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Writing Style, Readability, and Communication Vagueness as a Predictor of the Use of Visual Displays among Manuscripts Submitted to *Research in the Schools*

Anthony J. Onwuegbuzie
University of Cambridge
University of Johannesburg

Eunjin Hwang
Sam Houston State University

In a previous editorial, we examined the concept of *displaying with creativity*, which involves using visual displays—namely, tables and figures—for the purpose of exploration, communication, *c*alculation, storage, and decoration. Moreover, we documented that among manuscripts submitted to the journal *Research in the Schools* (*RITS*) over a 4-year period, a significant proportion of manuscripts (i.e., 19.7%) did not contain any visual displays, with a statistically significantly and practically significantly higher proportion of manuscripts containing tables than figures, and with the qualitative research manuscripts containing statistically significantly and practically significantly fewer visual displays than did both the quantitative research manuscripts and the mixed methods research manuscripts (Cohen's $d = 1.09$ and 0.93, respectively). Most notably, manuscripts that received a decision of either accept or revise-and-resubmit were statistically significantly (Cramer's $V = .32$) and practically significantly (Odds Ratio = 2.04; 95% confidence interval = 1.33, 3.12) more likely to contain one or more visual displays than were manuscripts that received a decision of reject (66.7%). In an attempt to understand further the role that visual displays play in manuscripts, we examined, in 71 manuscripts submitted to *RITS*, the relationship between the use of visual displays and the following predictor variables: readability, writing style, and communication vagueness. Findings revealed that all three sets of predictor variables were statistically significantly and practically significantly related to the use of visual displays. Implications of these findings are discussed.

Keywords: *Research in the Schools*, writing with discipline, displaying with creativity, tables, figures, visual displays, joint displays, crossover displays. manuscript rejection, manuscript acceptance, writing style, readability, communication vagueness

Above all else show the data.
—Edward Tufte

The above quotation by Edward Tufte—a U.S. statistician and professor emeritus of political science, statistics, and computer science at Yale University, who pioneered the field of data visualization—is extremely poignant. Indeed, data visualization is a powerful way to *represent* data in general and to *present* data in particular in a form that is transparent, warranted, understandable, coherent, insightful, meaningful, and actionable. As such, data visualization is seen by some researchers as the essential final step of any data analysis approach. However, despite its logical and, above all, visual appeal, a significant proportion of researchers representing the quantitative, qualitative, and mixed methods research traditions appear to underutilize visual displays—that can be characterized as representing either a table or a figure (American Psychological Association [APA], 2020)—in their empirical research and evaluation studies. Consistent with this assertion, in our previous editorial, we documented that among manuscripts submitted to the journal *Research in the Schools* (*RITS*) over a 4-year period, a significant proportion of manuscripts (i.e., 19.7%) did not contain any visual displays, with a statistically significantly and practically significantly higher proportion of manuscripts containing tables than figures.

Even manuscripts that contain at least one visual display often do not contain an optimal number of visual displays. For example, with respect to quantitative research studies, not only did Onwuegbuzie and Daniel (2005) report, via a visual display, that 91% of authors who submitted manuscripts for review for possible publication do not provide any *discussion* of assumptions for their statistical models used, but, even more importantly, they do not provide any visual data (e.g., histogram, boxplot, stem-and-leaf diagram, scatter plot,

Correspondence concerning this article should be addressed to Anthony J. Onwuegbuzie, Faculty of Education, University of Cambridge, 184 Hills Road, Cambridge, CB2 8PQ.
E-Mail: tonyonwuegbuzie@aol.com

interaction plot) to illustrate the extent to which the model assumptions were met, which can represent a serious error of omission. With respect to qualitative research, there appears to be an even greater underutilization of visual displays (Onwuegbuzie & Dickinson, 2008; Verdinelli & Scagnoli, 2013), which Miles and Huberman (1994) defined as "organized, compressed assembly of information that permi[t] conclusion drawing and action" (p. 11). In support of our assertion, Onwuegbuzie and Hwang (2019) discovered that the qualitative research manuscripts examined in their study contained statistically significantly and practically significantly fewer visual displays than did both the quantitative research manuscripts and the mixed methods research manuscripts (Cohen's $d = 1.09$ and 0.93, respectively). And the non-use of visual displays in qualitative research studies can render a manuscript not being sufficiently rigorous and rich and being characterized by what Bazeley (2009) referred to as a superficial reporting of themes in which "qualitative researchers rely on the presentation of key themes supported by quotes from participants' text as the primary form of analysis and reporting of their data" (p. 6). Further, Verdinelli and Scagnoli (2013), who examined articles that were published between 2007 and 2009 in the journals *Qualitative Health Research*, *Qualitative Inquiry*, and *Qualitative Research*, documented that only 27% of articles contained some type of data display.

