe Sutliff Sanders, Kara Coffino, and Lisa Von Drasek.

A very special gratitude goes out to the University of Minnesota's Graduate School for the support of the Doctoral Dissertation Fellowship, which significantly relieved the dissertation writing pressure. The Mixed Methods Interdisciplinary Graduate Group is also due thanks for providing funding for this work, and offering the valuable chance for a practice defense. I would also like to thank Bob DelMas, Kyle Nickodem, and the CAREI program for helping me wrap my head around my statistical analyses.

I am grateful for the participating schools and especially the support and assistance of Brendan McCaffrey, who helped me over the most worrying hurdle of this project.

Finally, I extend my gratitude to everyone who participated in my survey. I may not know who you are (although I have some suspicions) but your help was priceless.

Thanks for all your encouragement!

Dedication

This dissertation is dedicated to all the little kids, like me, who didn't think science fiction was meant for them. It was, and is.

Abstract

In this dissertation, I challenge the dominant assumptions in science fiction and children's literature criticism: that young children's science fiction is exclusively poor quality, unwelcoming to girls, and lacking in diversity. Most of all, I refute the bias that children do not or cannot read science fiction before they reach 12 years of age.

My results offer strong evidence in favor of the genre's quality and potential. After developing a method for recognizing high quality science fiction for children under 12 that hinges on the power of pictures to scaffold an introduction to the genre, I used this method on over 200 books. I discovered more excellent science fiction picturebooks, comic books, graphic novels, and early readers than anticipated. In addition, I use STEM strategies and the literary theories of feminist science fiction, Afrofuturism, Indigenous Futurism, and Latin@futurism to examine the books for girl-friendliness and diversity. This method revealed that exemplar books are currently in circulation and also offered direction for future improvement of children's science fiction and children's literature in general.

Other results demonstrate that children under 12 can and do read science fiction, though adult opinions of the genre require more attention. The children participating in the study show high competency in deciphering illustrations and comprehending complex science fiction picturebooks, while library circulation analysis demonstrates that science fiction has a surprisingly high and statistically significant readership among children in 5th grade and below. Meanwhile, the survey data from librarians and teachers indicates that they generally value the genre and include it in their classrooms and libraries, but will avoid using these books in large group settings due to several assumptions about their young readers.

Unlike previous literary criticism implies, this case study describes a high quality, vibrant genre that young children read and understand. Since more work is needed to improve adult comfort with this genre in classrooms and libraries, this study opens a future arena for scholarship. Additionally, the research design demonstrates the benefits of merging literary analysis with interdisciplinary methods: a future for children's literature studies overall.

Table of Contents

List of Figures	v
List of Tables	vi
Chapter 1: Introduction	1
Chapter 2: Key Definitions and Background	6
Chapter 3: Methodology	28
Chapter 4: The SF Books	64
Chapter 5: The SF Readers	102
Chapter 6: Discussion and Conclusion	150
Notes	164
Works Cited	166

List of Figures

Figure 3.1. Methodology Design Diagram	48
Figure 3.2. Survey respondents by location, based on where they logged on.	54
Figure 5.1. Survey answers to question: Compared to the genres listed below, how important is it to expose children to science fiction?.....	106
Figure 5.2. Survey responses to questions: How often do you use science fiction books with children in lessons or activities? How often do you recommend science fiction books to children?	114
Figure 5.3. Count of titles, by genre, for Virginia school.	119
Figure 5.4. Count of circulations, by genre, for Virginia school.	119
Figure 5.5. Count of titles, by genre, for Minnesota school.	120
Figure 5.6. Count of circulations, by genre, for Minnesota school.	120
Figure 5.7. Box plot of check-outs by genre at Virginia school.	123
Figure 5.8. Box plot of check-outs by genre at Minnesota school.	123
Figure 5.9. Density plots by genre for Virginia library.	124
Figure 5.10. Density plots by genre for Minnesota library.....	124
Figure 5.11. Percentage of codes from all three read-alouds, compared to Sipe's Storytime codes.....	130
Figure 5.12. Comparison of analytic sub-code percentages across read-aloud books....	136

List of Tables

Table 3.1. Demographics.	55
Table 4.1. Books that contain extrapolation/speculation, strong female characters, and diversity.	64
Table 4.2. Correlation probability matrix for book sample.	92
Table 4.3. Individual books by category and how many of the three criteria they met. ..	93
Table 5.1. Survey answers to question: Compared to the genres listed below, how important is it to expose children to science fiction?.....	107
Table 5.2. Survey questions and answers concerning using and recommending SF.	114
Table 5.3. Titles and check-outs in Virginia school library, by genre.	121
Table 5.4. Titles and check-outs in Minnesota school library, by genre.	121
Table 5.5. Median check-outs, by genre.	122
Table 5.6. <i>Star Wars</i> and non- <i>Star Wars</i> SF titles and check-outs in Virginia school library.	125
Table 5.7. <i>Star Wars</i> and non- <i>Star Wars</i> SF titles and check-outs in Virginia school library.	126
Table 5.8. Poisson linear regression coefficients for Virginia school.	127
Table 5.9. Poisson linear regression coefficients for Minnesota school.	127
Table 5.10. Parental questionnaire questions and answers concerning SF activities and fandom.	129
Table 5.11. Axial coding of <i>Mr. Wuffles!</i> read-aloud, using Sipe’s codes from <i>Storytime</i>	133
Table 5.12. Axial coding of <i>June 29, 1999</i> read-aloud, using Sipe’s codes from <i>Storytime</i>	133
Table 5.13. Axial coding of <i>Zoe and Robot: Let’s Pretend</i> read-aloud, using Sipe’s codes from <i>Storytime</i>	134

Chapter 1: Introduction

In a conversation in the spring of 2015, Jon Scieszka told me that his publishers had tried to discourage him from writing so much actual science into his *Frank Einstein* series of middle grade novels. The robots were great, the publishers thought, but scientific explanations for how the robots worked would bore or intimidate children. Luckily, Scieszka had enough success under his belt that he succeeded, with the help of illustrator Brian Biggs, in filling the *Frank Einstein* books with complex yet accessible brain science, computer programming, and more. The *Frank Einstein* series, per the publishers' recommendation, is intended for children between 8-12 years old. Science fiction for children under 12 years old is often approached this way: it is just too hard to pull off if you include the real stuff. However, leaving science out of science fiction invalidates the very name of the genre, never mind its core principles. This concept does not change in the case of science fiction for children under 12 years old.

There is a saying that the golden age of science fiction is twelve. In the series introduction to Penguin's Galaxy collection of classic science fiction, Neil Gaiman repeats this saying and reflects that "there is truth in this" because he read five out of six of the collection's novels within a year of his twelfth birthday (ix). Like nearly all writers who reference this saying, Gaiman leaves it unattributed—as though it were some obvious reflection of folk truth that needs no source. However, this quote began as a joke about the so-called "golden ages" of literature. In the 1996 reprint of David Hartwell's essay "The Golden Age of Science Fiction is Twelve," Hartwell cites the quote as being from Peter Graham, editor of the 1950s fanzine *Void*. Hartwell had left the saying

unattributed in the 1984 original. More importantly, in both versions Hartwell embraces the pun of the saying. He shuns formal literary concepts like golden ages in favor of evaluating science fiction—often abbreviated SF or sf by scholarship—in terms of its fandom. He spends the article deliberating over why some people, especially teens from the age of twelve, are in a prime position to become avid SF readers.

Hartwell makes an important qualification, though, in that he does not claim that SF readership spontaneously starts at age 12. He explains that it is “impossible not to become habituated even before kindergarten to the language, clichés, basic concepts of science fiction. Children’s culture in the contemporary U.S. is a supersaturated science fiction environment. The science fiction habit is established early” (84). Hartwell plays with the saying as a way of talking about the age of twelve as an apt time to delve into SF. It is an age in which children can discover a large library of SF classics for YA and adult audiences, ideally before adult concerns begin to limit their free reading time. Yet, in recent decades, the joking poetry of this saying seems to have increasingly bled into a wide-spread assumption that the age of twelve is a literal starting point, due to the choices of young readers as well as the availability of children’s SF.

In *The Oxford Encyclopedia of Children’s Literature* (2006) Michael Levy states that “twelve is the approximate age when children who will become lifelong readers of science fiction frequently begin to do so” (417). When it comes to younger audiences, Levy continues, “there is relatively little [SF] and much of what exists is not very good” (421). Similarly, A. Waller Hastings’s entry on science fiction in *Keywords for Children’s Literature* (2011) repeats the idea that “most avid readers of the genre

discover it around the age of twelve and quickly begin reading science fiction intended for adults” (206). He goes on to position SF for children under 12 as a problem: “‘science fiction’ for even younger readers continues to be problematic” (206). He goes so far as to put “science fiction” in quotes, questioning the validity of SF for those ages.

Yet there is evidence to the contrary. In an appendix to Farah Mendlesohn’s *The Intergalactic Playground: A Critical Study of Children’s and Teens’ Science Fiction* (2009), Mendlesohn and Zara Baxter report the results of a survey of 850 SF readers from 15 to 83 years old. In response to a question that asked when these SF fans began reading the genre, “over 90 percent had read sf by age 13” (212). The mean age that respondents reported starting to read SF was 9 years old; “the majority (55 percent) of readers started reading sf between the ages of 7 and 10” (212). Furthermore, 69% said that they read sf “written specifically for children”—though Mendlesohn and Baxter are skeptical about the accuracy of this data, since it is based on recollection (204).

Even if we disregard the specific age of twelve, many other scholarly comments make the same move as Levy and Hastings to position young children’s SF as generally problematic. Mendlesohn summarizes the core question of her book as “Is there any such thing as children’s science fiction?” (4). Her answer: “Yes, but not nowhere near enough” (4). She contends that most SF for children and young adults fails to meet genre standards for adults, which is essential to “persuade children to move into the adult genre” (3). Children’s SF is also posed as a contradiction. Perry Nodelman explains, “the shortage of good SF for young readers may be accounted for by generic differences between SF and fiction intended for young reader” (294). Levy and Hastings similarly attribute the

perceived problem with children's SF to children's limited science education and insufficient world experience.

Meanwhile, exceptions create a paradox. While dismissing the genre as impossible or too hard, each scholar simultaneously notes exceptions: books that meet and even surpass the expectations for excellence within science fiction *and* children's literature. Additionally, Mendlesohn's own survey respondents who claim to be avid adult SF readers do not seem to have been impeded by children's SF, in contrast to her own core concerns. The broad and concerning claims of an "impossible" genre contrast sharply with the evidence of success. Most concerning, the only source of "hard" evidence, Mendlesohn's survey, seems to utterly undermine the comparatively unfounded claims put forth by esteemed scholars in respectable handbooks and encyclopedias. This contradiction indicates a pressing need for clarification and re-evaluation of children's SF based on a wider array of evidence.

The real problem with children's SF is this haze of contradiction and confusion. Furthermore, this problem affects more than the scholarly arena. At first glance, the true quality and standing of children's SF may sound like a niche concern, but anecdotes like Scieszka's hint at the far-reaching significance. Even the most fantastic SF is inherently tied to science; children's SF by extension is tied to children's attitudes toward science. Research has produced evidence that SF produces a beneficial type of thinking about science in children. Fleischmann and Templeton's interview study with NASA scientists revealed that they were introduced to science as children through SF, and that the genre was a tool that shaped how they came to think about science (1). The American Society

of Mechanical Engineers similarly published short interviews with engineers who pursued their careers because of SF books and movies that they encountered as children (Brown and Logan 3). Some science programs like The Sci-Identity Project have experimented with using SF to better engage students (Ahn, Waugh and Druin 23). The presence of SF in a library collection provides opportunities for these early encounters. Gatekeepers from editors to scholars to elementary language arts teachers share the responsibility to make sure that children have access to high quality, engaging examples of SF. In order to fulfill this charge, it is important for all these professionals to have a clear idea of what the current supply of children's SF looks like, how to evaluate quality in SF, and how children currently interact with these books.

In order to address these academic and educational concerns, this dissertation reports a mixed methods case study of high quality, inclusive science fiction books for readers under 12. Despite the relative scarcity of young children's SF in comparison to other genres, it is not—as some scholars state—inaccessible or impossible for children. In contrast, this study indicates that children read SF books at a very high rate and they are capable of enjoying and understanding them far before age 12. The results of this study challenge the negative critical discourse and produce a clear picture of children's SF in order to enable better understanding, further study, and higher production of this fascinating, intergalactic meeting of the science fiction genre and children's literature.

Chapter 2: Key Definitions and Background

As a study with “science fiction” in the title, this project is already stepping on delicate boundaries. Genres, in particular, are infamously impossible to define to everyone’s satisfaction. Therefore, I must pause to identify which definition(s) of science fiction and other key terms that I am operating on throughout this project, and from which traditions. Andrew Milner explains that SF criticism often confuses the project of defining SF with evaluating SF aesthetics, and as a result many people get caught up in forging their own “selective traditions” (179). He is describing the common phenomenon wherein a science fiction fan sees an example of SF that she does not like and declares “that is *not* science fiction!” to reject what is disliked entirely. In more formal academic settings, this can take the form of crafting a definition/history of science fiction that conveniently includes and excludes certain styles or traditions or people.

I will endeavor to keep the projects of defining and evaluating distinct in this study. I am not trying to redefine SF, children’s literature, or even children’s SF. Instead I focus on the evaluative question of aesthetics, value judgements, and openly creating a useful selective tradition specific to children’s science fiction as a subset of both SF and children’s literature in general. In order to do so, I will rely on established definitions and theories of SF and children’s literature criticism, including several key children’s literature formats that also warrant definition. This chapter therefore offers several definitions of choice, reviews scholarship on SF aesthetics and quality, and then puts forward a selective method for applying pre-existing SF aesthetics to children’s SF.

Science Fiction

In this study, I will rely upon Brian Attebery's concept that "all genres are what logicians call fuzzy sets: categories defined not by a clear boundary or any defining characteristic but by resemblance to a single core example or group of examples" (33). This definition allows for similarity to or use of common tropes and well-recognized stories to carry the greatest impact in categorizing a book. In this study, I use Attebery's definition to freely apply the label of science fiction to any books that employ primarily SF tropes and similarities to other well-known SF works. Keeping in mind Milner's projects of defining and evaluating, I may personally think a book is poor quality, but for the purposes of this project that does not disqualify it from being science fiction. It is simply *bad* science fiction!

Attebery's concept of fuzzy sets does not come with a pre-made set of core examples, but relies on a knowledge and familiarity with the genre and what represents its core. In order to recognize and assign texts to the fuzzy set, I will call on my own experiences with SF to recognize the tropes and similarities, and I will also rely upon Istvan Csicsery-Ronay Jr.'s work on categorizing the major traits of SF. In *The Seven Beauties of Science Fiction* (2008), an expansion and update to Darko Suvin's foundational *Metamorphoses of Science Fiction* (1979), Csicsery-Ronay describes SF's functions as a "constellation" of traits that draw readers: fictive neology (signs indicating other worlds), fictive novums (a new concept altering known history or reality), future history (the cause-and-effect connection between the past and the future), imaginary science (deviations from known science, wherein enters the fantastic), the science-fictional sublime (temporal, special, physical, American technological, and

technoscientific sources of awe and dread), the science-fictional grotesque (weakening or threat to significant ontological or identity categories), and the Technologiade (myth or fable-like qualities linking back to familiar reality) (5-7). Csicsery-Ronay's constellation shape emphasizes that SF texts may include certain categories and not others, allowing for many different combinations. Therefore, I will use a fuzzy set definition for SF that centers around common tropes like the spaceship/robot/mad scientist, classic texts like *Star Wars* or the works of Robert A. Heinlein, and Csicsery-Ronay's constellation of SF traits.

As well as being my working definition for science fiction, I will apply this fuzzy set approach equally to children's SF. A. Waller Hastings suggests that "'children's science fiction' and 'adult science fiction' may, in fact, constitute two related but distinct genres of equal validity" (205). Yet, if we operate on the belief or hope that children's literature is meant to guide children into adult literacy, as Mendlesohn contends and I agree, then children's SF must meet existing genre definitions and not operate on different terms. Otherwise it will fail to facilitate the transition to more advanced SF. Therefore, I will consider children's SF as a subset of general SF rather than a separate genre, with the same definitions and only minor adjustments in evaluation to accommodate a specific audience.

Format and Genre

Literature criticism suffers from some confusion of terms, one of which is the overly free use of words like format and genre. Without naming names, some scholars regularly use these words as though they are interchangeable, even within the same article or chapter. As my students fiercely attest, this habit produces unnecessary

confusion. Instead, I will use these terms as I teach them and as often taught in elementary classrooms: format is the term for the physical shape and vehicle in which a story is told. Picturebooks, comic books, and e-readers are all examples of formats. On the other hand, genre describes categories of content, as defined by such abstract ideas as story patterns and formulas. Genres include science fiction, historical fiction, and nonfiction. Of course, in theory these concepts can overlap and interact in complex ways, but there remains a basic difference in terminology that will be upheld in this study.

Graphic Novels

Due to this project's focus on visual elements, I also find myself within the controversial territory of defining the term "graphic novel" in contrast to "comic book" or the broader term "comics." Many artists resist the term "graphic novel" altogether and associate it with the distasteful marketing contrivances of the publishing industry (Joseph 466). Shaun Tan, who was conscripted into the debate when his book *The Arrival*—proposed as a picturebook—was sold and received successfully as a graphic novel, remarks: "I use the terms 'comics' and 'graphic novels' interchangeably, because I don't see much difference between them; these terms both describe an arrangement of words and/or pictures as consecutive panels on a printed page" (2). Some scholars dismiss the graphic novel as a format because of how it came into being. Charles Hatfield's *Keywords* entry on the graphic novel argues that "the term 'graphic novel' describes neither a discrete literary genre nor a specific publishing format. Rather, it denotes a sensibility: an attitude taken toward comics" (100). Hatfield's position describes the term as simply a convenient, contemporary publishing niche. He describes a work-around for those who want comics to be recognized as a legitimate, respectable format, but feel

barred from this by the troubled history of comics and children as epitomized by the Comics Code.

Despite the graphic novel's entanglement in these political and publishing machinations, as the term has grown in popular usage other scholars have identified peculiarities that justify the graphic novel as a distinct comics format and more than an attitude or marketing tactic. The primary argument of this stance positions graphic novels as yet another medium of comics alongside comic books or comic strips, only distinguished by a greater length and novel-like plot complexity. Hatfield describes the comic book as America's previously premier "medium for long-form comics narrative" and therefore the "father to the graphic novel" (101). He is following a tradition of treating comic strips and comic books as specific media for packaging a narrative told through a specific grammar of comics, as described by theorists from Thierry Groensteen to Scott McCloud. Even Hatfield's *Keywords* entry, resistant as it is to the graphic novel as a distinct format, implies the need for the new medium it describes. Not only does he equate the graphic novel with comic books in the quote above, but he also repeats phrases like "novel-length comic" throughout the entry, a tendency which itself seems to indicate the need for a labeled format that describes novel-length comics. Comic books may be long-form in comparison to comic strips, but they are not novel-length unless compiled.

Mel Gibson similarly points to length, stating that graphic novels "share the grammar of comics, as they are longer works in a comic-strip form, containing a single narrative" (101). His emphasis on a single narrative is important, as it distinguishes the graphic novel from European albums and strung-together collections of episodic comic

books. Along the same lines, Michael Joseph differentiates the graphic novel through the length and corresponding binding size, as opposed to the thinner bindings of magazines. He defines them as “a subset of comics generally called alternative comics that, whether by original or subsequent design, find themselves published as books, and which therefore have some definable responsibility to “bookness”: that is, to the conventional form, history, or authority of the book” (466). This definition attributes a serendipitous sense of chance to graphic novels, which seem to have blundered into the space between comics and novels and then made the best of their liminal position.

This characterization feels apt, as it encompasses both Hatfield’s point that the term gained popularity as an excuse for legitimizing comics, but also acknowledges how the graphic novel’s new liminal position has benefited the format and enabled it to become something unique. For instance, the “bookish” binding of graphic novels came with other benefits. Joe Sutliff Sanders points out that librarians were only willing to endorse comics in general once they became available in “trade album editions, often called ‘graphic novels’” and could therefore sustain the standard library shelving, labeling, and circulation that floppy comic books could not handle (87). The endorsement of librarians is far-reaching, given that these professionals directly impact circulation and awards, lending much credence to the term in popular and publishing circles. Also, since “libraries regularly ghettoize their graphic novel collections in youth departments” (Goldsmith 19), the work of librarians has encouraged the graphic novel’s association with children and young adults.

In light of the definitions and history of the graphic novel, for this study I mostly

group comic books and graphic novels together as formats defined by the grammar of comics. However, when I do distinguish them—such as when offering specific book counts in chapter 4—I distinguish them from comics by their “bookness”: a novel-length narrative and bound like a book rather than like a magazine. However, I did not subsume middle grade novels that rely on frequent, story-significant illustrations but are not in comic panel format. This category of books violates the frequent defining of graphic novels as a subset of comics and/or relying on the grammar of comics, as in the definitions above. Instead, I categorize these under my own term “middle grade hybrids” to acknowledge their debt to, but difference from, formats like graphic novels and comic books.

Picturebooks

This project also relies heavily on the unique format of picturebooks. While not as controversial, I do rely on a concept of picturebooks as being qualitatively different from illustrated books. In the “Picture Book” entry in *Keywords*, William Moebius indicates that while the term has endured many uses and versions, scholars such as himself have been working to assign the one-word term “picturebook” to a specific type of book “in which pictures and words together are treated as semi-autonomous and mutually attractive chains of meaning, rather than as fixed images serving as a supplement to meanings fixed in words” (169). I therefore exclusively use the term “picturebook” rather than the two-word iteration “picture book” to emphasize the significance of the pictures in this format.

Children’s literature theorists such as Perry Nodelman (1988) claim that picturebooks are defined by the combination of words and complex, complementary, and

not merely illustrative images. Nikolajeva and Scott classify 5 different relationships between pictures and words in picturebooks: Symmetrical- “two mutually redundant narratives,” Complementary- “words and pictures filling each other’s gaps,” Expanding or Enhancing- “visual narrative supports verbal narrative, verbal narrative depends on visual narrative,” Counterpointing- “two mutually dependent narratives,” and Sylleptic- “two or more narratives independent of each other” which includes wordless books (12).

This project relies on both the differences and the inherent family resemblance of picturebooks, comic books, and graphic novels—though the nature of these similarities is hotly debated. Gibson asserts that “the picturebook, comic and graphic novel are complex and flexible media linked through their shared uses of image and text” (110). While related in image/text interdependency, these three formats are distinguished by form and use, especially in relation to their status as literacy tools in education. Most people have little difficulty with casually differentiating between them, until asked to formally theorize the differences. Scholars struggle to fully separate the formats; the special 2012 issue of *Children’s Literature Association Quarterly* was dedicated to wrangling with the theoretical and structural differences and similarities behind picturebooks and comics. Even this attempt by some of the leading scholars of picturebooks and comics leaves many gaps and contradictions in the theory, due to the frequent crossovers between the formats that make formal distinctions near impossible. In response, Sutliff Sanders argues that the main problem with attempting to differentiate by form alone is that the real differences all lead back to the end users. He suggests considering the “formal similarity between the two in the context of the different reading situations that they anticipate”

(59). Specifically, he finds that

a reliable and fertile difference emerges between comics and picture books: in general, if the book anticipates a solitary reader who chaperones the words as they go about their work of fixing the meaning of the images, that book is a comic; if the book instead anticipates a reader who chaperones the words as they are communicated to a listening reader, that book is a picture book.” (61)

I will return to this distinction in chaperoning below, as it is important for science fiction visual literacy as well.

Overall, I will use both picturebook theory and comics theory, including work directed at graphic novels, and utilize their theoretical fluidness to apply one set of codes to analyze components in the other format, such as when a picturebook uses speech balloons. The similarities between these formats allows me some freedom to mix and match their theories on pictures, if not the end user experience.

Early Readers

Meanwhile, early readers—otherwise known as easy readers, beginner books, and so on—are far less controversial than the terms above, but often ignored. In the only academic collection on early readers to date, editors Annette Wannamaker and Jennifer Miskec loosely define the format as “those books that children are first able to read entirely on their own” (4). This format can be distinguished from picturebooks, comic books, and graphic novels due to a more limited relationship between pictures and words: the two codes are more likely to mirror one another in order to support beginner readers. Daniel Hade and Laura Anne Hudock explain that early readers’ “illustrations usually support a developing reader to independently comprehend the words on the page through

letter-picture association or to decorate, extend, and reinforce the story narrative beyond the printed word” (88). There is potential here for some extra meaning and deciphering from the illustrations, but it is not the norm or so central to the format; early readers are not expected to employ the counterpoint or contradiction that Nikolajeva and Scott find in picturebooks. Even the trim size offers a difference between early readers and picturebooks, with early readers tending toward smaller sizes “because [picturebooks] privilege illustration as an art form” unlike early readers (Wannamaker and Miskec 5). In terms of quality, Papazian finds a distinction between purely instructional early readers and “literary” early readers that emphasize “theme, character, and story” over things like vowel sounds and sight words (72). Literary early readers, she contends, are eligible for critical readings whereas their purely practical counterparts are less so.

When considering the ambiguous differences between picturebooks and comics as noted above, early readers complicate the matter by falling in the middle. Considering Sanders’ definition, relying on the audience and chaperoning of meaning-making, it is especially interesting that Wannamaker and Miskec speculate that “Early Readers may be especially threatening to parents because they often represent a child’s first direct experience with a work of literature that is not being filtered by an adult who can alter or interpret written words when reading aloud to a pre-literate child” (8). Hade and Hudock explain that this liminal position allows space for books like Mo Willems’ *Elephant and Piggy* series, which productively “promotes a pedagogy of multiliteracies” (93) by teaching children to read words and comics conventions at the same time. Annette Wannamaker further notes that series like *Babymouse* feature the young protagonist

talking back with significant sass to a seemingly adult, even patronizing narrator, which demonstrates and plays metafictionally with the picturebook adult-child relationship that the expected audience of early readers is transferring away from.

The differences in illustration purpose and focus requires a different approach to early readers as compared to the other visual formats, but not one antithetical to this project. I examine science fiction early readers as an interesting combination of genre and format that targets new, and often newly independent, readers.

A Brief History of SF Aesthetics

Describing SF aesthetics also requires navigating several debates. As Milner points out, SF is always a “selective tradition” that is perpetually redefined to suit the perspective each definer (40). Yet, there are some broadly accepted, generic criteria for high quality: “scientific verisimilitude and plausibility, stimulating and innovative ideas, and that nebulous attribute, a sense of wonder” (Gordon 2). There are also specific SF pitfalls: “a lack of psychological depth or convincing characterization, clumsy or merely serviceable prose, wooden dialogue, awkward intrusions of information sometimes referred to as expository lumps or infodumps, and unlikely or wildly extravagant plots” (2).

The first criteria, plausibility and scientific innovation, often serves as the crux of disagreement. The debate divides between, as Brooks Landon explains, different emphases on either extrapolation or speculation (1). Robert A. Heinlein and John W. Campbell wrote in SF’s early days about the importance of extrapolation based on clear, hard science. Isaac Asimov later distinguished extrapolation as building on current technology, while speculation explores potential future side effects of current or

imaginable science. SF commentators have used both terms in various ways, Landon explains, but “either explicitly or implicitly, all questions about extrapolation and speculation have somewhere in their background concerns with plausibility—its nature, its standards, and its degree of importance” (5). This drive for plausibility insinuates that readers need a functional familiarity with science in order to fully engage with high quality SF—a significant claim when it comes to young readers with minimal science background.

One challenge to this framework questions the definition of “science.” According to Attebery, SF apologists rest the value of the genre on scientific plausibility and shun the fantastic, but he disagrees that speculation/extrapolation require detailed science or realism (3). He claims that this is mostly posturing to legitimize the genre and instead posits several categories of the Fantastic as inherent to SF:

Natural Fantastic: the depiction of any natural process or product of technology in such a way as to strike us as extraordinary or astonishing. Second, there is the Rationalized Fantastic, in which an apparently impossible operation turns out to be explicable through some extrapolation of contemporary science (or, often, the application of scientific terminology in a way that looks like an explanation). Third, there is the Situated Fantastic: the imposition of alternative viewpoints upon a situation such that one character’s magic is another’s high tech. Fourth, there is fiction that places scientific materialism within a larger conceptual framework that includes the supernatural: the Dissensus Fantastic. In it, either the text or its writer dissents from the kind of common-sense, rationalist beliefs

implied. (3-4)

Attebery's categories highlight the "slipperiness" of science fiction and fantasy. SF deserves appreciation not in spite of, but rather due to its Fantastic substrate, even when the genre is valued as a source of plausible scientific ideas or social critique.

Additionally, evaluating SF by its plausible science is complicated when one considers differences in what "science" means across cultures. Indigenous ways of knowing, especially, challenge and blur the boundaries of Western monolithic concepts of science. Grace L. Dillon explains that "many [Indigenous] cultures shared the pattern of disseminating scientific knowledge in everyday teachings [...] Storytelling was the medium of choice for transmitting and preserving traditional knowledge" (Walking the Clouds 8). Similar to Attebery's praise of the Fantastic substrate, Colin Scott demands that modern anthropology, aware of the artificial dichotomy between Western and Non-Western, must ask: "how are logical/empirical and mystical/magical aspects of thought related, in all traditions?" (176). Scott explains that Western science relies on the metaphors of myth and story; Western readers have merely become too familiar with them to notice (178). Consequently, it is all too easy for those Western readers to perceive science as unrelated to story and storytelling as unscientific, but the very existence of science fiction as a genre reveals the draw of reuniting science and story. Dillon explains that the popularity of specifically Indigenous SF can be explained because "Western science has lost something vital by isolating itself from spiritual origins in a quest to achieve objectivity. When we look for sciences that model the inextricable union of the metaphysical and the measurable, Indigenous Futurisms offer

new ways of reading our own ancient natures” (Introduction: Indigenous Futurisms 6).

Like many alternative futurisms, Indigenous SF is not new, but often unrecognized. Milner points out that SF’s geographical “core” traditionally lies in England, France, and the United States. SF in German, Russian, Czech, Polish and Japanese is “semiperipheral,” and the rest of the world is a “peripheral” producer of SF (178). However, this map only concerns the mainstream selective tradition. Indigenous SF scholars like Dillon indicate that native peoples have been writing SF for a long time, but simply have not called it SF (Symposium 377). The topics of native storytelling, she explains, not only disseminate science but also share many core foci with what has been traditionally called SF, such as social awareness and Othering. Recently, more of these authors are pushing to be categorized as SF and not labeled exclusively as Indigenous writing. The progress of Indigenous Futurisms powerfully demonstrates that SF and science knowledge and teaching has grown more open-minded, even in largely Western contexts. Given the persistent evaluative association between children’s literature and learning, children’s SF seems like an effective way to encourage children to think about science through storytelling.

Finally, as science fiction enters the 21st century, a major shift in criticism of the genre has been to position it as having evolved beyond a genre and into a mode. Veronica Hollinger outlines the ways in which science fiction “serves not only as a narrative project finely attuned to the technocultural environment, but also as a kind of image bank through which to orient our lives in this environment” (1). In this approach, SF is not just a form of literature but a way of thinking about life in an age in which technology

radically updates over the course of months; we must turn to science fiction concepts, Hollinger argues, in order to comprehend our world. Csicsery-Ronay gives the phenomena a name, saying that that SF produces “a kind of awareness we might call *science-fictionality*, a mode of response that frames and tests experiences as if they were aspects of a work of science fiction” (2, emphasis in original). His constellation of traits links to “the development of science-fictional habits of mind” that have been normalized in the modern world (1). Csicsery-Ronay’s constellations help define SF, but can also be used to evaluate a story on its own terms. A story can have any combination of traits, but greater aesthetic praise goes to works that balance many categories. Extrapolation and speculation are also reflected in his constellation in the traits of future history and imaginary science, but if the ultimate goal and benefit is science-fictional thinking then this reduces the need for hard science content. Instead, this system values stories that inspire awe and thought on technology and science, in whatever fashion.

Reframing for Children

Even while SF criticism has developed beyond a focus on and limited view of hard science, this core aspect of the genre and its aesthetic history haunts the potential of children’s SF. Scientific extrapolation and futuristic speculation are too hard, Hastings explains, for children who have had a minimal or no introduction to hard science. It appears easier, he notes with disappointment, for authors to leave out science altogether: “[T]here is little attempt to provide scientific explanations for details that are implausible at face value; instead, the trappings of the science fiction novel are used to frame a rather conventional story of adventure and active imagination” (Hastings 206-7). Mendlesohn and Levy similarly assert that SF stories for the youngest readers keep the tropes but

often fail to include science, resulting in a distinct lack of extrapolation and speculation. These stories that only use the trappings of SF still meet the fuzzy set criteria, but do not satisfy SF aesthetics. They are SF, just not *good* SF.

