AMERICAN UNIVERSITY OF BEIRUT

THE AUTOMATED DETECTION OF GENDER BIAS PATTERNS IN CHILDREN'S BOOKS AND STORIES

by
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ABSTRACT OF THE THESIS OF

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Title: The Automated Detection of Gender Bias Patterns in Children's Books and Stories

From the late 1960s through the 1970s, researchers worldwide have shown interest in the exploration of gender representation in children's literature, including books, stories, and educational materials. A significant representational discrepancy was witnessed and proved between both genders in central characters, illustrations, titles, and text in different children's stories and books through several studies conducted over the years. Several methods have been used for the detection of gender bias, yet most of these methods followed a manual frequency-based qualitative and quantitative content analysis approach that focuses on the word-level detection of gender bias in language. This study, however, presents an advanced automated computer-driven approach that can detect different gender bias categories at a phrase-level and sentence-level. This study applies its automated methodology and finds countless instances of gender bias patterns investigated in more than 200 children's books and stories, most of which are still read to and by children today. It also tries to explore any relationship existing between the gender bias categories detected and some attributes collected, such as "author's gender", "book genre", and "year of publication". This study finds significant effects of the" author's gender" and "book genre" on the use of the different types of gender bias categories where male authors tend to display a greater bias in language towards males as compared to female authors. This research also presents the previous work that has been done in the field of gender research in children's literature and discusses the negative impact that a gendered language has at a micro-level and macro-level. Finally, this work aims to enhance the existing detection approaches, especially for the identification of gender bias existing at the level of the language, and it presents an automated machine-led content analysis approach for this purpose.

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CHAPTER 1

INTRODUCTION

The period between the late 1960s through the 1970s marked an important turning point in the field of gender research in children's literature, alongside the emergence of the feminist movement also known as the second wave of feminism in the United States (Blumberg, 2008; McCabe et al., 2011; Narahara, 1998; Turner-Bowker, 1996). During that time, there was an interest among researchers in exploring and investigating gender bias in children's books and stories (Kinman et al., 1985; Weitzman et al., 1972) as well as in educational materials provided in the English language (Hartman & Judd, 1978). As a result, more researchers became aware of the gender disparity in the representation of females and males and the stereotypes attributed to each gender in children's literature (Peterson & Lach, 1990). Gender disparity between both genders has been witnessed in the titles, central characters, role models, illustrations, and the language used (Weitzman et al., 1972). Through the application of many qualitative and quantitative content analyses methods over the years, studies have proven that children's books and stories as well as educational materials provided at schools contain countless instances of gender biases that put men and boys in a superior and more privileged position as compared to women and girls.

The problem of the overrepresentation of males and underrepresentation of females in children's books and stories is not only characterized by the gender disparity in terms of the number of times a female appears as compared to a male in a title or an illustration or as a central character or a role model, but also by the traditional and stereotyped gendered activities attributed to each gender. According to Weitzman et al. (1972) in their study on several hundred

picture books for preschool children, including prize-winning books, over a period of five years (1967-1971), females were represented mostly as housewives who are passive, dependent, unadventurous, and calm and often depicted in indoor settings. On the other hand, males were described as active, independent, adventurous, breadwinners, and decision-makers and often depicted in outdoor settings. Although a great number of women and girls, today, are more involved in the labor force and workplace with shifting gender roles around the world, their depiction in these rigid traditional stereotypes has continued over the years and persisted in children's literature, especially inside English textbooks (Amini & Birjandi, 2012; Lee & Collins, 2006). Picture books, trade books, content books, and basal readers were all inspected for evidence of gender bias and sexism (Creany, 1995).

In addition to the disparity in the representation of both genders, the critical and challenging problem of gender bias in children's books lies mainly in the use of gender-biased language which in many cases sends implicit and explicit messages that reproduce and legitimate rigid gender systems. The manifestation of gender bias in children's books and stories is characterized by the prevalence of different types of gender-biased language that in most cases overly emphasize men and marginalize women. This biased language in children's books and stories can take several forms, some of these forms include the use of the generic "he", "his", or "him" to refer to both genders or to refer to a noun with an indefinite sex, such as "a professor should communicate his subject well" or "everyone seems happy with his life" (Amini & Birjandi, 2012; Doughman et al., 2021; Gastil, 1990; William, 1980). Other types of gendered language include the use of gendered occupational bias that results in the gendered division of labor, such as "professors are men and elementary teachers are women" (Doughman et al., 2021). Gendered word ordering pairs or firstness terms that are also known as mixed-sex

binomials tend to display gender bias when these pairs always tend to place the masculine term before the feminine term, as in the case of "father and mother" and "boys and girls" (Amini & Birjandi, 2012; Doughman et al., 2021; Motschenbacher, 2013b). A thorough discussion of the different types of gendered language is discussed in the literature review chapter.

Books and stories are highly important in children's early lives as they tend to be one of the earliest sources of information and knowledge for them. Books are given to children at the time they start developing their sexual identities and making sense of the world around them (Weitzman et al., 1972). Books also tend to influence the development of students' gender-based attitudes at an impressionable age (Lee & Collins, 2006). Books not only entertain, but they articulate cultural and social norms to a young child (Creany, 1995; Narahara, 1998; Peterson & Lach, 1990). Through books, children learn about the outside world, other girls and boys, what is right and wrong, how they should act and speak, and what they should be like as they grow up (Creany, 1995; Weitzman et al., 1972). Thus, these redefined societal templates set for each gender serve in shaping children's perceptions about themselves and others around them (Ochman, 1996).

Unfortunately, however, many of those books reinforce, legitimate, and reproduce a patriarchal gender system that embeds implicit and explicit biased messages that deliver gender stereotypes that stress male supremacy and female marginalization in society (McCabe et al., 2011). Children exposed to such gender-biased books and stories can very quickly integrate those stereotypes into their value systems and tend to perpetuate them as they grow older (Graham, 1975; Nilsen, 1977; and Arnold-Gerrity, 1978 as cited in Porecca, 1984). Gender bias has some detrimental effects starting from its individual influences on children characterized by undermining children's capabilities and academic performance (Cimpian et al., 2012; Crawford

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& English, 1981), limiting their potential for growth and development (Creany, 1995), and hindering children's future career aspirations (Bem & Bem, 1973). Not only does gender bias have an impact on an individual level but a nationwide level as well. The macro-level influence of gender bias in language is represented by obstructing women's involvement in the social and economic fields and the negative implications that result from the lack of balance in the number of women and men in the workplace (Gay et al., 2013). From here, paying close attention to what type of language children's books contain and detecting the different types of gendered language articulated are crucial steps towards achieving gender parity and mitigating the biases generated. This is why this work is highly concerned with facilitating and speeding up the process of detection through the proposal of an automated computer-driven approach that beats the state-of-the-art techniques, which have hugely relied on manual content analysis approaches.

Most of the related work that has been done so far in an attempt to capture gender biases in children's books has been performed through applying manual content-based and frequency-based analyses, on a collection of books, stories, and educational materials. In addition to this, the manual approach has been completed by human coders or "by hand" (Neuendorf, 2016; Krippendorff, 2018, as cited in Adukia et al., 2021). Moreover, previous research was characterized by simply computing and comparing the number of times females and males were represented in titles, central characters, illustrations, and language. In addition to that, gender bias in language was explored at the word-level providing very little context to the problem understudy and making it harder to comprehend and understand the context surrounding the biases detected. Thus, the detection of gender bias in children's literature has been always a challenge given the manual work that had to be exerted to identify the biases encountered.

The present study aims to go beyond the traditional manual approaches by introducing an automated detection approach for different types of gender biases, most of which were predefined in a previously built gender bias taxonomy by Doughman et al. (2021) and some which were previously detected through manual approaches in the related literature. The importance of this work as compared to the previous work lies in the introduction of automation which is more efficient and effective in identifying biases and stereotypes, especially when considering a very large number of books to analyze. This work intends mainly to go beyond the traditional methods of detection at the word-level and examine gender biases at the phrase-level and sentence-level, in an attempt to provide a deeper understanding of the intent and the direction of writing. This study presents descriptive research, including quantitative and qualitative, investigations of the visibility (frequency and nature) of the two genders across five categories. As detailed in Chapter 3, these categories include exclusionary bias through examining explicit marking of sex terms excluding males vs. terms excluding females, firstness or gendered word ordering pairs or mixed-sex binomials, masculine generic constructions, including gendered generic indefinite pronouns and occupational bias or gendered division of labor. In addition to that, this work aims to analyze and interpret the prevalence of the different types of biases identified in the sample of the children's books and stories collected and to perform an in-depth analysis that will investigate these biases as a function of some attributes, including "author's gender", "year of publication", "publishing company", and "country of publication", and "book genre". The results and findings of this work aim to answer the following research questions:

RQ1: What patterns of gender bias categories exist in the dataset under study, and how prevalent are these gender bias categories in children's books and stories?

RQ2: How has the pattern of prevalence of exclusionary bias and gendered word ordering pairs been changing over time in children's books and stories?

RQ3: Can any relationship be drawn and inferred between the gender bias patterns detected and the attributes collected through the below breakdowns?

> RQ3.1: Is there any relationship between "author's gender" and the gender bias patterns detected?

> RQ3.2: Is there any relationship between "book genre" and the gender bias categories prevalent in children's books and stories?

> RQ3.3: Is there a specific "publishing company or companies" that record high instances of gender bias in its published books?

> RQ3.4: Are gender biases more prevalent in specific countries or regions as compared to other countries and regions based on the "country of publication" of the book?

Studying and interpreting the relationships existing, if any, between the pervasiveness of gender bias in language and the mentioned attributes will help in getting a broader scope of gender bias and the factors that might influence its intensity in children's books and stories. Finally, this work intends to call attention to the gendered language found in children's stories and books by explaining the detrimental effects that gender biases have on individual and nationwide levels. Children's material developers, authors, and publishers need to be aware of the prevalence of gender biases as well as their short-term and long-term impact on individuals and countries.

CHAPTER 2

LITERATURE REVIEW

Around 50 years ago, Weitzman et al. (1972) conducted a landmark study that revealed the underrepresentation, passiveness, and submissiveness of women and girls as compared to men and boys in the titles, central characters, and illustrations in some of the most famous children's award-winning picture books. The award-winning picture books examined have always associated boys with active, independent, adventurous, and outdoor roles while girls were associated with passive, dependent, unadventurous, and indoor roles. "Females follow and serve while males lead and rescue" was the blunt message which authors delivered out of their stories and books. Weitzman's study has formed the foundation of many subsequent studies that have built on the frequency-based approach of Weitzman to further investigate the representation of both genders and check whether or not gender parity has been reached in children's literature over the years.

Most of the research that followed Weitzman's famous study adopted a frequency-based content analysis approach (Lewis et al., 2022). Researchers have extensively studied gender representation and compared the representation of males and females in titles and central characters in children's stories and picture books (Hamilton et al., 2006; Casey et al., 2020; McCabe et al., 2011; Turner-Bowker, 1996) Some researchers have also included other variables, such as "author's gender", "year of publication", "gender of central character", etc. in their studies and examined their relationship with the gender representation of males and females (Hamilton et al., 2006; Casey et al., 2020; Turner-Bowker, 1996). Researchers have also adopted a critical discourse analysis methodology which provides an in-depth analysis of the embedded

social, cultural, and ideological constructs in the language used in children's books and educational materials (Le Grange, 2015; Hamid et al., 2008; Parham, 2013)

In their study entitled "Linguistic Sexism And Gender Role Stereotyping In Malaysian English Language Textbooks", Hamid et al. (2008) examined linguistic sexism and gender role stereotyping in Malaysian English school books for years 3 and 6 published in the year 2004. They followed a frequency-based approach using the "Wordsmith tools 4" to generate word lists associated with each gender. These words were then tabulated into percentages and figures (Hamid et al., 2008). The categories looked at were (1) the number of male and female characters, (2) the terms of address used, (3) the use of male and female pronouns, (4) the use of male and female nouns about the family, and (5) occupations/activities associated with male and female characters. "Wordsmith tools 4" was first used to generate a frequency list of words and to assist in finding the collocation of words from the data (Hamid et al., 2008). After that "Concord tool" was used to add context to the words identified by the previous tool. The authors also used the "Critical Discourse Analysis tool" which systematically explores often obscure relationships between discursive practices, texts, and events and wider social and cultural structures, relations, and processes, thus giving more context to the text under study. Results showed the view of the second-place status of females is still deeply rooted in Malaysian English language textbooks where males are still prevalent over females and represented as the standard and norm (Hamid et al., 2008).