As outlined by Tufte (2001), quality visual displays should exemplify a "well-designed presentation of interesting data" (p. 51) that represents a matter of substance and of design. Further, such quality displays should "consist of complex ideas communicated with clarity, precision, and efficiency" (p. 51). More specifically, visual displays should

- show the data
- induce the viewer to think about the substance rather than about methodology, graphic design, the technology of graphic production, or something else
- avoid distorting what the data have to say
- present many numbers in a small space
- make large data sets coherent
- encourage the eye to compare different pieces of data
- reveal the data at several levels of detail, from a broad overview to a fine structure
- serve a reasonably clear purpose: description, exploration, tabulation, or decoration
- be closely integrated with the statistical and verbal descriptions of a data set (Tufte, 2001, p. 13)

According to the authors of APA (2020), visual displays can be presented to fulfil several purposes that include *exploration* (i.e., the data contain a message from which readers can learn; e.g., exploratory data analysis and data mining techniques); *communication* (i.e., the author wants to portray the underlying meaning contained in the data, which is the purpose of most data displays in scientific works); *calculation* (i.e., the display allows readers to estimate some statistic or function of the data); *storage* (i.e., data can be stored in a display for later retrieval, such as for use in a meta-analysis); and *decoration* (i.e., data display are used to highlight data and to make the report more visually appealing. At its optimum, as noted by Ben Schneiderman—a U.S. computer scientist, who is famous for his work on information visualization, and who originated the treemap concept for hierarchical data that are included in hard drive exploration tools, census systems, election data, stock market data analysis, gene expression, and data journalism—"Visualization gives you answers to questions you didn't know you had."

Traditionally, the *data* in data visualization has referred to primary information that is collected by the researcher(s) from a primary or secondary source and then subjected to some type of quantitative, qualitative, and/or mixed analysis. Yet, Onwuegbuzie and Hitchcock (2019) reminded researchers to think of data

> as stemming from *information* that is neither qualitative nor quantitative at its inception (Valsiner, 2000; cf. Figure 1)—with both qualitative data and quantitative data being socially constructed from experiences or phenomena (Sandelowski, 2014), "co-produced" (Moore, 2007, ¶ 2.3) and "co-constructed" (Moore, 2007, ¶ 2.3, 3.5, 3.6) by both the participant(s) and researcher(s) (Moore, 2007, ¶ 2.3), non-static and non-immutable (i.e., chang[ing] with person and time"; Sandelowski, 2011, p. 347), "situated" in their use (Moore, 2007, ¶ 3.7), and "tainted with an analytical or interpretive cast *in the very process of becoming data*" (italics in original; Wolcott, 1994, p. 16). (p. 10)

Therefore, by *data* in data visualization, we are referring to *any* information that can appear in any of the 12 components of a research study, which was categorized by Onwuegbuzie and Frels (2016), as follows: problem statement, literature review, theoretical/conceptual framework, research question(s), hypotheses, participants, instruments, procedures, analyses, interpretation of the findings, directions for future research, and implications for the field.

Purpose of Study

The most notable finding of Onwuegbuzie and Hwang's (2019) study was that manuscripts which received a decision of either accept or revise-and-resubmit were statistically significantly (Cramer's $V = .32$) and practically significantly (Odds Ratio = 2.04; 95% confidence interval = 1.33, 3.12) more likely to contain one or more visual display than were manuscripts that received a decision of reject (66.7%). In an attempt to explain the link between data visualization and manuscript quality, Onwuegbuzie and Hwang (2019) hypothesized that visual displays likely reduce communication vagueness, which has been linked to manuscript rejection (Onwuegbuzie, 2018), and increase readability, which also has been linked to manuscript rejection (Onwuegbuzie, Mallette, Hwang, & Slate, 2013). Thus, they called for future research in the area of visual displays wherein communication vagueness and readability were the subject of study.

With the goal of answering this call, the purpose of the present research study was to test these two hypotheses that pertain to data visualization being linked to readability and communication vagueness. Also, because of Onwuegbuzie and Daniel's (2005) finding that manuscripts submitted to a journal that are poorly written overall are, on average, approximately 12 times more likely to be rejected than are well-written manuscripts, we also tested the hypothesis that data visualization is linked to writing style. Specifically, the following three research questions were addressed:

1. What is the relationship between the use of one or more visual displays and readability among manuscripts submitted to a journal?

2. What is the relationship between the use of one or more visual displays and writing style among manuscripts submitted to a journal?

3. What is the relationship between the use of one or more visual displays and communication vagueness among manuscripts submitted to a journal?