The ultimate problem boils down to whether SF aesthetics are compatible with children's literature. Nodelman writes that SF is a genre that, generally speaking, likes to pose questions and support change while children's fiction reveals an ambivalence to change and tendency toward acceptance. This is represented most clearly in the way that the stories end. Mendlesohn also writes that children's SF often ends at home in comfort and without consequences from the story, meaning that all of the discovery and speculative potential is wasted. She feels that this violates the structure of SF entirely, which she defines through borrowing and modifying John Clute's concept of a "full fantasy" story to identify the full, proper structure of "the full sf story": "DISSONANCE, RUPTURE, RESOLUTION, CONSEQUENCE" (Mendlesohn 10). Dissonance is formed by the key difference or novum of the story that distinguishes it from realism, often established quickly through SF tropes. Rupture describes cognitive estrangement, or experiencing the difference of the imagined world because of the dissonance. Resolution carries its usual meaning for the plot of a story. Mendlesohn crucially contends that this stage must be followed by consequence: something different or changed that opens out the ending of the story with possibilities rather than closing it down as finished and contained. She insists that something must be learned by the end—another way for the conclusion to carry consequences. Meanwhile, Hastings contends that her criteria are too harshly applied, and offers the more hopeful idea that

it might be argued that the path of children's fiction is a spiral rather than a true circle; the child returns to a stable situation, but one that has been altered (either in external reality or in the child's understanding), so that a permanent change has occurred. If this is the case, there is no necessary barrier between juvenile fiction and 'true' science fiction (204-5).

Hastings seems unwilling to put any argumentative force behind this relatively passive claim that "might be argued" by someone else "if this is the case." Yet I find his logic persuasive. Children's science fiction can operate on this compromise by ending at home and in safety, and still conclude with a slightly changed world or worldview. This opens the door for subtle world changes, as can be easily expressed in the hidden-gems and paratexts of complex picturebook illustrations that may suggest permanent change even where the words do not. I will return to this idea in the next section.

Mendlesohn also focuses upon how many books fail to achieve a full rupture with reality, as produced by scientific information density about this new world. The problem, as she sees it, stems from adult assumptions: "where many adults see science as difficult and needing to be framed 'accessibly,' most children—at least until they are socialized into the same mind-set in their teens—regard science and information about science as very exciting indeed" (50). While adult novels are rarely produced or evaluated in terms of who might understand them, children's books are always under this scrutiny—but it is the adults performing the scrutiny. Mendlesohn takes a firm position that children can cope with the challenges of SF from a young age. As she points out, children's natural language bootstrapping ability actually puts them in a better position to figure out SF

novums and cognitive estrangement (31). Children also, she claims, delight in the information density of plausible SF. She disputes the common belief that “children do not read fiction to learn, they read to be entertained” and asserts that “this attitude not only misses the point of some books (and can serve to deny their quality by demanding they meet a rubric they did not set out to meet [...]), it denies the existence of some *children*” (51, emphasis in original). As she describes it, the lack of rupture in children’s SF may not lie in the books or with the children at all. Adults must be willing to offer concentrated information without worrying whether children will understand it all the first time through.

This problem with rupture relies on a definition of science aligned with outdated concepts of science education: memorizing facts and figures, the scientific method, and so forth. In his review of Mendlesohn’s book, Levy notes that contemporary inquiry-based science education contradicts some of her concerns (411). Instead of inflicting memorization drills, recent research-based STEAM (Science, Technology, Engineering, Art, and Math) education methods are trying to encourage delight in science through hands-on approaches and integration across fields, including the arts. Additionally, Indigenous ways of knowing are permeating science classrooms in successful ways. These strategies are highly tailored to the populations of the school’s area, and work to undermining the monopoly of Western science in children’s lives— “not to put Indigenous knowledge and Western knowledge in opposition to one another, but to extend knowledge systems and find value and new perspectives” (Mack, Augare and Different 53). These movements reveal that contemporary science teachers are

encouraged to inspire curiosity and include several different approaches to and definitions of science. A contemporary set of aesthetics for children's SF should do the same. A "hard science" focus for evaluating information density, while grounded in historical SF evaluations, does not reflect contemporary theories of SF as it is connected to the fantastic, storytelling, non-Western science, and science-fictional thinking. Therefore, while I agree that children can handle and enjoy dense science facts and information, alternative science that is connected heavily to personal experience and storytelling—and may not look much like traditional, "plausible" science facts—provides equally valid sources for extrapolation and speculation.

An Updated Method for Evaluation

A productive way to structure children's SF evaluation is through the educational concept of scaffolding: supporting a child toward independent competence in a particular skill. This instructional term was coined by Jerome Bruner in the 1950s, inspired by Lev Vygotsky's theory that there are skills that children can access and those that they cannot; in between is what he called the "zone of proximal development" (ZPD), or the range of skills children can access with guidance until reaching individual competence. I contend that children's SF falls within the ZPD of many children. The criticism that "full SF" is too hard reveals an assumption that genre readership is a skill that children do not and *cannot* have, while the assumption that they will get it instantly also assumes that they already have the skill and choose not to use it. However, the ZPD emphasizes that some skills are only beyond a child's capabilities without any assistance.

Advanced, YA or adult SF could be beyond an average child's decoding skills, but high quality children's SF should inherently bridge that gap. Generally speaking, the

educational expectation of children's books is that they introduce skills needed for advanced reading. In the case of children's SF, this means a little more active guidance than in adult SF. The SF genre already relies on clues and context to help readers navigate novums. Children's SF simply requires more such contextual hints. Mendlesohn may scoff at books that avoid immediate and complete rupture with known reality, but a softer introduction in children's SF is just a more scaffolded approach and in keeping with children's literature. Under this framework, children's SF still falls within the larger SF genre, but with more overt guidance intended to lead toward independent, advanced SF readership.

One key scaffolding tool, featured in by many beginning books for the youngest readers, is illustration. Pictures are an important scaffold for literacy education in general, but also for learning to read the SF genre. Visuals bridge the skills children already have (visual literacy) with the ones they need to read the "full sf story" (recognizing and thinking through dissonance and rupture).

Unfortunately, in the general history of SF aesthetics, visual formats are a marginalized selective tradition. Latham and Creekmur call their history of SF comics, for instance, an "alternative history" assigned to "the margins of significant SF" (2), despite making a large contribution: "the most prominent function of SF comics has been to actually depict the 'visionary' aspects that are seen as fundamental to the genre" (6). These depictions shaped how SF across formats depicts classic tropes from robots to space travel (6). Milner also argues that the visual belongs in SF criticism and is often inherent to the novum. Milner argues for recognizing alternate formats from theater to

film, identifying “a certain necessary tension between the novum as imaginative idea and its representation as spectacle” (49). The special effects of visual SF contribute to the traditional ideas of novum and cognitive estrangement in ways unrecognized by many critics using these terms, but these visual effects are crucial in the context of illustrated children’s books.

Many comic books are intended for children, and pictures are significant in many other children’s book formats like picturebooks and early readers, as noted above. Picturebook illustrations are particularly adept at delivering complex components of SF, due to the pictures’ inherent richness and significance to the text. Mendlesohn notes that the illustrations of the picturebook *Henry’s Quest* (1986) contain “informational density that typifies science fiction” (68). SF, she muses, could be well served by the picturebook’s “intra-iconic (and meta-textual) material” used in ironic juxtaposition with the words (228). This is an understatement of its potential!

SF in pictures works well as scaffolding since even the youngest children have been shown to develop expertise in pictorial interpretation—especially pre-literate and early literacy audiences. Research like Walsh’s (2003) study confirms that pre-literate children from 3-6 years old receive information from the pictures beyond what is granted them by the reading adult. Arizpe and Styles’ well-cited study, *Children Reading Pictures: Interpreting Visual Texts*, notes how children are skilled at perceiving details and nuances in picturebook illustrations. This provides an excellent base skill to guide readers into SF skills. While picturebook illustrations usually monopolize the critical praise for complex details, the use of art to bridge SF aesthetics need not stop at

picturebooks. Pictures are potent in early children's comics and graphic novels up through middle-grade versions.

Overall, children's SF only calls for minor differences from advanced SF, due to the need for scaffolding. My approach does not completely dismiss the critical arguments about the lack of the "full sf story" in children's SF, but repositions this concern in a way that more adequately dovetails with the end goals and uses of children's books. High quality SF for children should be evaluated on how it fulfills the genre's standards of speculation and extrapolation, including broader, alternative definitions from non-Western science and science-fictional thinking. I would add that high quality young children's SF should be given the leeway to introduce the complexities of the genre gradually and through skills already held by most children, especially pictorial reading skills.

Chapter 3: Methodology

Due to the conflicting and unclear portrayals of science fiction for children under 12 years old, this dissertation examines it as the subject of a case study. This chapter outlines my methodology for constructing and examining children's SF as a case, including overall design, theoretical framework, methods, and measures.

In summary, the first phase will feature close reading, genre, and format approaches to analyze the characteristics that enable books for readers under 12 to meet the standards of both science fiction and children's literature. Phase I should answer the first guiding subquestions concerning SF books: *In what ways are high quality illustrated science fiction books for children representing science and science fiction concepts? In what ways do or don't they align with feminist theories, educational STEM girl-friendly approaches, and theories of diversity?* Next, Phase II will be conducted as a concurrent mixed methods design, with the qualitative read-alouds, surveys with librarians and teachers, and the quantitative library circulation data analysis all leading to the last research sub-question on SF readers: *How do readers under age 12 interact with illustrated children's science fiction?* Each phase and method is laid out in more detail in the sections below, following the theoretical frameworks that support them.

Case Study Design

For this project, I chose an interdisciplinary multiphase mixed methods case study design to describe a single bounded case: science fiction for children under 12. In a literacy research case study, Diane Barone explains, the intent is to offer a better understanding and insight into the case, not to build a theory. Literacy case studies are:

“(1) *particularistic*, in that the study is centered on a particular situation, program, event, phenomenon, or person; (2) *descriptive*, in that the researcher gathers rich description of the object of study; (3) *heuristic*, as the study enriches a reader’s understanding; (4) *inductive*, as the data drive the understandings that emerge from the study” (8, emphasis in original). Case studies are best for “how” or “why” questions, studies where the researcher cannot control events, or phenomena within a real-life context (Yin 2).

Since I want to describe how quality SF for children under 12 works right now in everyday life, it is appropriate to compile evidence of these books as they exist in ordinary reading situations, letting the data direct the case study toward a heuristic understanding. Since the object of study is an abstract category or phenomenon, I must first establish the bounds of the case. Based on prior beliefs about SF and children as described by Hartwell, Mendlesohn, Hastings, Levy, and others scholars, I am limiting the case to books for children under 12. Target age is often delineated by publisher, but also implied by format choices like picturebooks. Due to the theories outlined in the previous chapter, the case is also bounded by a requirement that the story be presented as a picturebook, early reader, comic book, graphic novel, or hybrid middle grade novel—as defined in chapter 2. This not only limits the number of applicable books for practical purposes of time/space, but also draws the book sample toward the lower ages for a demonstration of extremes: if books for readers on the younger end of 0-12 can have satisfactory SF, then we can safely assume that books for the upper end will as well. Finally, the case is also bounded by the fuzzy set of the SF genre, as defined in chapter 2.

Case studies rely on “multiple sources of evidence,” united to create a full

depiction of the subject from several perspectives (Barone 23). Accordingly, this case study will be built with data from primary source books, read-aloud sessions with children under 12, an online survey of elementary teachers and children's librarians, and school library circulation data. The interdisciplinary and mixed methods components enhance the design since one effective strategy for case study research is to use multiple lenses to explore the research question, so that "different interpretations of the data [are] possible, each enriching the other" (Barone 21). The interdisciplinary nature of the data sources is especially helpful for complementary description. In the field of children's literature studies, several scholars have called for "more particular discussions of how young people have responded to individual texts" through methods usually reserved for educational and psychological research (Gubar 215). These fields, Gubar notes, all complement one another but rarely communicate. In this dissertation, they are united in order to create a more comprehensive view of children's SF as a case. I employ methods and theories from across fields for a stronger analysis that utilizes the strengths of literary analysis methods as well as literacy read-aloud strategies, survey data, and statistical analysis.

Theoretical Framework

Combining methods and disciplines for this proposed study is justified by a pragmatic paradigm of research. Dillon, O'Brien, and Heilman explain that in pragmatism, "conducting inquiry to useful ends takes precedence over finding ways to defend one's epistemology" (1118). Under pragmatism, the usefulness of methods and frameworks is more important than defining a paradigm and defending methods as coming from a similar basis of assumptions about research and knowledge. In fact,

opposing assumptions from different methods is helpful to achieve complementary data. This study benefits from the inherent variations in epistemology between methods and disciplines included, as the case only becomes a richer and more reliable portrayal with a broader set of perspectives.

Pragmatism also challenges me to keep an eye on how the research can help my participants, rather than just myself. I grounded this project on the assumption that it will go beyond contributing to scholarship and also help professionals, like STEAM educators and librarians. By extension it can improve the reading material and outcomes for children. To meet this goal, I had to go beyond evaluating children's SF for basic quality, as outlined in the last chapter, and also analyze the genre in terms of what will most benefit young readers today. While I do not claim that girl-friendliness or diversity is a requirement for high quality, how these books represent gender and diverse cultures makes a large impact on children and is important to consider alongside genre quality if I want to benefit children. Therefore, my theoretical frameworks for this study include not just picturebook/comics studies theories, children's literature theories, and genre criticism. I also look at the selective traditions of SF Feminism and Afrofuturism, as well as the emerging traditions of Indigenous Futurisms and Latin@futurism. From education studies, I also rely on girl-friendly STEAM strategies.

Format-based Criticism

Sequential art formats, such as picturebooks and comic books, are largely defined by how they use semiotics. The study of semiotics, Barbara Postema explains, specifies that "meaning is transferred through signs, using codes. Signs thus form an arbitrary code

which users learn to apply and interpret by convention” (488). Literacy researchers recognize the potential of semiotics in multimodal texts and work to theorize how these texts are comprehended, often through sources like Kress and Van Leeuwen’s well-referenced *Reading Images: The Grammar of Visual Design*, which offers “a descriptive framework that can be used as a tool for visual analysis” (12). Format-specific theories apply and refine these broader semiotic approaches.

Within picturebook theory, Maria Nikolajeva shifted Roland Barthes’s foundational work on reading codes to apply to picturebooks. In order to argue the complexity of visual literacy, Nikolajeva demonstrates that the comprehension of picturebooks requires the same mastery of Barthes’s proairetic, hermeneutic, semic, symbolic, and referential codes (28). She redefines his terms to better suit the complex visual elements in multimodal texts. Other scholars like William Moebius and Molly Bang have provided well-referenced indices of picture codes.

Similarly, Postema specifies that “the form of comics as a whole can be viewed as a system that utilizes a number of codes that are based on convention and that the reader must learn, to understand comics fully” (489). Scott McCloud describes comics as a language consisting of words, pictures, and icons unified in one purpose (47). Karin Kukkonen describes the process of reading these various codes within comics as “a dynamic process of narrative cognition, rather than a piecemeal combination of non-commensurable semiotic resources” (39). Like Barthes’ hermeneutic circle, the pieces can be taken apart, but to create understanding, they only work when together.

Format and multimodal studies, based on rich semiotic codes, focus analysis on

how the content is enabled by the form. For the purposes of this study, science and SF content is enabled by the form. Unfortunately, picturebook and comic format theories are often exclusively theoretical and untested with actual young readers. There are only a few well-referenced studies that have tested picturebook codes with reading children, such as that by Arizpe and Styles mentioned in Chapter 2. Lawrence Sipe comments, “given the considerable amount of theoretical work [...] that has been done on picturebooks, [...] I am struck by the avoidance of actual, 21st-century children” (4). Comics theory is often also not extended to studies with reading children, with a few exhaustively referenced examples such as Yannicopoulou’s (2004) study of pre-schoolers reading speech and thought bubbles. This shortcoming will be compensated for in this study through balancing format theory with literacy theory and data from reading children.

Theories of Adult Perceptions

Several methods will be inherently limited by the problematic nature of interpreting children’s motivations and books through an adult lens. Ever since Jacqueline Rose’s iconic (1984) book, *The Case of Peter Pan, Or the Impossibility of Children’s Fiction*, children’s literature scholars constantly grapple with the assumption that children’s books are at all representative of children or their interests. Rose proposes that children’s books are nostalgic products created by and secretly for adults; this relationship potentially skews all interpretations of children’s literature.

Without going into the myriad theoretical responses and debates inspired by Rose’s claims, this problem is an excellent reason for mixing interdisciplinary methods. In my study, the read-alouds with children compensate for this problematic assumption

by giving the children a chance to explain themselves. The reading sessions ensure that the survey data as well as my own interpretations are not too influenced by the unfounded assumptions that adults often carry about children and their books. With these two data sources side by side, I will also have a clearer picture of how adults are mediating children's SF access and readership. There is no feasible way to entirely remove adults from children's SF or this study, but these methods should check and balance one another for a fairer portrayal of the case.

Genre Criticism and Story Grammar

Literary genre criticism, originating from Aristotle's *Poetics*, assumes a text's classification offers valuable information about its content and interpretation. At its core, genre criticism assumes that readers build an awareness of genres. While elementary students have a technically smaller set of experiences with reading, pedagogical research demonstrates that this idea holds true for all ages. Literacy researchers as early as Mandler and Johnson (1977) and Stein and Glenn (1979) found that children could recognize and utilize genre story grammar for creating and understanding narratives. This applies to speculative fiction, as in Skolnick and Bloom's more recent (2006) study where children aged 3-7 understood the rules of fantasy across media. SF is rarely included in story grammar studies, but if genre awareness is an important reading skill, then children deserve to build genre awareness from representative SF books.

This approach also comes with shortcomings. Genre-based approaches to children's literature can be guilty of hiding other potentially more salient aspects of a text, such as historical factors (Westman 283-284). However, my genre analysis

circumvents this problem by incorporating selective traditions from SF theory that highlight the historically and socially situated nature of SF as a genre, through the history of influence between SF and several of its politically charged movements: Feminism, Afrofuturism, Indigenous Futurism, and Latin@futurism.

SF Feminism and Alternative Futurisms

Science fiction criticism has developed several selective traditions that reframe the genre through the perspective of certain groups of people, especially in terms of giving voice to past writers/creators and enabling the discussion of a better future. While many such selective traditions exist, in this project I focus on four: Feminist, Afro-futurist, Indigenous Futurism, and Latin@futurism.

Science fiction as a genre and Feminism as a social movement have a long history of influencing one another. Lisa Yaszek explains that SF has always been “naturally compatible with the project of Feminism” (1) because many feminist narratives rely on the SF’s cognitive estrangement and the potential of technological advances to imagine other realities for women. Feminist genre criticism oscillates between social goals and genre tropes, analyzing how each informs the other.

It is relevant to the visual focus of this dissertation that SF Feminism also ties into the history of SF in comics. Latham and Creekmur explain that the “explicitly feminist SF” of the 1960s and 1970s rose in conjunction with more female comics creators (3). Sween Noh argues that SF and comics together explore similar imaginative paths, and that when women entered into comics and SF in the 1960s and 1970s, they used the reality-free arena to tackle patriarchy in different ways. This relationship only grows stronger for

children's books. Noh points out that Japanese and Korean comics both make potent use of comics to question and subvert patriarchy, and do so mostly in young girls' comics rather than even adult women's comics (209). Today, the largest successful market for young girl's SF is the same as the most successful for young girl's comics: Shōjo, or Japanese girl's manga (Latham and Creekmur 4). When these manga are translated, they are the most consumed SF by girls internationally. Yet in countries that do not have a high regard for sequential art—such as the United States—this market has struggled.

This marginalization withholds the benefits of SF Feminism from children's books. In *Decoding Gender in Science Fiction*, Attebery explains that while not all SF takes advantage of its feminist potential, “gender is not merely a theme in SF” but rather “an integral part of the genre's intellectual and aesthetic structure” (10). At the same time, Attebery also notes that SF was only open to feminist experimentation once there was a separate YA market to inherit the sex taboo and free the adult books (6).

Mendlesohn explains that the feminist SF writers in the 1970s wanted more character and emotional development in the genre, but SF for the young did not follow suit:

It is just that the feminist writers were and are interested in different information (be careful of mistaking the change in subject matter for a fundamental difference of approach). Very little of this seems to have permeated through to the fiction written for children and teens: the exceptions stand out. (134)

Mendlesohn emphasizes that the adult feminist science fiction writers did not employ a “fundamental difference of approach,” but instead brought in and validated femininity in the context of intellectualism, science, and extrapolative imagination. When feminist

interests were translated to children's texts, though, they lost that context. Instead, children's SF depicts unscientific mother figures and girl protagonists who have no "interests beyond their own emotions" (Mendlesohn 118). Feminist readings of SF measure quality with an eye on the genre's social responsibility to women, and this ideal needs to be upheld in children's SF aesthetics as well.

In turn, "feminist sf might be credited with laying the groundwork for race reading in sf" (Lavender 188), or the Afrofuturist selective tradition. The term Afrofuturism, popularized in 1994 by Mark Dery in response to contemporary cultural trends of Futurism, was then defined as:

"speculative fiction that treats African-American themes and addresses African-American concerns in the context of twentieth-century technoculture—and, more generally, African-American signification that appropriates images of technology and a prosthetically enhanced future." (180)

Dery's original definition did not restrict Afrofuturism to one genre or medium, but located it across a whole swathe of expressive forms. Yet it is significant that "Afrofuturism emerges from and is in conversation with the generic traditions of science fiction" (Kilgore 6). Similar to Feminism, Afrofuturism thrives in partnership with SF's rich critical potential.

Afrofuturism, alongside Feminism, uses the genre's own conventions to push against the same mainstream, negative cultural concepts that are historically embedded within the genre. The connection to SF is, in origin, a negative one since it derives from the slave trade "translating the black slave body into a technology—a natural machine

necessary for the cultivation of the physical landscape” (Lavender 187). Afrofuturist and Feminist stories both work against “SF genre’s reputation as a repository of boys’ adventure stories descending from colonialist histories of racial exploitation and exclusion” (Kilgore 11). Kilgore contends that, “precisely because of this history, the tools provided by a Eurocentric culture not only belong to anyone who has been taught them but also can be used to transform meaning within the genre” (11). SF is a flexible enough framework that its own tools can be used to reframe it, all due to its potent ability to reflect and comment upon our gendered and racialized reality.

Afrofuturism is a relatively well-known movement among SF scholars, but remains a liminal selective tradition: “sf story collections and histories by white writers and critics barely mention race as a category of interrogation or speculation” (Lavender 188). However, the characteristics and goals of the movement are not new, just newly named. Sheree R. Thomas’s first in a line of Afrofuturist anthologies, *Dark Matter: A Century of Speculative Fiction from the African Diaspora* (2000), includes stories and essays that date from 1887 to 2000. The titular century of storytelling “showed that the fantastic is an old and familiar register in African diasporic writing” (Kilgore 3). It has gone unnamed and unstudied for some time because “sf’s frequent assumption of a color-blind future—whether an unintentional or deliberate privileging of whiteness—has blinded critics to matters of race” (Lavender 187). By overtly imagining inclusive futures, Jabari Asim explains, Afro-futurism has been a constant, healing project that reverses the damage done by continually revered historical figures like John C. Calhoun, who “demonstrated an absolute inability to imagine a future that included free Black people

thinking and living for themselves” (25).

Much like Feminism laid the groundwork for Afrofuturism, in turn “Afrofuturism thus becomes a model for how other peoples of color might view the futuristic art they create, allowing them to become conscious of their own imbrication in a technoscientific culture and to resist erasure from the narratives it sponsors” (Kilgore 10). Grace L. Dillon acknowledges this flow of influence in SF scholarship when she notes that the title of her *Indigenous Futurisms* anthology “pays homage to Afrofuturisms, an established topic of study for sf scholars” (2). As the latter half of Dillon’s comment indicates, her selective tradition of *Indigenous Futurisms* is even lesser known, but is similarly “not so new—just overlooked” (2).

Like Feminist and Afrofuturist SF, *Indigenous SF* focuses on imagining a future for Native and First Nations peoples. Also like Afrofuturism, *Indigenous Futurisms*—intentionally plural to reflect the multiplicity of Native tribes and identity—derives from a history of cultural and racial trauma, with a focus on the future. Dillon asserts that “Indigneous [sic] Futurisms are not the product of a victimized people’s wishful amelioration of their past, but instead a continuation of a spiritual and cultural path that remains unbroken by genocide and war” (Introduction: *Indigenous Futurisms* 2). This attitude can be traced to one of the movements’ foundational authors, Gerald Vizenor, and his concept of “survivance”—the act of not just surviving, but going beyond to achieve “an active repudiation of dominance, tragedy, and victimization” (15). David Higgins explains that Vizenor’s idea of survivance is particularly poignant in *Indigenous Futurisms* because “*Indigenous sf* stories reject victimry” as opposed to “fetishizing the

victim role, as mainstream science fictions often do” (53). Instead of victimhood, Dillon explains, Indigenous Futurisms embrace *biskaabiiyang*, an Anishinaabemowin term for the process of “discovering how personally one is affected by colonization, discarding the emotional and psychological baggage carried from its impact, and recovering ancestral traditions in order to adapt in our post-Native Apocalypse world” (Symposium 10). The focus is on reconstructive and productive futures, not compensatory futures.

As mentioned in the previous chapter, Indigenous Futurisms especially challenge SF’s assumptions about science, as “a fiction that sometimes fuses Indigenous sciences with the latest scientific theories available in public discourse, and sometimes undercuts the western limitations of science altogether” (G. L. Dillon, Introduction: Imagining Indigenous Futurisms 2) but overall works to demonstrate that “Indigenous science is not just complementary to a perceived western enlightenment but is indeed integral to a refined twenty-first-century sensibility” (3). Dillon notes that this approach to estranging us from science itself may grant Indigenous SF “the capacity to envision Native futures, Indigenous hopes, and dreams recovered by rethinking the past in a new framework” (2). However, Miriam Brown Spiers is concerned that Indigenous SF may not be recognized as science at all, but only fiction. She warns that Dillon’s choice to reclaim older stories as SF in her anthology risks portraying essential Indigenous worldviews as fiction. She encourages labeling only those stories that pair clearly recognizable SF tropes with Indigenous identities.

Another selective tradition developing from the same critical roots is Latin@futurism. Cathryn Merla-Watson explains that this broad selective tradition grows

out of “Catherine Ramírez’s foundational prism of Chicanafuturism—which, in turn, builds upon Afrofuturism” (np). She goes on to note that “Latin@futurism dates back to at least the late 1960s, it is just recently that scholars have begun to study it in a focused manner” (np), echoing similar comments above about Afrofuturism and Indigenous Futurisms. The earliest story in *Cosmos Latinos: An Anthology of Science Fiction from Latin America and Spain*, edited by Andrea L. Bell and Yolanda Molina-Gavilán, dates from 1913.

Like its predecessor in Afrofuturism, Latin@futurism is concerned with locating Latinx people in the future, without erasing the past or present. Merla-Watson defines this alternative tradition: “Latin@futurism excavates and creatively recycles the seeming detritus of the past to imagine and galvanize more desirable presents and futures” (np). She emphasizes that in many core texts of SF like *Star Trek*, “the filmic and more general discursive excision of Latin@s from the future signals a deep-seated and even genocidal desire of white America to disappear Latin@s altogether” (np). Much like Indigenous Futurisms, Latin@futurism is a broad term; it “references a spectrum of speculative aesthetics produced by U.S. Latin@s, including Chican@s, Puerto Ricans, Dominican Americans, Cuban Americans, and other Latin American immigrant populations” (np). This multiplicity of connected and yet different identities, Merla-Watson explains, is important to the overall tradition, which focuses on blurring these abstract borders as well as physical “hybrid and fluid borderlands spaces, including the U.S.-Mexico border” (np).

Stories from these alternative futurism traditions resist the genre’s colonialist

history and trends and therefore “sometimes intentionally experiment with, sometimes intentionally dislodge, sometimes merely accompany, but invariably *change* the perimeters of sf” (G. L. Dillon 3, emphasis in original). The impact goes beyond the stories within these futurisms. Merla-Watson explains that “Latin@futurism and alternative futurisms are revolutionizing how we think about the speculative genre at large” (np). There is real potential for change in all SF originating in these selective traditions.

The core argument that runs through these futurisms contends that the ability to imagine a future for non-mainstream people is an empowering and activist act in and of itself. Rather than convenient erasure, these stories offer validation of people’s very existence. With this point of view, the mere inclusion or exclusion of these identities from children’s SF becomes a cultural-political statement. Additionally, erased peoples cannot simply be re-assigned to metaphorical representation. A large part of Afrofuturism, inherited by Indigenous SF and Latin@futurism, is a very literal emphasis on diversity. These stories “eschew SF’s more metaphorical approach to the social and political realities of racial difference” (Kilgore 2)—in other words, these traditions reject the idea that a variety of aliens count as “diversity” in a text and can stand in for real differences. In order for a text to be diverse, it must contain direct and literal representations of difference.

Many people may not see these political movements within SF as relevant for the relatively simplified stories of children’s literature, but these foundational texts are in the direst need of diversity. Recent protests and programs that are thriving on social media,

such as #weneeddiversebooks and #1000BlackGirlBooks, demonstrate the growing realization that even illustration choices are excluding and erasing the identities of thousands of children. The first article on the topic, “The All-White World of Children’s Books” by Nancy Larrick, came out in 1965, but newer studies have steeply accelerated critical attention. The Cooperative Children’s Book Center (CCBC) statistics found that out of 3,400 books published in 2016, 278 (8%) were about African/African Americans, 55 (2%) were about American Indians/First Nations, 237 (7%) were about Asian Pacific/Asian Pacific Americans, and 166 (5%) were about Latinos (Publishing Statistics). This trend has been largely the same for the last several decades, according to publisher Lee and Low Books, who calculated that only 10% of books from 1994-2013 included multicultural content (Ehrlich). When people questioned how books with animal protagonists might be affecting these percentages in 2013, K.T. Horning from CCBC crunched the numbers coming in for that year to reveal that the problem was still there, even when animal protagonists are taken into account:

Of the 1509 books published in 2013 that we have received so far, 1183 (or 78.3%) are about human beings. If we subtract the 326 books about nonhuman characters from the overall total and just figure the percentages of books about people of color among the books with human characters only, we still get a fairly dismal number: of the 1183 books published so far in 2013 about human beings, 124 of those books feature people of color. That's 10.48%. (Horning)

This lack of representative books is cultural erasure in children’s lives. When this erasure occurs in the futuristic depictions of children’s SF, it only compounds the problem

through the impression that diverse children are not only insignificant in the present, but that they also have no future worth telling stories about.

Girls also suffer a reduction in representation as compared to boys. A 2011 study of children's books from 1900-2000 found that "on average, 36.5 percent of books each year include a male in the title compared to 17.5 percent that include a female" (McCabe, Fairchild and Grauerholz 207). Additionally, they found that "no more than 33 percent of books published in a year contain central characters who are adult women or female characters whereas adult men and male animals appear in up to 100 percent" and "boys appear as central characters in 26.4 percent of books and girls in 19 percent, but male animals are central characters in 23.2 percent of books while female animals are in only 7.5 percent" (McCabe, Fairchild and Grauerholz 209). Some attribute this to the commonplace assumption that elementary age boys will not identify with girl protagonists, though that may be a self-fulfilling prophecy.

To compound the problem, the lower proportion of girls intersects with the lack of diversity in children's literature. In 2015, 11-year-old Marley Dias founded #1000BlackGirlBooks because she was sick of only seeing books "all about white boys or dogs ... or white boys and their dogs" (Anderson). For her, having an identity at the crux of two underrepresented groups meant an even sharper lack of representation in books. Fortunately, her drive to collect 1000 books received an overwhelming response, and 4000 suggested titles! This girl's success indicates that while diverse books may exist, they are not in common circulation and must be called forth from the edges of children's literature publishing in order to better benefit young readers in a multicultural

world. Feminist, Afrofuturist, Indigenous, and Latin@futurism approaches offer a valuable justification for assessing books in light of this problem, and making sure that teachers, librarians, and scholars attend to the existing, but liminal SF that is not only high quality, but benefits children with a wide variety of identities.

STEAM

Considering the scholarly concerns in chapter 2 that science content and extrapolation may be too hard for young readers, STEM (sometimes STEAM wherein A = Art) education strategies may offer a useful way to look at accessible science content in SF. The topics of STEM and SF are not only nominally connected by science, but research shows a correlation between reading SF as a child and pursuing STEM careers, as discussed in the introduction. If reading SF as a child impacts children's developing ideas of science, as indicated in those studies, then the results support the concept of science-fictional thinking as argued by Csicsery-Ronay. An interchange between STEM education and children's SF literacy becomes mutually beneficial.

STEM is a hot subject in education studies. Guides and recommendations abound. However, "it is dangerous to assume that what is recommended for the general STEM student body is necessarily what works best for those who are underrepresented in that population" (Tsui 555). Tsui is referring to undergraduate education, but elementary pedagogy scholars who feel similarly are giving focused attention to addressing the lack of female students going into STEM fields and recognizing Indigenous science throughout elementary and middle school.