A similar study was conducted by Amini & Birjandi (2012) that aimed to examine the types of gender biases and their degree of prevalence in two of the Iranian mostly used English as a Foreign Language (EFL) textbooks at the high school level for the years 2010 and 2011. The design of their study consisted of a descriptive approach, including qualitative and quantitative

frequency-based analysis to determine the frequency and nature of both genders across five categories, including visibility (characterized by the number of times a female character appears in comparison with a male character), firstness, masculine generic constructions (described by using the masculine generics to refer to both genders), traditionally stereotypical biased occupations, and activities. Results showed striking evidence of male superiority over females in all five categories.

Lee & Collins (2006) conducted a study to investigate how changes in the status of women are reflected in Hong Kong English textbooks over the last decade. Following a frequency-based approach, the authors investigated and compared both genders in terms of female vs. male characters, social and domestic roles, semantic roles, titles, order of appearance, and pictorial representation. Their study concluded that some authors are now using more gender-inclusive terms, alternative pronouns such as "he" or "she", symmetrical phrases to include both genders, and representations of women and girls in non-stereotypical careers and activities. However, women and girls are still associated with housework, considered weak and passive, and less frequently mentioned than males in both visual and written modes.

More recent studies have been investigating gender bias in children's stories over a period of time with a focus on whether there has been a trend or pattern of change in gender representation between males and females given the strides that have been performed to promote gender diversity worldwide (Casey et al., 2020). In their study entitled "Sixty Years of Gender Representation in Children's Books: Conditions Associated with Male vs. Female Overrepresentation", the authors were interested in investigating the proportion of female-to-male protagonists or central characters in over 3,000 children's books published between the years 1960 and 2020 and targeted towards audience between the ages of 0 and 16. Casey et al.

(2020) examined the effect of the following attributes (1) "gender of central character", (2) "publication year", (3) "gender of book author", (4) "age of target audience", (5) "character type" (human vs. non-human), and (6) "book genre" (fiction vs. non-fiction). Results have shown that although there has been a significant increase in the number of female characters in children's books, there still exists a general male overrepresentation in children's literature. As for the attributes explored, the authors found that fiction books featuring non-human characters, non-fiction books featuring human characters, books by male authors, and books written for younger children are most susceptible to gender bias (Casey et al., 2020).

Most of the studies that have been done so far have extensively focused on a frequency-based approach that entailed comparing the representations of females and males in language and pictures. Yet recently, a few studies have been focusing on quantifying the degree of gender bias found in children's books based on a set of pre-compiled word lexicon which contains items describing social traits and behaviors that supposedly differentiate between females and males (Cryan et al., 2020; Lewis et al., 2022). Then, a gender bias score is given to a piece of text based on the number of occurrences of these gendered words (Cryan et al., 2020; Lewis et al., 2022).

Most of the literature on gender bias in books and stories has adopted a manual content analysis approach that has been done by human coders or "by hand" (Neuendorf, 2016; Krippendorff, 2018, as cited in Adukia et al., 2021). Moreover, most of the studies have explored gender biases at the word-level rather than phrase-level or sentence-level. Therefore, what this research work proposes is to automatically detect the diverse types of biases predefined in the previously built taxonomy beyond the word-level (Doughman et al., 2021). This work also aims to make use of the existing state-of-art techniques to detect the types of biases under study. At

the same time, this study tries to improve the detection techniques by exploring gender biases at

the phrase and sentence levels with a computer-driven content analysis approach.

CHAPTER 3

METHODOLOGY

This chapter discusses in detail the process and procedures of collecting the research dataset which consists of a sample of more than 200 books published between the 1900s and more recent years and targeted at children and young adults. This section also defines the gender-biased categories investigated and the lexicons formed for each category examined. It also presents and explains the automated process of collecting the books and preprocessing them from images into text files using Optical Character Recognition (OCR), so that they can be read and processed by Python, the programming tool used throughout this study. This study also shows the automated process of detecting the gender bias categories across each book. This process is characterized by feeding Python with the explicit marking of sex terms for computing the frequencies of these terms per book and creating patterns using the regular expression library for the gendered word ordering pairs or firstness terms as well as for the masculine generic constructions, comprised of the gendered generic indefinite pronouns and the occupational bias or gendered division of labor category.

3.1. Dataset

The books examined for this study include 203 books. To make the sample representative of

widely read titles, books from a variety of sources including award-winning books, the 100 best

books for young adults of all time, and some popular books read for children were selected. A

great number of the chosen books were found and scraped from the "International Children's

Digital Library" (ICDL) website by the University of Maryland. The books chosen cover the

period ranging from the 1900s until recent years, yet the distribution of the research dataset is not

100% uniform across the years where most of the books collected are published beyond the year

1950. Figure 3.1 below shows the distribution of our research dataset by years.
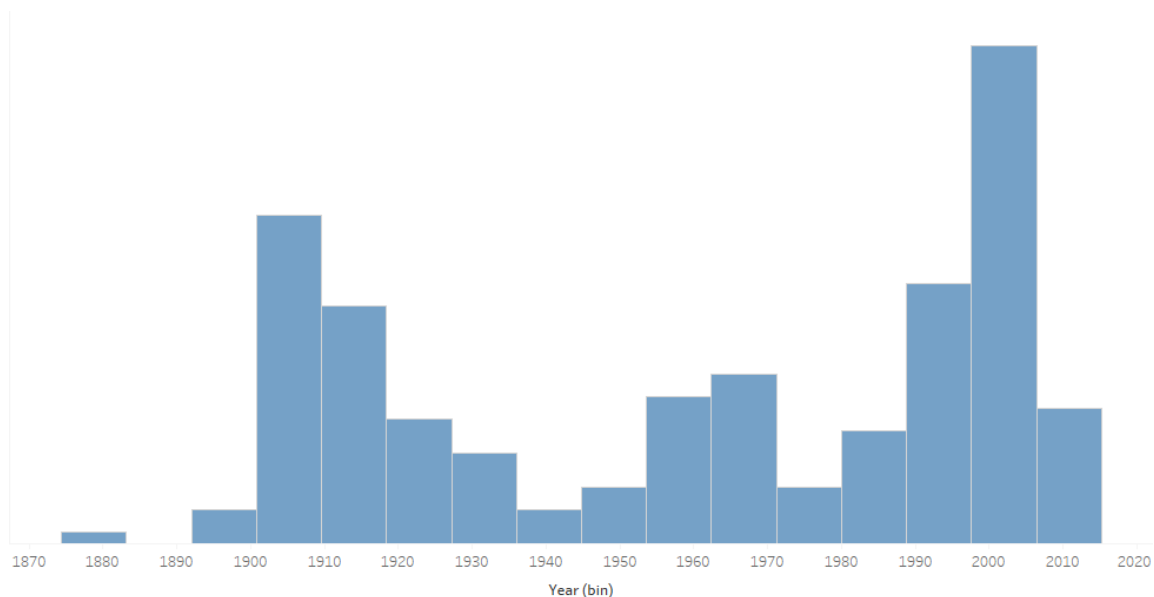
Figure 3. 1: Distribution of sample of books across the years

3.2. Attributes

Several attributes were coded for each book. These variables include (1) "book name",

(2) "author's name" (coded each author's name in case of multiple authors), (2) "author's

gender" (coded each author's gender in case of multiple authors), (3) "year of publication", (4)

"country of publication" (coded each country of publication in case of multiple countries), (5) "publisher/publishing company", (6) "book genre", (7) "translator's name" (coded for each translator in case of multiple translators), (8) "translator's gender" (coded for each translator in case of multiple translators), (9) "editor's name" (coded for each editor in case of multiple editors), and (10) "editor's gender" (coded for each editor in case of multiple editors). It is important to note that not all attributes were used in this study given that many books did not have values for them. For example, very few books were translated or edited, thus attributes with many null values were dropped from the analysis.

3.3. Data Collection

To obtain the texts of books and stories from the ICDL website, a fetching and scraping code was created to fetch the URLs of the different books included in the sample. After fetching the books' URLs, it was time to fetch the books as images by first using the "os" module available in Python that provides functions to identify the directory storing the URLs and second by using the "urllib.request" module that helps in opening URLs and fetching their contents. Each book was fetched as a collection of images. The fetching of the books resulted in a collection of images in "jpeg" format that was stored in a unique directory. Then, the images were transcribed through the Optical Character Recognition (OCR) tool using a collection of modules, including "glob", "cv2", and "pytesseract" modules, to transform them from "jpeg" files into "txt" files. The fetching and scraping codes allowed us to automate the collection of books and scale up the size of the research dataset that was mainly taken from the ICDL website. The remaining books were collected through a manual web search including different websites, such as www.pdfdrive.com and https://time.com/collection/100-best-ya-books/. The books that

were manually collected had a "pdf" format that was transferred into a "txt" format by pasting the content of these books in Notepad and saving them into the desired format.

Thus, this work was able to automate the book collection process allowing for a faster and more efficient methodology for data collection as compared to the previous studies performed. The next sections represent the different lexicons that were gathered and built prior to and during the study for each gender bias category investigated. The lexicons displayed in the following section were created through our efforts and by relying on some of the previous and related work. It is important to note that there isn't any ready-made word list or lexicon taken from related studies.

3.3.1 Explicit Marking of Sex Terms or Exclusionary Bias Lexicon

To detect the explicit marking of sex terms that exclude females and males, two datasets were created. One dataset includes exclusionary terms that exclude women and girls, such as the words "policeman" and "cowboy", while the other dataset includes terms excluding males, such as "washerwoman" and "saleslady". Both datasets account for the singular and plural forms of words. These datasets were created through the manual collection of exclusionary bias words from the literature review and related work. Refer to Appendix A for a full list of the explicit marking of sex terms used in this study.

3.3.2. Firstness or Gendered Word Ordering Pairs Lexicon

As for the gendered word ordering pairs or firstness category, the terms that were included in the research dataset are as follows (1) "men and women", (2) "male(s) and

female(s)", (3) "lords and ladies", (4) "brother(s) and sister(s)", (5) "boy(s) and girl(s)", (6) "husband and wife", (7) "mr. and mrs.", (8) "king and queen", (9) "prince and princess", (10) "father and mother", and (11) "dad and mom". All these terms were also present in their opposite form where the feminine terms were placed first and the masculine terms second. The regular expression library available in Python was used to find the patterns of the firstness terms through the creation of regular expression patterns. For example, the pattern used to detect all instances of the "mother and father" binomial in the text is as follows: `"[mM]others?\s+and\s+[fF]athers?"`

The regular expression pattern displayed above allows for the detection of all matches of the phrase "mother and father" along with some of its possible variations, such as "Mothers and Fathers" or "mothers and fathers". The "[]" construct character in the above pattern allows for the detection of either an uppercase "m" or a lowercase "m". The "?" quantifier character matches zero or one instance of the preceding character, which means that the pattern can match "mothers" with an "s" or "mother" without an "s". The "\s+" character is composed of two regular expression characters: the "\s" character referred to as the whitespace character which matches whitespace or a tab and the "+" referred to as a greedy quantifier that matches the preceding element one or more times. The same pattern and characters were used for all the mixed-sex binomial terms found in the lexicon. Refer to Appendix B for a full list of the mixed-sex binomial patterns used in this study.

3.3.3. Gendered Generic Indefinite Pronouns

The third category explored was the gendered generic indefinite pronouns where the indefinite pronouns, such as "no one", "anybody", and "someone" were captured along with the pronoun referring to them. Also, regular expression patterns were used to detect the sentences containing these pronouns along with the pronouns referring to them. Each regular expression pattern created included the pronouns, "his", "her", and "their" that might be referring to the indefinite pronoun. The following pattern was used for the detection of the gendered generic indefinite pronouns:

```
'(?<![\w\d])[Aa]ny(\s+)?one(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'
```

To make the above pattern easier to comprehend, the following example is used. The following pattern "(?<![\w\d])abc(?![\w\d])" makes sure that the match that is looked for is not preceded by some character, number, or underscore and is not followed immediately by some character or number, or underscore. So, in the example above, the regular expression pattern will match "abc" in "abc", "abc.", "abc ", but not "4abc", nor "abcde".