Conceptual Frameworks

Readability. Readability is based on the notion that the text "becomes readable, most agree, when variables in a text interact with those in a reader to make the writing easy to understand" (Harris & Hodges, 1995, p. 204). Therefore, readability formulas often are used for estimating readability (i.e., a text's difficulty) via "counts of language variables in a piece of writing to provide an index of probable difficulty for readers" (Klare, 1974/1975, p. 64). In the current study, we used two popularized readability formulae, namely, Flesch Reading Ease and Flesch-Kincaid Grade Level. According to Flesch (1946), the highest (i.e., easiest) Flesch Reading Ease Score is approximately 100, with a Flesch Reading Ease Score between 90 and 100 representing text that potentially can be understood by fifth-grade students; a Flesch Reading Ease Score between 60 and 70 representing text that potentially can be understood by eighth- to ninth-grade students; and a Flesch Reading Ease Score between 0 and 30 representing text that potentially can be understood by college graduate students (Flesch, 1946). In contrast, the formula for the Flesch-Kincaid Grade Level essentially involves a conversion of the reading ease score to a U.S. grade level in order for educators, students, parents, and other stakeholders to assess the readability level of text via a common index. We expected that readability would be improved via the use of visual displays.

Writing style. In order to represent writing style, we selected the following three writing style variables: average number of words per sentence, average number of sentences per paragraph, and the percentage of passive-voice sentences. We selected these variables because they represent logical variables in predicting the quality of writing. Further, Onwuegbuzie (2020b) reported that all of them predicted whether or not a manuscript is rejected for publication by the editor. We expected that writing style would be enhanced via the use of visual displays.

Communication vagueness. Hiller, Fisher, and Kaess (1969), who conceptualized communication vagueness, defined communication vagueness as a "psychological construct, which refers to the state of mind of a performer who does not sufficiently command the facts or the understanding required for maximally effective communication" (p. 670). Accordingly, they identified the following 10 categories of communication vagueness:

1. ambiguous designation (i.e., something potentially specifiable is mentioned but not definitely identified; e.g., stuff, and so on);
2. negated intensifiers (i.e., negations can be evasions; e.g., not quite; not necessarily);
3. approximation (i.e., use reflects real or referential vagueness or imprecise knowledge; e.g., sort of, pretty much);
4. bluffing and recovery (i.e., when a speaker/writer is not communicating effectively and attempts to shift responsibility for making sense of content to the listener/reader; e.g., actually, anyway);
5. admission of error (i.e., repeated admissions of error indicate lack of confidence or lack of competence; e.g., I made a mistake, I don't know);
6. indefinite amount (i.e., an amount that is potentially knowable but is not specified; e.g., some, a couple, a little, a lot);
7. multiplicity (i.e., pseudospecification or glossing over of complexity; e.g., types, kinds);
8. probability and possibility (i.e., indicates lack of clarity or lack of definite knowledge; e.g., at times, generally);
9. reservations (i.e., expressions of doubt or reluctance to commit to a specific point of view; i.e., appear, seems); and
10. anaphora (i.e., excessive and repetitious use of pronouns instead of direct references makes content more difficult to follow; e.g., she, he, it, them, latter, former).

We expected that communication vagueness—particularly, the vagueness of words written (cf. Hiller, 1971)—would be reduced via the use of visual displays.

Method

Sample Size and Procedures

To analyze the relationship between the use of visual displays and the readability, writing style, and communication vagueness among manuscripts submitted to a journal, we examined 71 manuscripts submitted to *RITS* over a 4-year period. These manuscripts represented approximately 50% of all manuscripts submitted to this journal over this period, which made these set of findings, at the very least, generalizable to the population of manuscripts submitted to *RITS*. The decision to use a sample size of 71 was the result of an a priori statistical power analysis. Specifically, because there were two readability variables, three writing style variables, and 10 communication vagueness variables—which resulted in three sets of discriminant analyses—the statistical power analysis was conducted on the 10 communication vagueness variables because it yielded the largest discriminant analysis model that necessitated the largest sample size. Therefore, a sample size of 71 was determined because it represented the sample size needed to detect a moderate multivariate relationship (i.e., discriminant analysis; f = .27) simultaneously for dependent measures (i.e., 10 communication vagueness categories) between the two groups (i.e., manuscripts that contained at least one visual display vs. manuscripts that did not contain any visual display) at the 5% level of statistical significance and a power of .80.

For each of the 71 manuscripts submitted to *RITS* over this time period, we meticulously documented every table and figure presented by these 71 sets of authors. Further, to collect data on readability and writing style, we used *Microsoft Office Word's Show readability statistics option* to compute two readability statistics (i.e., Flesch Reading Ease and the Flesch–Kincaid Grade Level) and three writing style indices (i.e., average number of words per sentence, average number of sentences per paragraph, and the percentage of passive-voice sentences).