STEM girl-friendly strategies work to bridge a gender gap like that found in

children's books and SF specifically. Educational research indicates that girls in elementary and middle school are equally capable in science, but are hindered by negative perceptions about women in science careers (Dare iii). Similarly, Mendlesohn explains that "the 'children' cited as SF readers are almost always boys" (37). She proposes that much SF for young readers poorly represents female protagonists and female scientists, preserving this perception (134). The consequences cross over between STEM and SF, as can be seen in Carol Haynes and Donald J. Richgels' discovery that not a single girl in their study showed any preference for SF at all, despite having equal science abilities in class (17-18).

Similarly, as mentioned in chapter 2, pedagogy scholars have recently turned to researching Indigenous ways of knowing as a means of teaching elementary science. This new direction in science education stems from a movement in science at large wherein "many Indigenous ways of understanding about the world have become accepted by scientific experts and are considered as adding value to science" and pedagogical theories that "the knowledge students have and how they learn is influenced by their culture, context, and their everyday experiences" (Mack, Augare and Different 52). Children with cultural contexts other than the mainstream are not at the heart of traditional science curriculum. The new approaches to incorporating Indigenous ways of knowing into classroom practice are highly specific to different regions and tribes, but rely on similar principles that can apply helpfully to children's SF. Though no work has been done on children's SF and Indigenous representation, that very lack of scholarship can be assumed to echo the lack of representation.

The inclusive strategies adopted by educators who want to encourage girls and Indigenous students to succeed in science classes may be helpful in evaluating the inclusiveness of children's SF. STEM's girl-friendly strategies align with ideas of poststructuralist Feminism in literature, or that "languages write identities, and do not merely reflect them" (Guerin, Labor and Morgan 234). The textual representations within these books, in the light of poststructuralist Feminism, are taken up by children reading the books and actively absorbed into their own gender identities. The same could be said of alternative futurisms, which rest on the assumption that not seeing oneself in the imagined future affects one's identity and sense of value. While this study will not be pursuing action research goals of helping the participants help themselves out of cultural limitations, the results will hopefully form a foundation for helping professionals choose and produce girl-friendly and diverse science fiction, to help all children read and write their own potential identities as anything from scientists to astronauts.

Methods

I will use methods from various frameworks that both answer the research questions and counteract the potential pitfalls of different methods. This multiphase mixed methods design therefore aligns with pragmatic standpoints (Creswell and Clark). There are two phases. The relationship between the first and second phase is sequential, whereas the qualitative and quantitative strands of the second phase are concurrent (see figure 3.1 below).

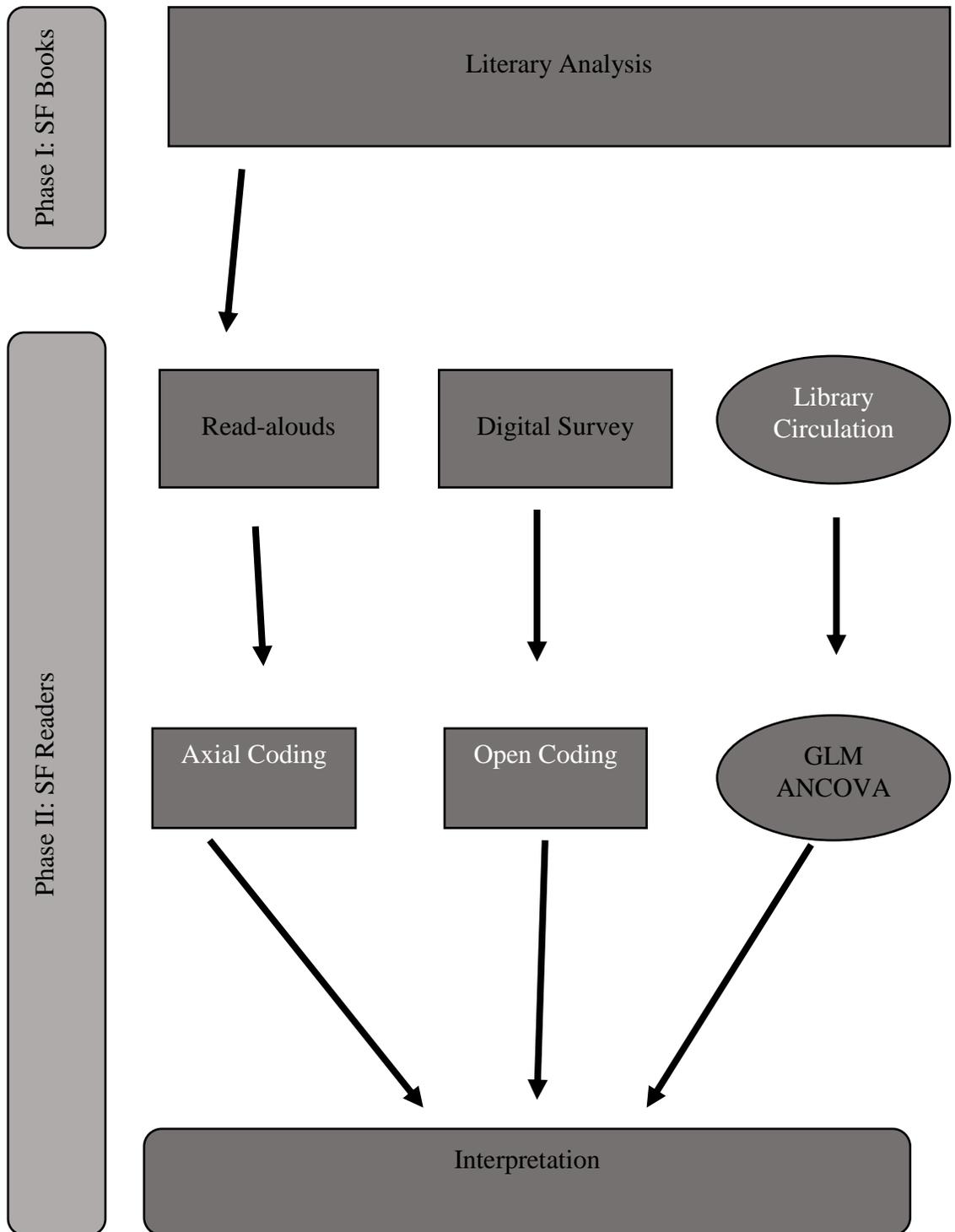


Figure 3.1. Methodology Design Diagram

Phase I: SF Books

Relying on the previous scholarly work on science fiction literature and children's literature, as described in chapter 2, I synthesized criteria for quality SF specifically for children under twelve. With this concept of modified SF quality in mind, I read 213 children's SF books, evaluated them, and selected several as exemplary cases for literary analysis.

Evaluating Books

I gathered children's SF books from online children's literature blogs, book-rating websites like *Goodreads*, library suggestions, books mentioned in Mendlesohn's *The Intergalactic Playground*, child_lit listserv suggestions, and ideas from colleagues. I kept looking for and reading children's SF until reaching saturation: when new books became rare and did not add anything different. As I read each book, I evaluated whether or not the book met the criteria of speculation/extrapolation, strong girl characters in science, and diversity, as described below.

In order to determine if a book included extrapolation or speculation, I applied a series of criteria, starting with what I playfully call the Hastings Test. In his "Science Fiction" entry in *Keywords for Children's Literature*, A. Waller Hastings questions whether young children's books that use science fiction tropes "to give a veneer of the unusual to everyday activities" are really science fiction at all (207). While his overall sentiment is mixing up the projects of defining versus establishing aesthetic values, I appreciate Hastings' accompanying example that "there is nothing intrinsically speculative" about the eponymous robot in *Ricky Ricotta's Mighty Robot*, who is "filling

a role that could as easily be given to the golem of Jewish folklore, a *djinn*, or a benign giant” (207, emphasis in original). Therefore, for each book on my list, I identified the novum(s) of the story and then determined whether or not they could easily be replaced with something ordinary or fantasy-oriented without majorly altering the story’s plot, themes, or lesson.

Additionally, I considered Mendlesohn’s demands that SF for children should meet what she considers “core genre values.” Her list aligns with the discussion of speculation and extrapolation in the previous chapter, but also includes a specific children’s literature interest towards learning:

core genre values: an outward-bound trajectory; information density; emotional development grounded in a reaction to the world rather than a boy-meets-girl romance or other social networking skills; encouragement to analytical thinking, whether applied to political, social or scientific contexts; a questioning approach to the material of the text and to the built world; a moral or ethical ruthlessness that argues with the world rather than tritely positing one stance as innately good, another innately bad; a sense at the end both that one has learned something, and that there is something more to learn. (183)

As mentioned in chapter 2, critics like Hastings have found Mendlesohn’s criteria to be a bit harsh. Similar to Hasting’s spiral compromise, I determined that each book should come close to at least one of these aspects, even if it made allowances for the target age or compromised with children’s literature conventions. I also allowed that this speculative/extrapolative content could be located within the illustrations. If none of the

core values were present in any form, then the book failed this test. Overall, the books had to pass these two tests to be assigned a “yes” for extrapolation/speculation.

Evaluating the books on strong female characters in science relied upon two straightforward criteria. Firstly, there had to be at least one female character, as categorized by pronouns or traditional female markers within illustrations, in the main cast. Secondly, this character needed to act as more than a viewer or antagonist for a male protagonist. In several books, for instance, female crewmates would seemingly only be along for the ride, or older sisters would impede their brothers’ scientific inquiry and adventures.

In order to evaluate each book’s diversity, I relied upon the distinctions proposed by Lee Galda et al. in *Literature and the Child*. The authors identify three different categories for diversity in children’s books: painted faces, culturally rich, and culture as a concept. The painted faces category refers to a book that offers visual cues of diversity like characters with various skin tones or physical ability, but no deeper reflection or story content about those qualities. The term culturally rich refers to a book wherein some non-mainstream cultural diversity is integral to the story. While Galda et al. also include a third category called culture as a concept, which includes books that explicitly talk about diversity as a concept or learning moment, these books tend toward nonfiction and I did not encounter any in this sample. Painted faces and culturally rich books, on the other hand, locate diversity in the future or speculative worlds of the books, satisfying the most basic goals of alternative futurisms. Any books that did not fit any of these descriptions were categorized as not diverse from the mainstream.

Written Analysis

With this overall coding in hand, I proceeded to identify the general trends in the overall sample of books. I then chose books that exemplified each different criteria for in-depth analysis. In order to demonstrate how the successful books were operating, I applied the method of close reading with picturebook theory, comics theory, and selective traditions like Feminist SF and alternative futurisms.

Close reading is, historically, a formalist method. Formalist analysis assumes that the words in a work of literature contain all the necessary information for analysis, without any need for biographical, cultural, or other contextual details. Formalism's core "assumption is that a given literary experience takes a shape proper to itself, or at the least that the shape and the experience are functions of each other" (Guerin, Labor and Morgan 103). Therefore, the formalist method, close reading, applies intensive attention to the denotations and connotations of the words, including etymology, as well as the structure, patterns, tone, and so forth. Formalist analysis is a traditional literary approach, but often criticized for ignoring the contexts that shape and can be used to understand literature.

It is not unusual, however, to extract the method of close reading for use with other approaches, and picturebook and comics theory have extended it to use with images. I expected the words and pictures of the texts to carry a large part of a book's interpretation, but only in conjunction with other sources of data. However, unlike reader-response criticism—the most drastic reaction to formalism—I did not assume the opposite view that the reader's interpretations completely override or carry more importance than the book's contents. Instead, I hold that the book is an independent art

object, in line with the formalists, while also treating the other sources of data in the study as valuable and complementary. Formalism's focus on each book as an independent art object allows for a zoomed-in examination of a book on its own terms, and helped reveal the successful elements of quality science fiction for children under 12. Through close reading, I could also identify and examine passages that best demonstrated extrapolation/speculation, girl-friendliness, and diversity. The assumptions of close reading borrowed from formalism then validate contextualizing and analyzing these details within the internal logic of the book as well as through the external theories.

First, I performed close reading on several books that excelled in speculation or extrapolation. These readings were informed by picturebook and comics theories to interrogate how exemplary books use both words and text to convey SF speculation and extrapolation. Then, I applied close reading, SF Feminism, and STEM girl-friendly strategies to books that excelled at representing women. Next, I paired close reading with Galda et al.'s measures of diversity and Afrofuturist concepts to demonstrate how key examples of diverse SF achieved success. Finally, I combined the above approaches to examine books that succeeded at all three criteria.

Phase II: SF Readers

Next, I gathered reader data to examine the ways that young readers under 12 engage with these examples. Methods included a survey of elementary teachers and children's librarians, library circulation data, and read-aloud sessions with children under 12 accompanied by a questionnaire for their parents.

Teacher/Librarian Survey Participants

Overall, 59 professionals who work with children responded to the survey.

However, several did not finish or opted to not answer certain questions. Therefore, each question has between 52 to 59 respondents. Since I am not examining the responses as cases across questions, but rather question by question, I did not throw out incomplete survey responses.

Of the 59 respondents, 52 allowed the survey software to perform geolocation (see figure 3.2). These respondents logged on from 19 different states in the US as well as from Canada and Australia.

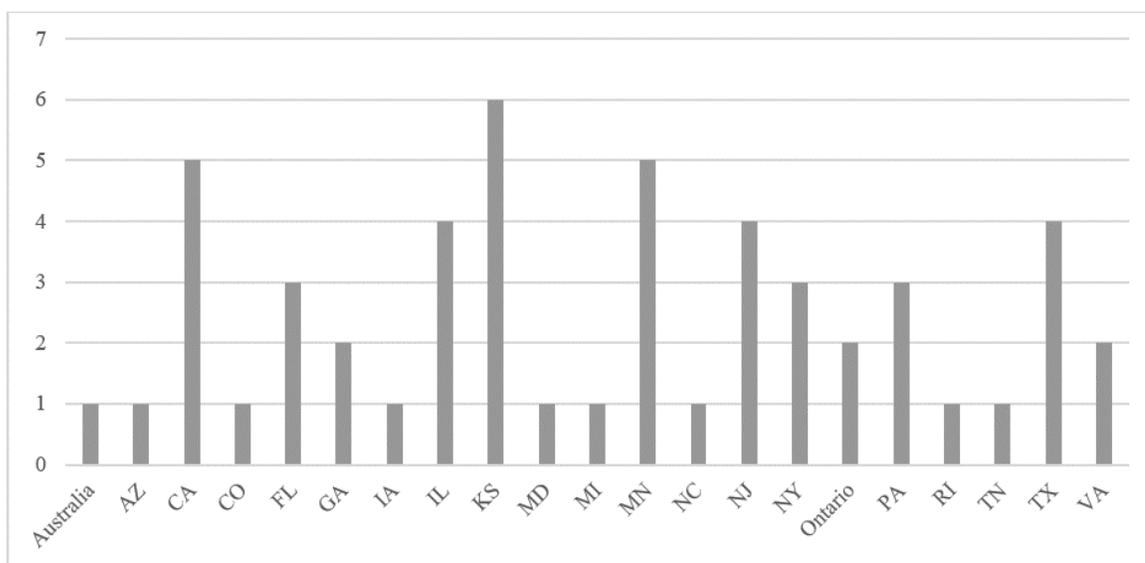


Figure 3.2. Survey respondents by location, based on where they logged on.

Of the respondents who answered demographic questions (see table 3.1), the large majority, 45 respondents (86.54%), identify female. The majority are also librarians (39, 75.00%). Two individuals selected the Other category for profession, but only one wrote in “Library Director.” Similarly, 38 respondents (73.08%) claim to be fans of SF. The write-ins for the Other category includes one “casual fan” with a preference for fantasy,

one non-fan whose favorite book is *Ender's Game*, and one person who says they are a fan depending upon the topic. 73.08% is an unexpectedly high turnout of fans, leading me to wonder what the respondents' definitions of "fan" may be or if the survey attracted more fans of SF than may be represented generally in the population.

Table 3.1
Demographics

Gender	Female	Male	Other
	45	7	0
	86.54%	13.46%	0.00%
Profession^a	Librarian	Teacher	Other
	39	17	2
	75.00%	32.69%	3.85%
Fan of SF	Yes	No	Other
	38	11	3
	73.08%	21.15%	5.77%

Teacher/Librarian Survey Measure

The survey results offer a broad picture of children's SF across many practitioners and locations. I designed the digital survey instrument specifically for this study on Qualtrics. It contains multiple choice questions such as which formats of SF they have in their library, yes/no questions such as whether they recommend SF to children, and short-answer questions such as what tactics they use to recommend SF to children. This survey was distributed and passed along through online social media. As descriptive data, it was not as necessary to get a statistically representative sample since I do not use it to make any statistical claims.

After data collection, I transformed the multiple choice and yes/no questions into percentages and graphs to offer clear visualizations of their distributions and

comparisons. Meanwhile, I used open coding over several read-throughs to identify trends within the open-ended questions. I ultimately identified between 10-15 different codes for each question.

Library Circulation Participants

I chose library circulation data sources through limited stratified sampling. The goal was to represent different regions, locations, and public vs private schools. There were two participating schools: one school is a private urban school in Minnesota serving K-5, the other a suburban public school in Virginia serving PK-5. Since both schools serve up to 5th grade, the upper age of children borrowing books from their libraries can be assumed to be 10-11 years old. For both schools, I contacted the school librarian and requested the library circulation data from 2015-2016. The private school in Minnesota is also the same school at which the read-alouds were performed, forging a link across the data sources.

Library Circulation Measure

There have been many collections and syntheses of school library circulation records concerning students' motivations or linking higher academic achievement and reading proficiency with library use (See Clark and Hawkins; Clark), but very few analyses of genre-specific lending. One such study by Gemma Moss and John McDonald made use of one elementary school's library circulation data to explore children's reading preferences in relation to the three different classrooms studied and their respective classroom reading cultures, but only looked at the differences between the broad genre categories of fiction, nonfiction, and poetry (405). This study revealed the significant

impact that the books available and their teacher's approach to these books had on children's recreational text choices, alongside the impacts of peer pressure.

Unfortunately, the current study cannot emulate all aspects of Moss and McDonald's qualitative examination since most school library systems do not store information about the students who have checked out the materials. Quantitative methods, however, are useful in this study for a contextual glimpse of larger trends. The details of library patrons that are unavailable through quantitative methods will be supplied by the larger qualitative bent of the read-alouds and survey. The check-outs in this study are meant to reasonably represent how much SF is being read, based on the reasonable assumption that the children who check out books actually read them. There may be cases in which a book is checked out and not read, but I will treat this as an unlikely event and, given the large size of the library circulation data sets, unlikely to skew the results.

Since library records systems do not categorize books by genre, I manually coded each title as "Science Fiction," "Fantasy," "Historical Fiction," "Realistic Fiction," or "Nonfiction" to provide the variable of primary interest, SF lending, and to enable a comparison with other main genres. These genres are generally considered the broadest categories, as represented in children's literature textbooks like that of Galda et. al. While coding, I collapsed any books with multiple copies into one data point with the total sum of the different copies' circulations, since genre would be the same between copies and more than one copy would inflate the number of titles. I also removed the rare entry for technology lending or DVD lending from the data, as these were beyond the scope of this

study.

The coding process itself was bound by the complexity of distinguishing genres that are not clearly separated from one another. I approached this coding task under the guidance of genre critic Brian Attebery's concept that genres are best seen as fuzzy sets, as described in the last chapter. While Attebery's suggestion is in part meant to curb the harsh distinctions between genres and allow "for partial membership in genre categories" (33), the needs of quantitative analysis require distinct categories for variables. I focused on Attebery's "core example" to code each book based on its relative similarity to a genre's core examples. I determined this similarity through my own experience and reading and in consultation with professional online reviews and publisher categorizations. In the case of books that straddled the differences between genres, I coded based on whichever genre bore the greatest emphasis on the structure of the book and its plot devices—in other words, whichever fuzzy set it resembled most.

Fantasy and SF, in particular, include a wide array of subgenres and sister genres marked by such different elements as talking animals to time travel to wizards. However, it was not practical or necessary for this analysis for me to code each sub-genre. Therefore, each code was inherently applied to a wide array of titles belonging to many sub-genres, but I applied the fuzzy set approach in these instances as well. For genres that are sometimes considered speculative fiction but not specifically science fiction or fantasy, I coded them by their strongest affiliation. Horror fiction, for instance, as a subset of speculative fiction that is often distinguished from fantasy and SF, was coded as "Fantasy" if it made use of magic or supernatural elements and "Science Fiction" if it

relied on technology to fuel an imaginative plot.

Nonfiction coding provided its own set of challenges, since this category can be very broad and not necessarily devoid of fiction, despite the name. I determined nonfiction books through Galda et. al.'s idea of "emphasis": if the book puts the greatest emphasis on conveying information, as opposed to telling a story, then it is nonfiction—even if there is also some sort of narrative there to aid in the information delivery (280). If the book happens to convey information, but is primarily a story, then it belongs in another genre. This approach is very similar to Attebery's fuzzy sets, with only a slight shift in focus. Based on this measure, I included concept books within the nonfiction group, as well as biography and creative nonfiction.

Once coded, I conducted a GLM ANCOVA to evaluate whether or not the genres had different circulation rates, by statistically significant standards. These statistical results complement and provide a larger context for interpreting the literary analysis, read-alouds, and survey data. Epistemologically, the quantitative results have more transferability and generalizability. These results reveal how much SF is being checked out, as compared to other genres, and if these counts confirm or dispute the trends voiced by scholars: low availability and rare reading. In turn, the quantitative piece lacks the detailed explanation of "why" and "how" provided by the qualitative methods.

Read-Aloud and Parental Participants

The read-alouds were conducted during the free afterschool program at a private, urban school in Minnesota. The location was chosen by convenience sampling, based on schools who were willing to participate. The regular attendees of the afterschool program

were all invited to participate, resulting in a total of 8 participants ranging from kindergarten to 5th grade (male=2, female=6). While obtaining parental permission forms, I also asked their parents to fill out a one-page questionnaire about their home's literacy environment and potential science fiction fandom. Of the 8 participants, 5 parents filled out this questionnaire.

Read-Aloud Measure

The read-aloud sessions were performed using three of the exemplary books from Phase I and following Lawrence Sipe's suggestions from *Storytime: Young Children's Literary Understanding in the Classroom*. I recorded these sessions and transcribed them for analysis using Sipe's picturebook read-aloud categories as an axial coding scheme, allowing me to identify different types of responses and then connect them to science fiction literacy and scaffolding concepts as developed in chapter 2 and chapter 4.

Sipe's picturebook read-aloud method offers a structure for looking at children's verbal literary meaning-making responses, including their responses to visual aesthetics. He does not name the method, perhaps in part because he does not pretend to have invented it. He developed it as grounded theory through observations of teachers who he saw as experts of this reading practice already. However, his model results in concrete recommendations for opening up students' literary responses, and then categorizing and analyzing those responses. It comes out usable as a method. He does not intend for it to be exclusively for "literacy researchers, theorists, and graduate students" (9) as a research tool—he also wants teachers to adopt this approach to reading picturebooks aloud in everyday classrooms in order to encourage and evaluate their student's literary

understanding.

Sipe ties this method of classroom picturebook read-alouds to scaffolding children's literary understanding. Since I am looking at the literary understanding of science fiction picturebooks, comics, and graphic novels as a scaffold for advanced science fiction literature, this may be a more representative method than an in-depth or unnatural comprehension test. Sipe's grounded theory categories reflect real classrooms and common reading situations. The experience is more natural and encourages students to produce the normal range of verbal reactions to the story during the course of reading it aloud. Of course the measure is still not a literal, direct look at student's understanding of SF, but it reflects an authentic reading and response experience along with some ways of interpreting the results.

Ultimately Sipe's grounded theory offers a handy, well-tested set of categories for analyzing different responses as types of literary meaning-making. He acknowledges readily that there are pitfalls—such as how often silence could be significant, and that it is impossible to accurately determine a student's motivation for a comment. Regardless, he suggests that a researcher or teacher can categorize the student's group dialogue to see what kinds of responses occur. Sipe's grounded theory produced 5 types of response: “analytical” response when the child talks about the text as an object; “intertextual” when the child is thinking and comparing across texts; “personal” when the child is connecting the book with their life; “transparent” response when the child merges with the story world and responds as though a part of it; and “performative” when the child uses the text as a platform for further creativity or manipulation of the story (182). Analytical

responses are further broken down into types: "making narrative meaning," or talking about setting, plot, characters, theme, peritext, structure, or speculation on plot and character thoughts; "book as made object or cultural product" when the topic of discussion is explicitly the author/illustrator's choices; "language of the text" when students read the text aloud, repeat sections of read text, ask about meaning of words, offer alternate wording, or use text to prove a point; "illustrations and visual matter" responses specifically concern the pictures and their media, arrangement, color, point of view, or background; finally responses about "relationships between fiction and reality" are about how the story relates to real life, or applying realistic thinking to a story (Sipe 111). For this project, for instance, finding intertextual responses is important as that category shows an emerging understanding of genre traits (143). Additionally, analytical responses show how they talk through interpreting the pictures versus the words, while their personal and performative responses may show whether or not they connect to the alienating elements of science fiction. Each category has something to show about the children's engagement with SF texts.

Parental Questionnaire Measure

The parental survey asked parents to select a range of numbers that represents the number of books in the house, and then if any of those books are SF. Parents were also asked if they read SF books with their children, did science-fictional activities, or if anyone in the home considered themselves a fan of SF across media. These questions were modeled on home literacy surveys like those developed and distributed by Get Ready to Read!, a service of The National Center for Learning Disabilities. This type of

survey is founded on the assumption that early exposure to a variety of reading activities and print materials, the home literacy environment (HLE), has a positive impact on literacy development. I altered the survey to fit a modification to the general assumptions about the impact of HLE: a child with exposure to many SF books, activities, and reading models may be better equipped to excel during my read-alouds. Stephen Robert Burgess explains that research with HLE surveys has demonstrated that they are useful and often representative, but the results should be taken cautiously due to the risks inherent in self-reported data (721). In this project, I am not establishing claims based on these surveys, but rather using them to provide context to the main data source: the read-alouds. In particular, it is useful to know if the children come from a background infused with and respectful of SF, especially when considering SF intertext.

Overall, this mixed methods design allows for comparison between the different methods to see if they all display the same trends or differ. Either way, the concurrent quantitative piece will provide a useful complement to the qualitative results, all of which will complement the literary analysis of Phase I. In the end, this mixed methods interdisciplinary case study relies on the strengths of several methods and disciplines in order to describe quality science fiction for children under 12 and how it is presented to and read by those target children.

Chapter 4: The SF Books

This chapter offers a detailed look at how children's SF books are performing overall, utilizing the criteria developed in Chapters 2 and 3. After reading 213 SF books marketed for children under 12 years old, I possess considerably more faith in the genre than many of the scholars cited in previous chapters. The books achieved an exciting level of success in terms of extrapolation and speculation, while the representation of female characters was adequate and the representation of diversity shows promise for improvement. An overview of the coding results, based on the measures described in chapter 3, is illustrated in table 4.1.

Table 4.1

Books that contain extrapolation/speculation, strong female characters, and diversity.

Format	Extrapolation/ Speculation	Female Characters	Diversity	
			Painted Faces	Culturally Rich
Picturebooks (<i>n</i> =135)	86 (63.70%)	40 (29.63%)	32 (23.70%)	1 (0.74%)
Early Readers (<i>n</i> =25)	13 (52.00%)	10 (40.00%)	6 (24.00%)	0 (0.00%)
Comic Books (<i>n</i> =17)	11 (64.71%)	12 (70.59%)	7 (41.18%)	0 (0.00%)
Graphic Novels (<i>n</i> =24)	22 (91.67%)	20 (80.33%)	12 (50.00%)	1 (4.17%)
Middle Grade Hybrids (<i>n</i> =12)	9 (75.00%)	10 (83.33%)	3 (25.00%)	2 (16.67%)
Total (<i>n</i> =213)	141 (66.20%)	92 (43.19%)	60 (28.17%)	4 (1.88%)

The sections of this chapter will work through examples of successful speculation

and extrapolation, girl-friendly books, examples of diversity, and the relationships between all three criteria in order to lay out how these books succeeded. It is important to illuminate these successes to not only dispute scholarly criticisms, but also to lay out a groundwork for cultivating a more accurate and useful impression of children's SF. All professionals involved in the creation, evaluation, and usage of children's literature can benefit from a greater knowledge of how issues of quality and representation currently function within this underrepresented genre and how they can be improved.

Extrapolation/Speculation

In terms of extrapolation and speculation, these books performed well. With more than half (66.20%) passing the tests described in the methodology section and every individual category surpassing 50% success, this result may be the most exciting for refreshing the reputation of children's SF.

Additionally, there appears to be a relationship between the format of the books and how often they successfully feature speculative or extrapolative plots. The lowest percentage of speculative/extrapolative content belongs to the early reader category (52.00%), with picturebooks (63.70%) not far behind. These formats are also the shortest, with the fewest words. Early readers are particularly restricted to sight word lists and word count limits. Picturebooks have the freedom to contain more complex language, and can sometimes contain whole pages of text, but it is more common in contemporary picturebooks to find only a sentence or two per page. Comic books, another format defined by brevity and sparse words, came in very close to picturebooks with 64.71%.

As a result, it is tempting to assume that a larger word count offers more room for speculation. Author/illustrator Peter Brown says, "If you really want to get into science

fiction and start thinking seriously about some of these complicated issues, I think you need time and words. You can't cram it into a short picture book" (np).ⁱ However, this may not be a straightforward issue of space. While the early reader, picturebook, and comic book categories have the lowest percentages comparatively, they all still achieved over 50% in terms of extrapolative and speculative texts. Additionally, by the logic that texts with more words have more room to speculate, the middle grade hybrids should have had the highest percentage of success, since they had distinctly more words than any of the other categories included in this study. That did not prove true. Instead, the graphic novel category has the highest percentage of speculative books (91.67%), surpassing the middle grade hybrids' results (75.00%)! Both formats are defined by their length and complexity, which may be a more accurate key to developing speculative/extrapolative content. The word count, it seems, may not be as helpful as what Peter Brown calls "time," or the sheer length and size of a story.

As expected, of the books that accomplished speculation or extrapolation, pictures were often key alongside or even in place of words. These books use pictures to scaffold an introduction to the SF genre, and to work in more content in a short space. I am not claiming that extrapolation, speculation, or science content needs to be "watered down" through illustrations. The incorporation of information dense pictures is not cheating or coddling children; instead, it means putting possibly new concepts in a more familiar medium, and one that can be just as dense as words.

As noted in chapter 2, Mendlesohn states that the illustrations in *Henry's Quest* (1986) contain "informational density that typifies science fiction" (Mendlesohn 68). The

pictures in *Henry's Quest* are so effective because they carry the entire science fiction context through what Nikolajeva and Scott call "Counterpoint in Genre" (24). The words are familiar fairy tale language, narrating the adventures of a peasant bumbling through the countryside, saving the day, and winning a princess. Meanwhile, the pictures focus on a post-apocalyptic society. In the illustrations, we learn about this new world and how humans recovered after some unknown event that had caused a major lapse in technology. The illustrations and words demonstrate different aspects of the basic science of gasoline and flammability. Overall, this book requires careful attention to the extremely detailed, and sometimes crammed landscape panels. The reward is a speculatively rich story about the future. To expand on Mendlesohn's note that intra-iconic material may work well for children's SF, I believe that this potential could solve many of the genre's perceived problems.

Henry's Quest contains a lot of words in multiple paragraphs per page, but rich pictures can enable speculation even in the absence of words. David Wiesner is an outstanding example of an author/illustrator who excels at crafting science fiction speculation and novums, or novel ideas, through pictures. *Mr. Wuffles!* (2013) has barely any words at all. Illustrations do the work of presenting children with a spin on a classic SF premise: the alien encounter. Wiesner shifts the speculation from how humans would receive and interact with aliens to how insects and cats on Earth might manage this extraterrestrial meeting. This story is developed in only 32 pages, without any written explanations.

Wiesner accomplishes this mighty feat using many small panels. Both *Henry's*

Quest and *Mr. Wuffles!* feature panels, in fact. Children may find another source of scaffolding in panels due to their familiarity with closure, or filling in the gaps between what is shown and what is not. In such a short format, a lot happens between the panels, and the child who has experience with closure is better equipped to fill in those gaps and access that speculation. This not only applies to picturebooks that use panels, but also to traditional picturebooks, wherein each spread functions like a large panel and the closure occurs in the page turn. Consider the difference between Wiesner's *Mr. Wuffles!* and two of his other speculative picturebooks, *June 29th, 1999* (1992) and *Flotsam* (2006). *Mr. Wuffles!* relies largely on what Scott McCloud would term "action-to-action" and "subject-to-subject" transitions between panels (70-71). Meanwhile, *June 29th 1999* uses mostly traditional 2-page spreads. The transitions between these tend toward the "scene-to-scene" type (McCloud 71). On each page turn, the setting of the pictures and words jumps across days and miles. These transitions allow the story to cover a wider span of time and touch in with the protagonist only at several key moments. In the case of *Flotsam*, another wordless book, Wiesner begins with several "action-to-action" panels per page during the mundane and realistic portion of the story. He then broadens to single or double spread "aspect-to-aspect" transitions upon reaching the awe-inspiring novum (McCloud 72). Readers are left with a lot of questions on each page turn, and must piece together the illustrations and the speculation between them.