The regular expression pattern used for the detection of the indefinite pronoun "anyone" along with the pronoun referring to it applies the same logic as the above example yet with some minor changes that account for variations of the pattern detected. First, the "[]" construct character is used to catch either the uppercase "A" or the lowercase "a". Second, the "(\s+)?" whitespace character "\s" followed by the greedy quantifier "+" and "?" quantifier character is used to account for the space or spaces existing, if any, between the word "any" and "one" given the fact that sometimes the indefinite pronoun "anyone" can include a space between the terms "any" and "one". Then the "\s+" character accounts for the space or spaces between the indefinite pronoun and the words that follow it. The ".*?" pattern matches any character (.) any

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number of times (*), as few times as possible to make the regex match (?). The "|" character

function as the "[]" character which means that it can catch the pronouns "his", "her", or "their".

Refer to Appendix C for a full list of the gender generic indefinite pronouns used in this study.

3.3.4. Occupational Bias or Gendered Division of Labor

The fourth category studied was occupational bias. A list of occupations was chosen and

looked for in the collection of books and stories. Twentynine occupations, including some of the

most important occupational roles that are most likely to be present in children's books and

which are usually associated with a particular gender, such as "doctor", "dentist", and "attorney"

were identified. The purpose of the gendered generic occupations was to check whether or not

certain occupational roles were attributed to a certain gender rather than the other. Below is a

snippet of the pattern used for the detection of occupational bias along with a feminine or

masculine pronoun used to correspond to the occupation. Similar regular expression patterns

(previously explained) were used for the detection of occupational bias at the sentence-level.

Refer to Appendix D for a full list of the occupations used in this study.

```
(?<![\w\d])a programmer(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?
(?<![\w\d])a programmer(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?
```

3.4. Automated Detection Approach of Gender Bias Categories

To begin with the automated detection process, a function that takes in the book path as

well as the exclusionary bias terms, firstness terms, and masculine generic construction patterns

as inputs was created. This function performs several different tasks. First, it opens the book path, reads the content of the book, and lowercases all the letters. Second, the function splits each book into sentences using the "sent_tokenize" module available in the Natural Language Toolkit library in Python. Within the same function, a for loop (first for loop or for loop nb.1) is created to iterate over each sentence inside the book and replace all the new line symbols "\n" that show in the data with a space " ". The same for loop also contains the "word_tokenize" module that is used to tokenize each sentence into words. A nested for loop (nested for loop nb.1) is then created inside the first for loop. This nested loop is given all of the explicit marking of sex terms as a dictionary and is responsible to compute the frequency of each of these terms, if present, inside each book. Another nested for loop (nested for loop nb.2) inside the first for loop (for loop nb.1) is created. The second nested for loop is given all the regex patterns that include the firstness terms or gendered word ordering pairs, the gendered generic indefinite pronouns, and the occupational bias patterns in the form of a dictionary. The second nested for loop checks whether the inputted regex patterns are present inside each book under study by going over each sentence inside the book and computing the frequency of each regex pattern at the phrase-level and sentence-level. The counts of the different gender bias categories are saved into a data frame composed of columns that represent the terms and patterns defined and of rows containing the split sentences of each book. This detection code represents a three-in-one automated detection approach and can detect different gender-biased patterns at the word-level, phrase-level, and sentence-level.

Figures 3.2 and 3.3 represent a visual demonstration of the automated collection of books process and the automated detection of gender bias categories process, respectively.
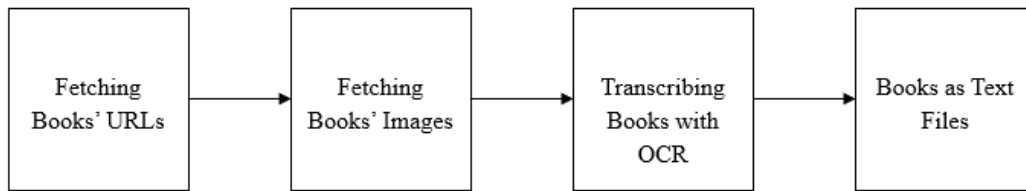
Figure 3. 2: The automated collection of books process
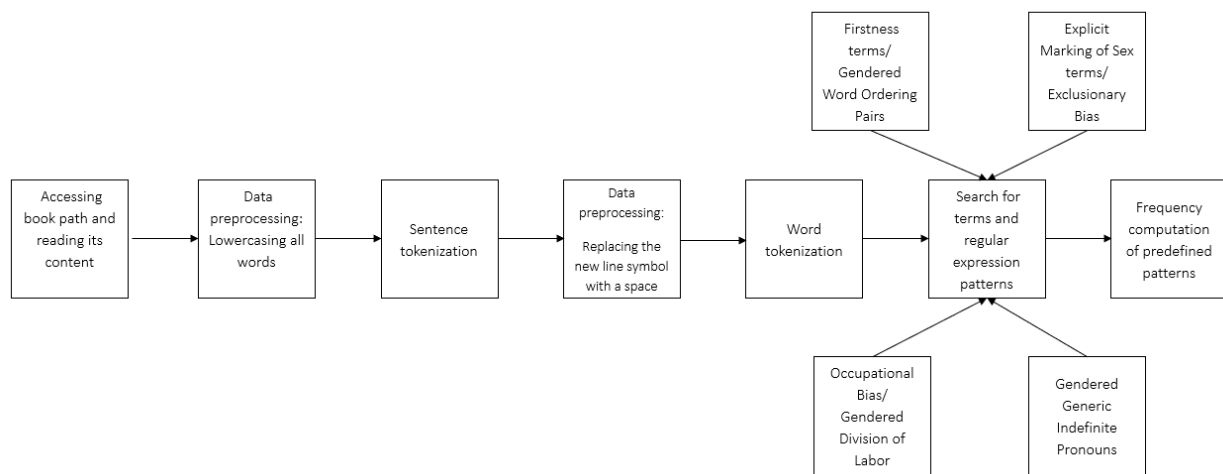
Figure 3. 3: The automated detection of gender bias categories process

CHAPTER 4

RESULTS AND DISCUSSION

This section presents the results of applying the research methodology adopted on the research dataset collected. The focus of this chapter is to succinctly answer each of the research questions previously raised. Section 4.1 includes the results and discussion of the explicit marking of sex terms and the gendered word ordering pairs in relation to the research questions raised in Chapter I while section 4.2 displays the instances collected for the masculine generic constructions, including the gendered generic indefinite pronouns and occupational bias or gendered division of labor. Section 4.1 provides a detailed description and an explanatory analysis of the prevalence of the exclusionary bias and firstness terms categories detected in children's books and stories. This section also tries to identify any significant relationships existing between the prevalence of some of the gender bias categories and some of the attributes previously collected, such as "author's gender" and "book genre". This chapter also summarizes and discusses the results in a broader context and in relation to the previous work done.

4.1. Exclusionary Bias and Gendered Word Ordering Pairs or Firstness Terms

RQ1: What patterns of gender bias categories previously defined exist in the dataset under study, and how prevalent are these categories in children's books and stories?

The first research question raised aims to see whether the types of the gender bias categories defined earlier exist and if so, how prevalent their existence is in children's books and stories. The results of applying the research methodology on the collection of books under study

show that the explicit marking of sex category or exclusionary bias as well as the gendered word ordering pairs tend to exist in children's books and stories at the text level. These biased categories that reproduce a gendered language, which is captured by children, are prevalent inside the text yet with varying degrees and dominance levels.

More than half, almost 53%, of the research dataset has shown to display an exclusionary bias pattern characterized by the presence of the explicit marking of sex terms that exclude women and girls while only 8% of the books and stories displayed an exclusionary bias against men and boys in the explicit marking of sex category. As for the firstness terms or gendered word ordering pairs, there also exists a significant disparity in the use of these terms where almost 50% of the books contain mixed-sex binomials with the masculine term appearing first, such as "men and women", yet only 30% of all books display mixed-sex binomials with the feminine term appearing first, such as "women and men".

Based on the results shown in Figure 4.1 for the explicit marking of sex terms, there is a huge discrepancy between the number of exclusionary terms that exclude females vs. the number of words that exclude males, resulting in a percentage difference of 187.65% across the books studied.
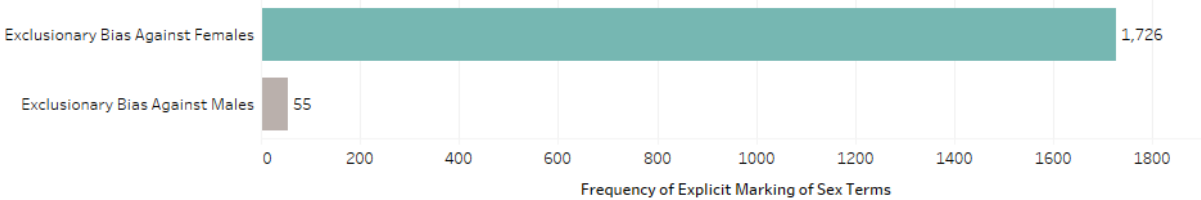
Figure 4. 1: Frequency of explicit marking of sex terms excluding females vs. males

As for the firstness terms or gendered word ordering pairs, there also exists a significant disparity in the use of these terms that reaches a 104.63% difference between firstness terms starting with a female term and those starting with a male term as shown in Figure 4.2 below.
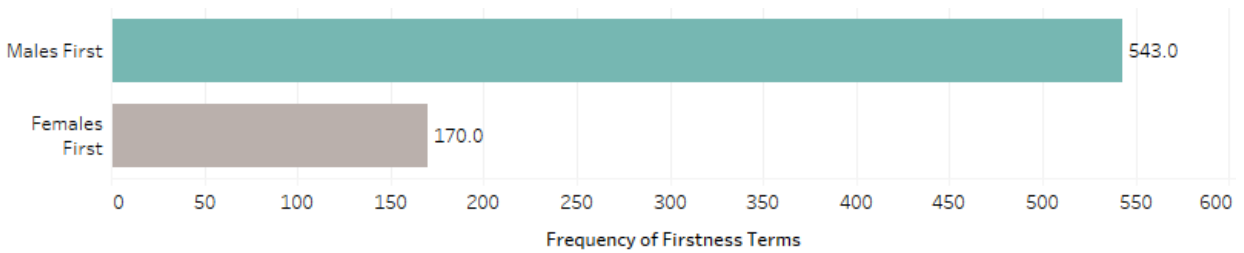
Figure 4. 2: Frequency of firstness terms with a masculine term appearing first vs. a feminine term appearing first

The most commonly used explicit marking of sex terms that exclude females and those which exclude males are found to be different (see Figures 4.3 and 4.4). The size of each word refers to the number of times the term was present across the research dataset. Thus, the bigger the size of the word, the more frequent its prevalence is across the books under study.

Figure 4. 3: Explicit marking of sex terms excluding females

Figure 4. 4: Explicit marking of sex terms excluding males

Some of the most commonly used firstness phrases with a masculine term appearing first in the books and stories are: "boys and girls", "father and mother", "brother and sister", "mr. and mrs.", and "men and women". On the other hand, "ladies and gentlemen" and "mother and father" are the most frequent mixed-sex binomials terms with a feminine term appearing first (see Figures 4.5 and 4.6 below)

Figure 4. 5: Firstness terms with a masculine term appearing first
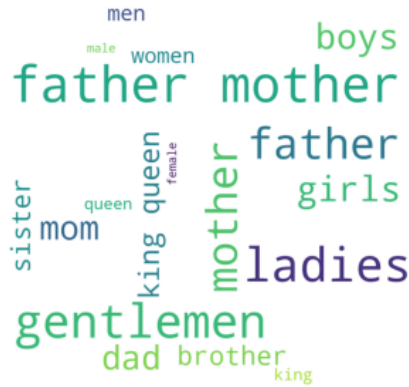
Figure 4. 6: Firstness terms with a feminine term appearing first

Therefore, the results show that the sample of books under study has proven to contain countless instances of exclusionary bias terms which exclude women and girls, as well as mixed-sex binomials that start with the masculine term followed by the feminine term. The gendered language used in these books and stories emphasizes the masculine gender making it seem more worthy than the feminine one. In addition to that, it is very clear that the feminine gender is almost invisible as compared to its masculine counterpart. These results serve as proof of how gender biases are not only manifested in central characters, titles, illustrations, and role models, but they are also deeply ingrained in the language used in children's literature.