With regard to the communication vagueness variables, we used QDA Miner, Version 5.0.33 (Provalis Research, 2019a), to conduct an initial coding of the 71 manuscripts for the communication vagueness contained in them. Then, we used WordStat 8.0.26 (Provalis, 2019b) to conduct a quantitative content analysis of the communication vagueness in the manuscript with respect to the aforementioned 10 categories of communication vagueness. As such, the data set created by these members of the editor team was extremely rich and unique, representing a data set that only journal editors have the opportunity to develop.

Analysis

We computed descriptive statistics (i.e., measures of central tendency, measures of variation) for all the variables. In addition, we used a series of discriminant analyses to determine (a) which readability variables, if any (i.e., Research Question 1), (b) which writing style variables, if any (i.e., Research Question 2), and (c) which communication vagueness categories, if any (Research Question 3), discriminated the use of visual displays versus the non-use of visual displays.

Results

Table 1 presents descriptive statistics pertaining to all the independent variables. In particular, it can be seen from this table that, with respect to the readability variables, the mean Flesch Reading Ease score was slightly under 30 and, therefore, was within the 0-30 range that represents text which potentially can be understood by college graduate students (Flesch, 1946). With respect to the writing style variables, according to Chafe and Danielewicz (1987), the number of words per sentence of academic writers is normally distributed with a mean of 24 words. Additionally, Elia (2009) reported that the average sentence length for encyclopedias was 22—specifically, with the average sentence length being 22.09 in Wikipedia (Range = 14.7 to 35.8) and 22.05 in Brittanica (Range = 14.4 to 32.8). Therefore, the mean number of words per sentence of 23.47 is very similar to Chafe and Danielewicz's (1987) finding. Further, the 21.34% passive voice percentage in Table 1 is very similar to Onwuegbuzie, Mallette et al.'s (2013) mean number of 21.52 (*SD* = 8.68). Also, the average number of sentences per paragraph was 5.42 is identical to the mean of 5.42 (SD = 5.60) sentences per paragraph documented by Onwuegbuzie, Mallette, et al. (2013). Finally, with regard to communication vagueness, anaphora was by far the most prevalent category, followed, by a distance, by multiplicity, and then by probability and possibility.

Table 1

Descriptive Statistics Pertaining to the Selected Variables Among Manuscripts Submitted to Research in the Schools (n = 71)

Variable	*M*	*SD*
Flesch Reading Ease	29.91	9.06
Flesch-Kincaid Grade Level	14.21	1.59
average number of words per sentence	23.47	3.14
average number of sentences per paragraph	5.42	5.33
percentage of passive-voice sentences	21.34	8.65
ambiguous designation	3.93	5.70
negated intensifiers	0.69	1.40
approximation	2.07	3.10
bluffing and recovery	1.27	2.14
admission of error	0.01	0.12
indefinite amount	4.21	5.35
multiplicity	14.59	12.31
probability and possibility	9.61	15.63
reservations	2.35	3.20
anaphora	36.72	34.96

Research Question 1: What is the relationship between the use of one or more visual displays and readability among manuscripts submitted to a journal?

A canonical discriminant analysis procedure was conducted to determine which of the two readability variables (i.e., Flesch Reading Ease and Flesch–Kincaid Grade Level), if any, best predicted whether or not the manuscript contained one or more visual displays. The two readability variables served as the predictor variables, with the manuscript visual display disposition serving as the dependent variable. This analysis revealed that both readability variables contributed statistically significantly to the prediction of manuscript visual display disposition. Specifically, the canonical discriminant analysis revealed a statistically significant canonical function ($\times^2[2] = 5.64$, $p < .05$; Wilks's Lambda = 0.92). The corresponding canonical correlation was .28, which suggested a medium effect size (Cohen, 1988). In addition, the group centroid (the average score on the discriminant function for manuscripts in both groups) for this function was .14 for manuscripts that contained one or more visual displays and -.58 for manuscripts that did not contain any visual displays. These statistics indicated that the discriminant function maximally separated manuscripts with visual displays from manuscripts without visual displays.