These books demonstrate a relationship between the number of panels and the relative deduction skills necessary to read the gutters. Fewer panels result in bigger closure gaps. Wiesner uses different mixtures of panels and transitions to fit very

different speculative storylines into pictures, with only occasional supplemental words. These successful examples demonstrate that rich picturebook spreads with excellent use of broad transitions and closure put well-scaffolded SF within reach of authors and illustrators. This intentional use of closure, along with the expectation that children can interpret it, helps significantly with fitting speculation into the brief format of picturebooks.

Scaffolding SF through sequential art also functions in graphic novels, which depend heavily on the elements of picture reading and closure. The sheer number of pages and panels in this format, as opposed to picturebooks, provides greater space for speculation and extrapolation from more detailed science. For instance, *A Wrinkle in Time: The Graphic Novel* (2012), adapted from Madeleine L'Engle's 1962 classic by Hope Larson, successfully extrapolates from current understandings of time and space with extra scaffolding from sequential art. Like the original novel, the story unabashedly dives into complex space/time concepts. In the original, the explanation of tesseract travel and the 1st, 2nd, 3rd, 4th, and 5th dimensions are accompanied by a handful of small in-text illustrations (L'Engle 73-75). Even though L'Engle's ant metaphor for tesseract travel is very concrete to begin with, she and her editors must have expected readers to benefit from the visuals, or they would not have included them in an otherwise purely textual narrative. The graphic novel version, by extension, offers even more guidance for younger readers. The consistently illustrated presentation further grounds these complex concepts by spreading the depiction out onto several pages. Thus, the same explanation of tesseract travel and dimensions occurs over five pages comprised of 21 panels (Larson

and L'Engle 138-142).

Middle grade hybrid books do not rely on the pictures as heavily as graphic novels, picturebooks or comic books. Yet these pictures help scaffold speculation and extrapolation as well. Scieszka's *Frank Einstein* series visits several scientific concepts such as brain science, and then extrapolates forward to artificial intelligence. In this series, Scieszka narrates in straightforward, explanatory language. Take for example this passage from the first book, *Frank Einstein and the Antimatter Motor* (2014):

“human brain cells are arranged in a network, like this...”

Frank sketches in marker a diagram of interconnected brain cells on the front of Grandpa Al's giant industrial refrigerator.

“But computers make yes or no decisions following rules. More in a long, straight line, like this.

So that kind of robot brain can't learn the way we do. It can only do what it's programmed to do.”

“Mmm-hmmm.” Grampa Al nods.

Frank continues excitedly. “But what if I made the robot brain like this—” (28)

Each time the words describe Frank sketching and saying “like this,” the illustrations by Brian Biggs leap into action to fill in the visual explanation. These pictures help conceptualize neural pathways and computer logic. The reader cannot use the text like a robotics handbook, of course, but the concept is plausible and specific enough for extrapolating upon. This is all successfully conveyed through illustrations. Consider, by comparison, the dialogue of Isaac Asimov's robotics scientists in his classic short story

“Robot Dreams”:

“Finally Calvin said, “What is it you have done, Rash?”

Linda said, a little abashed, “I made use of fractal geometry.”

“I gathered that. But why?”

“It had never been done. I thought it would produce a brain pattern with added complexity, possibly closer to that of the human.” (92)

This is all the scientific explanation that Asimov offers. Fractal geometry is very abstract here—just the sort of complex phrase that a young reader would have to choose to stumble on, look up, or skip over. Geometry, especially fractal geometry, is not usually taught until middle or high school. Instead of throwing in an abstract term, Scieszka and Biggs use illustrations to speculate on nearly the same kind of robot brain complexity. Their goal is very similar to Asimov’s—and the book otherwise includes allusions to Asimov for an interested child to follow—but Scieszka and Biggs employ strategic visual scaffolding just for the young reader.

When it comes to the format of early readers, this scaffolding function of pictures is not as applicable. Per format conventions reviewed in chapter 2, the pictures in early readers are busy doing the work of helping new readers identify words that may be eluding them. They therefore stick to “symmetrical” or “complementary” relationships with the words (Nikolajeva and Scott 12). Accordingly, it is not surprising that in this study’s sample of successful early readers, the speculative content seemed to rely upon the SF intertext rather than counterpoint illustrations or closure.

The SF intertext in these early readers simultaneously expects the reader to be

familiar with SF tropes and to develop a better familiarity with them in the process of reading. This pairs well with the early reader's unique qualities as a format. Gretchen Papazian notes that early readers offer a fascinating challenge to theories of reading like Barthes' concept of *déjà lu* or "already read," which posits that all meaning and understanding of reading derives from previous reading and experience. Yet, Papazian explains,

As a format that generally assumes its reader lacks knowledge of and/or extensive experience with reading, the Early Reader may have revealed a flaw in the theory of *déjà lu*. It might have suggested that there is a beginning to the signifying chain; there is or has to be some sort of denotative meaning upon which to build understanding. Instead, though, the Early Reader's representation of reading practices and processes supports and expands the theory of *déjà lu* by embedding the 'already read' in the text itself via characters and plot sequences; by raising questions about denotative meaning and showing the consequences of such rigid thinking; and by reveling in variety, uncertainty, and possibility. (79)

Papazian explains that by having characters reading books within the book, and other situations that embed reading within the reading, early readers simulate the experience of previous reading on the go. Applied to SF, the early reader is also perfect environment for young readers to encounter SF genre intertext, both embedded and expected. Readers are provided situations wherein they are rewarded for already having SF experience, but can simultaneously build SF reading experience from scratch.

Much of the intertext in this sample of early readers is achieved through product

tie-ins, series, and sprawling universes like *Star Wars*, Marvel, and DC. All this pre-existing material acts like a shortcut, allowing the story to jump right past world-building and get right to the action—or speculation. Yet readers need not have the background to understand the story at hand. For those without much previous experience, reading any story brings them into the middle of an entire world of SF tropes. There is no single entrance point. Anyone can enter the network from any SF story and a variety of media.

The SF intertext relies on a wide web of sources, including those beyond literature. In one of Jane Yolen's letters concerning her first *Commander Toad* early reader, she responds to an editorial concern that children may not get all her puns: "any kid who has seen *Star Wars*, *Star Trek* or *Battlestar Galactica* has heard the phrase deep hyper space and will get the pun" (Box 7, Folder 26). Yolen expects children to come to her *Commander Toad* books fully equipped with SF awareness from any one of several possible television shows, and to use that knowledge to navigate and enjoy her puns. Additionally, I would say, this pre-existing SF awareness provides a framework for Yolen's plot overall. Young readers who are not entering the world of space travel and spaceship crews for the first time can approach the story with a head start from that SF framework.

This intertext encourages readers to see SF books as part of a genre and as part of a larger category of stories and trends. Comic books especially are often episodic and serial, and many of the Marvel and DC early reader series follow suit. A good part of the speculation in these books exists solely in dialogue between the book's plot and the broader context of the series. For instance, the extremely short level-one early readers

that introduce common super heroes, like *Ant-Man: This is Ant-Man* (2015), offer the hero's name, origin, powers, and allies. There is very little explanation for the powers in the text, save that they derive from science: "One day, Scott met a scientist named Hank. They talked about science. Hank gave Scott a special suit. Scott tried it on. Scott shrank to the size of an ant!" (7-8). It is hard to extrapolate from current science when the science itself is so vagueⁱⁱ, but speculation emerges when the book continues to consider how Scott experiments with ants and how he chooses to use the technology. The book questions the responsibility of having such power, but much of that is between the lines. The supervillains that he punches are not named, and their villainy—like the ethics of Ant-Man's actions—are left entirely in the intertext. If the reader is meant to ponder the "What if" about Ant-Man's use/abuse of technology, they would have to learn more about the Avengers and these villains in order to make an informed decision.

As quoted in chapter 1, David Hartwell claims that children are fully immersed in science fiction concepts from popular culture from an early age. An ideal literacy development also exposes children to picturebook examples before encountering early readers. As a result, picturebooks are in a particularly good position to introduce SF intertext. A picturebook is usually meant for pre-literate or beginning readers, inherently implying collaboration in reading and working through genre conventions. Other sources of story like television programs and video games can also serve this function of familiarizing children with SF tropes from a young age. In these media, the intertext acts like a sort of shortcut to get to speculation, much like the images.

While my focus is ultimately on successful books as a path forward, it is worth

noting what is working against the unsuccessful books. For this I will focus in on the category with the median of speculative/extrapolative success: the comic books. Over half the comic books tested well for speculation and extrapolation (64.71%), but of those comic books that did not make the cut, the problem seemed to point to a preference for slapstick over speculating or extrapolating, even when they had plenty of closure to work with and plentiful series tie-ins/intertext available. Two of these books, by Art Baltazar and Franco, told the stories of superhero families and sidekicks as children. If I had included more than one or two books from each series in the sample, Baltazar and Franco's contributions would have flooded the comics category. With 12 issues of *Superman Family Adventures* and over 50 issues in the *Tiny Titans* series, these books are certainly the most available comic books that are clearly intended, in art and reading level, for young children. These series both defer to puns and joke set-ups rather than considerations of technology or societal advances, even when the heroes' designs or powers are wide open to such explorations. The creators make the occasional intertextual joke that seems intended for parent-fans of the DC Universe, but even these do not bring in extrapolation or speculation.

Other books by Baltazar and his collaborating writers and artists follow a similar pattern, like *Li'l Battlestar Galactica* (2014) and *Li'l Bionic Kids* (2014). These are primarily a host of slapstick situations for kids, with jokes that seem exclusively for parents based on the original *Battlestar Galactica* (1978) and *Six Million Dollar Man* (1973) television shows. Meanwhile, the Marvel Universe has its own line of child-version hero comic books, *Mini Marvels*. These stories are similarly juvenile, but with

one important shift: the jokes about Marvel Universe characters seem to be aimed at a younger audience. That is, there is less slapstick in favor of even more jokes based on the characters. However, the implication seems to be that the young reader would know these characters from contemporary movies, television, and other sources and therefore be in on the jokes. They are expected to know the intertext, and follow along as the creators play with it. Additionally, what the characters can do with their powers is more center-stage, edging the story into speculation. For instance, in *Paperboy Blues* (2016) when young Spider-man shows up at young Xavier's school to collect the school's overdue newspaper fees, this all-kid school reveals that they use Xavier's mind manipulation powers to run the place on their own without adults. The characters even dabble in a short debate about the ethics of fooling adult bill collectors in order to sustain their independence. This is all couched in the silly scenario of young Spider-man's paper delivery job, but there is at least some speculative thought about the use of powers, unlike in *Tiny Titans* or the *Li'l* comics.

The more robustly successful comic books in the sample did not infantilize the characters for children in the same way. In the case of *Emily's Intergalactic Lemon Stand* (2004) by Ian and Tyson Smith, the art style was similarly naive, but the story was far less slapstick. The plot was similarly silly and humorous, but it effectively introduced speculation too. The storyline and characters questioned what robots are capable of when commanded and created by human greed and competitiveness.

Meanwhile, Marvel's comics that are directed at slightly older children are far more regularly speculative. The Marvel website has a section for kids with games,

information on the characters, and digital comic book issues. These comic books are produced specifically for Marvel Kids, but do not seem to be particularly different from their mainstream comics—save perhaps the lack of especially gritty or gory storylines. These comics feature well-known and recently cinematized characters like Spider-Man, Ant-Man, and the Guardians of the Galaxy. Like the intertext in Marvel’s early reader about Ant-Man, a reader with background knowledge of these characters has a better platform from which to access the stories, but the comics also stand alone with more successful speculation/extrapolation than the *Mini Marvels* series or the Ant-Man early reader. Even within issue #1 for each character, Spider-Man speculates about the responsibility and consequences of having his spidey-abilities, Ant-Man experiments with the biology, communication, and attitudes of different kinds of ants, and the team of Guardians deal with being unexpectedly sucked into an interdimensional portal. There is mild speculation in the comics, but the multimodal format allows for a direct link to the characters’ origins and context. Readers can use the other resources on the website to learn that Spiderman has powers because of a radioactive spider bite rather than magic.

Among the light-hearted comic books mentioned thus far, one comic book mini-series, Grant Morrison’s *We3* (2004-5), offered an interesting dilemma for the purposes of this study. I first discovered the title on a list of the “Best 15 Fantasy & Sci-Fi Graphic Novels for Kids (And the Whole Family)” on a website called Geeks Raising Geeks, a resource guide for parents. Upon reading the comics however, I was surprised by their sad tone and the amount of gore and violence toward animals. Blood and guts, in near-photo-realistic detail, fly from the animals and the humans alike. I considered revoking it

as a story for children under 12, which would have disqualified it from this study. Yet the reading level was fine. Furthermore, it was very accessible: the complexity of technology was minimal and the interpretation was almost exclusively in the pictures. I realized that many video games played by relatively young children are condemned for their *senseless* violence—but the violence and gore in *We3* are squarely in service of the story's speculation. Instead of glorifying the violence, it eventually becomes a sad, numbing symphony about technology in war and whether we as humans should drag animals into our own messes. The violence and gore is shocking and heartbreaking at times, but a very poignant delivery for an ultimately anti-violence message that is bound to stick *because* of those very gory images. I ultimately left it in the study, though it does pose an interesting question for future research into measures of age-appropriateness versus speculative potential.

Overall, the books tested very well in terms of their speculative and extrapolative content. Of course this does not mean that all SF children's books make use of this potential; plenty are still only superficially clothed in SF tropes or too concerned with slapstick to offer speculation. However, these rousing examples of success are enough to support a claim that this area is not failing like critical comments imply. Featuring pictures and a hearty dive into the SF intertext cannot solve every problem, but the scaffolding functions offer a good means for success.

Girl-Friendly SF

In terms of the representation of girls, this sample of books achieved under 50% success, with a total of 43.19% passing the tests mentioned in chapter 3. Within groups, the highest percentages of girl-friendly books belong to the categories of comic books

(70.59%), graphic novels (80.33%), and middle grade hybrids (83.33%). Given the history between SF, feminism, and comics outlined in chapter 3, these successes are not surprising. Meanwhile, early readers (40%) and picturebooks (29.63%) lag significantly with about half the success. This divide is deeply problematic. While speculation/extrapolation can reasonably claim a need for more time or space in the narrative, featuring female protagonists does not have to contend with such barriers. Recalling the statistics from chapter 3, “no more than 33 percent of books published in a year contain central characters who are adult women or female characters whereas adult men and male animals appear in up to 100 percent” (McCabe, Fairchild and Grauerholz 209). With this number in mind, the success of the comic books, graphic novels, and middle grade hybrids seems astronomical—and may be impacted by the small size of those groups (all $n < 24$). However, picturebooks are the largest group ($n = 135$). With more titles, the picturebook group had every chance to even out in the numbers, but instead revealed a lack approximately 3 percentage points lower than McCabe, Fairchild, and Grauerholz’s findings. These numbers mean that children’s SF is falling prey to the same problems as children’s literature at large, and needs to inherit more successful tactics from Feminist SF and girl-friendly STEM strategies. Looking at the successful examples, as I do below, is one step toward demanding and producing better representation of girls in SF books and by extension all children’s literature.

Selecting books that merely include girls only scratches the surface of what these books can accomplish. Children’s SF that compounds the presence of female characters with girl-friendly strategies and effective speculation/extrapolation have the potential to

create powerful introductions to the genre and help combat negative perceptions about SF and STEM careers. Several successful books in this study demonstrate how girl-friendly STEM strategies can manifest in children's SF, while also satisfying feminist SF expectations, including locating women in speculative and extrapolative science situations.

Within education studies, the girl-friendly STEM movement is all about overturning the common stereotypes that reinforce male-flooded science professions. The research associated with this movement may be helpfully applied to SF for young readers here. Educational researchers have identified several girl-friendly STEM strategies for science teachers. These include recommendations to (1) Provide opportunities to be amazed, (2) Link content to prior experiences, (3) Provide first-hand experiences, (4) Encourage discussion and reflections of the social importance of science, (5) Physics appears in application-oriented contexts, (6) Relate physics to the human body, (7) Experience physics quantitatively, and (8) Engage in collaborative learning (Dare 29). None of these are inherently "girly" concepts, but all have been found to better engage girls while continuing to support boys.

Additionally, it is important that these girl-friendly strategies build on the core genre qualities of speculation and extrapolation. Deborah Underwood and Meg Hunt's *Interstellar Cinderella* (2015) serves as an example of a book that satisfies feminist and girl-friendly strategies, but falls short of speculation or extrapolation. *Interstellar Cinderella* is a particularly straightforward example of a feminist picturebook merely clothed in SF tropes, something that Mendlesohn and Hastings identify as a persistent

problem. The book presents robots, spaceships, and aliens overlaying a basic Cinderella tale. While the retelling undermines the original Cinderella story to amusing and ultimately feminist effect, it does not make any attempt at speculation or extrapolation. The story structure remains overwhelmingly fairy tale, with an underdog hero, supernatural aid, challenges, and just rewards. This Cinderella proves herself through skill instead of shoe size, and refuses marriage for a place as royal mechanic. However, the story does not produce any reflection on social or technological science—except perhaps the types of social questions that all fractured fairy tales produce. As a Cinderella tale, we have seen this plot many times over in many forms. Technology and science are not important for the story's themes, but simply serve as new stage. This book achieves half of the feminist science fiction goals. It validates Cinderella as a character with mechanical skill and goals, rather than just emotional concerns. It offers several girl-friendly strategies such as linking to prior experiences, i.e. reading other Cinderella stories, and it stresses the social importance of science by suggesting that mechanical skills make one socially desirable. Yet it falls short of locating women within the consequences of science, or scientific extrapolation. Cinderella and the reader never get to wonder if fixing the prince's spaceship will start a war or birth a new line of dangerously smart spaceships. The mechanical engineering aspect of the story is subsumed under romance.

Other examples, however, do combine girl characters with speculation/extrapolation and girl-friendly strategies, achieving super-nova success. For instance, *Zita the Spacegirl* (2010) by Ben Hatke satisfies several girl-friendly aspects in

conjunction with speculation. For one, it offers girl-friendly STEM strategy #1: the opportunity to be amazed. SF novums depend upon the unfamiliarity and amazement of exposing the reader or hero to a new world or situation. When Zita lands on another planet, the first six panels of that world serve to emphasize the wondrousness: first a panel of her dazed face asking “where...”, and then three panels of various alien close-ups that display strange faces, strange skin, and even strange socks (Hatke 18). The fourth panel, larger and slightly zoomed out, demonstrates Zita’s own awe and shock as well as the tall, intimidating alien menagerie around her (18). Finally, the sixth panel on the next page is even bigger and zooms further out to show huge aliens, robots, and a gargantuan city of strangely shaped buildings. This last panel is unframed and bleeds to the edge of the page, emphasizing the shocking size and extent of the strangeness for both Zita and reader (19). In this sequence, the format of comics panels succeeds in helping induce amazement.

Another aspect of girl-friendly science, the social importance of science, can be found in Zita’s climactic decision. This girl-friendly strategy from STEM education is the most directly linked to SF speculation, which often questions the social consequences of technology. At the story’s climax, Zita must choose whether to use a rare energy source to go home or to save an entire planet that has not been kind to her. She chooses to save them and remains lost in space. This type of choice focuses on speculation about technology, rather than hard SF extrapolation. Like many SF plots, the social importance operates on two levels: the literal society of this planet, and the general morals of using science for social good rather than for personal gain.

Another example of these traits operating well can be found in *A Wrinkle in Time: The Graphic Novel*. This book, as mentioned above, extrapolates from current understandings of physics to imagine methods of space travel and time manipulation. It does this extrapolative work while including a smart female lead character and incorporating girl-friendly qualities related to physics education. For instance, when Mrs. Which accidentally stops on a two-dimensional planet, the dialogue about how such an alteration to our physical space would feel is supported by a visual depiction (Larson and L'Engle 145). These three panels switch styles to look like depictions of sound waves, and the new text font is reminiscent of a 16-bit computer game. These panels allow the reader to glean intertextual details from the visual style in order to better grasp the concept of 2D-ness. The visual references rely on familiar concepts and metaphor to express what 2D might feel like personally, satisfying the girl-friendly STEM strategies of linking to prior experiences and relating physics to the human body.

As graphic novels, the last two examples expect a fully literate reader. There are also exceptional books that succeed at girl-friendly and speculative SF for the pre-literate and beginner reader. Ryan Sias's *Zoe and Robot: Let's Pretend!* (2011) is a picturebook/early reader crossover that features a girl protagonist. It offers readers the chance to wonder about the differences between human and robotic intelligence and what happens when the two converge. This story achieves speculation through a robot—an SF trope that has achieved popular culture and day to day familiarity. The book begins when Zoe tries to play pretend with Robot, who explains “ROBOTS DO NOT KNOW HOW TO PRETEND” and later, upon failing, concludes “ROBOT CAN NOT PRETEND”

(Sias np). The conflict circles around Zoe wanting the robot to learn how to pretend, and it insisting that robots do not or cannot pretend. For children, the speculation here concerns what robots are capable of doing and how much they can be like us. For an advanced reader, the speculation may actually concern what a child's openness and creative persistence could do to the development of AI.

A skeptical reader might protest that this book falls short of my Hastings test for speculation/extrapolation, since Robot could be replaced by a child who is resistant or feels insecure about playing pretend. However, what is key to this book is that Robot makes it an issue of his entire race when he states “*ROBOTS DO NOT KNOW HOW TO PRETEND*” (np, emphasis mine). Shifting this single word to the plural changes the entire story from a narrative about one robot's abilities to the inherent abilities of an entire line of robots. After all, if this robot can learn to pretend, then the implication is that all similar robots by extension can do the same. The speculation generated here asks what else they might learn to do. The story hinges on Robot's ability to learn a human trait that had separated it from Zoe at the start. At the very end, Robot initiates the next round of pretend, potentially implying that it may be good at pretend or excel more quickly than Zoe. This echoes a common speculative concern in SF stories about what happens when robots learn a trait that was previously exclusive to humanity—and then surpass humans at it.

Zoe's actions in this book reflect the problem-solving attitude of engineering, and follow several girl-friendly strategies. The entire story takes place in a generic middle-class living room, with familiar toys and items all in the service of a common game:

pretend. The whole setting satisfies STEM strategy #2: linking STEM to prior experiences. Zoe's solutions are tangible and use familiar tools. At the start, Robot refutes Zoe's pillow-mountain by insisting that "ROBOT DOES NOT SEE A MOUNTAIN" (np). Zoe, in turn, enacts some creative engineering by painting mountains on the bottom of goggles—beginning the process of Robot learning to compromise between reality and pretend.

This book may seem simplistic; it is just that. Sias uses minimal words, effective pictures, SF intertext, and the most straightforward of girl-friendly STEM strategies. If this simple book can accomplish these goals, then any picturebook or early reader has the potential to achieve the same SF successes. Overall, these examples demonstrate that girl-friendly, feminist children's books that satisfy the expectations of speculation/extrapolation are possible. When these exceptional cases have paved the path toward letting girls into the club, we can reasonably hold all children's SF up to the expectation that it will demonstrate gender equality.

Diversity in SF

In terms of diversity, 30.05% of these books included non-mainstream representations of diversity within pictures or plots. This total is higher than average, ringing in at 19 percentage points higher than the overall rates for children's literature: "of the 1183 books published so far in 2013 about human beings, 124 of those books feature people of color. That's 10.48%" (Horning np). While still not ideal, this result reveals the potential of diverse children's SF.

Within this sample's diversity, painted faces stories occurred more often than culturally rich stories, accounting for 28.17% of the 30.05%. Graphic novels led the

formats with 50% painted faces, followed by comic books with 41.18%. The middle grade hybrids (25%), early readers (24%), and picturebooks (23.70%) were all in the same range with about a quarter achieving painted faces diversity. Of the 213 books, only 4 were culturally rich. There were no culturally rich early readers and comic books at all, while picturebooks and graphic novels each had one culturally rich title (0.74%, 4.17%). Middle grade hybrids achieved 2, for 16.67% of the total category.

As mentioned in chapter 3, the mere inclusion of diverse-looking characters is a political move to include non-mainstream identities in the future and science. Similarly, Isaiah Lavender III offers ethnoscares as a specific type of Afrofuturist criticism. Lavender explains that “reading an ethnoscape” is a specific use of cognitive estrangement that functions by “bringing the language of one world, the fictional world, into collision with the language, experience, and perception of an extratextual reality in which race functions as a technology of oppression” (197). Like SF’s common use of cognitive estrangement, the ethnoscape is made strange by the racial “ideas and histories that the text uses, defines, discards, renovates, and invents” (189). The most unique aspect of this approach is that it is not necessarily dependent upon the intentions of the author, but rather how the reader perceives the ethnoscape. One can read an ethnoscape in any type of SF, by looking for “an alternative image that enables us to rethink the intersections of technology and race as well as their political, social, and cultural implications” (189).

Ethnoscares within children’s literature can be as simple as looking for painted faces representation as a validation of people of color within science. In one such

example, Brian Pinkney's *Cosmo and the Robot* (2000), the picturebook tells the story of a family of scientists and a dysfunctional robot on Mars. Their nationality or ethnicity is undefined, but their skin color is clearly not portrayed as white. This book qualifies as painted faces, as the storyline follows Cosmo and his sister's adventures with the robot without any mention or significance given to their race. Despite—and perhaps due to—their skin color not affecting the plotline, Pinkney's illustrations normalize scientists of color and allow children of color to see themselves as potential space explorers and settlers. Pinkney's choice serves to imagine an ethnoscape wherein the scientists' skin color is not even worth mentioning, implying that in this fictional world people of color are recognized and valued in a space program—in direct opposition to the cultural history of erasing the contributions of racial minorities that still haunts contemporary space programs.

By opposition, *The Worst Band in the Universe* (1999) by Graeme Base is full of blatant cultural references and nods to African American culture and musical traditions, but Base conveniently obscures the race of his protagonists by portraying them as green and yellow aliens. The plot of this picturebook takes place in an alien world that, harkening to jazz's defiant history, praises pre-written traditional songs and considers the writing or improvising of music to be heresy. The leader of the banished musical criminals is named Skat and portrayed like a yellow anthropomorphic cat alien, referencing both scat singing and the colloquial “cool cat” label popularized by black musicians like Cab Calloway. The plot and storyline are culturally charged, but utterly undermined by depiction as aliens—what Mendlesohn calls “an easy way to avoid

deciding on the colour skin your fictive characters should have” (240-241). Given the history of white musicians co-opting African American musical styles and even directly stealing songs, it is not safe to simply assume that these aliens are a straightforward representation of African American musicians. The illustrations deny that connection, functioning to extend the technology of oppression rather than propose an ethnoscape to question it. In this case, the inclusion of cultural content did nothing to represent and support readers of color due to the lack of literal depictions.

Painted faces illustration is easy to achieve, especially in books with large casts of characters or crowds of people. Culturally rich narratives, however, are far less common. The act of world building in speculative fiction often erases our own cultures. Books that include our realistic world at all, though, should also include the cultural richness of reality. One successful example of this occurs in Adam Rex’s middle grade hybrid, *The True Meaning of Smekday* (2007), discussed below. On the other hand, books that depict entirely alien or alternate worlds often reflect mainstream culture, albeit in a futuristic guise. There is no reason not to include non-mainstream culture, too, as in Cathy Camper and Raúl the Third’s graphic novel *Lowriders in Space* (2014). This alternate version of our world is populated by humanoid animals rather than people, but instead of avoiding the need to assign racial traits to the protagonists, this story’s animals are portrayed as Mexican American. Their word balloons are peppered with Spanish words and phrases. The final pages of the book include a glossary of “Mexican-American slang, car, and astronomy terms” (57). Putting these three categories together in one glossary equates them, making cultural slang and car jargon just as important as astronomy, which tends to

be given more mainstream value. Likewise, the mere existence of Spanish language in an SF context locates many Spanish-speaking Latinx people in the future, fulfilling the most basic goals of alternative futurisms.

This book goes beyond painted faces to cultural richness since the cultural context is integral to the story. Building lowrider cars, the author's note explains, is a Mexican-American tradition that began in post-World War II Southern California. This story purposefully brings an uncommonly recognized version of science and engineering into the SF spotlight. The author's note explains that "This book was written to celebrate the artistry, inventiveness, mechanical aptitude, resilience, and humor that are all part of lowrider culture" (57). The mention of "inventiveness" and "mechanical aptitude" especially make it clear that lowrider modifications are scientific, engineering endeavors. Yet these modifications are culturally associated with "ghettos" and low-income hobbyists, excluding them from most valued engineering activities. This book forces the recognition that cars are complex machines and their modifications can be extrapolated into the future just like any other engineering endeavor.

The concept of *rasquachismo* from Latin@futurism criticism applies well to this story. According to Tomás Ybarra-Frausto, *rasquachismo* refers to a sensibility rather than a style. He explains that it is a culturally and community-acquired sensibility about "making do with what you have" (np). Creating lowriders from bits and pieces, he notes, is a prime example of *rasquache* art. Furthermore, the plot of *Lowriders in Space* is not concerned with hard scientific explanations of the car's components. Many are richly wondrous and poetic rather than scientifically accurate—such as catching the entire

Pleiades star cluster and using it for a steering wheel—but this too is culturally grounded. Merla-Watson explains that “Latin@futurist texts often blend speculative genres, such as sci-fi, fantasy, horror, whereby they create new, hybrid forms reflective of cultural mestizaje” (np). Several modifications to the car look like the magic of fantasy rather than the science of SF, because this entire distinction is rejected by Latin@futurism. In fact, the mixture of realistic and unrealistic modifications in *Lowriders in Space* creates rasquachismo in microcosm: a cosmic lowrider crafted from both engineering and magic. Considering Attebery’s fuzzy sets, the story sits comfortably on the border of fantasy and science fiction, recalling Merla-Watson’s point that Latin@futurism revolves around representation of borders. *Lowriders in Space* belongs in this dissertation’s discussion of SF not despite these fantastic elements, but because of them. I could argue why it belongs more in the SF fuzzy set, but it is ultimately more important that it welcomes Latinx children into Latin@futurism’s versions of SF, through a familiar sensibility of rasquachismo and the sheer inclusion and valuing of Latinx futures.

Lowriders in Space is one of two books in the sample to feature Spanish, accounting for just under 1% of the sample. Compared to the 5% of children’s literature that depicts Latinx characters, according to the CCBC statistics for 2016, this is disappointing. Even worse, the other book, Judy Schachner’s *Skippyjon Jones: Lost in Spice*, includes Spanish-English sing-song nonsense words without any specific Latinx context, positioning it as stereotype rather than positive representation.

While diversity may be the least successful category for this sample of books, the stellar examples covered above prove its potential and possibility. Painted faces

representation is as easy as altering the illustrations to include non-mainstream identities, but even this simple act can make a world of difference for children looking for a character like them in the context of SF and science. In future studies, this concept can and should be extended past the categories of race and culture to include representations of disability and more. Culturally rich diversity requires more work on the part of the author, but is hardly impossible. All SF stories inherently reflect some bits of modern culture, and shifting those to a non-mainstream culture adds a meaningful message about which cultures are included in scientific dialogue of the future, and whose science counts. This diversity goal is worth more effort, and reveals an important area of improvement for children's SF.

All Together Now

Separately examining the criteria of speculation/extrapolation, the presence of females, and diversity above provides a detailed view of each. However, the history of each criteria as reported in chapters 2 and 3 indicates that these ideas have been frequently connected. As demonstrated within the girl-friendly section above, in some ways evaluating these criteria requires looking at them together. In order to take a fine-tuned look at how these three criteria interact, I constructed a simple correlation matrix (see table 4.2). Within the mixed methods and interdisciplinary context of this study, conducting correlation analysis is useful to reveal more information from this book sample about how the different criteria relate to each other.

The results demonstrate that the speculation/extrapolation variable has a very weak bivariate relationship with the female characters variable ($r=0.16227$), but it is statistically significant from zero ($F(1,211)=5.706$, $p=0.01779$). Speculation/extrapolation

also has a very weak relationship with diversity ($r=0.07867$) that is not statistically significant ($F(1, 211)=1.314, p=0.253$). The criteria for females and diversity have the strongest—if still relatively weak—relationship with each other ($r=0.2968$), and strong statistical significance ($F(1,211)=20.383, p=<0.001$).

Table 4.2
Correlation probability matrix for book sample

		Speculation/Extrapolation	Females
Pearson Correlation	Speculation/Extrapolation		
	Females	0.16227	
	Diversity	0.07867	0.2968
Significance	Speculation/Extrapolation		
	Females	0.01779	
	Diversity	0.253	0.00001
F-value	Speculation/Extrapolation		
	Females	5.706	
	Diversity	1.314	20.383

df=(1, 211)

Books that met the female and diversity criteria were most likely to overlap, whereas the speculation/extrapolation only seemed to be slightly correlated with the criteria for female characters and not with diversity at all. This result indicates that female and diverse protagonists are likely to appear together in books, perhaps due to situations wherein the author/illustrator conscientiously makes a choice toward inclusiveness. Meanwhile, the lack of a strong relationship between extrapolation/speculation and the other two criteria is problematic, as it is important to align these underrepresented groups with the best of children's SF as represented by the truly extrapolative/speculative books.