RQ2: How has the pattern of prevalence of exclusionary bias and gendered word ordering pairs been changing over time in children's books and stories?

Figure 4.7 shows that there has been a fluctuating pattern for both kinds of explicit marking of sex terms (terms excluding females and terms excluding males) over the years in which spikes in the usage of terms that exclude women and girls were witnessed in the early

1900s then in the 1960s with a decreasing and almost a negligible presence of the explicit marking of sex terms excluding females post the year 1960 and in most recent years. On the other hand, the pattern detected for the explicit marking of sex terms excluding males also includes fluctuations in the years ranging between the 1900s and 1920s, yet the frequency of these terms is really low as compared to that of exclusionary bias terms excluding females. Few sparks in the usage of terms excluding males were witnessed in the 1970s through 1980s and the year 2000. More recent years, however, do not show any existence of the explicit marking of sex terms excluding males and those excluding females.
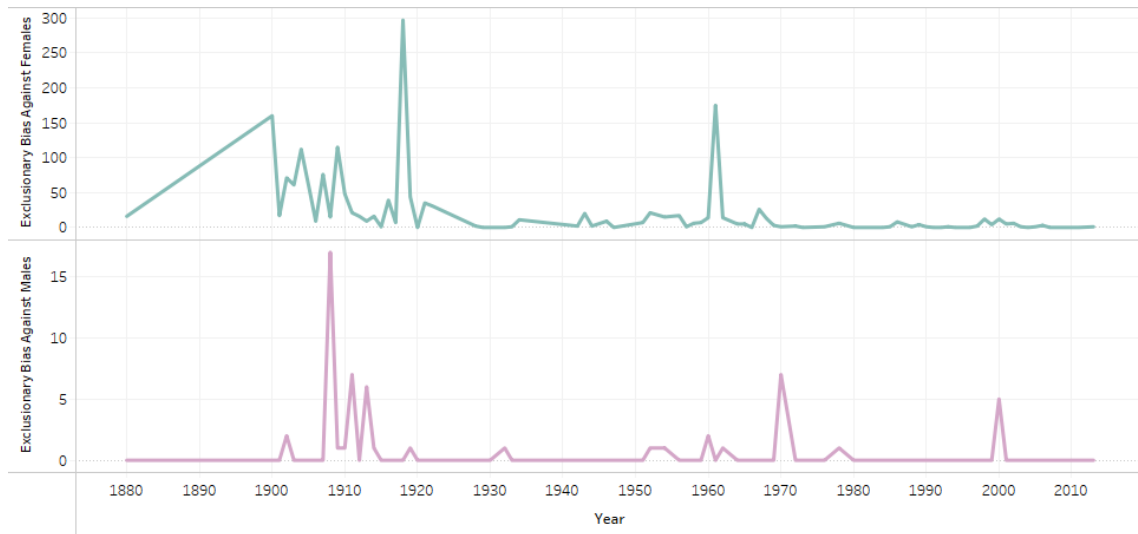
Figure 4. 7: Trend of exclusionary bais over the years

Similar to the trend and pattern of the explicit marking of sex terms usage over the years, there is a highly varying pattern for both gendered word ordering pairs (see Figure 4.8 below). However, it is important to note that firstness terms starting with a female term have higher fluctuations as compared to that of males, especially in the recent years. Moreover, recent years

show that the usage of gendered word ordering pairs with the masculine terms appearing first is negligible.
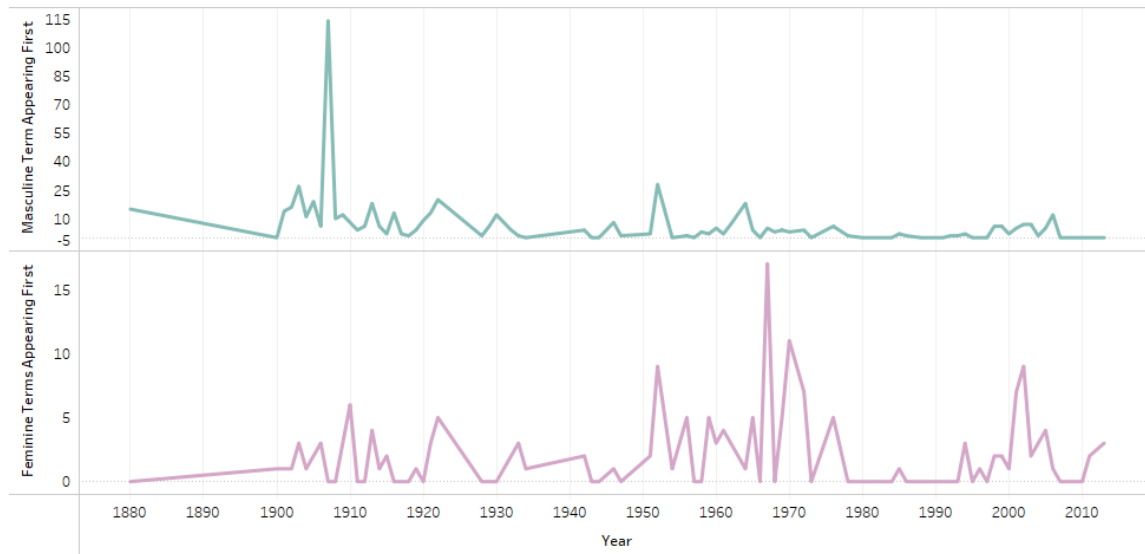
Figure 4. 8: Trend of firstness terms over the years

The increase in the frequency of firstness terms starting with a feminine term and the decrease in the number of firstness terms with a masculine term appearing first might be an indication of the changing style of authors in the use of mixed-sex binomials in children's literature. Figure 4.8 shows that the increase in the number of mixed-sex binomial placing the feminine term first was witnessed in the years 1960s through the 1970s and in the early 2000s. The reason behind this increase might be the "Second Wave of Feminism" that originated in the United States in the early 1960s, and which mainly called for the equal representation of both genders, especially in children's books, stories, and educational materials.

The conclusion that can be drawn from the pattern of the explicit marking of sex terms over the years is that children's books and stories published in recent years do not contain any

significant number of explicit marking of sex terms that exclude females and males. Given the decreasing pattern of both explicit marking of sex terms in recent years, it is important to consider that mitigating gender biases in language that exclude females does not happen through introducing biases that exclude males. Therefore, Figure 4.7 is a good indication that biases against both genders are becoming null. Unlike the decreasing pattern in both explicit marking of sex categories, the firstness terms starting with a feminine term have been witnessing a fluctuating pattern in recent years with an overall increase in the frequency of these terms. On the other hand, the firstness terms starting with a masculine term have witnessed an overall decrease in their prevalence in children's books and stories. RQ3 discusses in depth the factors that play a role in influencing the use of these terms.

RQ3: Can any significant relationship be drawn and inferred between the gender bias patterns detected and the attributes collected through the below breakdowns?

RQ3.1: Is there any significant relationship existing between "author's gender" and the gender bias patterns detected?

The interaction between "author's gender" and exclusionary bias revealed that both male authors and female authors employ explicit marking of sex terms that exclude women and girls much more than the terms that exclude men and boys. For books written by male authors, the ratio of explicit marking of sex terms excluding females to the explicit marking of sex terms excluding males is approximately 40:1 while for books written by female authors, this ratio is equal to 15.2:1.
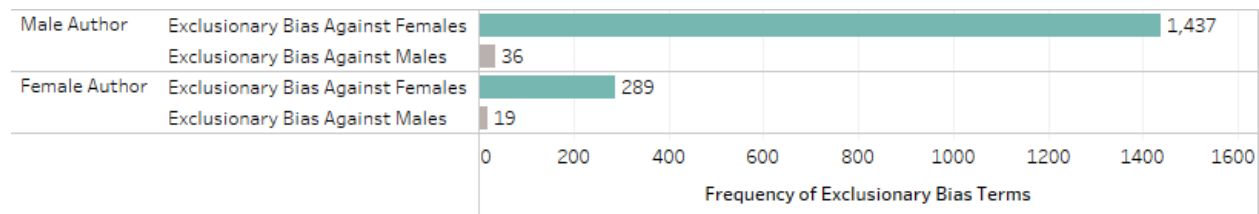
Figure 4. 9: Frequency of exclusionary bias terms by male authors vs. female authors

In an attempt to determine whether "author's gender" has a significant effect on the use of the explicit marking of sex terms, the Mann-Whitney U Test was conducted as an alternative to the Two Sample Welch T Test. However, before choosing the test that is most appropriate for the data at hand, the data had to be investigated to assess whether or not it meets the data distribution normality assumption. To determine the distribution of the data for the explicit marking of sex terms excluding females and those excluding males, the descriptive statistics, including the skewness metric which measures the symmetry of the data distribution, were computed. The skewness measure for the explicit marking of sex terms excluding females and for those excluding males is so high indicating a positive-skewed or right-skewed distribution, the fact that does not allow the use of the Two Sample Welch T Test (see Tables 4.1 and 4.2) for independent samples.

Descriptive Statistics	
Mean	8.502463
Standard Error	1.986498
Median	1
Mode	0
Standard Deviation	28.30323
Sample Variance	801.073
Kurtosis	57.86124
Skewness	**6.953814**
Range	292
Minimum	0
Maximum	292
Sum	1726
Count	203

Table 4.1.1: Descriptive statistics of explicit marking of sex terms excluding females

Descriptive Statistics	
Mean	0.270935961
Standard Error	0.10453532
Median	0
Mode	0
Standard Deviation	1.489399045
Sample Variance	2.218309516
Kurtosis	84.02204011
Skewness	**8.460286186**
Range	17
Minimum	0
Maximum	17
Sum	55
Count	203

Table 4.1.2: Descriptive statistics of explicit marking of sex terms excluding males

As an alternative to the Two Sample Welch T Test for independent samples, a non-

parametric test named the Mann-Whitney U Test was used. The Mann-Whitney U Test is used to

check differences between two independent groups, and it does not require any particular distribution of the data under study. This test checks whether there is a difference in the rank sum between the first group and the second group. Thus, in the case of "author's gender" and explicit marking of sex terms excluding females, the Mann-Whitney U Test is used to check whether there is a significant difference in the usage of explicit marking of sex terms excluding females between female and male authors. Two hypotheses were formulated: hypothesis (1) which is the null hypothesis states that there is no significant difference between male authors and female authors in their usage of explicit marking of sex terms excluding females. While hypothesis (2) known as the alternative hypothesis states that women and men authors significantly differ in their usage of exclusionary bias terms in children's books and stories (check Appendix E for a step-by-step calculation of the Mann-Whitney U Test).

The Mann-Whitney U Test resulted in a p-value= $0.04 < \alpha = 0.05$, thus there is a significant effect of "author's gender" on the use and prevalence of explicit marking of sex terms excluding females. To assess whether "author's gender" has a significant effect on the use of explicit marking of sex terms excluding males, the same hypotheses previously mentioned were stated but this time for the explicit marking of sex terms excluding males. The results did not show any significant effect of " author's gender" on the use of these terms with a p-value=$0.81 > \alpha = 0.05$.

Previous research has described the effects of "author's gender" on gender bias in children's books. In their study, Casey et al. (2020) examined the effects of "author's gender" along with other variables such as "type of character (human vs. non-human)" and "age of target audience" on the male-to-female ratio of both genders as central characters to find that books authored by men display a greater male-to-female ratio as compared to books authored by

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women. While Casey et al. (2020) study cannot be comparable to the current study given that they studied the effects of "author's gender" on the representation of females and males as central characters and not in text or language, a similar study to ours is the study by Turner-Bowker (1996) which investigated the effects of "author's gender" on the use of female and male adjectives in the text of children's books and stories. Unlike our current study, the results of Bowker's study showed no difference between female and male authors in their use of adjectives for female and male characters. However, it is possible to say that male authors tend to include gender biases favoring males over females in their books and stories.