An examination of the standardized canonical discriminant function coefficient (Table 2) revealed that, using a cutoff loading of 0.3 (Lambert & Durand, 1975; Tabachnick & Fidell, 2007), both reading variables were practically significant, with Flesch-Kincaid Grade Level being, by far, the best predictor. Further, the structure coefficients (i.e., structure matrix) between the independent variable set and the standardized canonical discriminant function (Table 2) indicated that, using a cutoff loading of 0.3 (Lambert & Durand, 1975; Tabachnick & Fidell, 2007), both readability variables discriminated the two sets of manuscripts. Again, Flesch-Kincaid Grade Level was the best predictor. Interestingly, Flesch Reading Ease had negative coefficients, suggesting that manuscripts that contained one or more visual displays had lower Flesch Reading Ease scores, which, as a reminder, means better readability.

Table 2

Standardized and Structure Coefficients for Readability Variables Predicting Whether or Not a Manuscript Contained One or More Visual Displays

Variable	Standardized Coefficient	Structure Coefficient
Flesch-Kincaid Grade Level	1.32*	.98*
Flesch Reading Ease	-0.38*	-.79*

* coefficients with effect sizes larger than .3 (Lambert & Durand, 1975)

Research Question 2: What is the relationship between the use of one or more visual displays and writing style among manuscripts submitted to a journal?

An All Possible Subsets (APS) canonical discriminant analysis procedure was conducted to determine which of the three writing style variables (i.e., average sentence length, average number of sentences per paragraph, and the percentage of passive-voice sentences), if any, best predicted whether or not the manuscript contained one or more visual displays. The three writing style variables served as predictor variables, with the manuscript visual display disposition serving as the dependent variable. All possible models involving some or all of the three writing style variables were examined. That is, via this APS discriminant analysis, separate discriminant functions were computed for all writing style variables singly, all possible pairs of variables, all possible trios of variables, and so on, until the best subset of writing style variables was identified according to some pre-specified criteria. For this study, the criteria used were Wilks' lambda, the probability level (i.e., *p* value), the canonical correlation coefficient (which served as a measure of effect size), the standardized canonical discriminant function coefficients, and the structure coefficients. It should be noted that the APS discriminant analysis is different from stepwise discriminant analysis, in which the order of entry of variables is based exclusively on the probability level. Indeed, stepwise discriminant analysis does not guarantee the optimal model, and, therefore, several researchers (e.g., Onwuegbuzie & Daniel 2003; Thompson, 1995) problematize this type of analysis, instead advocating some form of canonical discriminant analysis.

The selected model indicated that all three writing style variables contributed statistically significantly to the prediction of manuscript visual disposition. Specifically, the canonical discriminant analysis revealed a statistically significant canonical function ($\times^2[3] = 12.23$, $p = .007$; Wilks's Lambda = 0.83). The corresponding canonical correlation was .41, which suggested a medium-to-large effect size (Cohen, 1988). In addition, the group centroid for this function was .22 for manuscripts that contained one or more visual displays and -.89 for manuscripts that did not contain any visual displays. These statistics indicated that the discriminant function maximally separated these two types of manuscripts.

An examination of the standardized canonical discriminant function coefficient (Table 3) revealed that, using a cutoff loading of 0.3 (Lambert & Durand, 1975; Tabachnick & Fidell, 2007), all three writing style variables were practically significant, with the average number of sentences per paragraph being the best predictor. With respect to the structure coefficients (Table 3), using a cutoff loading of 0.3, again, all three writing style variables were practically significant, with the average number of sentences per paragraph being the best predictor. In Table 3, the writing style elements with a positive coefficient (i.e., average number of sentences per paragraph) indicated that authors with longer paragraphs were *more* likely to produce manuscripts that contained one or more visual displays. Conversely, writing style elements with a negative coefficient (i.e., average number of words per sentence and the percentage of passive-voice sentences) indicated that authors who wrote shorter sentences and who used the passive voice more were *less* likely to produce manuscripts that contained one or more visual displays.

Table 3

Standardized and Structure Coefficients for Writing Style Elements Predicting Whether or Not a Manuscript Contained One or More Visual Displays

Variable	Standardized Coefficient	Structure Coefficient
Average number of sentences per paragraph	0.74*	.59*
Average number of words per sentence	-0.64*	-.54*
Percentage of passive statements	-0.41*	-.54*

* coefficients with effect sizes larger than .3 (Lambert & Durand, 1975)

Research Question 3: What is the relationship between the use of one or more tables and/or figures and the frequency of communication vagueness among manuscripts submitted to a journal?