When considering the speculation/extrapolation, girl-friendliness, and diversity on the level of individual books, 33 (15.5%) of the books individually succeeded on all three

fronts while 39 (18.31%) did not meet any of the three criteria. The majority of the books fell in the middle, meeting one (84, 39.44%) or two of the criteria (57, 26.76%). See table 3 for a breakdown by format.

Table 4.3

Individual books by category and how many of the three criteria they met.

Format	None	1 out of 3	2 out of 3	All Three
Picturebooks (<i>n</i> =135)	31 (22.96%)	60 (44.44%)	32 (23.70%)	12 (8.89%)
Early Readers (<i>n</i> =25)	6 (24.00%)	11 (44.00%)	6 (24.00%)	2 (8.00%)
Comic Books (<i>n</i> =17)	1 (5.88%)	6 (35.29%)	6 (35.29%)	4 (23.53%)
Graphic Novels (<i>n</i> =24)	0 (0.00%)	5 (20.83%)	8 (33.33%)	11 (45.83%)
Middle Grade Hybrids (<i>n</i> =12)	1 (8.33%)	2 (16.67%)	5 (41.67%)	4 (33.33%)
Total (<i>n</i> =213)	39 (18.31%)	84 (39.44%)	57 (26.76%)	33 (15.50%)

If we compare by percentages to try to bypass the different sample size of each format, graphic novels impress with the highest percentage (45.83%) of individual books meeting all three criteria and zero books that had absolutely none. Considering this alongside the category's impressive results for each of the criteria (see table 4.1), graphic novels generally outperformed all the other formats in this sample—a strong recommendation for future partnerships between SF and graphic novels for children.

Middle grade hybrids (33.33%) and comic books (23.53%) follow behind the graphic novels, straddling the one quarter mark for books with all three criteria. Both formats also had only one title without any of the criteria, for less than 10% of the

category. Unfortunately, picturebooks and early readers reverse this success, with under 10% of the books each category meeting all three criteria, while 24% of early readers and 22.96% of picturebooks met none of the criteria. As the shortest and smallest formats, these two categories' results seem to reflect the same concern for space discussed above, though it is a poor excuse since including female protagonists and painted faces diversity takes up little to no narrative space.

Since individual books that achieved all three criteria were rarer than those that met one or several of the three measures separately, these books deserve a deeper look as exemplary cases of children's science fiction. Below I offer in-depth looks at a comic book, Marvel Comics' *Moon Girl and Devil Dinosaur: BFF* (2016) and a middle grade hybrid, Adam Rex's *The True Meaning of Smekday* (2007).

Nested Case 1: Moon Girl and Devil Dinosaur: BFF

Marvel's relatively new superhero, Moon Girl, offers a radical new direction for children's science fiction. With a 9-year-old protagonist, this series invites young readers to revel in a young hero's inventions and love for science alongside the usual adventures and fun of the Marvel Universe. The best part, however, is depicted quietly in the illustrations, without comment in the words: Lunella (code name Moon Girl) is a young African American girl. On top of that, she is not simply smart. Marvel announced at the July 2016 San Diego ComicCon that Moon Girl is now the number one smartest hero in their entire Marvel Universe, beating out the likes of Reed Richards, Tony Stark, Bruce Banner, Hank McCoy and the other generally white, male, adult geniuses that have vied for the title.

Moon Girl also offers complex intersectionality between race, age, and gender.

Lunella functions as a mirror for African Americans, girls, and young people interested in science, and offers them a place in the future and science fictional superhero adventure stories. Her identities also fuel some of her conflicts. During the events of volume 4, Lunella comes head to head with the Hulk, and calls out his battle with Devil Dinosaur as a “macho slugfest. It’s certainly not very smart...or safe...or even efficient...but definitely, definitely not smart” (np). That Lunella calls out the fight as “macho” strongly indicates a gendered commentary—both the Hulk and Devil Dinosaur are portrayed as male. Lunella’s commentary undermines their supposed combination of smarts and strength, questioning whether these qualities can actually function together. While the story elsewhere offers extrapolation on bio-warfare and other technologies, in this moment it focuses on speculation about the use of intelligence for violence. Marvel often depicts its smart men getting into fights and then using their intelligence to bolster their strength through mutations or inventions. The Hulk is a potent example, as he uses his genius to physically alter himself to greater strength and size, but his transformation is triggered by anger, a decidedly “macho” emotion.

Yet this ability to use intelligence for strength is depicted as off limits to Lunella because she is a girl. In this scene, Lunella shouts and tries to stop the fight—a play on the usual background female in superhero fights who weeps and wails helplessly while her hero and the villain duke it out. When Lunella decides to enter the fray, she wields a homemade electric gun and punching device. Despite her direct punch to Hulk’s face, the fight stops only because Devil Dinosaur uses his tail to protect and block her while the

Hulk laughs it off. Like the usual smart Marvel hero, Lunella tried to enter the fight with strength from her intelligent inventions, but was denied access by both her ally and her enemy. In this moment, Lunella's age intersects unhelpfully with her gender. The Hulk's laughter echoes cultural expectations that she is young and female, and therefore not capable of fighting. Devil Dinosaur's protective reaction sends the same message. Being perceived as innocent is a historical triumph for black-skinned children, who, as demonstrated in Robin Bernstein's *Racial Innocence: Performing American Childhood from Slavery to Civil Rights*, have not always received the benefit of childhood innocence. At the same time, this innocence is a defeat. The Hulk and Devil Dinosaur both indicate that this not an acceptable avenue for her intelligence, because she is young and female.

Lunella's attempt to intervene backfires by allowing the Hulk to deliver a final punch and stand triumphant and cocky over the dinosaur. Yet the authors have already developed empathy for Lunella at this point, and the Hulk—despite being a long-time hero in the Marvel universe—is not to be cheered here. The narrative sets him up to look like a jerk. When he returns to his human shape and lectures Lunella about being too young to have a valid part to play, the audience is encouraged to resist him and support Lunella. It is clear that gender and age are working against Lunella in her world—in a clear reflection of our society—but the writers ask the reader to be frustrated along with her in the face of these pressures. It is significant that this obstacle for Lunella is presented by a known and loved hero, and not by a villain. Children who encounter laughter or incredulity about their interest in sciences, for instance, can expect it to come

from trusted and loved ones. It is good to see a model that even heroes are sometimes limited in their perspective, and resilience is worthwhile.

Overall, Moon Girl's intersecting identities provide a chance for representation and for more young readers to see themselves in the expansive Marvel Universe. At the same time, her intersecting identities are not passive tokens of diversity, as they offer a productive way to speculate about how identities operate in the fictional world, as well as in our own.

Nested Case 2: The True Meaning of Smekday

Adam Rex's *The True Meaning of Smekday* relies on the common metaphors associated with alien invasion SF but couples them with real racial diversity and cultural richness. SF narratives often speculate about our alien encounters through allusions to colonial conquest, and *The True Meaning of Smekday* follows suit. The behavior of the first alien race to invade, the Boov, runs clearly parallel with the United States' history of behavior toward Native Americans. In their first broadcast, the Boov declare:

- A. The Boov had discovered this planet, so it was of course rightly theirs.
- B. It was their Grand Destiny to colonize new worlds, they *needed* to, so there really wasn't anything they could do about that. (Rex 60, emphasis in original)

The parallels do not stop with this nod to Columbus's "discovery" and the concept of Manifest Destiny. The leading Boov captain, Smek, calls humans "the Noble Savages of Earth" and declares: "I generously grant you Human Preserves—gifts of land that will be for humans forever, never to be taken away again, now" (63). Each region has its own preserve, and "Americans were given Florida. One state for three hundred

million people” (64). Of course, later on, Boovs decide they like oranges, take back Florida, and re-relocate humans to Arizona. The allegory is unmistakable, and intended to replicate and reinforce the American Indian cultural experience of diaspora through a familiar emotion for young readers: “it’s not fair!” In many SF novels—even for adults—this sort of allegorical sympathy for the colonized is often the extent of the diversity.

Adam Rex goes beyond to include real diversity and multiculturalism. After all, the story takes place in our contemporary reality before the invasion event. The protagonist, Gratuity Tucci, just so happens to be biracial. This is not played up as important, but rather depicted as matter-of-factly normal. Since Gratuity is the narrator as well, she does not bother to describe herself. In fact, her race is not mentioned directly for quite some time—though readers may notice her dark skin in Rex’s frequent polaroid picture illustrations, which start on the dedication page. Eventually, though, Gratuity’s gender and race begin to leave a small trail of micro-aggressions throughout the plot. For instance, the small refugee population of boys hiding under Happy Mouse Kingdom reject her outright just for being a girl, despite the life or death scenario. Similarly, when Gratuity tries to find her mother through the Bureau of Missing Persons, the worker’s assumption that her mother is also dark-skinned completely undermines the search and needlessly extends their separation. Gratuity’s identities are not always center-stage, but they realistically flavor and influence her path through this post-apocalyptic landscape.

Rex makes another, potentially more significant, move toward cultural richness by not stopping at allegorical references to Native American diaspora. In all 213 books in this study, only *The True Meaning of Smekday* clearly features a Native American

character, which is 0.47% of this sample. Comparatively, Native Americans/First Nations characters featured in 2% of the 3,400 children's books counted by the CCBC in 2016. Increasing this low representation is always important, but even more so in the presence of such keenly Native American themes.

The character is named Chief Shouting Bear. Gratuity calls him Chief, but we later learn his real name is Frank. His parodic fake name, like much of his depiction, turns out to be part of the novel's prejudice theme. Gratuity's initial description of him reads: "He otherwise wore the same clothes as anybody else—no buckskin or beads or anything. I'm probably an idiot for even mentioning that" (Rex 252). This moment shows Gratuity becoming aware of her own prejudices and rejecting them mid-narration, setting a model for young readers of all backgrounds to deal with stereotypes. Throughout the story, prejudice is depicted as coming from people—or aliens—in power, but also being exchanged between victims. For example, Chief's hospital roommate Mr. Hinkel "thinks Indians like me ought to live somewhere else" but Mr. Hinkel is in the hospital because he "got beat up pretty good by someone who thinks gay people like *him* ought to live somewhere else" (321-322, emphasis in original). Small moments like this offer the reader the chance to compare the story's speculative inter-species prejudices to a variety of real-world prejudices.

Chief also undermines and points out the archaic stereotypes that often freeze natives in old colonial depictions. Gratuity finds Chief running a junkyard in Roswell, hiding alien livestock and an alien spaceship under the guise of an obviously fake spaceship. Chief actively uses the community's social assumptions to hide these artifacts:

“I played the crazy Indian bit to the hilt” (Rex 326). He forces the prejudices leveled against him to work for his benefit, and in doing so makes a place for himself in the future. He is the only adult with competence in futuristic alien technology. Chief has taken good care of the ship’s most delicate working parts and even got the ship flying once. Once the invasion hits, he continues to investigate alien technology and captures the one alien tool essential to the story’s resolution. His competence is not because he is particularly capable of understanding alien things—which would court the “magical native” trope—but simply because he has worked for his understanding. It also helps that he is not panicking. The other adults depicted in the story are busy struggling to accept their new reality, bordering on mania as they try to force things to continue resembling “normal.” Meanwhile Chief accepts the invasion due to both his long knowledge of aliens and his Diné identity. The parallels to Native American history are not lost on him. He perceives the aliens’ treatment of humans through generations of cultural mistreatment, as opposed to a new experience. For him, it is more of the same. Chief’s depiction does not necessarily qualify the book as Indigenous Futurism, but it productively locates a native person in the future and allows reading an ethnoscape of Native American identity in the larger story, without allowing stereotypes to stand.

Without *Gratuity*, this SF tale would have sent yet another message that the normal world before invasion is best represented by white or male protagonists. Without Chief, *The True Meaning of Smekday* would have told a Native American theme while erasing the real people. Adam Rex incorporates a female character, painted faces diversity, speculative content. He manages to keep the tone of this story goofy while

using cultural richness to tackle real problems, indicating that others can do it too.

Conclusion

This chapter reveals that children's science fiction already has many resounding successes, and those books that show a need for improvement have working models and potential to improve. As the last section shows, the criteria of speculation/extrapolation, girl-friendliness, and diversity can intersect for stronger books overall. Like any genre, children's science fiction has strengths and weaknesses, but overall deserves development and attention in the name of producing more beautifully successful books, like those examined here.

Chapter 5: The SF Readers

This chapter presents the results from Phase II's three data sources: the survey of librarians and teachers, the library circulation data, and the recorded read-aloud sessions. The chapter begins with the survey data. This starting point offers perceptions about children's SF as held by professionals in the US, Canada, and Australia, and how those adults are construing, influencing, and mediating the relationships between children and SF books. Then, the chapter moves to library circulation data for a more direct picture of children's interactions with genre texts including SF. By examining which genres children in two elementary schools checked out over one year, we can compare actual genre circulation with less influence from opinions and biases. The chapter concludes by narrowing in on a few children in recorded read-alouds. These readings capture how children interact with SF in more direct way than the survey and a more nuanced way than can be deduced from the broader circulation data. Overall, this chapter's results operate like a funnel, going from a wide, once-removed perspective on children's SF reading to a broad, concrete snapshot and finally to a narrow, specific view.

Librarian and Teacher Survey Data

The digital survey results offer a glimpse into how SF is being actively used and supported in classrooms and libraries. The resounding tone of the survey responses below falls along the lines of "Science fiction is important, just like everything else!" In stark contrast to scholars who dismiss or single out children's SF as problematic, these professionals insist that SF is equal to, if perhaps less proliferous than other genres. This is not to say that the survey results show no specific benefits or problems with SF, just

that the respondents repeatedly described SF as a peer of other genres. When explicitly prompted to consider the specific strengths and weaknesses of SF, the responders overall describe children's SF as funnier than mature SF, full of hope, and a great recommendation for kids interested in science and speculation. Respondents also describe SF as a genre that offers great benefits for individual students, but not groups of children. Because each question had 52-59 responses, throughout the following discussion I provide percentages to assist with comparison.

SF Among Many Genres

Many of the responses state that these professionals use and treat science fiction like any other genre of literature. For instance, when asked what, if any, differences exist between children's SF and YA or adult versions of SF, many describe differences that would be the same between children's and YA/adult books, regardless of genre. Out of 59 respondents, 12 (20.34%) mention relying upon the protagonist's age to estimate an age range for readers. Others find the biggest differences to be in reading level (3, 5.08%) and vocabulary (5, 8.47%). The most common response, with 29 (49.15%) respondents, describes a difference in terms of child-appropriate content: no sex or violence and low levels of horror and gore.

Similarly, the respondents report using normal, non-genre specific procedures to work with SF. In response to the question of how they identify potential SF readers, 30 out of 50 respondents (60.00%) indicated that they simply ask or observe what children like. This is not a surprising result, as reference interviews and reader's advisory services are significant to libraries. For teachers, the educational practice of "book whispering" is

a similar concept, if considered less essential to classroom instruction—see Donalyn Miller’s *The Book Whisperer*. Both practices are built around observing or asking each child individually about their interests and favorite books in order to recommend further similar reading or to find ways to bridge to new areas of potential interest. It is not genre specific.

When asked how they recommend science fiction, most respondents also evoke common practices. Many indicated that they market SF books to children through book talks, another core service of libraries and especially school librarians. 4 (8.00%) specifically mention book talks by name, while others mention the items traditionally included in book talks: plot descriptions (15, 30.00%), character (8, 16.00%), theme (2, 4.00%), and setting (3, 6.00%). One of the most popular methods, it seems, is simply to act excited about the book with the expectation that the enthusiasm will catch on. 13 respondents (26.00%) mention excitement, and their explanations make it clear that this strategy is not specific to SF books.

Others do not pay much attention to the SF genre label, with 5 (8.93%) stating that they choose books for other reasons like humor and that these books just happen to sometimes be SF. Also, 5 (8.93%) say that they use SF in their classes and activities as part of exposing children to all genres as part of general literacy, without any specific emphasis on SF. 3 respondents (5.36%) write that they had not thought about using SF in lessons or activities before at all, but might now that the survey brought it to mind. In response to the question “Why do you choose to use or not use science fiction books in lessons or activities?” one respondent wrote, “Interesting, I never realized that deficiency

before!” The survey itself, for this respondent, was the inspiration for her to describe SF in her classroom/library as a “deficiency.” Instead of answering the question directly, she wrote in her own surprise at her answer.

In response to the question about why SF is or isn’t important to introduce children to, nearly half of the respondents similarly situate SF as one among many important genres. Out of 50 responses, 21 (42.00%) firmly state that it is important for elementary school age children to read SF, because they feel it equally important to expose children to all genres. 13 respondents (26.00%) specify that anything that gets children interested in reading is worthwhile, while another 2 (4.00%) mention vocabulary benefits of wide reading. Another 4 (8.00%) explain that all fiction genres are important for developing empathy, including SF.

The determination to hold SF as an equal genre among many can be seen best when respondents were asked to compare the importance of reading SF to each other major genre (see figure 5.1 and table 5.1). For most genres, over 80% of respondents chose the “Same” option. Only for Informational Texts/Nonfiction did less than 80% select “Same,” but the number was still over 50% (32, 61.54%). Informational Texts/Nonfiction received the highest number of votes as more important than SF, with 18 respondents (34.62%). Historical Fiction and Contemporary Realistic Fiction are considered more important by 6 (11.54%) and 9 (17.31%), respectively. Fantasy is very close to SF across the board, with only 3 people (5.88%) ranking it as more important than SF, and 0 ranking it as less important! In total, no genre was ranked as less important than SF by any more than 5% of respondents. This small skew indicates that

SF may be considered as one among many important genres, but when forced into comparison it is more likely to come out as less important than more important.

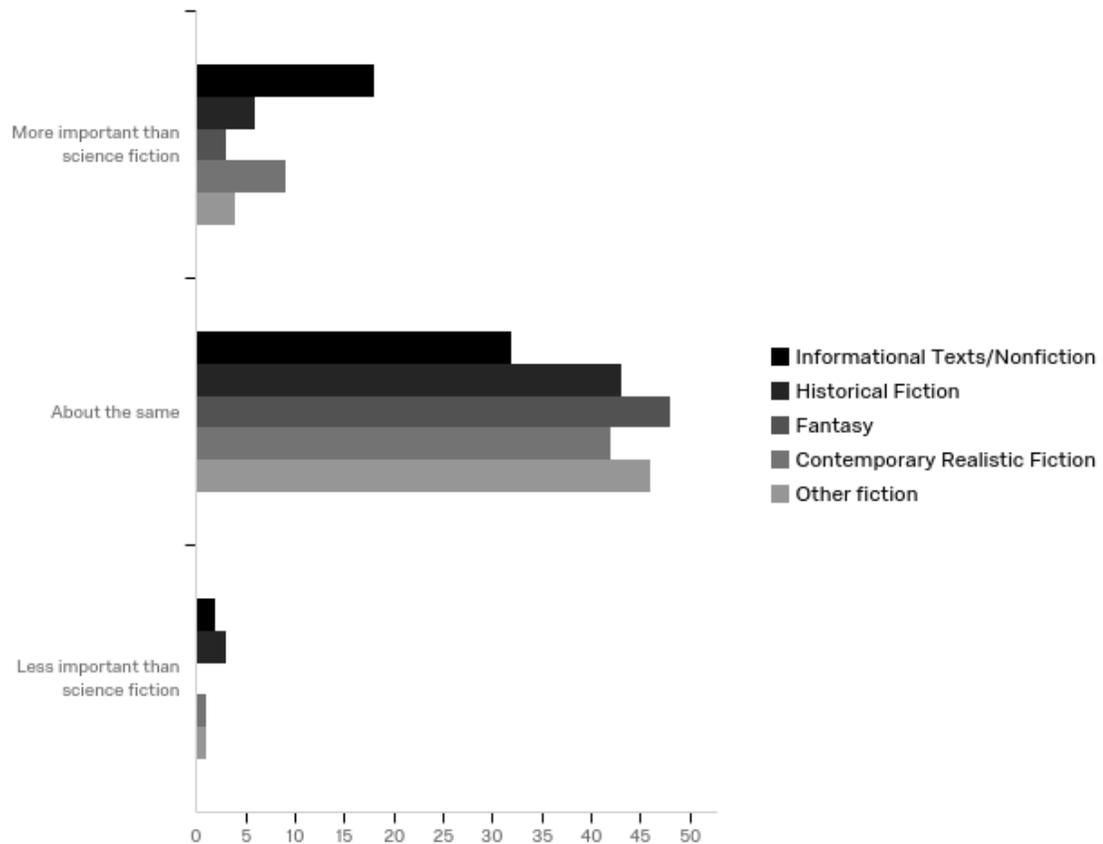


Figure 5.3. Survey answers to question: Compared to the genres listed below, how important is it to expose children to science fiction?

Of those who chose to explain why SF is not as important for children to read, 2 (4.00%) cite the fact that the genre is not on standard tests, and another 2 complain that it is too sparse to use effectively. 3 respondents (5.36%) say that they do not use SF in their activities because they are unfamiliar with it themselves. Meanwhile, 1 individual (2.00%) explains that she values realistic fiction more, because “I see more immediate

need for students to see themselves mirrored in texts and to learn about others who are different from themselves.” This response implies that children cannot see themselves and others as clearly in fantastic stories, and may explain why the realistic stories were chosen as more important than SF while Fantasy did not receive as much differentiation.

Table 5.1

Survey answers to question: Compared to the genres listed below, how important is it to expose children to science fiction?

Genre	More important than SF	Same	Less important than SF	Total Responses
Other	4 7.84%	46 90.20%	1 1.96%	51
Informational /Nonfiction	18 34.62%	32 61.54%	2 3.85%	52
Historical Fiction	6 11.54%	43 82.69%	3 5.77%	52
Fantasy	3 5.88%	48 94.12%	0 0.00%	51
Contemporary Realistic Fiction	9 17.31%	42 80.77%	1 1.92%	52

SF Peculiarities

Despite the emphasis on SF as equivalent to other genres, the survey results also include several enlightening comments about the unique benefits and drawbacks of this genre for children. More than half of the respondents (63.80%) report that they recommend SF to their readers most of the time or often. When answering how they identify potentially interested readers, some respondents rely on core examples of the genre, like Attebery’s fuzzy sets. 7 respondents (14.00%) explain that they often use children’s affinity for common SF tropes like robots and spaceships to determine who

may like SF, while 6 (12.00%) use STEM interests as a reason for recommending SF.

Another 4 (8.00%) make connections to SF based on a reader's enjoyment of other core texts across media, with *Star Wars* being a commonly cited example. When trying to convince potential readers to take the books, 18 respondents (36.00%), say that they draw the child's attention to a book's similarity to that child's previous favorites, with 5 of these respondents (10.00%) drawing comparisons to the child's previous enjoyment of SF tropes and 3 (6.00%) making connections to other core genre texts—often, again, *Star Wars*.

Of particular interest, 3 (6.00%) of the respondents say that they identify readers who may like SF through their interest in speculation; they look for children who like “scientific subjects but are looking for something more than just information on these types of subjects.” The phrase “more than just information” is a great way to describe speculation and the exploration and broadening it implies. When trying to convince potential readers to take the books, 4 respondents (8.00%) report talking up the technological and speculative innovations of the books.

One popular trend among the ways that the respondents recommend the books is the word “adventure,” with 11 respondents (22.00%) reporting this as a successful tactic for making an SF book sound appealing. This calls back to A. Waller Hastings' concern that in much children's SF, “the trappings of the science fiction novel are used to frame a rather conventional story of adventure and active imagination” (207). Scholars of postcolonial SF, including Afrofuturism and Indigenous Futurisms, have also exhibited concern that adventure or action-oriented SF is often the most prone to colonial and

subjugating narratives of encountering and removing the threat of the Other. In the context of these critical concerns, this trend in the survey was disturbing.

Gender concerns were less apparent, with only one respondent bringing it up. This one respondent mentions that “if the book has female characters, I point that out to girl readers.” Beginning with “if” poignantly indicates this librarian’s awareness that much SF does not include a female character. Given the feminist slant of this study, this particular answer was fascinating as an indication that the presence or absence of girls in children’s SF is important on the ground and not just in theory. However, having more than one response of this type would have been helpful to make this argument stronger.

The most popular (15, 30.00%) reason for singling out SF as an important genre for children to read is the idea that it could expand a child’s mind by encouraging imagination and out-of-the-box thinking. 4 responses (8.00%) specify that SF books encourage critical thinking, both in terms of what is realistic in fiction and in terms of real-world applications. One respondent states:

...it exposes them to other possibilities and makes them think about the future of their world. It might make them question the current or historical practices or actions of our society or race, and where those actions might lead us in the future. It will make them wonder about technology - the possibilities and the pitfalls. It's a fantastic way to express a feeling about something that is currently happening or happened in the past, since sci-fi plots sometimes parallel real events and consequences. They can make kids think about their own values, whether they would be able to survive, make the right decisions, be brave, etc., if put in a

similar situation.

This response also rings of speculation, with phrases like “think about the future” and “wonder about technology” harkening back to the most traditionally valued qualities of SF. 10 (20.00%) of the respondents mention that SF is particularly valuable as a source and inspiration for speculation and extrapolation about the future, citing the cases in which SF has predicted scientific innovations: “Many ideas that were once considered science fiction generations passed are now realities of today. Before something can be created it must first be imagined!” 8 respondents (16.00%) indicate that SF may encourage an interest in STEM classes and careers, with one (2.00%) specifically mentioning the potential for girl-friendly SF to inspire girls in STEM.

In an interesting contrast, 3 respondents (6.00%) claim that the genre is helpful for offering escapism—a concept that is often negative and accused of helping readers avoid reality to an unhealthy degree. However, these teachers and librarians invoke a positive use: “Science fiction can be a great escape for children. [...] Also, children can relate to the main characters in science fiction and then come out comforted that if the book character could face the uncertain technological future, then so can they.” This response portrays escapism in Tolkien’s sense of “Recovery, Escape, Consolation”: fantastic stories may offer escape, but only in the name of returning to the real world refreshed and better equipped for reality (145).

Similarly, some respondents describe a tone or attitude in children’s SF that trends toward lighthearted, humorous, and hopeful. When asked to identify any differences between children’s SF and YA or adult examples of the genre, 4 respondents

(6.78%) find children's SF to be hopeful, whereas 5 respondents (8.47%) say that YA SF tends toward a darker tone. Similarly, 5 (8.47%) explain that YA and adult SF is more often dystopian than children's SF. 3 (5.08%) also claim that humor is more important and common to children's SF than to YA or adult SF. Children's SF is described as being about adventure and friendship by 3 (5.08%) while romance is attributed to YA and adult SF by 6 respondents (10.17%).

Despite all this praise, fewer respondents report using SF in lessons and activities, with less than half (34.49%) of the respondents professing to use the genre most of the time or often in their activities or lessons. Of those that do, 8 respondents (14.29%) say that they use SF in activities because of the genre's ability to inspire critical thinking skills. These responses focus on encouraging children to think through possibilities and engage their imaginations to analyze real science and society. One respondent writes: "I think it is an excellent way to explore human nature in an engaging and interesting way." Other responses reference the STEM practices of creating a hypothesis and problem-solving: "I often find sci-fi books to be very rich mentor texts that can inspire students to wonder, make predictions, ask questions, and learn more. When a child reads about an idea that is just beyond what is known, it pushes them to think bigger." A total of 6 responses (10.71%) mention science lessons specifically, and one (1.79%) even mentions history lessons. Only 1 respondent (1.79%) demonstrates concern that SF in lessons may "lead students to believe misperceptions" and another (1.79%) admits frankly that the genre is not on achievement tests and therefore not prioritized.

On Complexity/Difficulty

On the whole, the responses show a paradoxical portrayal of children's SF as both simple and complex. 18 respondents (30.51%) find that children's and YA SF differ in terms of complexity, with children's SF offering simpler themes, plot, characters, and ethical dilemmas. 5 respondents (8.47%) note that YA and adult SF have more complex science concepts. One respondent seems to believe that adult and YA SF have the same level of science explanation, but the older readers have more science knowledge to fill in gaps:

In children's books, the "science" in science fiction is often portrayed without explanation, or just in a simple way. By way of example: the focus isn't on how exactly the rocket works, unless the rocket happens to break; the focus is on the adventure of flying in the rocket. Not that detailed explanations are often given in YA/adult science fiction, either, but literate adults can "fill in the gaps" in a way that allows them to move forward in the story without being bothered by details, and they can discern between what details are truly significant, as opposed to complementary.

This respondent suggests that children would be overwhelmed by too much detail and find it hard to find centrally important plot points amidst a flurry of information. This explanation also suggests that adults would actually be "bothered by" too many details, perhaps because with more detail they are more likely to find a flaw or lack of logic. This response evokes the difficulty inherent to including complex science in any narrative for any age.

The responses simultaneously portray children's SF as being *more* complex when

compared to other children's books. In response to how they identify interested SF readers, 2 respondents express concern about the complexity of the books, especially in chapter book form:

recommending science fiction chapter books to children at the elementary level wasn't very successful. Children would bring back these novels because they were hard to follow. I suspected this was because often the author assumed scientific knowledge the typical child doesn't know about or because the plots were too complex for a younger child to follow

This concern reflects directly on the critical comments by A. Waller Hastings mentioned in chapter 2. 1 respondent (2.00%) concludes that SF is not as important for children to read because the stories are simply too hard to work with: "the concepts or a specific plot can be [sic] confusing to a child since you're asking them to look beyond norms."

Many respondents portray children's SF as hard to work with in organized, group activities, due to the complexity of the narratives. More than half (65.55%) of the respondents never or rarely use SF in their activities or lessons while a similar percentage (63.80%) do recommend SF most of the time or often (see figure 5.2 and table 5.2). This comparison shows a tendency to encourage children to read SF on their own, but not in guided or group situations. Pearson's chi-square test of goodness of fit shows that the distribution of these two questions is not random: $\chi^2(3, N=58) = 14.28, p=0.002544$. This indicates that the results from these respondents can be taken as fairly representative of the larger population of librarians and teachers.ⁱⁱⁱ

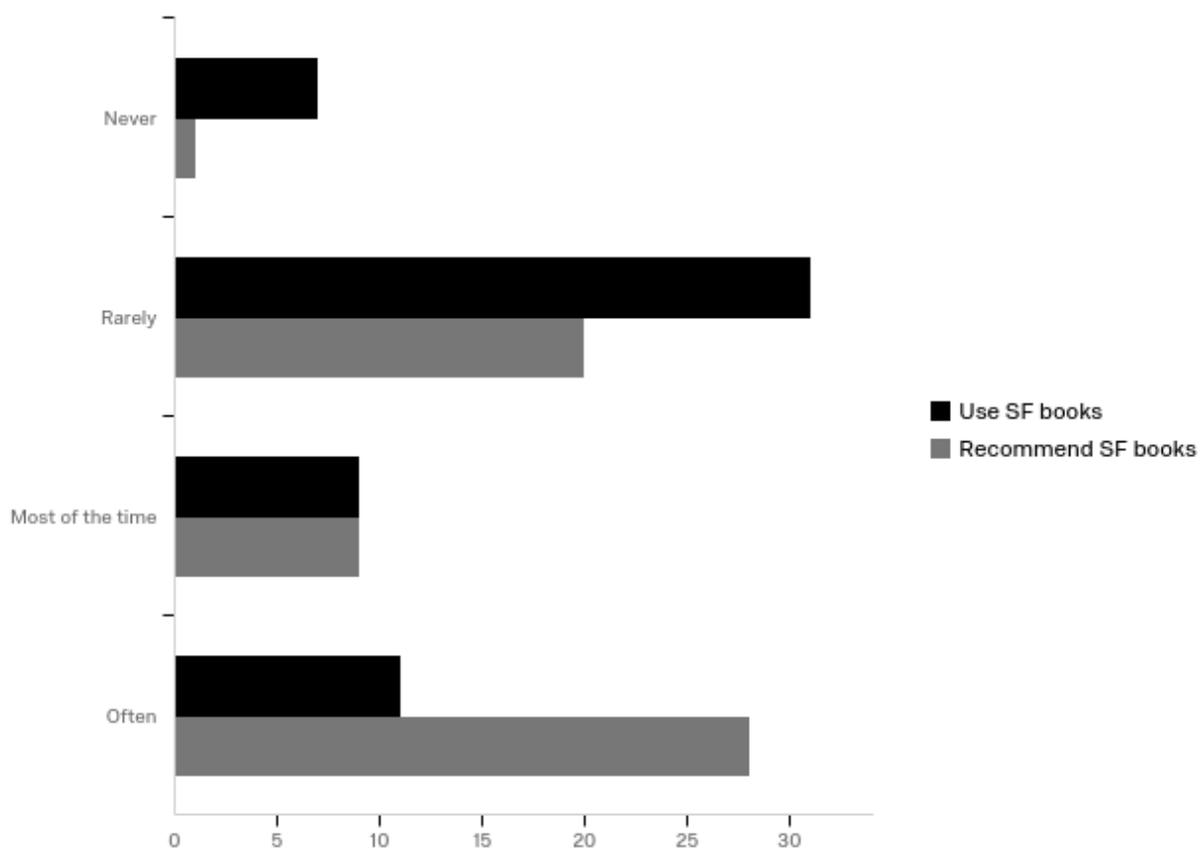


Figure 5.4. Survey responses to questions: How often do you use science fiction books with children in lessons or activities? How often do you recommend science fiction books to children?