As for the gendered word ordering pairs or firstness terms, it is important to note that there isn't a huge discrepancy between the ratios of firstness terms starting with a masculine term to the firstness terms starting with a feminine word for both author genders where this ratio is equal to 2.18:1 for female authors and 4.3:1 for male authors.
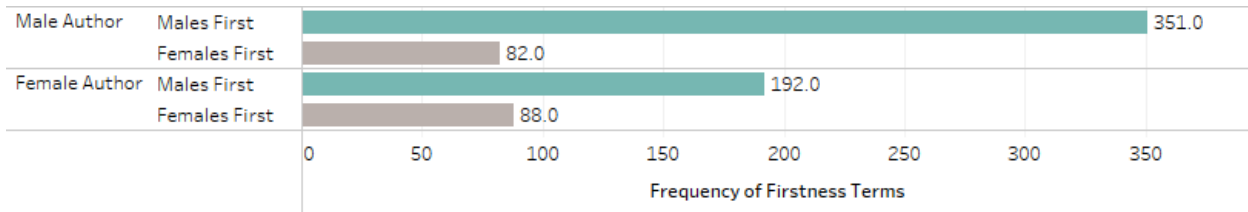
Figure 4. 10: Frequency of firstness terms by male authors vs. female authors

The Mann-Whitney U-Test was also used to assess whether there is a significant effect of "author's gender" on the use of the firstness terms given that the data is not normally distributed for firstness terms starting with a masculine term first as well as for firstness terms starting with a masculine term first (see Tables 4.3 and 4.4 for below for descriptive statistics). The null hypothesis states that there isn't a significant difference between male and female authors in the use of firstness terms while the alternative hypothesis states otherwise.

Descriptive Statistics	
Mean	2.674876847
Standard Error	0.587065335
Median	0
Mode	0
Standard Deviation	8.364393497
Sample Variance	69.96307857
Kurtosis	125.6376242
Skewness	**10.21364623**
Range	108
Minimum	0
Maximum	108
Sum	543
Count	203

Table 4.1.3: Descriptive statistics of firstness terms starting with a masculine term

Descriptive Statistics	
Mean	0.837438424
Standard Error	0.130246828
Median	0
Mode	0
Standard Deviation	1.855731646
Sample Variance	3.44373994
Kurtosis	15.18185191
Skewness	**3.479222615**
Range	13
Minimum	0
Maximum	13
Sum	170
Count	203

Table 4.1.4: Descriptive statistics of firstness terms starting with a feminine term

The Mann Whitney U-Test resulted with a p-value= 0.83 > α= 0.05 for firstness terms starting with a masculine word first and a p-value=0.55 > α= 0.05 for firstness terms starting with a feminine term. Therefore, male authors and female authors do not differ in their use of mixed-sex binomials or firstness terms.

 While the current study does not show any significant effect of "author's gender" on the use of mixed-sex binomials in children's books and stories, several studies have examined this association and yielded different results that make reaching an overall conclusion about the influence of the sex of author on mixed-sex binomials difficult. While some of the previous studies have found an impact of "speaker's sex" on firstness terms where male authors tend to use more mixed-sex binomials starting with masculine terms (McGuire and McGuire 1992; Wright & Hay 2002; Wright, Hay & Bent 2005; Hegarty et al. 2011 as cited in Motschenbacher, 2013a), still some other studies found that the author's gender is the weakest factor in influencing the use of mixed-sex binomials either starting with a masculine term or those starting with a feminine term (Sullivan, Casagrande, and Belyayeva; 1995 as cited in Motschenbacher, 2013). Even in the study of Motschenbacher (2013) that proves a relationship between "author's gender" and specific firstness terms, the "sex of the author" was considered only a moderate factor.

Given the research dataset under study, this research has shown that there is a significant relationship between "author's gender" and the use of explicit marking of sex terms that exclude women and girls. On the other hand, a significant relationship does not exist between "author's gender" and the use of exclusionary bias terms that exclude men and boys. The absence of a significant relationship between "author's gender" and the explicit marking of sex terms excluding men and boys might be due to the fact that the sample of books chosen does not

contain many instances of exclusionary against males for both male authors and female authors. Also, the absence of a significant relationship between "author's gender" and the usage of firstness terms can be attributed to the small sample size and the low number of instances of this gender bias category for both authors. Therefore, increasing the sample size is one way to increase the power of the study and enhance its results.

RQ3.2: Is there any relationship between the "book genre" and the gender bias categories prevalent in children's books and stories?

Given that more than 85% of the collected books are fiction books, and the remaining ones are mainly non-fiction with few other genres that constitute less than 3% of the total sample size, there was an interest to assess whether there is a significant effect of "book genre" (fiction vs. non-fiction) on the use of the gender bias categories found. Given that the data is not normally distributed, the Mann-Whitney U-Test was used.

Figure 4.11 shows that fiction books contain a greater number of exclusionary bias terms that exclude females as compared to the explicit marking of sex terms excluding males. On the other hand, non-fiction books barely contain any exclusionary bias instances whether against males or females.
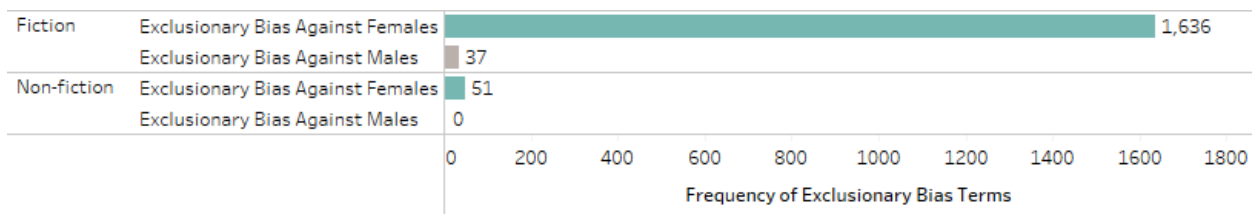
Figure 4. 11: Frequency of exclusionary bias terms for fiction vs. non-fiction books

The ratio of explicit marking of sex terms excluding females to those excluding males for fiction books is 44.2:1 while this ratio does not exist for non-fiction books given that there wasn't any explicit marking of sex terms excluding males in them. Two hypotheses were formulated: the null hypothesis states that there isn't any significant difference between fiction and non-fiction books in the use of explicit marking of sex terms, and the alternative hypothesis states that there is a significant difference between fiction and non-fiction books in the use of explicit marking of sex terms. For the explicit marking of sex terms excluding females, there is no significant difference between "fiction" and "non-fiction" books in the use of these terms, p-value=0.65> α=0.05. The same result was found for the terms excluding males with a p-value= 0.55 > α=0.05.

As for the gendered word ordering pairs, the ratio of mixed-sex binomials starting with a masculine term to those starting with a feminine term is 3.19:1 for fiction books while for non-fiction books it is 7:1.
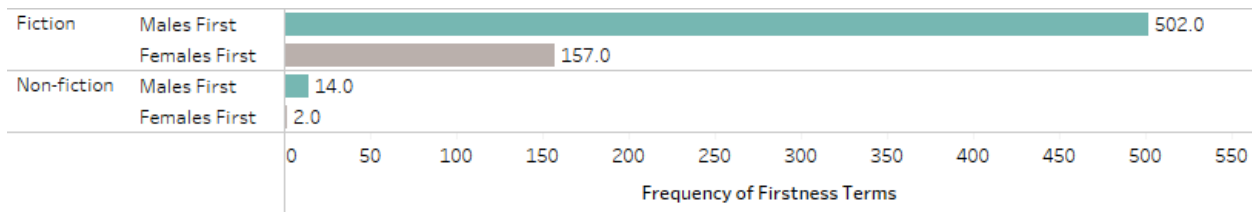
Figure 4. 12: Frequency of firstness terms for fiction vs. non-fiction books

The null hypothesis states that there isn't a significant difference between fiction and non-fiction books in the use of firstness terms while the alternative hypothesis states otherwise. The Mann-Whitney U-Test was also performed and resulted in a p-value=0.04 < α= 0.05 for the

firstness terms that place the masculine term first and the feminine term second. This signifies that there is a significant relationship between "book genre" and the use of mixed-sex binomials, where fiction books tend to be saturated with firstness terms starting with the male word as compared to non-fiction books. As for the firstness terms that place the feminine word first, there is no significant difference between fiction and non-fiction books with a p-value=0.12 > α=0.05.

While previous studies have investigated the effect of "book genre" on the male-to-female ratio as central characters, the current study is perhaps one of the first studies if not the only study that shows an association between the "book genre" and the language used in children's books and stories. The only significant relationship existing was found between the "book genre (fiction vs. non-fiction)" and the use of firstness terms starting with a masculine term in which fiction books display a great number of mixed-sex binomials starting with a masculine term as compared to non-fiction books.

RQ3.3: Is there a specific "publishing company or companies" that record high instances of gender bias in its published books?

Figure 4.13 aims to show the top five publishing companies that produced and published books that contain the greatest number of instances of the explicit marking of sex terms excluding women and girls as well as gendered word ordering pairs that place masculine terms before feminine terms. The other categories that exclude males are not considered given their limited prevalence in the research dataset under study. As shown below, the "Reilly & Lee Company", followed by "The Macmillan Company", "Charles Scribner's Sons", "George M. Hill Company", and "Dover Publications, Incorporated", respectively, are the top five publishers that recorded the highest instances of the two gender bias categories examined. It is important to

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note that all of these publishers are American companies except for "The Macmillan Company" which is a British publishing house.
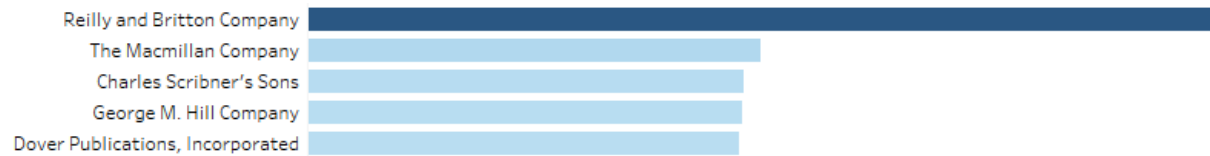
Figure 4. 13: Top 5 publishing houses displaying gender biases against females

Hence, most of the publishing houses that displayed the highest instances of gender bias in children's books and stories in the exclusionary bias against females category and firstness terms starting with a masculine term category are American publishing houses. Given the above results, there is an interest to raise a new research question that aims to answer whether the above-listed companies still display gender biases in children's books and stories in recent years. However, there are not enough books published in recent years by the same publishing companies. Thus, it is hard to tell if these same publishing houses still display gender biases in their published books.

RQ3.4: Are gender biases more prevalent in specific countries or regions as compared to other countries and regions based on the "country of publication" of the books in the research sample?

The United States ranks as the number one country across the countries included in the dataset that reports the greatest number of instances of gender bias in the language in its books. Books published in the United Kingdom also contain a significant amount of gender biases in their language. This result might not be surprising given that both countries house the most

famous publishing companies around the globe which were and still are responsible for publishing a huge number of children's books each year. Netherlands, New Zealand, and Jamaica follow the United Kingdom in terms of recording gender bias instances in their books. However, the statistics provided for Netherlands, New Zealand, and Jamaica cannot be conclusive given that there is not a representative sample of books published in these countries. From here, there is an interest to dig deeper and check the trend of each gender bias pattern in the United States given that the majority of the books in the research dataset are published in this country.