An All Possible Subsets (APS) canonical discriminant analysis also was used to identify an optimal combination of communication vagueness categories (i.e., independent variables) that best predicted whether or not the manuscript contained one or more visual displays. This analysis revealed that a model containing the following six communication vagueness categories provided the best fit ($\times^2[6]$ = 12.44, p = .05; Wilks's Lambda = 0.83) to the prediction of manuscript visual disposition: indefinite amount, admission of error, reservations, anaphora, and probability and possibility, and negated intensifiers. This model was indexed by a canonical correlation coefficient of .42, which suggested a medium-to-large effect size (Cohen, 1988). In addition, the group centroid for this function was .22 for manuscripts that contained one or more tables/figures and -.91 for manuscripts that did not contain any tables or figures. These statistics indicated that the discriminant function maximally separated these two types of manuscripts. In Table 4, communication vagueness categories with a positive coefficient (i.e., admission of error, reservations, anaphora, and negated intensifiers) indicated that authors high on these categories were *more* likely to produce manuscripts that contain one or more visual displays. Conversely, communication vagueness categories with a negative coefficient (i.e., indefinite amount and probability and possibility) indicated that authors high on these categories were *less* likely to produce manuscripts that contain one or more visual displays.

Table 4

Standardized and Structure Coefficients for Communication Vagueness Variables Predicting Whether or Not a Manuscript Contained One or More Visual Displays

Variable	Standardized Coefficient	Structure Coefficient
Indefinite amount	-1.30*	-.36*
Admission of error	0.94*	.55*
Reservations	0.84*	.58*
Anaphora	0.84*	.44*
Probability and possibility	-0.80*	.50*
Negated intensifiers	0.40*	.60*

* coefficients with effect sizes larger than .3 (Lambert & Durand, 1975)

Discussion

The present study is unique in at least three ways. First, it represents the first study to investigate the relationship between the use of visual displays and readability among manuscripts submitted to a journal for review for possible publication. Second, this investigation represents the first attempt to examine the relationship between the use of visual displays and writing style. A third uniqueness was that this inquiry involved examination of the relationship between the use of visual displays and communication vagueness.

In previous *RITS* editorials, the authors have advanced the concept of *writing with discipline*, which refers to writing manuscripts that are intended to be submitted to a journal for review for possible publication that have minimal APA errors in the abstract (Hahs-Vaughn, Onwuegbuzie, Slate, & Frels, 2009) and the body of the manuscript (Onwuegbuzie & Combs, 2009; Onwuegbuzie, Combs, Slate, & Frels, 2010), as well as in the reference list (Onwuegbuzie, Combs, Frels, & Slate, 2011; Onwuegbuzie, Frels, Hwang, & Slate, 2013; Onwuegbuzie, Frels, & Slate, 2010; Onwuegbuzie, Hwang, Combs, & Slate, 2012; Onwuegbuzie, Hwang, Frels, & Slate, 2011; Onwuegbuzie, Waytowich, & Jiao, 2006; Waytowich, Onwuegbuzie, & Jiao, 2006) and table (Frels, Onwuegbuzie, & Slate, 2010a) sections of empirical and non-empirical (e.g., methodological, conceptual, theoretical) manuscripts; avoiding grammatical errors (Onwuegbuzie, 2017); using appropriate verbs (Frels, Onwuegbuzie, & Slate, 2010b); using link words/phrases to connect sentences and paragraphs whenever possible (Onwuegbuzie, 2016); avoiding communication vagueness (Onwuegbuzie, 2018); and maximizing readability (Onwuegbuzie, Mallette, et al., 2013). Onwuegbuzie and Hwang's (2019) finding regarding the link between the use of visual displays and manuscript disposition (i.e., the editor's decision) indicates that using visual displays represents another component of writing with discipline, what these authors referred to as *displaying with creativity* (p. i).

The present study revealed that the use of visual displays in manuscripts is related to certain elements of writing style, readability, and certain elements of communication vagueness. That is, *displaying with creativity* is related to *writing with discipline*! With regard to writing style, the finding that the average number of sentences per paragraph is positively related to the use of visual displays is intriguing and is worthy of further investigation, as is the finding that authors of manuscripts with visual displays tend to use the passive voice less than do their counterparts who do not use visual displays. Such an investigation could provide useful information about the what factors assist the process of writing with discipline —bearing in mind that manuscripts submitted to *RITS* that are poorly written overall are approximately 12 times more likely to be rejected, on average, than are well-written manuscripts (Onwuegbuzie & Daniel, 2005). Further, that the average number of words per sentence is negatively related to the use of visual displays indicates that manuscripts with visual displays tend to contain shorter sentences. This finding has intuitive appeal because it supports the adage that "a picture is worth a thousand words!" Interestingly, as noted previously, Onwuegbuzie (2020b) reported that all three writing style variables analyzed in the current study were statistically significant and practically significant predictors of whether or not a manuscript is rejected for publication by the editor. Therefore, the link among writing style, use of visual display, and quality of manuscript is worthy of further investigation.