Table 5.2
Survey questions and answers concerning using and recommending SF.

Question	Never	Rarely	Most of the Time	Often	Total
How often do you use science fiction books with children in lessons or activities?	7 12.1%	31 53.45%	9 15.52%	11 18.97%	58
How often do you recommend science fiction books to children?	1 1.72%	20 34.48%	9 15.52%	28 48.28%	58

When asked why they did or did not use SF in lessons or activities, many

respondents claim that there are too few children's SF books. Of 56 respondents, 18 (32.14%) report having few books to choose from, especially at lower grade levels. Similarly, the only individual who reported that they never recommend science fiction explains that there is a lack of available books for their grade level.

Another 10 responses (17.86%) explain that using SF books in classroom read alouds or library storytime is problematic because the chapter book options are too narratively complex to be suitable for reading aloud over several sessions. 2 (3.57%) respondents say that SF books are too long and 3 (5.36%) say they are too complex: "I have to appeal to broad ability levels in chapter book read-aloud selections. These books typically have to be shorter, with more simple plots." Others reflect that the books are simply better-suited to older children and independent reading: "I will use sci fi picture books on occasion in storytime but have always considered the kind of suppositions sci fi is based on to be difficult for younger children to grasp. We do read some sci fi in our middle grade book club." This response acknowledges the possibility of SF picturebooks, but simultaneously defers to middle grade books for a more appropriate match of content to age. Overall, these results imply that for the majority of the respondents, SF seems too scarce and too demanding to be useful for a large group activity.

On SF as a Weird Genre Text

Another trend across the survey responses is a tendency to characterize SF as the odd-genre-out, along with other outsider fantastic texts of horror and fantasy. SF is described as weird, unusual, a last resort, and some respondents even imply that the name of the genre itself is off-putting to children.

Throughout the responses, respondents relate SF to other genres and subgenres under the speculative fiction umbrella. One person (2.00%) says that SF is a good alternative to horror for children, as it can bring up similar questions without being as scary. Fantasy is mentioned specifically by 4 (8.00%) respondents as a good way to tell who may also enjoy SF, implying a connected readership between the two genres. When describing the differences between children's SF and YA/adult SF, 3 respondents (5.08%) place SF on a sliding scale with Fantasy, explaining that "Children's science fiction tends to skew more towards fantasy ("soft" science fiction), whereas YA and adult can skew either way - towards fantasy or towards science / technical fiction ("hard" science fiction)." This explanation works well in the context of children's SF being a gentle introduction to YA and adult SF, beginning with science concepts that are more social, unexplained, and interesting without technical detail—which is also sometimes a feature of adult and YA SF.

Respondents also differentiate SF by a specifically weird feel. 3 respondents (6.00%) say they recommend SF to readers who like "weird" or "freaky" books. 2 respondents (4.00%) report directly telling potential readers that SF books are "weird" or "funky" to appeal to them. Weird is a particularly interesting choice of word, given that it has a history with SF. For instance, the magazine *Weird Tales* (original run 1923-1954) is often regarded as foundational in fantasy and SF publishing in the United States. Additionally, in 2003 the New Weird movement in SF emerged as an experimental "cross-genre movement" (Wolfe 6). This connection, intentional or not, draws children's SF in line with the history of general SF.

Some other responses also point out a specific group of readers for SF: the “reluctant” readers. 2 of the respondents (3.57%) say that they use the genre in activities to help to engage reluctant readers, in part due to popularity and in part due to the frequent presence of pictures in SF. Similarly, 2 respondents (4.00%) state that SF is important to read because many reluctant readers are supported well by SF books. One respondent even describes the genre as slightly subversive, reporting that the books can be easily recommended to children by pointing out that the genre is not required reading, and therefore feels more fun. 5 (10.00%) of the respondents mention that they recommend SF specifically to reluctant readers or students who simply are “disinterested” in other books: when “traditional fiction and non-fiction does not interest them.” This portrayal of SF as a last resort is interesting, especially given the distinction between SF and traditional fiction. SF seems to be perceived as a genre for special cases.

Several people connect the popularity of SF to its usefulness, bringing in a peer element and assumptions about the genre. 11 (19.64%) report that they use the genre in activities because it is popular and one respondent (2.00%) makes SF books sound appealing by telling the potential reader that it is popular among other children. Meanwhile, another 5 (8.93%) say that they do not use SF books because the genre is distinctly *unpopular*. One of these respondents describes the paradox: “SF tends to be less popular, seen by them as something you either really love or are not interested in all. For them it's a genre of extremes.” This response calls to mind traditional associations of SF with the nerd/geek/unpopular kid, which is interesting to find already in elementary-aged perceptions.

With this bias in mind, it is telling that 2 respondents (4.00%) report that they never say the words “science fiction” when recommending it. Similarly, other respondents (4, 8.00%) say that they successfully recommend SF books through what they called “sub-genre” terms instead, like “steampunk” or “humor.” In these cases, there is an assumption that the genre’s name itself either is too broad, unfamiliar, or sounds unappealing. These responses point to SF as an “extreme” case that elicits polarized responses: either a strong following or pointed avoidance.

Overall, the survey results demonstrate that for professionals working with children and literacy, SF is largely important as only one of many important genres and paths to reading proficiency. It contains many unique benefits from science to speculative potential, but also suffers from a lack of availability, higher complexity than other children’s books, difficulty to use in group activities, and a feeling of strangeness. In the end, the respondents give the impression that any more than a taste of SF is only best for the isolated, unusual, and/or reluctant reader.

Library Circulation Data

The results from my two participating school libraries show trends of SF readership that both agree with and challenge the critical conception of SF for young children. Overall, this data source reveals that while there are not as many SF titles in circulation as other genres, children are checking out those SF books with more regularity than the other genres.

The overall circulation numbers between the schools look very different, simply due to school size. The Virginia school—a large public suburban school—produced 60,477 check-outs of 6,711 different titles. Meanwhile, the Minnesota school—a small

private urban school—reported 11,143 check-outs of 3,107 different titles. Despite this disparity, their distribution across genres is fairly consistent (see figures 5.3 to 5.6).

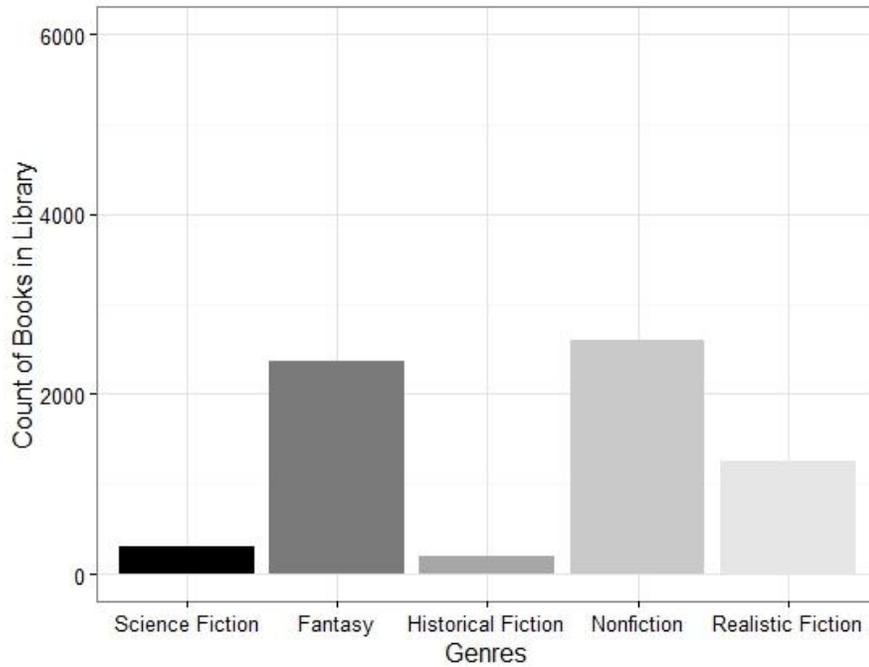


Figure 5.5. Count of titles, by genre, for Virginia school.

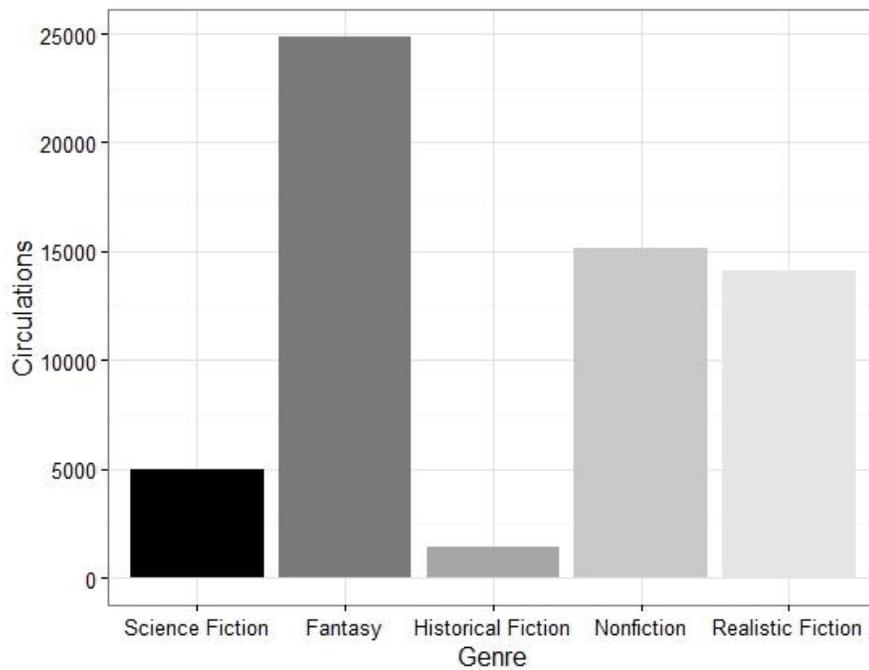


Figure 5.6. Count of circulations, by genre, for Virginia school.

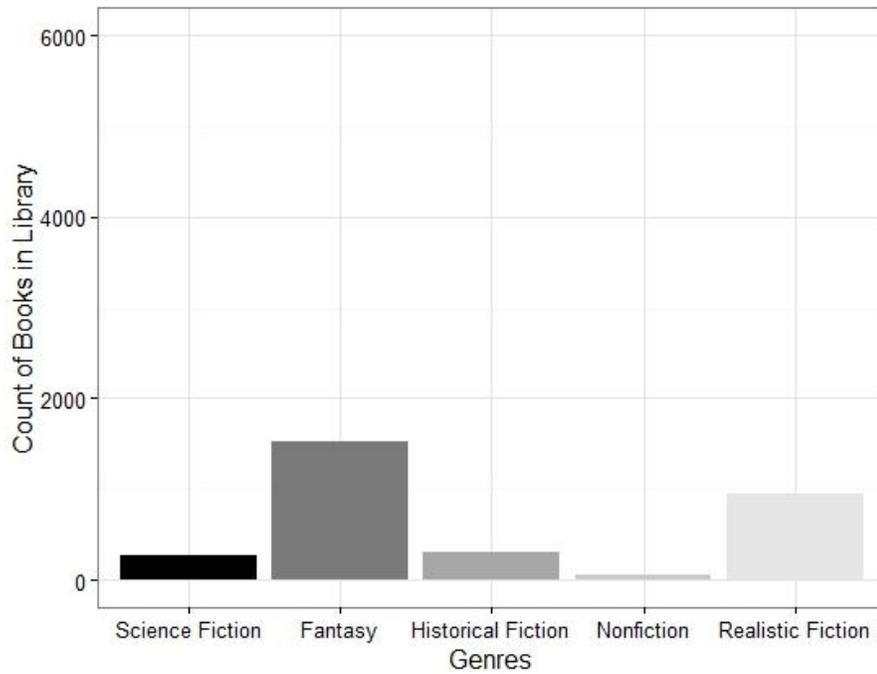


Figure 5.7. Count of titles, by genre, for Minnesota school.^{iv}

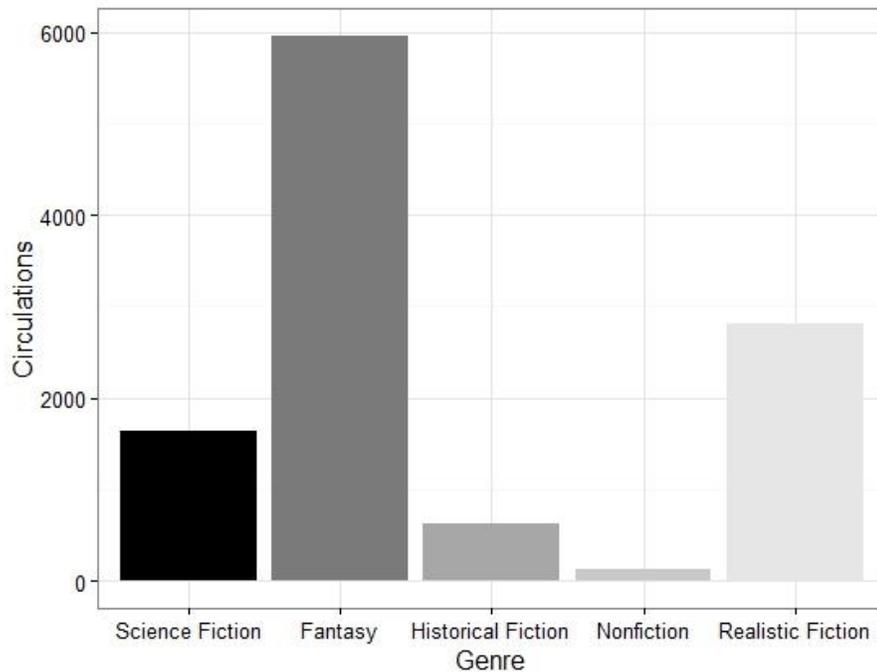


Figure 5.8. Count of circulations, by genre, for Minnesota school.

The bar graphs in figures 5.3 to 5.6 emphasize the comparative popularity of genres. Both libraries show a relatively small number of SF titles and circulations

compared to other genres. Given the similarities between SF and fantasy, the vast difference between their circulation is glaring. Fantasy is clearly a favorite above and beyond all the others, though realistic fiction seems well-regarded too. Nonfiction is surprisingly even more popular than realistic fiction at the Virginia school. Historical fiction and SF have the lowest number of titles, but SF has far more circulations.

These results agree with critical commentary that there is not much science fiction available for children under twelve. However, the bar graphs do not do justice to the dramatic, exponential difference between the number of SF titles and the number of SF circulations, as compared to the difference in other genres. SF books over-compensated for low numbers through being checked out at the highest average rate per book in any genre (see tables 5.3 and 5.4).

Table 5.3
Titles and check-outs in Virginia school library, by genre.

Genre	Titles	% of total	Check- Outs	% of total	Mean check- outs per book
Science Fiction	303	4.51%	4988	8.25%	16
Fantasy	2360	35.16%	24837	41.07%	11
Historical Fiction	194	2.89%	1434	2.37%	7
Nonfiction	2603	38.79%	15115	24.99%	6
Realistic Fiction	1251	18.64%	14103	23.32%	11

Table 5.4
Titles and check-outs in Minnesota school library, by genre.

Genre	Titles	% of total	Check- Outs	% of total	Mean check- outs per book
Science Fiction	268	8.62%	1641	14.73%	6
Fantasy	1527	49.13%	5955	53.44%	4
Historical Fiction	311	10.01%	620	5.56%	2
Nonfiction ^a	59	1.90%	117	1.05%	2
Realistic Fiction	942	30.31%	2810	25.22%	3

^a The nonfiction numbers appear disproportionately low because they do not account for the entire nonfiction readership at this school, only creative nonfiction picturebooks.

While the fantasy genre had the highest number of raw books and check-outs in

both schools, achieving close to half of the entire check-outs for the year (Virginia, 41.07%; Minnesota, 53.44%), the wider spread of available books meant that each different fantasy title was checked out, on average, 11 times in Virginia and 4 times in Minnesota. Meanwhile, the SF books comprised only 8.25% and 14.73% of the check-outs, respectively, but on average had 16 and 6 check-outs per book. This indicates that SF lending is limited to a small pool of books, but those books are circulated more often than any of the other genres!

By focusing so much attention on SF's average circulations per book, I do run the risk of having extreme numbers skew the results. Yet even the median of circulations by genre shows more SF lending per book (see table 5.5).

Table 5.5
Median check-outs, by genre.

Genre	VA Median	MN Median
Science Fiction	9	4
Fantasy	5	2
Historical Fiction	3	1
Nonfiction	3	1
Realistic Fiction	5	2

Additionally, SF contains few extreme cases in comparison to other genres. The box plot in figure 5.7 demonstrates how nonfiction and realistic fiction at the Virginia library have single titles with very high check-outs, lending greater weight to those categories. In the Minnesota school (see figure 5.8), each genre has several extreme cases lifting the average, with fantasy holding the highest single data point.^v

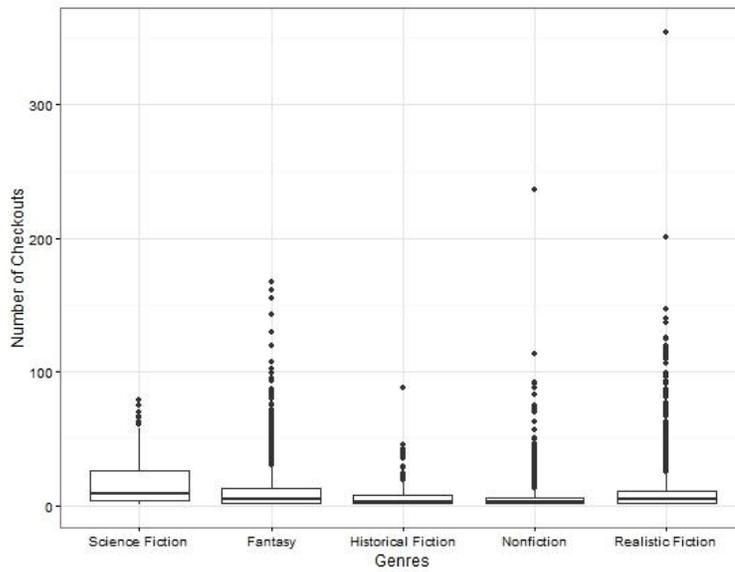


Figure 5.9. Box plot of check-outs by genre at Virginia school.

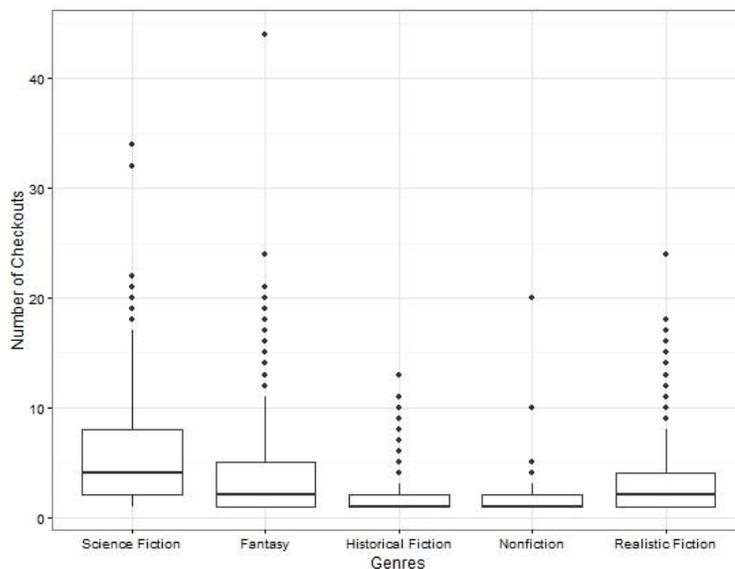


Figure 5.10. Box plot of check-outs by genre at Minnesota school.

Density maps reveal that SF achieved a more normal distribution than the other genres (see figures 5.9 and 5.10). The spikes in the density map of every genre except for SF indicate that the other genre titles are mostly checked out one or two times each. The SF genre, in both schools, is a much lower and rounder curve—demonstrating a more

evenly distributed tendency toward more than one check out per title.

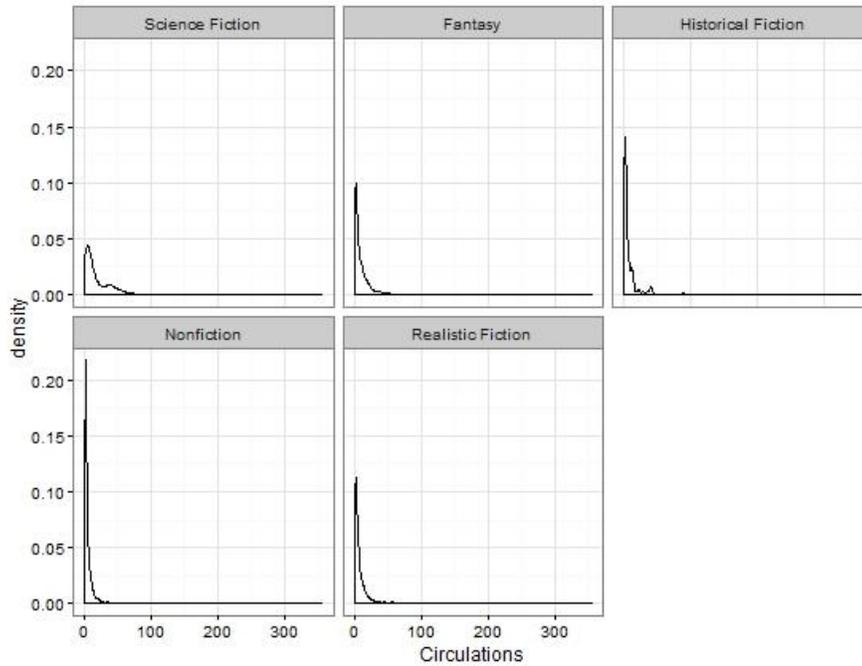


Figure 5.11. Density plots by genre for Virginia library.

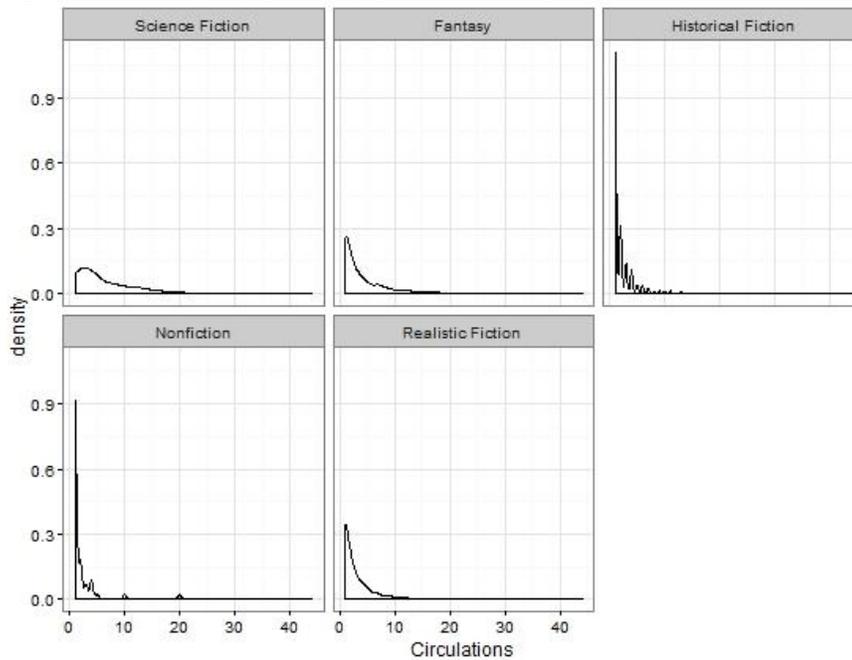


Figure 5.12. Density plots by genre for Minnesota library.

While this is all to say that there is no statistical basis for concern over SF's

extreme cases, my personal observations while coding led me to have some concern about the impact of *Star Wars* books. Statistical tests like the graphs above indicate that no single book is overly skewing the data, but there is no direct way to test for the influence an entire series of media tie-ins. Additionally, since Phase II in this study contains three concurrent methods, I was able to notice *Star Wars* developing as a consistent theme across every method. Additionally, *Star Wars* posed an interesting threat since the 2015-2016 school year coincides with the release of *The Force Awakens*, which set new box-office records for a film opening. Disney reports that over the first four days of the film's release, 8% of viewers were 12 and under (McClintock np). Due to these reasons, I coded *Star Wars* books separately from the larger SF category to make sure that these media tie-ins are not the force—pun intended—behind the entire SF category's results.

At the Virginia school, *Star Wars* books accounted for 25 (8.25%) of the SF titles and 796 (15.96%) of the SF circulations. *Star Wars* books do not make up the majority of titles, or even the majority of the circulations of SF. The most intriguing result is the mean check-outs per book. Without *Star Wars*, SF circulation per book only drops from 16 times per book (see table 5.3 above) to 15 times per book (see table 5.6). However, the *Star Wars* books by themselves have an impressive 32 circulations per title.

Table 5.6
Star Wars and non-*Star Wars* SF titles and check-outs in Virginia school library.

Genre	Titles	% of SF titles	Check-Outs	% of SF check-outs	Mean check-outs per book
Non- <i>Star Wars</i> SF	278	91.75%	4192	84.04%	15
<i>Star Wars</i> SF	25	8.25%	796	15.96%	32

Similarly, at the Minnesota school, *Star Wars* books made up 41 (15.30%) of the SF titles and 479 (29.18%) of the SF circulations. With *Star Wars* removed, the SF circulation only drops from 6 times per book (see table 5.4 above) to 5 times per book (see table 5.7), on average. Meanwhile, the *Star Wars* books achieved 12 circulations per title.

Table 5.7

Star Wars and non-*Star Wars* SF titles and check-outs in Minnesota school library.

Genre	Titles	% of SF titles	Check-Outs	% of SF check-outs	Mean check-outs per book
Non- <i>Star Wars</i> SF	227	84.70%	1162	70.81%	5
<i>Star Wars</i> SF	41	15.30%	479	29.18%	12

These raw calculations are further supported by the results of regression analysis. Due to the large number of books that were only checked out once or twice, I used a Poisson distribution to compensate for the non-normal skew. I also removed nonfiction from the Minnesota model, since I knew it was not a truly representative number (see note 1). For both models, there was reason for concern about the assumption of homogeneity of variance, but when I ran the model with robust standard errors the results were all still highly significant. Therefore, I report the original values in tables 5.8 and 5.9 below.

With non-*Star Wars* SF functioning as the reference category in each model, the intercept indicates the log of mean circulations for non-*Star Wars* SF. In other words, the variable's coefficient indicates the difference between the log of SF's mean and the log of the mean for that category of book. I have provided the calculated means in tables 5.8 and 5.9, for easier comparison. For both data sets, the *Star Wars* variable has the only positive

coefficient, since it is the only category that has a higher mean than non-*Star Wars* SF.

Table 5.8
Poisson linear regression coefficients for Virginia school.

Book Category	β	Standard Error	p	M
Non- <i>Star Wars</i> SF (intercept)	2.71331	0.01545	<.001	15.0791
Fantasy	-0.35964	0.01670	<.001	10.52412
Nonfiction	-0.95429	0.01746	<.001	5.806744
Historical Fiction	-0.71295	0.03059	<.001	7.391717
Realistic Fiction	-0.29087	0.01759	<.001	11.27333
<i>Star Wars</i> SF	0.74741	0.03866	<.001	31.83989

AIC 98317

Table 5.9
Poisson linear regression coefficients for Minnesota school.

Book Category	β	Standard Error	p	M
Non- <i>Star Wars</i> SF (intercept)	1.49784	0.02796	<.001	4.472019
Fantasy	-0.13692	0.03082	<.001	3.899779
Historical Fiction	-0.80792	0.04894	<.001	2.983001
Realistic Fiction	-0.40491	0.03373	<.001	2.983001
<i>Star Wars</i> SF	0.96029	0.05357	<.001	11.68294

AIC 16877

These regression models indicate that the differences between non-*Star Wars* SF and each other category of book are statistically significant in both data sets. The statistically significant results of the models offer evidence that the observed counts of SF circulation are valid representations, and did not occur in these libraries by chance. Therefore, I can assume that these proportions of SF lending do a fair job of reflecting the overall trends of elementary library lending. More school sites would make for a more solid claim to generalization, but that must wait for further research. Additionally, even though *Star Wars* is quite popular, it does not explain away the overall popularity of SF

in comparison to other categories.

Read-Aloud Data

This read-aloud data demonstrates that the participating children are perfectly capable of reading quality SF. In the read-aloud sessions, the children were happy to speak about the books in ways that range through all five of Lawrence Sipe's categories of read-aloud talk. Overall, their conversational turns revealed valuable literary engagement with SF, from tropes to speculation. The parental questionnaires reveal that these participants mostly come from book-filled homes and homes with SF readership and fandom, indicating that these children are well-positioned to comprehend SF for their own age.

Parental Questionnaires

Of the five parental questionnaires returned, the results were fairly consistent. All but one parent reported having 100+ books in the home. The differing parent reported having between 50-100 books. This result functions as a rough measure of the overall HLE and indicates that at least five of the eight participating children have the benefit of exposure to a large array of print materials in their home. Additionally, every parent reported that these household books include SF. I have no way of knowing how many are SF—and did not want to ask such a difficult question—but the presence of any SF in their home library indicates that these children are coming from a SF-friendly home environment, at least.

Four parents reported doing SF activities with their children, and the same four claimed to have SF fans in the home. The written-in explanations are listed in table 5.10.

The parents' answers about activities indicate that at least four of the eight participants in the read-aloud sessions can be expected to have some exposure to SF intertext. Similarly, four out of eight participants have SF literacy role models at home—though counting a little brother as a role model may be a stretch! The *Star Wars* franchise appears in five of these eight answers, revealing that the parents regularly returned to this core genre text as an example of their home SF environment.^{vi} Only three parents reported reading science fiction with or to their children, and one of them wrote in that these readings were often *Star Wars* books. Overall, this sample of children seem to be coming from a background that would make it likely that they have seen SF books and media, and would therefore have some knowledge of SF intertext.

Table 5.10

Parental questionnaire questions and answers concerning SF activities and fandom.

Question	Answers
Do you (or another adult in the home) participate in any other science fiction themed activities with your child(ren) such as watching movies like <i>Star Wars</i> , playing science fiction video games like <i>Halo</i> or <i>Portal</i> , dressing up like aliens or robots, etc.?	watch Star Wars watch Star Wars, princess Leia for Halloween movies, videogames, action figures, legos
If yes, please briefly list some activities:	watch Star Wars, draw or make robots
Would you describe yourself or anyone in your home as a fan of science fiction books, movies, or other media?	little brother (4) is the biggest fan of Star Wars
If yes, please list who, by relation (father, sister, etc):	adults and children like Star Wars uncle- pseudo father figure because father is deceased
	mother, father

Read-Alouds

Given my conclusion in chapter 4 that David Wiesner creates masterful speculation and extrapolation through illustrations, I chose two of his picturebooks for the read-aloud sessions: *Mr. Wuffles!* and *June 29, 1999*. While *Mr. Wuffles!* offers a read-aloud with very few words, *June 29, 1999* features paragraphs of advanced language, creating a comparison of interest between how the two are interpreted. I also chose to read *Zoe and Robot: Let's Pretend* since this simple picturebook/early reader hybrid would offer more access to the words as well as the pictures, even across a broad range of reading abilities. Additionally, *Mr. Wuffles!* and *Zoe and Robot* both employ comics panels and speech balloons.

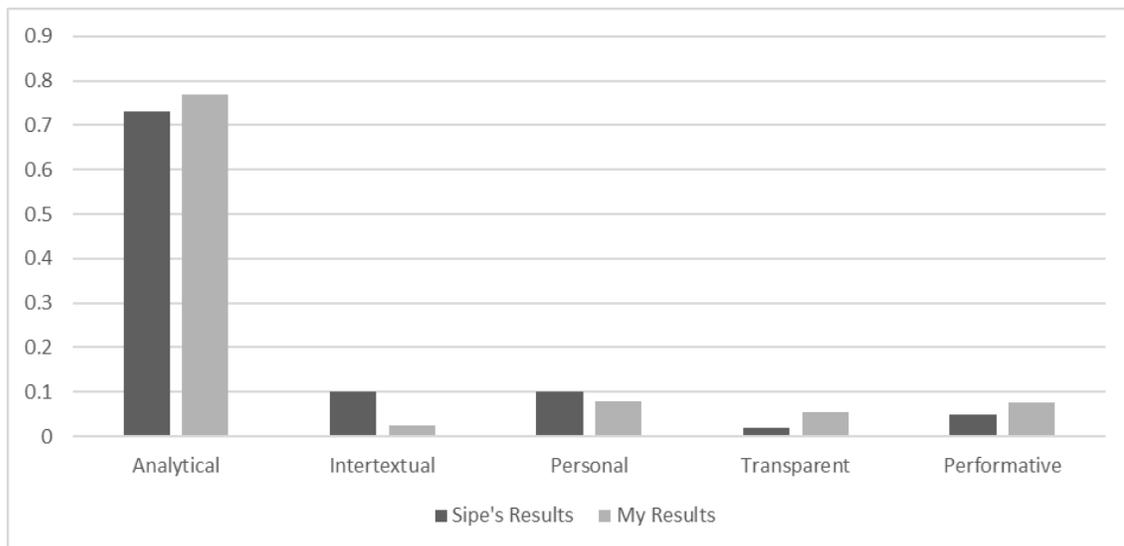


Figure 5.13. Percentage of codes from all three read-alouds, compared to Sipe's *Storytime* codes.