Figure 4. 14: Top 5 countries displaying gender biases in children's books and stories

As shown in Figure 4.15, peaks in the prevalence of exclusionary bias (explicit marking of sex terms excluding women and girls) were witnessed in the early 1900s. Recent years, however, have shown a fall in the presence of exclusionary bias, especially after the 1960s and 1970s, the period that witnessed the second wave of feminism in the States which raised awareness about the gender bias existing in children's literature.
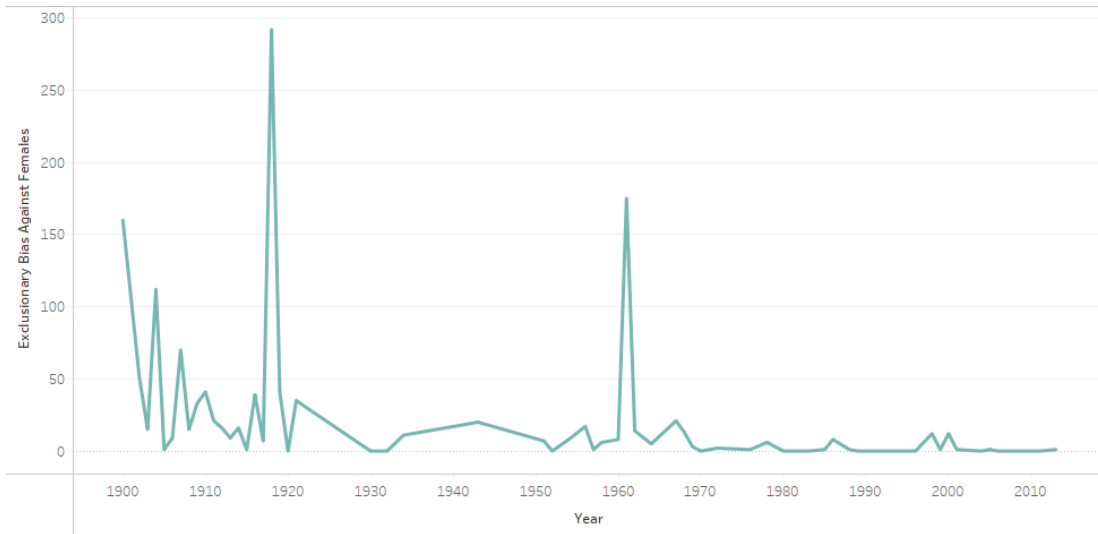
Figure 4. 15: Trend of exclusionary bias against females in the United States

A similar trend to the exclusionary bias pattern over the years also exists in the gendered word pair orderings in the United States where peaks in the usage of firstness terms starting with a masculine term were shown in the early 1900s followed by much lower peaks with almost no presence of these terms in later years.
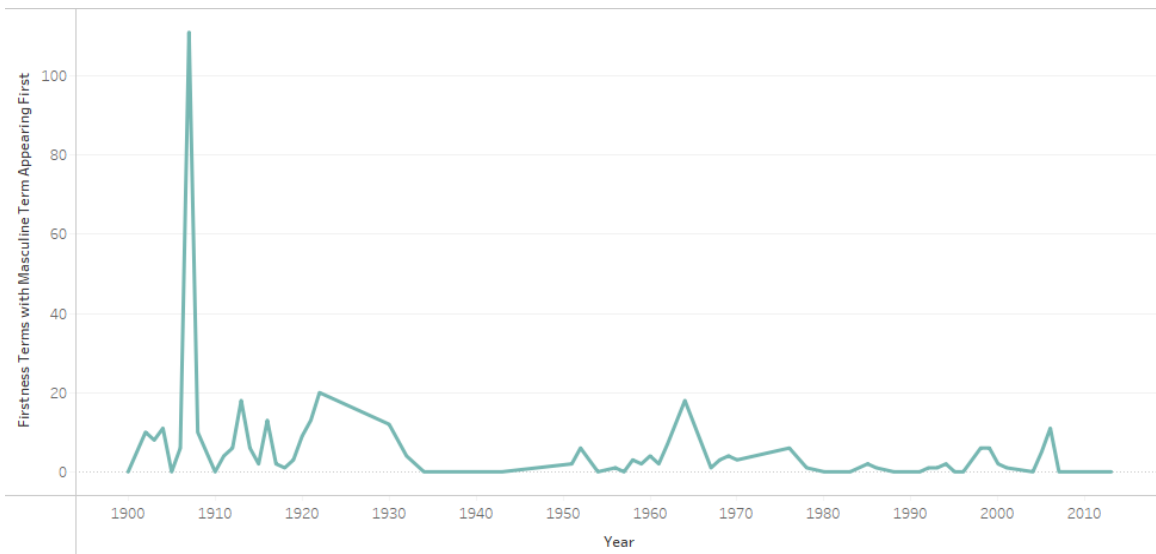
Figure 4. 16: Trend of firstness terms with the masculine term appearing first in the United States

Although the American publishing houses in the United States recorded the highest instances of a gendered language across other countries in the research dataset, recent years have shown a huge decrease in the prevalence of gender bias categories, mainly exclusionary bias terms excluding females and firstness terms starting with a masculine term in children's books and stories.

4.2. Masculine Generic Constructions: Gendered Generic Indefinite Pronouns and Occupational Bias

Another manifestation of a gendered language is the use of masculine constructions as generic rooted in the grammar of the English language itself. This manifestation is represented in the use of indefinite pronouns that are referred to with a masculine pronoun. Several books in the research dataset contain instances of this type of bias. Below are some sentences that were detected and manifested the masculine generic bias for the indefinite pronouns.

Book Name	Gendered Generic Indefinite Pronoun Statements
To Kill a Mockingbird	❖ i knew that mr. gilmer would sincerely tell the jury that **anyone** who was convicted of disorderly conduct could easily have had it in **his** heart to take advantage of Mayella Ewell, that was the only reason he cared ❖ hold out your hand i thought she was going to spit in it, which was the only reason **anybody** in Maycomb held out **his** hand: it was a time-honored method of sealing oral contracts ❖ see why we had to keep our heads anyway, that **nobody** i knew at school had to keep **his** head about anything. ❖ by noontime that day, there was not a barefooted child to be seen in Maycomb and **nobody** took off **his** shoes until the hounds were returned. ❖ we don't know, but there is circumstantial evidence to indicate that Mayella Ewell was beaten savagely by **someone** who led *almost exclusively with **his** left*
I Will Get There	❖ It is a good thing that i go out when i do because i know that they are all itching to get on with the inevitable conversation and that as long as i am in the room, or in the house even, they will just sit there being polite, trying not to hurt my feelings, and **no one** will say what everyone has on **his** mind. ❖ **everyone** who is playing a part has to write **his** own part, and in that way we'll be sure to get the most out of the play. ❖ today i don't care about the new york times, not even the travel section, which i usually read first, or the business section, which i read because the biographies of smart businessmen are interesting and i think that maybe someday i'll read one about my father and how clever he is as a designer and how he got to be rich because **everyone** had to start using **his** doorknobs, or some knives of his, or something. ❖ i'm strictly average when it comes to sports except for swimming, when i'm on my own, and in track meets, where there may be a team but it's really **everyone** on **his** own.
From Mixed Up Files	❖ **everyone** in her family had **his** own bedroom and wastebasket except her mother and father who shared both with each other ❖ well, perhaps, tomorrow you can push **someone** down and grab **his** paper while **he's** trying to get up
Magic by the Lake	❖ but ever and anon one of them would notice **one of the others** dipping **his** finger in the lake and muttering something, and then looking disappointed.
Magic or Not	❖ Laura felt depressed, as though **everyone** in a family had died and **his** life were being laid open for the general

	public to peer at.
The Knight's Castle	❖ what they expected to see was a grisly dungeon, with chains, and somebody grinding **somebody** else's bones to make **his** bread.

Table 4.2.1: Sentences containing masculine gender generic indefinite pronouns

Although the patterns created for this study intended to capture biases that favor males over females and vice versa, all of the gendered generic constructions captured were masculine generic constructions. Not a single indefinite pronoun was associated with a feminine pronoun. As for the occupational bias or gendered division of labor category, the depiction of females and males in traditionally stereotypical biased occupations can be another reflection of a gendered language in children's literature. This work was able to automate the detection of a limited set of occupations, yet out of the occupations that were looked into very few sentences displayed gendered generic division of labor. The reason that very few instances were found for the occupational bias category goes back to the fact that most of the occupations, such as "teacher" or "bus driver" or "dentist", in children's books and stories are represented as characters. For example, the following sentence "said the dentist with a smile on his face" is referring to a specific male character in the story who is a dentist. Therefore, a solid conclusion cannot be reached given the limited presence of occupations in the sample of books chosen. Below are a couple of sentences containing occupational bias.

- mother thinks that she's saying the funniest things in the world, and she laughs like **a tv comedian** laughing at **his** own jokes
- his family was from Maycomb county originally, his mother worked for **a photographer** in meridian, had entered **his** picture in a beautiful child contest and won five dollars
- once i saw **a model** having **her** picture taken by the fountain.

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It is important to note that this is one of the very few studies that have investigated the prevalence of the indefinite pronouns referred to with a masculine pronoun or masculine generic constructions as named by Amini & Birjandi (2012). Previously, Amini & Birjandi (2012) investigated this type of gender bias in two of the Iranian mostly used EFL textbooks at the high school level by applying a manual content analysis approach. However, in this study today, the detection of this gender bias category was investigated through an automated computer-driven approach, yet human judgment was needed to label the sentences that were biased towards one gender over the other.

CHAPTER 5

IMPACT

Given that our results have shown the existence and prevalence of gender bias in the language in children's books and stories, this chapter aims to shed light on the detrimental effects of being exposed to some of these biases along with other kinds and forms of gender biases that might be encountered in children's books, stories, and educational materials. This chapter outlines the impact of gender biases in language at an individual level or micro-level and at the nationwide level or macro-level. The individual level or micro-level influence describes how gender biases can negatively affect children's mental imagery, academic performance, and career attractiveness. On the other hand, the nationwide or macro-level influence presents the long-term impact of biases at a country level in relation to a country's social and economic development and progress.

5.1. Micro-level Influence

Gender bias effects tend to persist throughout a person's lifetime in which it does not only have a direct impact on an individual's early childhood but also affects their choices in the future. Gender bias in the language in school textbooks tend to limit an individual's potential growth and development (Creany, 1995). In their paper, Hamid et al. (2008) summarized the negative effects of sexism, linguistic sexism, and sex-role stereotyping in textbooks on children and the nation as a whole. According to Jariah Mohd., 2002; Kimmel, 2004; Smith, 1988; Steward et al. 2003 (as cited in Hamid et al., 2008), gender stereotypes in textbooks associate

each gender with a certain mode of behavior, course of study, and career option. This association would serve in limiting each person's potential so that a person can only fit into what is imposed by these gender stereotypes in school textbooks and society as well. Not only do textbooks tend to impose certain modes of behavior on each person based on their gender, but these books also provide role models for children in defining standards for feminine and masculine behavior (Narahara, 1998). What is dangerous about these biases in text and pictures is that children tend to imitate and identify with these representations, and thus end up accepting and giving in to what is presented to them as a social norm despite them being not fully convinced with what is being imposed on them (Mischel, 1970 as cited in Scott, 1981).

The language used in text tends to have a direct impact on children's academic performance. The use of "generics" vs. "female-inclusive" language has been proved to affect the memory for factual material in both genders where males had higher recall scores when masculine generic pronouns were used in the text as opposed to females who had higher recall scores with female-inclusive language (Crawford & English, 1981). Gender bias in language becomes more serious when it deteriorates children's performance once they are exposed to it. A study by Cimpian et al. (2012) showed how children tend to perform worse on a given activity when exposed to a generic statement that links their ability to perform a certain activity to a social group, regardless of whether the statement is positive or negative. Therefore, gender generic statements, such as "Girls are good at activity X, while boys are good at activity Y" tend to undermine children's capabilities.

Having children exposed to masculine generic constructions has consistently and constantly shown to evoke mental images of men rather than women, even if these generics are accompanied by explicit statements in which the reference includes both genders (Gastil, 1990;

Hyde & Hyde, 1984; Moulton et al., 1978). These mental images have consequences that can be characterized by the lack of sense of identification of the non-targeted group (Kesebir, 2017). Experimental research has also clearly demonstrated that masculine generics do not depict women and men as equal human beings. Moreover, they make women and girls invisible in people's imagery and memory, thus failing to perform their assigned generic function (Ng, 2007 as cited in Menegatti & Rubini, 2017)

Gender biases become more critical and dangerous when they tend to detrimentally affect people's careers and work choices. Earlier research by Bem & Bem (1973) has shown the tangible impact of sexist linguistic forms on people's behavior in professional contexts. Their study found that real job advertisements targeted toward one gender only make members of the non-targeted gender group less interested in pursuing the job (Bem & Bem, 1973). The study also showed that more women were willing to apply to counter-stereotypical jobs when gendered-fair language was used in the job advertisement as opposed to using gender-exclusive language (Bem & Bem, 1973). In another study that was conducted by Stout & Dasgupta (2011), women who were exposed to a gender-exclusive language (the use of the pronoun "he" to refer to both, women and men) during a mock job interview showed a lower sense of belonging, less motivation, and reduced expected identification to the job. These consequences will in turn lead to ostracism, a process characterized by the exclusion of a person from his or her society or group. Furthermore, ostracism will most likely arouse negative emotions, threatening people's need to belong to a community, and encouraging people to distance themselves from the setting they are in (Williams, 2007 as cited in Stout & Dasgupta, 2011).

