

## FOREGROUNDING SOCIOPOLITICAL AWARENESS AND CRITIQUE IN SECONDARY SCHOOL STATISTICS CURRICULUM

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*With large scale social issues such as human migration, climate change, and growing economic disparities, statistical literacy needs to go beyond consuming and producing data that merely incorporates real-world contexts, but that critiques the structures and discourses that are shaping and perpetuating inequitable social, and economic conditions. The goal of this work is to theorize the importance of fostering sociopolitical awareness and critique in conjunction with learning powerful statistical concepts and practice, fostering a critical statistical literacy in secondary mathematics classrooms. In taking an initial step towards this goal I will be discussing the results of an analysis of an American written curriculum series for secondary mathematics, looking at the contexts and the elements of a critical statistical literacy present in those lessons.*

### INTRODUCTION

In modern society, which is drenched in data (Steen, 2001), individuals need to be statistically literate (Gal, 2004). There has been an explosion of data in every facet of life (Ben-Zvi & Garfield, 2008). As a result of this abundance of data in society, statistical literacy is becoming a crucial literacy for being a citizen in today's modern societies. As Franklin et al. (2007) states "every high school graduate should be able to use sound statistical reasoning to intelligently cope with the requirements of citizenship" (p.1). However, it is important for critical citizenship education that this literacy goes beyond the tradition 'consumption and production' conception of statistical literacy to include fostering sociopolitical awareness and critique. Statistical literacy for critical citizenship needs to include critically interrogating what is being consumed in and produced by data-based arguments. Large scale social and environmental issues, such as climate change, refugee crises, and poverty, need to be addressed in school curriculum so that students are not only aware of them, but have experiences investigating them (Apple & Beane, 2007). In this way, schools can serve as sites for fostering students/citizens who can thoughtfully engage issues in their local and global community for the purposes of creating a more just world for tomorrow.

Today in the context of secondary education, the teaching of statistics and data analysis is almost universally situated in the mathematics curriculum (Burril, 2011). Unfortunately, when situated in school mathematics, statistics concepts and practices have often been reduced to mundane computations (Cockcroft, 1982), stripped of the power they have for investigating issues that are meaningful to students lives, as well as their historical and sociopolitical contexts. In the K-12 context, there needs to be an emphasis put on teaching statistical concepts and practices consistent with the discipline of statistics, and that are useful for investigating sociopolitical issues prevalent in the world today. To engage in active, critical citizenship students need a *critical statistical literacy*. My objective for this paper is to describe what a critical statistical literacy could be situated in a specific philosophical perspective towards the goals of education and citizenship. A second goal is to show a specific example of what this perspective can highlight related to written curriculum.

### THEORETICAL FRAMEWORK

In this section I begin by situating this work within a specific goal for education and vision of critical citizenship. I then discuss how intersecting critical and statistical literacies are important for considering sociopolitical issues and how considering context and statistical investigations are crucial aspects of this framework. I end by discussing why texts are important to investigate from the theoretical perspective I outline.

A predominant goal education in western societies is democratic equality, preparing students to be active citizens in society (Labaree, 1997). Education centered on citizenship benefits society by fostering a literate and educated citizenry who can make critical decisions, and in turn create a stronger democratic society for all. The work I describe in this paper is situated around this

goal for education, viewing it as a public good for all, preparing youths to take up the role of citizens (Apple & Beane, 2007; Giroux, 1989; Labaree, 1997), and not to create an elitist hierarchy of types of citizens. With that being said there are many different and competing views of what makes a “good” citizen situated in social, cultural, and historic contexts. For example, one view is that of the “personally responsible citizen,” who is a hard working individual who follows the law, has “good” character, and is responsible in his/her community (Westheimer & Kahne, 2004). This type of citizenship maintains the status quo. The problem with this mentality is that the status quo today includes unjust structures of racism, classism, and sexism that favor certain individuals and disadvantages others (Giroux, 1989).