Overall, my distribution of read-aloud codes is close to Sipe's results (see figure 5.11). Through his research of read-alouds across classrooms and teachers, Sipe found that "approximately 73% of the children's conversational turns" were analytical (85).

Meanwhile, 10% were intertextual, 10% were personal, 2% were transparent, and 5% were performative (86). In my much smaller sample, the children's conversational turns were 76.81% analytical, 2.42% intertextual, 7.97% personal, 5.31% transparent, and 7.48% performative.

All five of these categories are of interest to this study, if for very different reasons. To start, the analytical code describes conversational turns when the children are working through the plot and meaning of the story and demonstrating their understanding. This category speaks to the scholarly concern that children may not understand science fiction, especially the science part.

The results of these read-alouds demonstrated children working with what they knew, and filling in the rest without hesitation, often through their own skill at speculation. While reading *Zoe and Robot*, for instance, several of the children became involved in a discussion about programming in robots, based on what they knew about robotics and computer science already. From the moment I revealed the front cover, they began talking about robots in terms of both realistic and speculative science:

MARIA: I think Robot has no idea about how to pretend because of the question mark above his head
 JOHN: Yea, because they only do what's programmed in them. They don't know how to pretend!
 EMILY: Ooo. Good point
 JOHN: They have no imagination
 [...]
 JOHN: Unless they put a BRAIN inside its head

In this excerpt, each child's comments fit into Sipe's analytic code. Maria^{vii}, a pensive girl around 4th grade, performed analysis by interpreting the semiotic significance of a question mark floating above a character's head in conjunction with the book's title.

John, an enthusiastic *Star Wars* fan of the same age, carried on this thought by applying his working knowledge of robotics and programming to explain why Robot might not be able to pretend. His next comments then speculate that programming does not include imagination, but putting an organic brain inside a robot might produce imaginative capabilities. The children returned to this same idea of programming several times throughout the reading, to explain Robot's actions. After we finished the book, John continued to speculate:

EMILY: That's kind of weird. Cause in the beginning we were saying that robots can only do what they're programmed to do. So what does it mean that he figured out how to pretend at the end?

JOHN: It's because he bonked his head and things got shook around so he knows how to pretend because the program got messed up so now, now he can...

EMILY: So if you messed up a program even by accident, you might have some interesting results?

JOHN: Imagination!

By the end, John had combined his awareness of brain damage and programming to wonder if a concussive impact could change programming too. These examples of the analytic code show how this category captures the moments when these children were working through both the plot and the speculative elements of the book. In my three read-alouds, I had slightly more analytical conversational turns than Sipe. This is could be due to variance in sample, but could also reflect the time spent interpreting SF elements.

The only book with narrating words, *June 29, 1999*, had the lowest percentage of analytic conversational turns overall (see tables 5.11, 5.12, and 5.13). This distribution seems to speak to the books' differences in layout rather than in SF content.

Table 5.11
Axial coding of *Mr. Wuffles!* read-aloud, using Sipe's codes from *Storytime*.

Code	Observations
1: Analytical	131 (77.06%)
1a: "making narrative meaning"	110 (64.71%)
1b: "book as made object or cultural product"	0 (0.00%)
1c: "language of the text"	9 (5.29%)
1d: "illustrations and visual matter"	7 (4.12%)
1e: "relationships between fiction and reality"	5 (2.94%)
2: Intertextual	0 (0.00%)
3: Personal	9 (5.29%)
4: Transparent	5 (2.94%)
5: Performative	25 (14.71%)
Total Conversational Turns	170

Table 5.12
Axial coding of *June 29, 1999* read-aloud, using Sipe's codes from *Storytime*.

Code	Observations
1: Analytical	108 (71.52%)
1a: "making narrative meaning"	90 (59.60%)
1b: "book as made object or cultural product"	2 (1.32%)
1c: "language of the text"	5 (3.31%)
1d: "illustrations and visual matter"	0 (0.00%)

1e: "relationships between fiction and reality"	11 (7.28%)
2: Intertextual	10 (6.62%)
3: Personal	18 (11.92%)
4: Transparent	13 (8.61%)
5: Performative	2 (1.32%)
Total Conversational Turns	151

Table 5.13

Axial coding of *Zoe and Robot: Let's Pretend* read-aloud, using Sipe's codes from *Storytime*.

Code	Observations
1: Analytical	79 (84.94%)
1a: "making narrative meaning"	57 (61.29%)
1b: "book as made object or cultural product"	0 (0.00%)
1c: "language of the text"	13 (13.98%)
1d: "illustrations and visual matter"	8 (8.60%)
1e: "relationships between fiction and reality"	1 (1.08%)
2: Intertextual	0 (0.00%)
3: Personal	6 (6.45%)
4: Transparent	4 (4.30%)
5: Performative	4 (4.30%)
Total Conversational Turns	93

The smaller words count in *Mr. Wuffles!* and *Zoe and Robot* seem to have instigated more spoken explanations of what was going on in the story. The children were happy to fill in for narration, especially when there were no words at all. Their interest in interpreting the pictures was directly vocalized during *June 29, 1999* when the first page was wordless:

EMILY: So this is like the first page, and there's no words on it. So what do you think? What are we supposed to do with that? Should we just skip it?
 EVERYONE: No!
 RACHEL: No that is the time to look at the picture

Rachel, a high energy girl who I estimated to be around 2nd grade, was very matter of fact in this moment. She had enough experiences with wordless spreads to know precisely what is expected of readers when there are no words. *Mr. Wuffles!* was full of this kind of work, which is captured in the analytic subcategory 1a: "making narrative meaning." Sipe explains that "the responses in this subcategory comprised over half of the responses in Category 1: literary analysis was clearly of prime importance in the children's developing literary understanding" (91). Likewise, this subcategory comprised the majority of analytical responses in all three of my books (see figure 5.12).

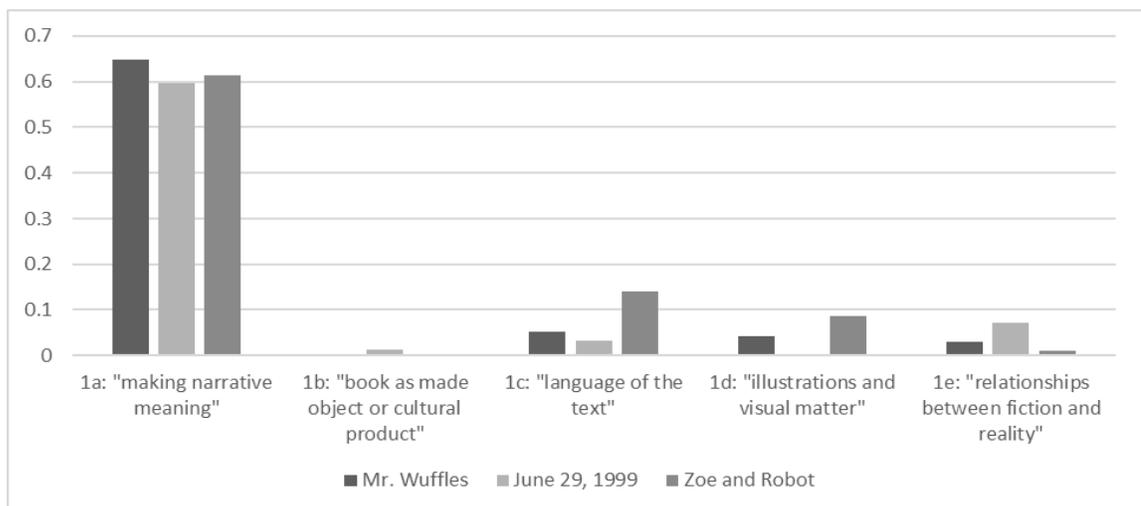


Figure 5.14. Comparison of analytic sub-code percentages across read-aloud books.

Making narrative meaning, subcategory 1a, achieved the highest percentage during the reading of *Mr. Wuffles!*. Due to different attendance and sign-ups on different days of the afterschool program, there were only two participants present for reading *Mr. Wuffles!*: John and Zoe, a bubbly kindergartener. As noted in chapter 4, the panels in this story are numerous, with sometimes only seconds or moments passing between panels. I found that John and Zoe were quick to zip through small action panels until they found an interesting panel to talk about or I directed their attention to one. Full page spreads brought on the most conversation, due to having the largest space for closure and the most details. Wiesner most often employs full-page spreads for dramatic moments. Upon turning to the page where the aliens find the insect's wall drawings under the radiator, we had the following conversation:

EMILY: What did they find under there?

ZOE: Scary stuff and weird stuff

EMILY: Yea

JOHN: They found ancient drawings

EMILY: Ancient scary drawings?

JOHN: By the ancient cave ants, or ancient cave bugs

EMILY: Oh it's the bugs that drew all these? How do you think the bugs feel about the cat?

JOHN: They feel like they want to battle him.

Zoe's response reads the tone of the picture. Her two adjectives acknowledge that the cave paintings look violent and that these paintings are an unexpected thing to find under furniture. John's analysis applies art and anthropology to recognize the naïve art style as an allusion to cave painting. He then notes the insects on the far right of the page, and extends his interpretation to conclude that they are the artists and, by extension, also

ancient and cave-based. He then notes the tone of the spread—or accepts Zoe’s interpretation—when he decides that the drawings are hostile and indicate a desire for battle.

Zoe and John were highly competent at deciphering Wiesner’s detailed art and interpreting the panel transitions. However, their analysis misinterpreted the most extrapolative part of the book: the set of discs that appear to be a crucial part of flying the spaceship. I pointed out the alien’s broken power-discs when they first appear and we had the following exchange:

EMILY: What’s that, you think?

ZOE: Um it’s something to—

JOHN: Oh I know! A broken artifact

EMILY: Hm!

JOHN: Or, you know, a broken plate because someone was just pretty angry at dinner

[EMILY and ZOE laugh]

ZOE: Oh I know this one! Um, the cat is getting up and all they’re thinking “oh no our plates are broken!”

EMILY: That would be a funny thing to focus on, if you were being attacked by a cat. Plates! Over here they’re looking at the plates again.

JOHN: They’re thinking “Jeez somebody was pretty angry at dinner”

John’s use of the word “artifact” draws on the phrase “alien artifact” as a term found in SF stories or historical mysteries about finding aliens or ancient clues about aliens. He is using his intertextual knowledge to interpret this story, making this an analytical response rather than an intertextual one. He then offers another, sillier interpretation about dinner plates. Zoe’s response takes up John’s humor while also recognizing that it would be absurd to be mourning broken plates while a giant predator looms nearby.

I did not correct them or push them to understand my own interpretation of the discs. After all, my undergraduate children’s literature students usually only develop a

solid hypothesis about the discs on their second or third read-through! More importantly, Zoe and John did not focus for long on the mystery of what these objects were or why the aliens cared about them. Their lack of deep understanding was quickly glossed over with humor, and they continued reading without consequence. They missed out on the plot point that the broken discs prevented the aliens from flying away immediately, and the potential extrapolation about future technology when the aliens slice replacement discs. Yet this absence did not seem to bother either child or impede their enjoyment of the story. Most importantly, it did nothing to hinder their access to the overarching speculation about alien encounters. In the end, both John and Zoe responded to the final image by speculating on how the alien visit made an impact. Looking at the last page, Zoe says, “They changed it, they did.” She is likely referring to the insects’ new cave drawing, which depicts the recent battle and the aliens. John reiterates her statement with one profound alteration: “They changed.” John’s simple sentence encapsulates a lot of alien encounter speculation and indicates that he has noticed that this book has the type of broad, altered ending that Mendlesohn hopes for in SF.

The extra interpretive work required by picture-dependent narrative may have driven the 1a subcategory percentage higher in *Mr. Wuffles!* and *Zoe and Robot*. Additionally, it is interesting that *June 29, 1999* was the only book with absolutely no explicit talk about the illustrations. Sipe’s subcategory 1d: “illustrations and visual matter” does not refer to reading the pictures for meaning—this is part of 1a—but rather 1d refers to talk about the style, layout, and art choices. Whereas we discussed backgrounds in *Zoe and Robot* and the repetition of cat limbs to demonstrate movement

in *Mr. Wuffles!*, the format of *June 29, 1999* did not seem to elicit this conversation.

The children's analytic work during the *Zoe and Robot* read-aloud was more heavily directed at reading and interpreting the speech bubbles, as captured by the much higher percentage of code 1c: "language of the text." This code captures instances of children reading the words aloud, asking language-specific questions, and debating the meaning of words. In *Zoe and Robot*, there are speech balloons in nearly every panel, and these contain easy early-level reading words^{viii}. While *Mr. Wuffles!* also features speech balloons, they are full of alien symbols instead of legible language. This inspired many performative responses instead, as discussed later in this section.

In *Zoe and Robot*, several of the 1c conversational turns were focused on how to read robot dialogue. When I turned to the first page of *Zoe and Robot*, Maria spontaneously read the robot's speech balloon aloud in a robotic monotone:

MARIA: "No, Zoe. Robots cannot climb mountains"

EMILY: Oh, robot voice. Why do you know to do a robot voice?

MARIA: I don't know

Maria could have been picking up on the all-caps way that Robot's dialogue is written, but it is more common for all-caps to be interpreted as shouting. Her impromptu vocalization adeptly interprets language and signification, drawing from experiences with pop culture robots and the semiotics of written language. This knowledge is pervasive enough that she cannot even name what source she is relying on for her robot voice. Throughout the story, several other students also tried their hand at reading the text with their own robot voice, especially when I found it difficult to read one of Robot's speech balloons that included an exclamation point in a robotic monotone.

Sipe's subcategory 1e, "relationships between fiction and reality," came up most often during the reading of *June 29, 1999*. This book is speculative and outlandish from the beginning, but there are no overtly SF tropes until the end. This provoked mild interpretive tension between some of the children. While John was convinced that aliens were involved from the beginning of the plot, Mackenzie repeatedly refuted his prediction—and attempted to shut down anyone who repeated it—on the grounds that aliens do not exist. There are also no giant vegetables falling from the sky in our current reality, but this plot point did not receive her criticism. This was particularly interesting, as the other books have obvious SF tropes from early in the plot, but the aliens of *June 29, 1999* are withheld as a surprise on the last two pages. This late reveal seems to have exposed Mackenzie's resistance to SF tropes, but not fantastic premises. It seems that, to Mackenzie, aliens were a sort of cop-out.

Code 1b: "book as made object or cultural product" only came up in one book, when Rachel noted that *June 29, 1999* looked like "an old-school book" and later when Maria wanted to know why Wiesner did not add a timeline.

My percentage of intertextual codes was much lower than Sipe's. This is of particular interest due to my emphasis on SF intertextual tropes and understandings as discussed in chapters 2 and 4. Much like I was saying about the SF intertext in particular, Sipe explains that this category helps readers develop an awareness of text sets and genres. Some of this difference can be attributed to sample size as well, but upon re-reading my transcripts I noticed that the children were displaying their intertextual understanding in other ways, rather than in explicit comparisons that would be coded as

intertextual in Sipe's system. His intertextual code only came up in one book: *June 29, 1999*, where it came up twice.

First, after I read the title on the cover, Mackenzie, a reserved older girl, commented, "It sounds like a horror movie" though she did not offer any explanation. Later, the other children took up this idea again when we reached the inside title page:

JOHN: This sounds like, this sounds like one of those movies that's like "there's an Armageddon happening" because it's like June 29, 1999. That sounds, that sounds

EMILY: Does that really specific date make it sound menacing like we were saying before?

RACHEL: That sounds like a horror movie!

JOHN: That sounds like a horror movie like Friday the 13th

In this excerpt, John compares Wiesner's book to an entire set of apocalyptic stories as well as to a specific horror film, *Friday the 13th*. This movie is not usually considered SF, but the horror genre is considered part of speculative fiction like fantasy and SF. The connection is worthwhile for John's analysis, as it allows him to reflect on how a specific date seems to point to a large event. World-shifting events are common triggers for rupture in both SF and horror. Later when the illustrations show giant vegetables falling from the sky, Maria compares the story to a popular fantasy story: "It's like *Cloudy with a Chance of Meatballs!*" Whether she meant the book or the movie, she was performing the same work of comparing across the fantastic. In this way, a knowledge of other speculative fiction genres might factor into children's interpretations as they work to comprehend SF books.

The only intertextual connection specific to SF was also the most explicitly scientific conversation. When Wiesner threw the phrase "Extraterrestrial conditions" at

us, not only did we have a funny tongue-twister moment, but the children weaved together SF intertext with scientific language and speculation:

EMILY: What are extrater— extraterre—I can't even say it! Extraterrestrial conditions
 JOHN: I'm pretty sure it's something to do with aliens
 EMILY: Alien conditions?
 JOHN: Because I'm pretty sure ET, he stands for extra-terrestrial
 EMILY: Oh, yea so thinking of the ET movie, if ET means extra-terrestrial than that associates it with aliens, yea
 MACKENZIE: I feel like extraterrestr—...
 JOHN: terrestr—
 MACKENZIE: terre—extraterrestrial might be a word for growing things or like earth forming?
 RACHEL: Now—
 EMILY: Oh, yea that word "Terra" is in there and that means earth
 RACHEL: Now that we got more into the story I think they're sending food to aliens
 EMILY: They're sending food to aliens?
 RACHEL: I think so
 MACKENZIE: There's no aliens...

Here, again, John is happy to jump into SF concepts with aliens, through a clever intertextual interpretation. The E.T. movie clearly associates extraterrestrial to aliens, and so John made the popular culture connection to help him define a large, scientific term. Mackenzie took a more strictly scientific route, making connections to the root word "terra," which I assume she had heard in other agricultural and scientific contexts. Mackenzie may have been the oldest student present, meaning she has the highest accumulation of science classes. Meanwhile, Rachel ignored Mackenzie's definition. Her response returns to the analytic mode to weave John's alien connection into the plot thus far in an attempt to predict the ending, an example of the most popular analytic sub-code: making narrative meaning. Mackenzie is not willing to abandon known science and realism, however. Her final response falls into the analytic subcategory 1e: the

relationship between fiction and reality. It is fascinating that John and Mackenzie's interpretations, while seemingly antagonistic here, could have been combined to produce the most accurate definition.

The talk following John's connection to E.T. reveals an underlying understanding of tropes like aliens. While my participants were not explicitly talking about intertextual comparisons, Mackenzie and Rachel both knew without hesitation what an alien was. Mackenzie was aware that they are not a scientifically proven idea, and Rachel's response reveals that she knows that aliens are associated with space—since the food was being sent up in balloons. While Sipe's coding scheme does not acknowledge that their knowledge here is inherently intertextual, they are relying on known tropes to produce their analysis, like Maria's robot voice interpretation above. Their subtle display of intertextual knowledge indicates such science-fictional fluency that perhaps it simply seems unnecessary or too obvious to specifically comment upon it.

Next, the personal category of response revealed personal connections to the story. This category can seem irrelevant, but its connection to science fictional thought is only more subtle. Sipe explains "If children draw the story to themselves in these easy and down-to-earth ways, and are not discouraged by their teachers, they may develop the ability to make much more important and meaningful connections as they become more astute and sensitive readers" (153). This category can seem trivial, he warns, but it lays the groundwork for something very important to speculative fiction in general: the ability to turn around and apply the story to real life. This category requires the most leeway from stringent SF demands, as this approach positions it as a scaffold for future SF

reading skills rather than expressing them immediately. Personal connections are not only a future investment, though. This category also captures children's reflections about the novum as the aspect that makes this SF world similar yet dissimilar from our own world. This response was most popular in the reading of *June 29, 1999* (see tables 5.11, 5.12, and 5.13 above). The children were excited that they knew the vegetables, and several shouted out when the pictures revealed a vegetable that they personally enjoy:

RACHEL: [gasp] I love lima beans!

JOHN: I like cucumbers. I'd probably just go home and eat it

EMILY: Oh you'd just eat it?

RACHEL: Mmmm lima beans.

EMILY: Would you want a gigantic lima bean?

RACHEL: YEA I would just eat it! [munching sounds]

While this category of response does not reveal much in terms of how children are understanding the science or larger speculation, it shows that they became invested in the story enough to imagine themselves in the story world. This personalizing speculation reflects some of Mendelsohn and Nodelman's concern that children's literature is inward-focused, because at this moment the children were not concerned with the larger consequences of a world covered in giant vegetables. They were considering their own likes and dislikes. Yet I contend that these children were taking up the speculation, merely on a small scale. They wondered what they would do were the strange events to happen to them. After all, many advanced SF books function well because they challenge the reader to consider how they would personally feel in the depicted dystopia or future. The children's focus may have been on only one corner of the speculative content, but it was a small, scaffolded version of a more advanced SF thought experiment.

The transparent and performative categories are similar, both for Sipe and for this

study. Sipe explains that “they represent two different, contrasting enactments of what I call the aesthetic impulse” (169). In the context of this study, both types of aesthetic response can indicate engagement in the awe and wonder of SF. Transparent responses are the “receptive aspect” and performative responses are the “expressive aspect” of the aesthetic impulse (180).

Transparent responses capture moments wherein the children are fully “immersed in the storyworld” (Sipe 173), experiencing and reacting to Csisery-Ronay’s science fictional sublime and Gordon’s statement that quality SF includes “that nebulous attribute, a sense of wonder” (2). Transparent conversational turns can only demonstrate the audible evidence of a child’s absorption, “providing only tantalizing glimpses of what was probably happening inside the children’s minds” (Sipe 86). This category is strictly for automatic responses and exclamations that are not communicative in intent, which also makes it the most subjective to code. I had to evaluate whether I thought the child was reacting reflexively due to being absorbed in the story, or if they were performing for peers. Transparent conversational turns most often manifested in exclamations upon the page turn. On the first few page turns of *June 29, 1999* there was a chorus of shouts and screams and “OH MY GOODNESS” at each new giant vegetable. Even Mackenzie murmured “really big...” when the first batch of enormous veggies were revealed. Similarly, both John and Zoe held out a long “ooohhh” on the page turn when Wiesner reveals the insects’ cave painting of Mr. Wuffles. These transparent responses are testaments to Wiesner’s mastery of the page turn as a means of capturing the awe and wonder of SF. In contrast, Sias’s illustrations evoked character-driven joy. When Robot

finally succeeded at pretending, Rachel and Maria both exclaimed “yay!” This response is equally transparent, but less to do with SF awe. Sias’s book is set to be domestic and familiar, however, so this is not a surprising or even unintentional lack. My sessions produced more transparent responses than Sipe’s, perhaps due to the wonder of SF.

The performative category, Sipe explains, is the least likely to be encouraged or tolerated in literary settings. These “responses were often mildly (or wickedly) subversive and transgressive; in some quarters, they would probably be considered totally off-task. They threatened to deconstruct the story into a totally free (and in some cases anarchic) play of signifiers” (Sipe 174). The performative category may seem, at first glance, to contain the least useful moments of the read-alouds. Yet, these responses reveal an understanding and active interpretation as preconditions for the performance. Sipe claims that “if, as I have argued, the findings of these studies indicate that the children were astute literary critics and displayed various types of literary understanding, the children’s performative responses display their abilities as specifically *deconstructive* literary critics” (180, emphasis in original).

The picturebook with the most performative responses was by far *Mr. Wuffles!*

After the first alien speech balloons appeared, John said:

JOHN: “Waaa!” That’s what I think that says

EMILY: You think that says “Waaa!” Why do you think that?

JOHN: I don’t knooooow

EMILY: Could you read this?

ZOE: [silly nonsense noises]

EMILY: Hm! It could say that. I definitely can’t read it. What do you think they’re doing?

ZOE: Um. They’re making something, like a trap for the cat. Or the cat wouldn’t like it. I can read those, I think [pointing to the next alien speech bubbles]

John's interpretation of the first speech bubble sounded like a cry of surprise, and had a solid basis in the illustrations: the aliens' hands are thrown up in the air, with wide eyes and open mouths. His drawn out "I don't knooow," accompanied by a bashful smile, indicated that he knew he had done something silly and was waiting to see how I would take it.

Zoe was less reserved about her performances, and leapt into action. Even when I tried to steer us back to the next panel, she declared "I can read those, I think." This phrasing is almost an exact reversal of my prior statement that "I definitely can't read it." Sipe describes several aspects of Bakhtin's carnival that apply to the performative code, including "the common people assume roles of power usually held by their masters" (180). Zoe's performances reveal delight in being able to do what the adult—the supposed expert reader—cannot do. From that point on, Zoe was determined to vocalize dialogue for every single balloon in the book. Her alien speech consisted of a series of squeals, pops, shrieks, beeps, and some monkey-like noises. John's occasional contributions indicated that he accepted without question that Zoe's performances were carefully considered and not random:

ZOE: I can read these ones, I think! And this one says, and that one says... [silly noises]
 EMILY: Why do you think that's that one? [pointing to last panel, which got a scream-like reading]
 JOHN: Because because they look scared!

John had noticed that Zoe's alien language was informed by the expressions of the aliens in the panel. She interpreted their facial cues, and expressed her analysis through the tone of her noises. At times John also offered recommendations for her performances based on

his more advanced knowledge of written language, such as when he noted, “I don’t think that one would be [exclamatory nonsense sound] I think that would be [questioning nonsense sound] because there’s a question mark.” At one point, he experimented with transposing Wiesner’s set of geometric shapes into phonemes based on association: “That one looks like it says [carefully enunciated nonsense word] because that one looks like an eight, that one looks like a D, that one looks like an O.” The intentional nature of Zoe and John’s sounds became even clearer when we reached the insects’ speech balloons:

EMILY: What do you think—this looks different. How do you think the ants talk?

JOHN and ZOE, together: [skittering noises]

EMILY: Oh, yea! Like little bug skittering noises? [laughs as they both continue making noises] It’s kind of scary sounding! What’s happening over here?

ZOE: Oh, it’s saying [alien noises]

EMILY: And what’s the bug saying?

ZOE and JOHN, together: [skittering sounds]

EMILY: Do you think they can talk to each other? Do they understand each other?

JOHN: Probably

ZOE: I think they kind of do

Their performance of insect language sounded completely different from the aliens, reflecting the very different shape and content of Wiesner’s speech bubbles. It incorporated a knowledge of insects, and their conclusions about the alien-to-insect communication derived from the series of conversations depicted across the panels on that page.

John and Zoe’s performances were informed by the context of the image, and revealed analysis and expression all at once. They were not talking to me in measured, academic language about their interpretation. They did not translate the alien and insect speech bubbles into English. Instead their subversive “reading” performance revealed

real inferences and critical reading, even as they took joy in flooding our read-aloud with silliness.

The read-alouds successfully portrayed children engaging in a variety of valuable literary conversations about SF picturebooks. Their talk ranged from insightful to enthralled, indicating that SF can be understood and enjoyed by some children under 12. Considering the participants' home SF environment, as indicated by the questionnaires, they are probably representative of well-prepared children. Others with less literary HLS, less SF exposure, and fewer SF role models may not produce the same quality of read-aloud talk. This set of data offers a detailed glimpse into the analysis and reading of several children on the higher end of SF preparedness—a picture of what is possible for children's SF, given good conditions.

Conclusion

This chapter's data sources together portray a genre for children that has its own strengths and weaknesses. While the problem of availability is persistent, children's desire to read SF is more powerful yet. The professionals surveyed believe the genre has value, and the library circulation supports that children read widely across the sparse books available. The read-aloud data shows that these children were capable and willing to delve into analyzing and enjoying SF. Overall, this chapter suggests that SF has high potential, limited only by the adult perceptions that reinforce stereotypes and potentially keep availability low.

Chapter 6: Discussion and Conclusion

Altogether, the results of this dissertation provide compelling evidence that SF for children under 12 years old is a valuable, successful, yet misunderstood category of texts. The variety of disciplinary approaches, including qualitative and quantitative methods, support and expand on one another's results, enabling a thorough description of a children's genre that deserves updated appreciation. While the previous chapters considered each method and its results distinctly, this chapter synthesizes across data sources to complete a holistic portrait of the case: SF for children under 12. I describe what it is, what it is not, and what it could be.

First and foremost, the resounding outcome of this case study is that SF can function just fine as a high-quality children's genre, even though scholars were correct about its scarcity. To review, existing scholarship positions SF for children under 12 as "problematic" (Hastings 206) because "there is relatively little of it and much of what exists is not very good" (Levy 421). While my results reinforce this claim that there is a "shortage of good SF for young readers" (Nodelman 294) relative to other genres, this data also overwhelmingly refutes the claim that the available SF tends to be poor quality or suffers from "generic differences between SF and fiction intended for young readers" (Nodelman 294).

It is unfortunately true that in comparison to other genres—especially SF's sister genre fantasy—there are fewer SF books than ideal. This can be seen most clearly in the library circulation data, with SF representing only 4.5% of the Virginia library's circulated titles and 8.62% of the Minnesota library's circulated titles. Similarly, 18

survey respondents reported that they do not use SF in group activities because there are simply too few books to choose from, especially at lower grade levels. Also, the only survey respondent who claims to never recommend science fiction attributed this choice to a lack of available books for her students' grade level.

In the face of my other results, this scarcity of children's SF is a call to action rather than cause for despair. Children's SF is available enough that children are accessing it, or perhaps it is more accurate to say that children are accessing it *in spite of* the scarcity. The library circulation data provides strong evidence that despite the lower availability, children's SF is frequently checked out by children under 12—and more regularly per book than other genres! At both schools, SF books received the most check-outs per book on average, and—unlike the other genres—SF books were often checked out more than once each. This intense wear-and-tear on the available children's SF suggests that there is a strong demand just waiting to be supplied. If children's SF is receiving this highly concentrated lending because of the low number of available titles, then we already have a perfect opportunity for authors and editors to supply those titles and for librarians and teachers to expand their SF holdings with high quality titles.

Since the vast majority of the survey respondents adamantly expressed that SF is just as important as other major genres, it should be easy to convince teachers and librarians to equalize their SF holdings if more SF becomes available and/or they are provided resources to help them locate high quality books. However, the survey also revealed that librarians and teachers are unlikely to use SF in storytime or promote it in group settings, and only 18 out of 38 who responded this way blamed it on a lack of

availability. The others described SF as too narratively complex, not age-appropriate, and better for solitary reading. The first two concerns indicate that professionals could benefit from resources that specifically point them to SF books that are well-suited to read-alouds and particular age groups. Their preference for SF as solitary reading is more complicated as it may hint at underlying and unintentional SF stereotyping.

The surveyed professionals clearly recognize the benefits of SF and want to treat it as equal literacy, but they—and their students—may be effected by lingering stereotypes nonetheless. Depending upon the genre, approximately 60-80% of the respondents ranked each other major genre is just as important as SF. It is telling that most of the other 20-40% of responses found SF to be less important than the other genres while no more than 5% ranked SF as more important than any other genre. Some of their explanations imply a lingering bias against SF, either on the part of the children or the professionals. Two respondents specifically said that the name “science fiction” was so off-putting that they never use it with children. Others claimed to prefer using subgenre names instead, indicating a similar avoidance. A few answers draw attention to SF as “weird” and “freaky” or a last resort for disinterested readers. Even when intending to be positive, these answers appear to echo the old, negative concept of the outcast SF nerd. Meanwhile, this stereotype holds less and less validity. In contemporary popular culture, SF has become less stigmatized. Superhero films have boomed and the new *Star Wars* films have topped box offices. According to Neil Gaiman, “Nowadays, people own their nerd-dom” (qtd. in Westcott). Professionals may need more training to realize that SF is not as “weird” than it used to be, especially since children are likely to notice if

their literacy role models appear to stigmatize the genre.

Whether anyone recognizes it, children seem to be enjoying SF texts—and not just the weird children. The high number of circulations per SF book can be taken as an indirect measure of SF enjoyment, since these books were voluntarily chosen—with or without librarian recommendations. More direct evidence that young readers enjoy SF can be seen in the read-aloud participants. Sipe's transparent and performative codes describe aesthetic responses, and these children's conversational turns were 5.31% transparent and 7.48% performative. These results are 2-3 percentage points higher than Sipe's overall observations, indicating that the children in this study were more aesthetically engaged in these SF books than could be expected from an average read-aloud. Only one of them presented himself overtly as a SF fan, but most of them had SF home exposure that could mitigate the effect of negative SF stereotypes.

When it comes to the observations of the professionals, though, the respondents contradicted one another about whether or not most children like SF. Eleven of the professionals reported that the genre is popular, but five said that it is unpopular. All their claims have weight, despite being inherently second-hand, since these professionals have their fingers on the pulse of children's likes and dislikes due to performing readers' advisories and book whispering. Taken together, their opposing responses characterize young readers as having strongly polarized opinions toward SF; it is either heartily enjoyed or firmly rejected. If this is true, then the high rate of SF check-outs may be due in part to passionate repeat readers. Alternately, many different children may like and read SF without identifying those books as genre texts.