Gendered word ordering pairs have also imposed a great concern for researchers and linguists, especially females, who discussed the implications of having the masculine term

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always appearing first followed by the feminine term in mixed-sex binomials. Researchers were interested in studying the effects of these gendered pairs on how people perceive them and the level of relevance that they put to the first and second terms appearing in gendered word ordering pairs or binomials. Several feminist critiques have evolved in trying to explain mixed-sex binomials and their implication. Most feminist points of view have considered placing feminine terms after masculine terms in a word binomial a way of indicating a power-related social order where women are considered as "the second sex" (Motschenbacher, 2013b). Furthermore, these word order patterns indicate that the second term often designates concepts that are less valued, or less familiar, or less useful as compared to the first term (Allan 1987; Nöth 1993, as cited in Motschenbacher, 2013). Therefore, the more frequently the masculine term is mentioned as the first term in mixed-sex binomials, the more dominance the man tends to have in the real world. In her study, Kesebir (2017) tried to show how word order in conjoined phrases can be a means of expressing and reinforcing stereotypical beliefs associated with gender. Results showed that people would give greater importance to the term that was mentioned first as compared to the term mentioned second. Also, participants believed that the term mentioned first was more involved and more central to the context presented given the background information provided (Kesebir, 2017).

5.2. Macro-level Influence

What is dangerous about a society saturated with gender stereotypes and biases is that the effect of these biases can go beyond the micro-level influence and impose a macro-level influence that can affect a whole nation by hindering its women's capabilities to contribute to their nation's economic growth and development (Hakura et al., 2016; Seguino, 2008). Gender

bias in language and the stereotypes that it reproduces, perpetuates, and legitimizes in society tend to impose formal and informal barriers on women's participation in the economy and society. Also, the degree to which a country marks gender in its everyday language tends to play a crucial role in determining to what extent women are allowed to participate in the socio-economic fields (Gay et al., 2013).

A study conducted by Gay & Santacreu-vasut (2013) provides evidence on how countries that speak languages highly associated with grammatical gender markings tend to witness lower rates of female participation in the labor market. Also, this study provides cross-country and individual level analyses on how women who speak a gendered-marked language tend to face barriers in their access to land and credit (Gay et al., 2013). Thus, the drawbacks of being exposed to and speaking a gendered language transcend negative individual influences and extend to threaten the entire economic cycle of nations. In a similar study to that of Gay & Santacreu-vasut (2013), Shoham & Lee (2018) show that language is one of the direct predictors of gender-wage inequality. Shoham & Lee (2018) reported that countries with a higher level of gender marking in their dominant language tend to have a higher gender-wage gap between women and men (Shoham & Lee, 2018).

A gendered language can also increase the educational gender gap inside a country. A study by Davis and Reynolds (2018) has shown that speaking a gendered language is associated with a 0.75-year increase in the educational gender gap. A gendered language is also associated with a 7.6% point rise in the gender gap in secondary school completion. Davis and Reynolds (2018) suggest that there tends to be a link between a portion of the educational gender inequality and the greatly unvarying linguistic structures which tend to remain persistent despite

the societal, economic, and cultural changes as well as the shifting gendered roles and duties that take place inside a country over the years.

There exists a great impact of gender imbalances in income between women and men on the quality of life of individuals in a nation. According to Seguino (2008), gender imbalances in income result in lower investments in children's well-being, including education, nutrition, and healthcare given that females are more likely to spend on their children relative to their male counterparts. Second, the wage gap between men and women which makes women unable to influence resource allocation decisions constrains investments in children's well-being and might impose a negative effect on the quality of future labor supply, productivity, and growth.

The prevalence of gender bias in children's books and stories should be a matter of huge concern given the hurtful effects that the generated stereotypes coming out of a gendered language have not only on an individual level but on a nationwide level as well. Therefore, recognizing and acknowledging these facts is highly crucial to understand the severity of the problem at hand. This study aims not only to prove the existence of gender biases in children's books and stories through an automated detection approach but to also pinpoint that these detected gender biases have always been a threat to individuals and countries. Understanding the dangers of gender biases makes this work highly crucial given that recognizing the negative implications and detecting the gender biases are complementary measures that put us on the right track toward finding a solution and mitigating gender biases in children's books and stories.

CHAPTER 6

LIMITATIONS AND FUTURE WORK

A notable caveat of the present study is that the analyses performed do not reflect actual reading rates. In other words, we analyzed children's books publicly available on the Internet and the "International Children's Digital Library" website, but some books will be more popular than others at different points in time. Although the sample of books under study includes award-winning books and popular stories for children that transcend time and place making our study relevant and significant, the distribution of these books in terms of year of publication is not 100% uniform across the period specified. The distribution of books tends to be left-skewed and contains more books published post the year 2000. As for the research results, there was limited evidence of the presence of occupational bias or gendered division of labor category across the books and stories. Moreover, the absence of a great number of instances of some other patterns, such as exclusionary bias against males, in non-fiction books resulting in the absence of a significant effect between the "genre of the book" and the use of exclusionary bias against males can also be attributed to the small sample size dealt with. Therefore, to get a more solid answer on the prevalence of certain gender bias categories in certain types of books (fiction vs. non-fiction), the sample size has to be increased in any future work done. Also, collecting more books with a uniform distribution across the years will remove any kind of bias that can be present in the data and allow for accurate conclusions for each gender bias category investigated.

This study introduces a machine-led content analysis methodology and provides an automated detection approach that can detect different types of biases in books and stories at the word-level, phrase-level, and sentence-level, and thus improve the state-of-art detection

techniques existing in the literature. However, a fully advanced and automated methodology that uses machine learning predictive models which can provide a score for the level of gender bias found in books and stories is yet to be achieved. Moreover, it is important not only to account for other explicit and blatant categories of gender bias in language but also to consider the implicit and subtle biases present in the language of children's literature that go unnoticed many times.

While detecting the different gender bias categories that can be encountered in books and stories is the first step towards mitigating the gender bias phenomenon in children's language, the mitigation process is a more complicated technique. However, the reduction of certain instances of gender bias categories in language, especially those explored in this study, can be as simple as replacing a masculine pronoun referring to an indefinite pronoun with "his or her" or "their". Another mitigation technique for the use of explicit marking of sex terms that exclude females or males is to replace the term "man" or "woman" with a gender-neutral term. For example, one possible replacement for explicit marking of sex terms can be replacing the term man in "policeman" with the word "officer". The gender bias in mixed-sex binomials or firstness terms can also be controlled by ensuring that the word ordering pairs in children's books and stories do not always start with a masculine term. This can be achieved through reversing the order of the terms, however, mitigating bias against females cannot be solved by introducing bias against males. Therefore, establishing parity between the frequency of mixed-sex binomials starting with a masculine term and those starting with a feminine term is what needs to be achieved. The examples listed here are some mitigation techniques that can be adopted for the gender bias categories that our study has investigated, yet all types of bias in language have to be reduced if not ended in children's books, stories, and educational materials.

CHAPTER 7

IMPLICATIONS AND CONCLUSION

The results of this study provide evidence that gender disparity does not only exist at the level of central characters, illustrations, and titles as shown and proved by previous research, but it also tends to be created and maintained through the use of differential language at the phrase and sentence levels in children's books and stories. This research was able to prove that the gender bias categories that were previously identified (Doughman et al., 2021) are found to exist in the collection of books and stories under study, most of which are still read to and by children until today. Fortunately, however, this study shows a decreasing trend in recent years in the prevalence of gender bias patterns, especially in the explicit marking of sex terms against females and the firstness terms with a masculine term appearing first in mixed-sex binomials.

This study is perhaps one of the very few studies if not the only study that has introduced the automated detection of gender-biased language at the phrase-level and sentence-level, taking an edge over previous work that explored biases at the word-level through a manual "by hand" approach. While this study explores the different categories of gender bias existing in language inside children's books and stories, most of the previous studies have only investigated gender bias and its representation at a high level by studying the gender disparity in central characters, illustrations, and titles as in the two famous and recent studies of Casey et al. (2020) and McCabe et al. (2011).

The present study also differs from previous studies in terms of methodology. While previous studies have mainly focused on a qualitative manual approach for the identification of gender biases through a traditional content analysis involving human coders and labelers, this

study introduces a machine-led or computer-driven content analysis detection approach as a major contribution. The automated identification of gender biases in children's literature can facilitate and enhance the detection process. Moreover, this work combines both qualitative and quantitative methods, allowing for a more complex and comprehensive analysis of the data under study.

Language shapes children's lives (Peterson & Lach, 1990). Language is a sword with two edges allowing us to express ourselves, thoughts, and ideas. At the same time, language might restrict us from expressing ourselves freely. However, whether language is a tool of self-expression and freedom or a tool of restriction and limitation, it is highly important to be aware and able to identify what is being perpetuated and what is being abandoned by the language. Therefore, this study aims to raise awareness among writers, publishers, educators, teachers, and parents on how language can reproduce traditional gender stereotypical beliefs that have detrimental effects on their children. Moreover, this work proposes a computer-driven approach that can guide content creators and publishers to assess and evaluate the quality of children's books and stories to ensure that textbooks are free from a gendered language before publishing these books and making them available to the general public.

APPENDIX A

EXCLUSIONARY BIAS TERMS

"agribusinessman", "agribusinessmen", "airman", "airmen", "ambulanceman", "ambulancemen", "anchorman", "anchormen", "artillerymen","artilleryman","asanteman","backwoodsman","backwoodsmen","bagman","bagmen","barman","barmen","bellman","bellmen","binman","binmen","bondman","bondmen","bondsman","bondsmen","businessman","businessmen","carman","carmen","chairman","chairmanof","chairmanship","chairmen","coalman","coalmen","cochairman","cochairmen","congressman","congressmen","conman","conmen","corpsman","corpsmen","counterman","countermen","countryman","countrymen","craftsman","craftsmanlike","craftsmanship","craftsmen","deliveryman","deliverymen","doorman","doormen","draftsman","draftsmanship","draftsmen","elmann","Englishman","Englishmen","fatherland","fellowman","fellowmen","fireman","firemen","flagman","flagmen","foreman","formen","frenchman","frenchmen","freshman","garbageman","garbagemen","gaurdsmen","groundsman","groundsmen","guardsman","guman", "hairman","hairmen","handcraftsmanship","handyman","handymen","highwaymen","highwayman","horseman","horsemen","huntsman","huntsmen","igloman","iglomen","infantryman","infantrymen","journeyman","journeymen","landlord","landlords","mailman","mailmen","manhood","manhour","manhours","mankind","manmade","manpower","manscaping","middleman","middlemen","militiaman","militiamen","milkman","milkmen","moneyman","moneymen","newsman","newsmen","newspaperman","newspapermen","oilman","oilmen","ombudsman","ombudsmen","packman","packmen","pararescueman","pararescuemen","patrolman","patrolmen","pieman","piemen","pitchman","pitchmen","policeman","policemen","postman","postmen","pressman","pressmen","railwayman","railwaymen","repairman","repairmen","rescueman","rescuemen","rifleman","riflemen","salesman","salesmen","seaman","seamen","securityman","securitymen","serviceman","servicemen","showman","showmen","snowman", "snowmen","spokesman","spokesmen","sportsman","sportsmen","stateman","statemen","statesman","statesmanlike","statesmanly","statesmanship","statesmen","stockman","stockmen","storeman","storemen","swagman","swagmen","switchman","switchmen","talisman","talismen","taximan","taximen","timesman","timesmen","trackman","trackmen","tradesman","tradesmen","underclassman","underclassmen","upperclassman","upperclassmen","vicechairman","vicechairmen","warehouseman","warehousemen","watchman","watchmen","weatherman","weathermen","welshman","welshmen","wireman","wiremen","woodman","woodmen","workman","workmanlike","workmanship","workmen","yardman","yardmen","yeoman","yeomanly","yeomen", "ranchman", "ranchmen", "boatman", "boatmen", "cowboy".