A particular compelling finding surrounds those concerning readability. In a nutshell, readability indices differ as a function of whether or not the manuscript contains visual displays. Specifically, authors who include visual displays tend to have lower Flesch Reading Ease scores, with lower Flesch Reading Ease being indicative of more readable text. Now, as stated earlier, Flesch Reading Ease Score between 0 and 30 representing text that potentially can be understood by college graduate students (Flesch, 1946). And this cutoff score of 30 was empirically verified via three studies, which are presented chronologically as follows: (a) Metoyer-Duran (1993), who examined whether readability estimates differed significantly among published, accepted, and rejected manuscripts and abstracts from College and Research Libraries during the 1990-1991 period, reported that the mean Flesch Reading Ease Score was 28.04 for accepted manuscripts and 30.77 for rejected manuscripts; (b) Gazni (2011), upon examining the relationship between Flesch Reading Ease Scores of 260,000 abstracts of articles, spanning 22 disciplines, that were published between 2000 and 2009 from the five institutions (e.g., Harvard) that received the largest number of citations and their citation rates, observed that the Flesch Reading Ease Scores, which ranged from an average of 12.6 in pharmacology/toxicology to an average of 25.6 in mathematics, all fell within the 0-30 range; and (c) Onwuegbuzie, Mallette, et al. (2013) documented that manuscripts with Flesch Reading Ease scores between 0 and 30 were 1.64 more times less likely to be rejected for publication than were manuscripts with Flesch Reading Ease scores greater than 30. Interestingly, findings from the current study provided a fourth body of evidence regarding the significance of the cutpoint score of 30. Specifically, using Fisher's Exact Test, not only were manuscripts with Flesch Reading Ease scores within the 0-30 range statistically significantly (p = .047) more likely to contain visual displays that represented a medium effect size (Cramer's V = .23), but also manuscripts with Flesch Reading Ease scores within the 0-30 range were 3.44 times (95% confidence interval [CI] = 1.01, 12.28) more likely to contain visual displays than were manuscripts with Flesch Reading Ease scores greater than 30.

With regard to Flesch-Kincaid Grade Level, Onwuegbuzie, Mallette, et al. (2013) documented that manuscripts with Flesch-Kincaid Grade Level scores of 16 and above were 4.55 times less likely to be rejected than were manuscripts with Flesch-Kincaid Grade Level scores less than 16. However, in the present study, 16 did not turn out to be the cutpoint score, with no statistically significant difference in the use of visual displays between manuscripts with

Flesch-Kincaid Grade Level scores of 16 and above and those with Flesch-Kincaid Grade Level scores less than 16 (Fisher's Exact Test p = .58). Instead, 13 turned out to be the cutpoint score, with manuscripts with Flesch-Kincaid Grade Level scores of 13 and above statistically significantly more likely to contain visual displays than were manuscripts with Flesch-Kincaid Grade Level scores less than 13 (Fisher's Exact Test p = .05), with manuscripts with Flesch-Kincaid Grade Level scores of 13 and above being 3.97 times (95% CI = 1.03, 15.30) more likely to contain visual displays than were manuscripts with Flesch-Kincaid Grade Level scores less than 13.

Finally, the relationship found between the use of visual displays and certain communication vagueness categories also is noteworthy. In particular, the finding that manuscripts that are characterized by communication vagueness associated with indefinite amount are less likely to contain visual displays has logical appeal because it suggests that these authors are not taking advantage of visual displays—especially tables—to provide more specific information. Similarly, the finding that manuscripts that are characterized by communication vagueness associated with probability and possibility are less likely to contain visual displays also has logical appeal because it suggests that these authors are not using visual displays to maximize clarity and to demonstrate relevant knowledge.

Conclusions

In conclusion, as demonstrated in this editorial, there appears to be a strong link between the use of visual displays and elements of writing style, readability, and communication vagueness. And because a strong relationship has been documented between manuscript disposition (i.e., acceptance vs. rejection) and these same writing style elements (i.e., average number of words per sentence, average number of sentences per paragraph, and the percentage of passive-voice sentences; Onwuegbuzie, 2020b), readability (Onwuegbuzie, Mallette, et al., 2013), and communication vagueness (Onwuegbuzie, 2018), it appears that writing style, readability, communication vagueness, and quality of manuscript are inter-related in some way. Mixed research techniques (see, for e.g., Johnson & Onwuegbuzie, 2004; Johnson, Onwuegbuzie, & Turner, 2007; Tashakkori & Teddlie, 2010) can play an important role in exploring further these relationships. For example, in the qualitative phase(s), (*RITS*) authors could be interviewed to determine the causal direction, if any, among writing style, readability, communication vagueness, and visual displays. For example, in general, do authors use visual displays to enhance writing style, readability, and/or communication clarity, or is improvement in writing style, readability, and/or communication clarity the result of using visual displays? With respect to the quantitative phase(s), path analysis/structural equation modeling can be used to explore the interplay of these variables. Further, mediation analyses and moderating analyses, via a series of regression models (Baron & Kenny, 1986; Hayes, 2018) can be conducted to identify mediating and moderating relationships involving these variables. In any case, it is clear that investigating the role of visual displays represents a fruitful area for research.