Put together, the lack of availability, risk of stereotypes, and evidence of children's engagement indicate an urgent need for SF to see an overhaul in representation. If librarians and teachers do not use it in activities, then this lack of academic endorsement and usage makes SF less visible and less modeled to children as valuable literature. Even if home environments include SF representation, the disparity between home and "official" literacy arenas may depict SF as insignificant personal reading. This risks perpetuating old ideas of SF as exclusionary or frivolous reading material, which in turn might dissuade young readers and other professionals from taking the genre seriously. This, in turn, only supports the assumption that the genre is divisive, or only for personal reading. Young readers will likely keep reading it anyway, but with the impression that it is not worth thinking about, actively undermining many of the goals and benefits of SF. Additionally, these children would be reading without a solid idea of how to evaluate SF for quality and other literacy concepts that are most often delivered via academic instruction. Finally, the cycle does not end there. The working assumptions about SF that are held by librarians and teachers can reinforce the negative concept of SF held by scholars and editors. This entire system of assumptions runs the risk of being a closed loop, without ever once reflecting the actual reading habits of children.

An Essential Digression: Star Wars as Core Children's SF

One major access point to SF that arose in this study requires a moment of focused attention: the *Star Wars* franchise. I had anticipated that the *Star Wars* films would be a core genre text, but I did not expect the broader franchise to emerge independently in each set of data without provocation. The importance of *Star Wars* became noticeable during Phase II, when I saw that the teachers and librarians were not

mentioning many specific texts by name, preferring instead to talk more broadly about categories and types of book. It therefore stood out when two respondents mentioned *Star Wars* by name when explaining how they recommend books, four mentioned *Star Wars* as a way to identify potential SF readers, and one mentioned *Star Wars* while talking about how SF is great for engaging reluctant readers. This tendency to name-drop *Star Wars* became more interesting yet when my parental questionnaires also repeatedly mentioned *Star Wars* by name in 4 out of 5 responses. One of my more active participants, John, proclaimed himself a *Star Wars* fan and eagerly showed me his newest *Star Wars* book after the read-aloud. Even though not a single mention of *Star Wars* occurred during the read-aloud recording, this context was informative since John was one of the most active and reflective participants.

After noticing *Star Wars* in these methods, I returned to the library circulation data. While coding the library data points, I had noticed many different *Star Wars* books from a variety of series that all seemed to be getting high numbers of check outs. As described in chapter 5, my observation across methods inspired me to code *Star Wars* as a separate variable at the last minute. At the Virginia school, *Star Wars* books only accounted for 8.25% of the SF titles, and 15.30% of the SF titles at the Minnesota school. However, the *Star Wars* books by themselves received over double the average circulations of the other SF books. At the Virginia school, the *Star Wars* books received 32 circulations per title, as opposed to 15 per book for other SF. The average was 12 circulations per *Star Wars* title in Minnesota, as compared to 5 times per book for other SF. The *Star Wars* books were not carrying the circulations for the entire genre, since the

non-*Star Wars* SF still had a higher average circulation per book than all the other genres, but the high average circulations demonstrate that SF readership is definitely more intense around this franchise.

While conducting Phase I, I had not noticed *Star Wars* developing as a motif yet, since I was trying to limit myself to 1-2 books from a single series. Yet there are enough different *Star Wars* series that I still ended up with four early readers, two picturebooks, and one graphic novel. One of the early readers is actually an Angry Birds mash-up, *Angry Birds Star Wars: Yoda Bird's Heroes* (2013), demonstrating that *Star Wars* is such a pervasive cultural text that even level 1 new readers can be expected to enjoy mash-ups and puns about the original film characters. Now, revisiting the Phase I *Star Wars* books in retrospect, it is telling that only those books including original series characters achieve demonstrable extrapolation/speculation. The books based on the original films like *Star Wars: The Mystery of the Rebellious Robot* (1979) and *Star Wars: The Maverick Moon* (1979) feature situation-based plots while *Star Wars: Finn and Poe Team Up!* (2016) and *Star Wars: Rey Meets BB-8* (2015) veer toward focusing on characters interacting with one another. Even new books based on old characters, like *Star Wars: Trapped in the Death Star!* (2016), achieved speculation/extrapolation through a focus on the situation or event. Books with brand new characters beyond the movies, like book one of *Star Wars: Jedi Academy* (2013), also did not include speculation/extrapolation. Overall these writers seem to assume that children will already know the characters of the old films and therefore do not require an introduction or character-based story. The plot in old-character stories tend to be all about what the characters are doing, not who they

are. There is more room for speculation in a story about a situation. Meanwhile, the newer characters are just that: new. They are still being built up to pop culture recognition and their stories reflect that character-driven goal.

What this *Star Wars* motif indicates most, in the context of this study, is that the franchise holds a lot of responsibility for children's SF exposure, and should be held accountable for what that means for science-fictional literacy. SF for children under 12 is already a limited pool with concentrated readership, and the popularity of *Star Wars* further focuses that SF readership in one area. This is not automatically a problem, but the writers need to step up the speculative SF content if these books are going to encourage SF reading beyond the franchise. After all, speculative material is plentiful in the films, which—despite being space opera—contemplate the reach of government power, the ethics of rebellions, the use of advanced technology for weapons, and so forth. If this speculative content did not make children dislike the films, then it can and should be included in the books for children, too.

Children's SF Quality

Given the above conclusions, the need for quality children's SF takes on greater weight. If children already read and enjoy SF, regardless of shortage, then it is important to consider what kind of introduction to the genre they are they receiving from these books. Mendlesohn argues that in order to provide a viable transition to SF for adults, children's SF books must contain genre traits representative of SF literature. What she really seems to want, though, are traits representative of specifically *high quality* SF literature. As Andrew Milner explains, the projects of genre definitions and aesthetics must be disentangled. Poorly rendered children's SF may still lead to adult SF reading,

but quality children's SF is important if we want to prepare kids to benefit from the *best* literature that SF has to offer. This is more likely if the available children's SF books meet high genre standards in a scaffolded way, and if children are understanding those high quality examples of SF.

As laid out in chapter 2, the genre standards for SF can be scaffolded in children's SF through the assistance of rich pictures and closure in comics. Judging by the results of the literary analysis in chapter 4, the available children's SF books are meeting extrapolation/speculation standards just fine. Over half of the books passed my tests for speculation or extrapolation, far surpassing the low expectations set by scholarly comments. 141 out of 213 books succeeded, or 66% of the sample. Longer formats had higher percentages, indicating that speculation and extrapolation benefit from space to flesh out these science fictional situations. Yet even the shorter formats achieved over 50% success each. The survey respondents also did not seem to think that young children's SF was generally poor quality. These professionals may not be SF specialists, but their answers reveal that they understand the genre's core tenets. Several pointed out speculation and extrapolation as a way to recommend SF books and identify potential SF readers. Others praised the genre for its rich extrapolative and speculative thought experiments. The concerns that they *did* raise about SF quality stemmed from low availability. Simply put, when the available pool is small, the presence of poor examples gets in the way more.

The scholarly concern voiced by Mendlesohn and Hastings that much children's SF may be over-simplified does not seem to be reflective of the genre in action in

libraries and classrooms. If anything, the survey respondents were concerned that children's SF is too complex in comparison with other genres, despite being less complex than SF for YA or adult audiences. This, in turn, reflects some of the critical concerns voiced by Hastings and Nodelman that children's SF may not be prolific or done well because of a general belief that it would be too hard for children. However, this complaint about complexity from the surveyed professionals was voiced in regards to group reading situations, which by necessity must meet the needs of many different literacy and comprehension levels. In individual reading situations, one professional explains why she does not often use SF:

Mostly due to availability. There is not a lot out there for K-5 audiences that I can read aloud. I also found that recommending science fiction chapter books to children at the elementary level wasn't very successful. Children would bring back these novels because they were hard to follow. I suspected this was because often the author assumed scientific knowledge the typical child doesn't know about or because the plots were too complex for a younger child to follow.

Since this professional claims to have very few SF books available for read-aloud, her readers are encountering SF novels with not only a minimal science background, but also a minimal SF reading background. Mendlesohn believes that children should be able to "bootstrap" their way into complex SF, but it seems that providing early, scaffolded examples in picturebooks, early readers, and comics is also important for helping children develop techniques for reading SF in short formats before they encounter long, complex novels.

Ultimately, this concern about whether younger children can understand speculative/extrapolative SF can only be answered satisfactorily by direct studies with actual young readers. This study's read-aloud results serve as an example that well-prepared children are capable of understanding, playing with, and performing their own speculation while reading high quality SF in a group situation. Several analytical responses showed the children following speculative plots, engaging with the speculation itself, and initiating their own speculative tangents.

The concern seems to be that children will be so off-put by confusing complex SF that they will shun the entire genre for good. Yet the children in the read aloud sessions did not seem perturbed at all by a lack of understanding. When John and Zoe could not understand the energy discs during the reading of *Mr. Wuffles!*, they were perfectly happy to make up a silly interpretation and then move on regardless. This ability to move along may be important to sustaining their positive experience. Like a hard word, they skipped it. Upon re-reading, they may have been better prepared to understand. This result would probably have been different if I had pressed them to figure out what those discs were, or shut down their joke. Alternatively, I could have simply told them what my interpretation was. The guidance of teachers and librarians impacts whether children believe it is absolutely necessary to understand something right away and this should be taken under careful consideration when reading speculative or extrapolative SF with young readers. Guidance and genre training may shape their approach to confusing or complex narratives in later reading experiences.

The conclusions above consistently call for building up the quantity of children's

SF with high quality texts. This is also a great opportunity to balance out the content of girl-friendly and diverse books for children in SF. At the risk of sounding like a competition, SF literature has a small lead over general children's literature; this is no time to stop. This study's sample of books achieved slightly higher percentages of representation than the overall children's literature averages for girl-friendliness and overall diverse content. This achievement may reflect a trickle of influence from SF's long, symbiotic history with traditions like Feminism and Afrofuturism. Yet it is important to remember that this bar for success is far too low for satisfaction. Children's literature in general is just beginning to see an urgent movement for more diverse representation and gender equality, and children's SF still suffers from the same issues of representation as children's literature overall. For instance, Indigenous Futurisms and Latin@futurism did not have many representations in this sample, leaving a lot of room for improvement. Culturally rich narratives were rare, especially in the shortest formats. If children's SF can inherit more of SF's radical traditions, it will vastly improve the genre's ability to welcome a wider variety of young readers into the wonders of both SF and science.

Children's SF could easily be the *leading* children's literature genre in terms of representation; the framework is already there in SF's history. If accomplished in tandem with fully extrapolative and speculative SF, then more children will be able to imagine themselves and people different from them as important agents in our collective future. Additionally, many of these books already exist, as this study shows. Like Marley Dias's #1000BlackGirlBooks movement, sometimes the quality books that already exist simply

need to be called forth from the margins for better acknowledgement of their successes. However we accomplish it, the quest is clear. Professionals in children's literature must apply more effort to ensure that high quality, diversely representative SF is available to young children.

Future Research

As a case study, the goal of this dissertation is to thoroughly describe a phenomenon of interest: science fiction for children under 12. As a holistic understanding of the genre, this opens many avenues for further research. Even within this dissertation, several questions emerged that could not be addressed within one project. For instance, I found no critical literary work on Indigenous or Latinx SF specifically for children. Additionally, the incongruous views of teachers and librarians who answered the survey calls for further analysis on the representation of SF in teacher training and library science programs. Also, these results indicate that editorial and marketing professionals may wish to investigate the sales trends of SF. With a groundwork established by this dissertation, researchers across disciplines can begin to interrogate the nuances of young children's SF and fill the void of meaningful scholarship and production.

Conclusion

Children under 12 are reading, appreciating, and understanding SF books. In the end, it turns out that children read the genre without any regard for whether scholars think it is problematic. If this readership of SF is proven to children's publishers, then the demand can be filled with more high quality books. If more books are available, then teachers and librarians can expand their holdings and usage, alongside shifts in training and perceptions of SF. We cannot simply declare that children's SF is impossible and

throw our hands up in defeat. With all these young readers already on the line, everyone involved in children's literature has a responsibility to make sure that the SF genre is rich with speculation and extrapolation, representative of many identities, and more widely available for children under 12.

Notes

ⁱ It is worth noting that Peter Brown follows this statement up with “I’m sure someone will now prove me wrong.”

ⁱⁱ However, this book is one of the only exceptions that I found in which an image added extrapolative content to an early reader. On the page that reads “Soon Scott found a way to talk to ants” there is a picture of him in a mask and lab coat, shooting gas from a beaker-like jar at the ants (9). This picture refers to how Ant-Man uses pheromones in order to communicate with the ants, one of the more extrapolative features of his storyline in the comics and movies. Young readers may or may not gather this from their intertextual knowledge, but that little extrapolation is nonetheless contained in the tension between the picture, words, and intertext for those who can find it.

ⁱⁱⁱ This should be taken cautiously, however, since the sampling method was voluntary and not random.

^{iv} The Minnesota school library’s nonfiction total is not representative, because it only shows their creative nonfiction picturebooks. The rest of the nonfiction circulation was recorded in the same data file as the upper elementary school’s nonfiction circulation. Therefore, it was invalid for this study since the upper elementary school library serves children over 12.

^v While it seems like Minnesota’s SF cases may be problematically high, figure 6 is on a notably smaller scale than figure 5. The highest check-out case in Virginia is 354 check-outs, while the highest in Minnesota is 44. The high SF cases for Minnesota are close to 30. These extreme cases would not be skewing the overall check-outs for SF by much.

^{vi} It is true that I mention *Star Wars* as an example in the activities question, but the other common examples were not echoed in this way. I take that as an indication that the consistent mention of *Star Wars* cannot be blamed on parents simply parroting my examples.

^{vii} All the children's names are pseudonyms to protect their identity.

^{viii} I have not independently checked beginner word lists to verify that the book's words are easy, but the back cover marketing text clearly targets "new readers" and underlines that the overall Balloon Toons series contains "simple stories."

Works Cited

- Ahn, June, Amanda Waugh and Allison Druin. "Sci-fi, Storytelling, and New Media Literacy." *Knowledge Quest* 41.1 (2012): 23-27. Print.
- Anderson, Meg. "Where's The Color In Kids' Lit? Ask The Girl With 1,000 Books (And Counting)." *NPR* 26 February 2016. Web. 22 October 2016.
<<http://www.npr.org/sections/ed/2016/02/26/467969663/wheres-the-color-in-kids-lit-ask-the-girl-with-1-000-books-and-counting>>.
- Asim, Jabari. "Afro-Futurism." *The Crisis* 123.2 (2016): 22-28. Web. *Proquest*. 20 October 2016.
- Asimov, Isaac. "Robot Dreams." *Masterpieces: The Best Science Fiction of the Twentieth Century*. Ed. Orson Scott Card. New York, NY: Ace Books, 2001. 91-96. Print.
- Attebery, Brian. *Decoding Gender in Science Fiction*. New York: Routledge, 2002.
- . *Stories about Stories: Fantasy and the Remaking of Myth*. Oxford: Oxford University Press, 2014.
- Attebery, Brian. "The Fantastic." *The Oxford Handbook of Science Fiction*. Ed. Rob Latham. New York: Oxford University Press, 2014. 1-9. Web. *Oxford Handbooks Online*. 29 October 2015.
- Baker, Dale and Rosemary Leary. "Letting Girls Speak Out About Science." *Journal of Research in Science Teaching* 32.1 (1995): 3-27.
- Barone, Diane M. "Case Study Research." *Literacy Research Methodologies*. Ed. Nell K. Duke and Marla H. Mallette. 2. New York: The Guilford Press, 2011. 7-27.

Brown, Alan S. and Brittany Logan. "How Fiction Puts the Science in Engineering."

Mechanical Engineering 32 (2015): 1-8. Web. *The American Society of*

Mechanical Engineers. 29 October 2015.

Brown, Peter. *Interview with Peter Brown*. Emily Midkiff and Laura Lemanski. 30 March 2016.

Burgess, Stephen R. "The Influence of Speech Perception, Oral Language Ability, the Home Literacy Environment, and Pre-reading Knowledge on the Growth of Phonological Sensitivity: A One-year Longitudinal Investigation." *Reading and Writing: An Interdisciplinary Journal* 15 (2002): 709-737. Web. *Springer*. 8 February 2017.

Camper, Cathy and Raul the Third. *Lowriders in Space*. San Francisco, CA: Chronicle Books, 2014. Kindle ed.

Clark, Christina and Lucy Hawkins. *Public Libraries and Literacy*. London: National Literacy Trust, 2011.

Clark, Christina. *Linking School Libraries and Literacy*. London: National Literacy Trust, 2010.

Creswell, John W. and Vicki L. Plano Clark. *Designing and Conducting Mixed Methods Research*. 2. Los Angeles: Sage, 2011.

Csicsery-Ronay Jr., Istvan. *The Seven Beauties of Science Fiction*. Middletown, CT: Wesleyan University Press, 2008.

- Dare, Emily. *Understanding Middle School Students' Perceptions of Physics Using Girl-Friendly and Integrated STEM Strategies: A Gender Study*. Dissertation. Minneapolis: University of Minnesota, 2015. Web. December 2015.
- Dery, Mark. "Black to the Future: Interviews with Samuel R. Delany, Greg Tate, and Tricia Rose." *Flame Wars: The Discourse of Cyberculture*. Ed. Mark Dery. Durham, NC: Duke UP, 1994. 179-222. Print.
- Dillon, Deborah R, David G O'Brien and Elizabeth E Heilman. "Literacy Research in the 21st Century : From Paradigms to Pragmatism and Practicality." *Theoretical Models and Processes of Reading*. Ed. Donna E. Alvermann, Norman J. Unrau and Robert B. Ruddell. Newark, DE: International Reading Association, 2013. 1104-1132. Print.
- Dillon, Grace L. "Introduction: Imagining Indigenous Futurisms." *Walking the Clouds: An Anthology of Indigenous Science Fiction*. Ed. Grace L. Dillon. Tucson, AZ: The University of Arizona Press, 2012. 1-14. Print.
- Dillon, Grace L. "Introduction: Imagining Indigenous Futurisms." *Walking the Clouds: An Anthology of Indigenous Science Fiction*. Ed. Grace L. Dillon. Tucson, AZ: The University of Arizona Press, 2012. 1-14. Print.
- . "Introduction: Indigenous Futurisms, Bimaashi Biidaas Mose, Flying and Walking towards You." *Extrapolation* 57.1-2 (2016): 1-6. Web. Liverpool University Press 1 November 2016.
- . "Symposium on Science Fiction and Globalization: Global Indigenous Science Fiction." *Science Fiction Studies* 39.3 (2012): 374-384. Web. 19 September 2016.

Ehrlich, Hannah. *The Diversity Gap in Children's Publishing, 2015*. 5 March 2015. Blog Post. 28 January 2017.

Fleischmann, Kenneth R. and Thomas Clay Templeton. "Past Futures and Technoscientific Innovation: The Mutual Shaping of Science Fiction and Science Fact." *Proceedings of the American Society for Information Science and Technology* 45.1 (2008): 1-11. Web. *Wiley Online Library*. 14 November 2015.

Gaiman, Neil. "What We Talk About When We Talk About Science Fiction." Heinlein, Robert. *Stranger in a Strange Land*. New York, NY: Penguin, 2016. ix-xxii. Print.

Galda, Lee, et al. *Literature and the Child*. Boston, MA: Cengage Learning, 2013. Print.

Gibson, Mel. "Picturebooks, Comics and Graphic Novels." *The Routledge Companion to Children's Literature*. Ed. David Rudd. New York, NY: Routledge, 2010. 100-111. Print.

Goldsmith, Francisca. *The Readers' Advisory to Graphic Novels*. Chicago: ALA, 2010. Print.

Gordon, Joan. "Literary Science Fiction." *The Oxford Handbook of Science Fiction*. Ed. Rob Latham. New York: Oxford University Press, 2014. 1-8. Web. . *Oxford Handbooks Online*. 29 October 2015.

Gubar, Marah. "On Not Defining Children's Literature." *PMLA* 126.1 (2011): 209-216.

Guerin, Wilfred, et al. *A Handbook of Critical Approaches to Literature*. 5. New York: Oxford University Press, Inc., 2005.

Hade, Daniel and Laura Anne Hudock. "Redefining the Early Reader in an Era of Multiliteracies: Visual Language of Mo Willems' Elephant and Piggie Series."

The Early Reader in Children's Literature and Culture: Theorizing Books for Beginning Readers. Ed. Annette Wannamaker and Jennifer M. Miskec. New York, NY: Routledge, 2016. 88-99. Print.

Halpern, Diane F., et al. "The Science of Sex Differences in Science and Mathematics." *Psychological Science in the Public Interest* 8.1 (2007): 1-51.

Hartwell, David. "The Golden Age of Science Fiction is Twelve." *Visions of Wonder: The Science Fiction Research Association Anthology.* Ed. David G. Hartwell and Milton T. Wolf. New York, NY: Tor Books, 1996. 81-96. Print.

Hastings, A. Waller. "Science Fiction." *Keywords for Children's Literature.* Ed. Philip Nel and Lissa Paul. New York: New York University Press, 2011. 202-207. Print.

Hastings, A. Waller. "Science Fiction." *Keywords for Children's Literature.* Ed. Philip Nel and Lissa Paul. New York, NY: New York University Press, 2011. 202-207. Print.

Hatfield, Charles. "Graphic Novel." *Keywords for Children's Literature.* Ed. Philip Nel and Lissa Paul. New York NY: New York University Press, 2011. 100-105. Print.

Hatke, Ben. *Zita the Spacegirl.* New York, NY: First Second, 2010. Print.

Häussler, Peter and Lore Hoffmann. "An intervention study to enhance girls' interest, self-concept, and achievement in physics classes." *Journal of Research in Science Teaching* 39.9 (2002): 870-888. Print.

Häussler, Peter, et al. "A typology of students' interest in physics and the distribution of gender and age within each type." *International Journal of Science Education* (1998): 223-238. Print.

- Haynes, Carol and Donald J. Richgels. "Fourth Graders' Literature Preferences." *The Journal of Educational Research* 85.4 (1992): 208-219. Print.
- Higgins, David. "Survivance in Indigenous Science Fictions: Vizenor, Silko, Glancy, and the Rejection of Imperial Victimry." *Extrapolation* 57.1-2 (2016): 51-72. Web. *Liverpool University Press*. 1 November 2016.
- Hollinger, Veronica. "Genre vs. Mode." *Oxford Handbook of Science Fiction*. Ed. Rob Latham. New York: Oxford University Press, 2014. 1-10. Web. *Oxford Handbooks Online*. 29 October 2015.
- Horning, K.T. *I See White People*. 11 July 2013. Blog Post. 28 January 2017.
- Joseph, Michael. "Seeing the Visible Book: How Graphic Novels Resist Reading." *Children's Literature Association Quarterly* 37.4 (2012): 454-467. Web. *Project Muse*. 15 October 2016.
- Kilgore, De Witt Douglas. "Afrofuturism." *The Oxford Handbook of Science Fiction*. Oxford: Oxford University Press, 2014. Web. *Oxford Handbooks Online*. 19 October 2016.
- Kress, Gunther and Theo van Leeuwen. *Reading Images: The Grammar of Visual Design*. London: Routledge, 1996. Print.
- Kukkonen, Karin. "Comics as a Test Case for Transmedial Narratology." *SubStance* 40.1 (2011): 34-52. Web. *Project Muse*. 13 November 2011.
- Landon, Brooks. "Extrapolation and Speculation." *The Oxford Handbook of Science Fiction*. Ed. Rob Latham. New York: Oxford University Press, 2014. 1-9. Web. *Oxford Handbooks Online*. 29 October 2015.

Larson, Hope and Madeleine L'Engle. *A Wrinkle in Time: The Graphic Novel*. New York, NY: Margaret Ferguson Books, 2012. Print.

Latham, Rob and Corey Creekmur. *Comics. The Oxford Handbook of Science Fiction*. Ed. Rob Latham. New York: Oxford University Press, 2014. 1-10. Web. *Oxford Handbooks Online*. 29 October 2015.

Lavender, Isaiah, III. "Ethnoscapes: Environment and Language in Ishmael Reed's Mumbo Jumbo, Colson Whitehead's *The Intuitionist*, and Samuel R. Delany's *Babel-17*." *Science Fiction Studies* 32.2 (2007): 187-200. Web. *JSTOR*. 23 October 2016.

L'Engle, Madeleine. *A Wrinkle in Time*. New York, NY: Square Fish, 1962. Print.

Levy, Michael. "Science Fiction." *Oxford Encyclopedia of Children's Literature*. Ed. Jack Zipes. Oxford: Oxford University Press, 2006. 417-422. Print.

Mack, Elizabeth, et al. "Effective practices for creating transformative informal science education programs grounded in Native ways of knowing." *Cultural Studies of Science Education* 7 (2012): 49-70. Web. 5 Feb 2016.

Mandler, J. and N. Johnson. "Remembrance of Things Parsed: Story Structure and Recall." *Cognitive Psychology* 9 (1977): 111-151. Print.

Mccabe, Janice, et al. "Gender in Twentieth-Century Children's Books: Patterns of Disparity in Titles and Central Characters." *Gender and Society* 25.2 (2011): 197-226. Web. *JSTOR*. 22 October 2016.

McClintock, Pamela. "Box Office: 'Star Wars: The Force Awakens' Opens to Record \$238M for Cosmic \$517M Global Launch." *The Hollywood Reporter* (2015).

Web. <<http://www.hollywoodreporter.com/news/star-wars-box-office-star-850340>>.

McCloud, Scott. *Understanding Comics: The Invisible Art*. New York: HarperPerennial, 1994.

Mendlesohn, Farah. *The Intergalactic Playground: A Critical Study of Children's and Teens' Science Fiction*. Ed. Donald E. Palumbo and C.W. Sullivan III. Vol. Critical Explorations in Science Fiction and Fantasy 14. Jefferson, NC: McFarland & Co., 2009.

Merla-Watson, Cathryn Josefina. "The Altermundos of Latin@futurism." *Alluvium* 6.1 (2017). Web. 28 March 2017.

Milner, Andrew. *Locating Science Fiction*. Liverpool: Liverpool University Press, 2012.

Moebius, William. "Picture Book." *Keywords for Children's Literature*. Ed. Philip Nel and Lissa Paul. New York, NY: New York University Press, 2011. 169-173. Print.

Moss, Gemma and John W. McDonald. "The Borrowers: Library Records as Unobtrusive Measures of Children's Reading Preferences." *Journal of Research in Reading* 27.4 (2004): 401-412. Print.

Nikolajeva, Maria and Carole Scott. *How Picturebooks Work*. New York, NY: Garland Publishing, 2001. Print.

Nikolajeva, Maria. "Interpretive Codes and Implied Readers of Children's Picturebooks." *New Directions in Picturebook Research*. Ed. Bettina Kümmerling-Meibauer, Cecilia Silva-Díaz Teresa Colomer. New York: Routledge, 2010. 27-40. Print.

Nodelman, Perry. "Out There in Children's Science Fiction: Forward into the Past."

Science Fiction Studies 12.3 (2015): 285-296. Web. *JSTOR*. 1 November 2015.

Noh, Suen. "Science , Technology , and Women Represented in Korean Sci-Fi Girls'

Comics." *International Journal of Comic Art* 10.2 (2008): 209-234. Web. *IJOCA*.

8 December 2015.

Papazian, Gretchen. "Reading Reading in the Early Reader: Mindset, Emotion, and

Power." *The Early Reader in Children's Literature and Culture: Theorizing Books*

for Beginning Readers. Ed. Annette Wannamaker and Jennifer M. Miscec. New

York, NY: Routledge, 2016. 71-87. Print.

Postema, Barbara. "Draw a Thousand Words: Signification and Narration in Comics

Images." *International Journal of Comic Art* 9.1 (2007): 487-501. Web. *Art Full*

Text. 13 November 2011.

Publishing Statistics on Children's Books about People of Color and First/Native Nations

and by People of Color and First/Native Nations Authors and Illustrators. 15

February 2017. Web. 24 January 2017.

<<https://ccbc.education.wisc.edu/books/pcstats.asp>>.

Reeder, Amy, Brandon Montclare and Natacha Bustos. *Moon Girl and Devil Dinosaur:*

BFF. New York, NY: Marvel, 2016. Print.

Rex, Adam. *The True Meaning of Smekday*. New York, NY: Hyperion Books, 2007.

Print.

Rose, Jacqueline. *The Case of Peter Pan, or the Impossibility of Children's Fiction*.

London: Macmillan, 1984. Print.

- Sanders, Joe Sutliff. "Chaperoning Words: Meaning-Making in Comics and Picture Books." *Children's Literature* 41 (2013): 57-90. Web. *Project Muse*. 20 January 2014.
- Scieszka, Jon and Brian Biggs. *Frank Einstein and the Antimatter Motor*. New York, NY: Amulet Books, 2014. Print.
- Scott, Colin. "Science for the West, Myth for the Rest?" *The Postcolonial Science and Technology Studies Reader*. Ed. Sandra Harding. London: Duke UP, 2011. 175-197. Print.
- Sias, Ryan. *Zoe and Robot: Let's Pretend!* Maplewood, NJ: Blue Apple Books, 2011. Print.
- Sipe, Lawrence. *Storytime: Young Children's Literary Understanding in the Classroom*. New York, NY: Teacher's College Press, 2008. Print.
- Skolnick, Deena and Paul Bloom. "What Does Batman Think about SpongeBob? Children's Understanding of the Fantasy/Fantasy Distinction." *Cognition* 101.1 (2006): B9-18. Print.
- Stein, N. and C. Glenn. "An Analysis of Story Comprehension in Elementary School Children." *Advances in Discourse Processes*. Ed. R.D. Freedle. Vol. 2: New Directions in Discourse Processing. Norwood, NJ: Albex, 1979. 53-119. Print.
- Tan, Shaun. "The Accidental Graphic Novelist." *Bookbird* 49.4 (2011): 1-9. Web. *Project Muse*. 15 October 2016.
- Tolkien, J.R.R. "On Fairy-Stories." *Tree and Leaf*. London: George Allen and Unwin, 1964. 109-161. Print.

- Tsui, Lisa. "Effective Strategies to Increase Diversity in STEM Fields: A Review of the Research." *The Journal of Negro Education* 76.4 (2007): 555-581. Web. *JSTOR*. 22 October 2016.
- Vizenor, Gerald. *Fugitive Poses: Native American Indian Scenes of Absence and Presence*. Lincoln, NE: First Bison Books, 1998. Print.
- Walsh, Maureen. "'Reading' Pictures: What Do They Reveal? Young Children's Reading of Visual Texts." *Reading: Literacy and Language* 37.3 (2003): 123-131. Web. *ERIC*. 24 October 2013.
- Wannamaker, Annette and Jennifer M. Misceck. "Introduction: Early, Easy, First, Beginner, and Chapter." *The Early Reader in Children's Literature and Culture: Theorizing Books for Beginning Readers*. Ed. Annette Wannamaker and Jennifer M. Misceck. New York, NJ: Routledge, 2016. 1-12. Print.
- Westcott, Kathryn. "Are 'geek' and 'nerd' now positive terms?" *BBC News Magazine* 16 November 2012. Web. 24 February 2017.
- Westman, Karin E. "Children's Literature and Modernism: The Space Between." *Children's Literature Association Quarterly* 32.4 (2007): 283-286. Print.
- Wolfe, Gary. "Literary Movements." *The Oxford Handbook of Science Fiction*. Oxford: Oxford University Press, 2014. 1-9. Web. *Oxford Handbooks Online*. 29 October 2015.
- Wyatt, Chris and Illus. Ron Lim and Rachelle Rosenberg. *Ant-Man: This is Ant-Man*. New York, NY: Marvel Press, 2015. Kindle ed.

Yannicopoulou, Angela. "Visual Aspects of Written Texts: Preschoolers View Comics."

L1— Educational Studies in Language and Literature 4.2 (2004): 169-181. Print.

Yanowitz, Karen L. and Staria S. Vanderpool. "Assessing Girls' Reactions to Science

Workshops." *Journal of Science Education and Technology* 13.3 (2004): 353-359.

Print.

Yaszek, Lisa. "Feminism." *The Oxford Handbook of Science Fiction*. Ed. Rob Latham.

New York: Oxford University Press, Inc., 2014. 1-9. Web. *Oxford Handbooks*

Online. 29 October 2015.

Ybarra-Frausto, Tomás. *LATINOPIA ART TOMÁS YBARRA-FRAUSTO*

"*RASQUACHISMO*" Barrio Dog Productions Inc. 15 August 2011. Web. *Vimeo*.

28 March 2017.

Yin, Robert. *Case Study Research: Designs and Methods*. 3. Thousand Oaks, CA: Sage,

2003. Print.

Yolen, Jane. "Letter to Jim." *Jane Yolen Papers*. Box 7, Folder 29. The Kerlan

Collection, University of Minnesota, Minneapolis MN, 22 January 1979.

Archived Material. 26 September 2016.