"countrywomen","spokeswomen","countrywoman","spokeswoman","womanhood","ombudswomen","ombudswoman","saleswoman","saleswomen","saleslady","stateswomen","stateswoman", "workingwomen","workingwoman","policewoman","policewomen","newswomen","newswoman","washerwomen","washerwoman","businesswomen","businesswoman","laundrywomen","laundrywoman","servicewomen","servicewoman","selectwomen","selectwoman","congresswomen", "congresswoman","committeewoman","committeewomen","chairwoman","newspaperwomen","newspaperwoman","womanpower","landlady","chairwomen"

APPENDIX B

FIRSTNESS TERMS PATTERNS

- `'[Bb]rothers?\s+and\s+[sS]isters?'`
- `'[Ss]isters?\s+and\s+[Bb]rothers?'`
- `'[lL]ord\s+and\s+[lL]ady'`
- `'[lL]ady\s+and\s+[lL]ord'`
- `'[lL]ords\s+and\s+[lL]adies'`
- `'[lL]adies\s+and\s+[lL]ords'`
- `'[mM]en\s+and\s+[wW]omen'`
- `'[wW]omen\s+and\s+[mM]en'`
- `'[bB]oys?\s+and\s+[gG]irls?'`
- `'[gG]irls?\s+and\s+[bB]oys?'`
- `'[Mm]r(\.?)\s+and\s+[Mm]rs(\.?)'`
- `'[Mm]rs(\.?)\s+and\s+[Mm]r(\.?)'`
- `'[mM]ales?\s+and\s+[fF]emales?'`
- `'[fF]emales?\s+and\s+[mM]ales?'`
- `'[hH]usband\s+and\s+[wW]ife'`
- `'[wW]ife\s+and\s+[hH]usband'`
- `'[wW]ives\s+and\s+[hH]usbands'`
- `'[hH]usbands\s+and\s+[wW]ives'`
- `'[lL]adies\s+and\s+[gG]entlemen'`
- `'[gG]entlemen\s+and\s+[lL]adies'`
- `'[Kk]ings?\s+and\s+[qQ]ueens?'`
- `'[qQ]ueens?\s+and\s+[kK]ings?'`
- `'[pP]rince\s+and\s+[pP]rincess'`
- `'[Pp]rincess\s+and\s+[Pp]rince'`
- `'[Ff]athers?\s+and\s+[mM]others?'`
- `'[mM]others?\s+and\s+[fF]athers?'`
- `'[Dd]ads?\s+and\s+[Mm]oms?'`
- `'[mM]oms?\s+and\s+[dD]ads?'`

APPENDIX C

INDEFINITE PRONOUNS PATTERNS

- `'(?<![\w\d])[Aa]ny(\s+)?one(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[Ee]very(\s+)?one(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[Ee]]very(\s+)?body(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[Aa]ny(\s+)?body(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[nN]o(\s+)?one(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[eE]ach(\s+)?one(?![\w\d])(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[nN]o(\s+)?body(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[sS]ome(\s+)?one(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[sS]ome(\s+)?body(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[nN]one(?![\w\d])(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`
- `'(?<![\w\d])[oO]ne(?![\w\d])(\s+)(.*?)(\s+)(his|her|their)(?![\w\d])(\s+)?'`

APPENDIX D

OCCUPATIONAL BIAS PATTERNS

- `'(?<![\w\d])a programmer(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a programmer(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a software engineer(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a software engineer(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a surgeon(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a surgeon(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a composer(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a composer(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a model(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a model(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])an attorney(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])an attorney(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a photographer(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a photographer(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])an accountant(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])an accountant(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`

- `'(?<![\w\d(?![\w\d])(\s+)?'])a professor(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a professor(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a physician(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a physician(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a journalist(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a journalist(?![\w\d])(\s+)(.*?)(\s+)her (?![\w\d])(\s+)?'`
- `'(?<![\w\d])a nurse(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a nurse(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a psychologist(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a psychologist(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a teacher(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a teacher(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a dentist(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a dentist(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])an architect(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])an architect(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a painter(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a painter(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a poet(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`

- `'(?<![\w\d])a poet(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a filmmaker(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a filmmaker(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a dietitian(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a dietitian(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a comedian(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a comedian(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a chiropractor(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a chiropractor(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a pastor(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a pastor(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a paralegal(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a paralegal(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a dj(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a dj(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a yoga teacher(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a yoga teacher(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])an interior designer(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])an interior designer(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`

- `'(?<![\w\d])a personal trainer(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a personal trainer(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a rapper(?![\w\d])(\s+)(.*?)(\s+)his(?![\w\d])(\s+)?'`
- `'(?<![\w\d])a rapper(?![\w\d])(\s+)(.*?)(\s+)her(?![\w\d])(\s+)?'`

APPENDIX E

MANN WHITNEY U-TEST FORMULAS

R_i: Sum of all ranks in a sample

n_i: Sample size of group i

C: Continuity correction, when $U > \mu$, C= -0.5, when $U < \mu$, C= 0.5

$$U_1 = R_1 - \{\frac{n_1(n_1 + 1)}{2}\}$$

$$U_2 = R_2 - \{\frac{n_2(n_2 + 1)}{2}\}$$

U= minimum of U_1, U_2

$$\mu = \frac{n_1 * n_2}{2}$$

$$\sigma = \sqrt{\frac{n_1 * n_2 * (n_1 + n_2 + 1)}{12}}$$

$$Z = \frac{U - \mu + C}{\sigma}$$

From Z table we get p-value

APPENDIX F

GENDERED GENERIC INDEFINITE PRONOUNS STATEMENTS

like **somebody** tried to wring **his** arm off .
none of them had done an honest days work in **his** recollection.
so it is only right that **each one** should tell **his** part.
let **each one** tell **his** part.
each one sat down upon the first person in the first row of **his** particular section, stayed there for a minute or two, thinking happy, enthusiastic, appreciative thoughts all the while, and then moved onto the lap of the person in the next seat, and so on, all across the row.
"i wonder," he said, "whether the stars are set alight in heaven so that one day **each one** of us may find **his** own again... look at my planet.
how **anyone** can be so clever with **his** hands is a mystery to me!
in my heart, i know there's **someone** who deserves t my trust (as i do **his**), and i wouldn't be able to tolerate peter in his place.
no one could see a foot before **his** face, but grannie turned toward town and started forward.
each one got to read part of **his** most interesting-looking book out loud, and then the others were free to criticize.
what they expected to see was a grisly dungeon, with chains, and **somebody** grinding somebody else's bones to make **his** bread.
nobody could possibly have **his** ears in his legs. Why not? because it's ridiculous, that's why you know what i think is ridiculous? the centipede said, grinning away as usual.
it is a good thing that i go out when i do because i know that they are all itching to get on with the inevitable conversation and that as long as i am in the room, or in the house even, they will just sit there being polite, trying not to hurt my feelings, and no one will say what **everyone** has on **his** mind.
everyone who is playing a part has to write **his** own part, and in that way we'll be sure to get the most out of the play.
i'm strictly average when it comes to sports except for swimming, when i'm on my own, and in track meets, where there may be a team but it's really **everyone** on **his** own.
everyone in her family had **his** own bedroom and wastebasket except her mother and father who shared both with each other.
well, perhaps, tomorrow you can push **someone** down and grab **his** paper while **he's** trying to get up.
don't you think if **someone** starts out to tell you about **his** father's farm, he should stick to his guns, then get around to telling you about his uncle's brace?
freddy whispered, "**nobody** signs **his** name.
as for the officers, the name of the great jinjin set them moaning and weeping at a great rate and **every one** fell upon **his** knees before the throne, begging for mercy.
every one of the poor fellows heartily wished **he** was back in oogaboo caring for **his** orchard, and some were so unhappy that they began to reproach ann for causing them all this trouble and danger.

it is certainly a strange sight, was polychrome's reply;but i cannot see how there can be more than one king, or queen, in any one country, for were these all rulers, no one could tell who was master. one of the kings who stood near and overheard this remark turned to her and said: one **who is master** of **himself** is always a king, if only to himself, in this favored land all kings and queens are equal, and it is our privilege to bow before one supreme ruler"the private citizen. who's he? inquired betsy.

the nomes trembled at the sound of the king's gong and whispered fearfully to one another that something unpleasant was sure to happen; but **none** dared pause in **his** task.

faney going on living all one's life and knowing that **everyone** one meets is thinking to **himself**, that is the man who killed his stepfather it would be better to be hang at one you mast look at it in a more hopeful way than that, ned,â€• mr. porson sail kindly; â€œmany will from the frst believe, with us, that you are innocent, you will live it down, my boy, and sooner or later we may hope and believe that god will suffer the truth to be known, at the worst, you know you need nob go on living here.

even you, mother, with all your prejudices, must allow that it will be a good thing for me to have **some one** with me who will really care for me, who will nurse me if i am sick or wounded, who would lay down **his** life for mine if necessary.

so the wise girl retired for the time, but, of course, a good deal of the smell of hot cabbage remained behind, as it will do, and toad, between his sobs, sniffed and reflected, and gradually began to think new and inspiring thoughts: of chivalry, and poetry, and deeds still to be done; of broad meadows, and cattle browsing in them, raked by sun and wind; of kitchen-gardens, and straight herb- borders, and warm snap-dragon beset by bees; and of the comforting clink of dishes set down on the table at toad hall, and the scrape of chair-legs on the floor as **every one** pulled **him- self** close up to his work, the air of the narrow cell took a rosy tinge; be began to think of his friends, and how they would surely be able to do something; of lawyers, and how they would have enjoyed his case, and what an ass he had been not to get in a few; and lastly, he thought of his own great cleverness and resource, and all that he was capable of if be only gave his great mind to it; and the cure was almost complete.

and why should i want a case for it? well, **everyone** to **his** taste replied the cobbler; but i must say if i had such a nose i would have a nice red leather cover made for it.

it is only through work and care that man can ever hope to be good for anything. Hans stared at these words, and at last he begged that his boat would tell him what use it was to **anybody** that this gold and silver should lie moldering there, and the owner of it be continually trying to increase **his** treasure, which already overflowed his store rooms.

the greater part of them are always quarrelling and complaining of each other's faults, while **nobody** thinks of **his** own. Hans tried to deny the truth of these words, but he could not do it, and sat silent, hardly listening to what his friend was saying.

is it to stand much longer on the earth Â«tt must stand till **some one** comes and pushes it down with **his** foot, then it will fall, and under its roots will be found more gold and silver than even mark the rich has got.â€™ â€˜then j dreamt i came to a river, and the old ferry- man said to me: for thirty years the ferryman has rowed in and from.

no one but a **true philosopher** could be so indifferent to **his** diet.

no one else could balance a fish on **his nose** or ride a : junicycle.

in two or three hours we can form a strong breast-work on the an indian attack 11 rocks nearly out to the middle of the stream, where the current is too swift for **anyone** to make **his** way up against it?

however, if you have any scruples on the subject there is no occasion for you to have any share in what i may discover. i think i will agree with you and risk it: though certainly at prevent t don't see what advantage any amount of money wanld be to me, the houses of the peasants were for the most part comfortable, although small, for since the expulsion of the Spaniards, the people bad had no reason to make a pretence   or mag   4 tropical forest 89 of poverty, daring the Spanish rule **no one** dared, by the size of **his** house or by **his** mode of living, to show signs of wealth above his fellows, for to do so would be to expose himself to the cruel exactions of the tax-collectors and local officials; and even now they had hardly recognized the change that had taken place, and remained wedded to the habits that had become rooted in them by centuries of op- pression.

and her snaky tail were horrible enough to make **anybody** lose **his** sleep for months.

now, be careful, at this distance **everyone** ought to bring down **his** man. although that was not accomplished a number of men were seen to fall and the rest retired out of sight.

the enemy were evidently in great strength, in an instant **everyone** was at **his** post, and steady volleys were poured into the darkness on the garden side of the fort, where the chief attack seemed to be coming.

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