Notwithstanding, the link found in the present study between the use of visual displays and elements of writing style, readability, and communication vagueness, as well as the link reported by Onwuegbuzie and Hwang (2019) between the use of visual displays and manuscript disposition, suggest that more preparation is needed for doctoral students as to how to create tables and figures. Indeed, it appears that many instructors of quantitative research (e.g., statistics, measurement) appear to emphasize the analysis (i.e., computation) of data—as opposed to the presentation of data. And with respect to the presentation of data, it also appears that instructors of these courses tend to emphasize the narrative (i.e., within-paragraph) reporting of data instead of visual presentation. Therefore, it appears that in quantitative research courses, visualization of data is regarded by many, if not most, instructors as being of secondary importance. And this lack of focus on the visualization of data in graduate-level quantitative courses likely reflects the fact that although there are hundreds of textbooks devoted to statistical analyses, there are very few books devoted to presenting data (e.g., Evergreen, 2017; Nicol & Pexman, 2010).

Similarly, with respect to the qualitative research courses, an examination of qualitative research course syllabi by both Onwuegbuzie (2020a), and 10 years earlier by Verdinelli and Scagnoli (2010), revealed no mention of visual presentations. Consequently, as is the case for quantitative research courses, in general qualitative research courses (e.g., introductory qualitative research courses), there appears to be much more emphasis on narrative presentation than on visual presentation, with the visualization of data only being featured in specialized courses such as visual ethnography courses. And this lack of pedagogical focus on visual display likely stems from the fact that, with the exception of the books authored by Matthew B. Miles and A. Michael Huberman (i.e., Miles & Huberman, 1984, 1994; Miles, Huberman, & Saldaňa, 2014)—which still represents the most comprehensive classification system of visual displays—there is a dearth of general (i.e., non-specialized) qualitative research textbooks devoted to the visualization of qualitative data (Onwuegbuzie & Dickinson, 2008; Verdinelli & Scagnoli, 2013). Even the *Sage Handbook of Qualitative Research* (Denzin & Lincoln, 2018) only has one of its 42 chapters (i.e., Magolis & Zunjarwad, 2018) devoted to the visualization of qualitative data.

Moreover, there does not appear to be a single textbook devoted to the *teaching* of visual display in either quantitative or qualitative research courses. But with the recent attention on visual display among mixed methods researchers via *joint displays*, which involve presenting both qualitative and quantitative findings (Fetters, Curry, & Creswell, 2013; Guetterman, Fetters, Curry, & Creswell, 2015), by means of "tables or figures that combine and display both quantitative and qualitative data together" (Johnson, Grove, & Clarke, 2019, p. 301) and *crossover displays* that "summarize and integrate both qualitative and quantitative results within the same framework" (Onwuegbuzie & Dickinson, 2008; p. 205; see also Onwuegbuzie & Leech, 2019), the way has been paved for mixed methods researchers to lead in the promotion of visual displays.

In any case, because of the importance of visual displays in the empirical research process that findings from the current and previous (Onwuegbuzie & Hwang, 2019) editorial have supported, it is imperative that instructors of graduate-level research methodology courses recognize the central role that data visualization should play in the preparation of doctoral students. Yet, without such training in the visualization of data, it is likely that many students will continue to lack the knowledge, skills, and confidence to create even the most basic forms of visual displays, let alone the more sophisticated forms of visualization. And rather than assuming that doctoral students can train themselves in data visualization, these skills should be taught explicitly. Although we recognize that it is unlikely that the many/most doctoral curricula have room for required courses devoted to data visualization, we recommend that, at the very least, elective courses be deigned and that as many students as possible be encouraged to enroll in them. And as noted earlier, by *data* in data visualization, we are referring to any information that can appear in any of the 12 components of a research study, as categorized by Onwuegbuzie and Frels (2016).

Further, data visualization should permeate the doctoral curriculum, optimally being incorporated into as many doctoral courses as possible in such a way that data visualization skills are not taught in isolation. Most importantly, and as indicated by the current findings, data visualization should be incorporated into research methodology courses. Without such data visualization skills, how can faculty members expect doctoral students to produce quality reporting of data? And without the ability to produce quality reports, it will be difficult for students and emergent scholars to be effective producers of research.

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