Though citizenship is often cited as a rationale or goal in educational scholarship, and more specifically in mathematics and statistics education (e.g. Ben-Zvi & Garfield, 2008; Franklin et al., 2007; Gal, 2004; Steen, 2001), scholars often do not explicitly describe what view of citizenship they take up in their work. This is an issue because different views of citizenship can lead to different perspectives on how to shape educational experiences for students. For example, schooling based on the personally responsible view of citizenship would likely revolve around the individual pursuit of the knowledge recommended by the government. This would likely also include some community service to emphasize individual’s personal responsibility in the community. An issue with this view of citizenship and education is its individualistic focus. Students in this type of school setting likely compete over test scores, extracurricular activities and service hours in an effort to rise above their peers to gain social mobility. However, schools with democratic education in mind are “marked by an emphasis on cooperation and collaboration rather than competition” (Apple & Beane, 2007, p. 12). The goal should be to lift the community up, not just certain individuals. How likely is a teacher to design tasks for students to interact and collaborate with one another on common goals if the view of good citizenship they hold revolves around students only being responsible for themselves?

I draw from the perspective that citizens should participate actively in their community and/or government, but should also interrogate and critique the structures at play within their community and government, which can produce conditions of injustice, and actively work to change those structures that do (re)produce injustices. Drawing from Giroux (1989),

It is important to acknowledge that the notion of democracy cannot be grounded in some ahistorical, transcendent notion of truth or authority. Democracy is a "site" of struggle, and as a social practice is informed by competing ideological conceptions of power, politics, and community. This is an important recognition because it helps to redefine the role of the citizen as an active agent in questioning, defining, and shaping one's relationship to the political sphere and the wider society. (p.28-29)

I agree with this view of democracy as a site of struggle and citizens as active agents. In today’s modern societies we have a plurality of different views, values, and ideas, which as citizen’s in such societies we must be able to negotiate and navigate in our daily lives. Strengthening the bonds between fellow citizens through a common goal of democracy, while also accepting and appreciating the plurality inherent in our society is crucial to being a citizen (Giroux, 1989). I will henceforth refer to this view of citizenship that I have described as *critical citizenship*. It is based upon this perspective of education and citizenship that I develop the idea of a critical statistical literacy by intersecting critical and statistical literacies.

### *Critical Statistical Literacy*

Intersecting critical literacy with statistical literacy forms the basis of what I am calling a critical statistical literacy based on the notions of reading and writing. Scholars of critical literacy foreground the connection between literacy and power. Many discuss literacy as an emancipatory force (Freire & Macedo, 2003; Giroux, 1989; Gutstein, 2006), beginning with learning to read the word *and* the world, which can then help individuals to learn to write both the word and world—transforming their lived realities through the power of literacy. When democracy is viewed as a site for struggle, through the dialogue of a plurality of views, literacy for critical citizenship needs to include the ability to critique and interrogate the discourses and structures in society that reproduce

oppressions and injustices. As Gutstein (2006) points out, “U.S. schools socialize students into non-questioning roles, creating and maintaining passive identities so that students do not believe in their own power to shape the world” (p.88). By providing students experiences to see how they are situated by social structures, and also how their own schooling is shaped by historical, political, and socially constructed institutions and discourses, can help students create and maintain active citizen identities where they believe in their own power to influence and shape the world around them. With these notions from critical literacy in mind let us now consider how they intersect with the predominate views today of reading and writing from statistical literacy.

Reading statistical arguments is a key element of statistical literacy (Franklin et al., 2007; Gal, 2004). To describe reading statistics I draw from Gal’s (2004) definition of statistical literacy,

(a) people’s ability to interpret and critically evaluate statistical information, data-related arguments, or stochastic phenomena, which they may encounter in diverse contexts, and when relevant (b) their ability to discuss or communicate their reactions to such statistical information, such as their understanding of the meaning of the information, their opinions about the implications of this information, or their concerns regarding the acceptability of given conclusions. (p.49)

This notion of reading in the context of statistical literacy is quite useful and powerful for considering reading the word. Intersecting this notion with critical literacy brings the perspective of reading the world that is both shaping statistical information and data-related arguments, as well as being shaped by them. In the context of reading a critical statistical literacy could include: i) critiquing statistical information and data based arguments encountered in diverse sociopolitical contexts; ii) interrogating discourses and social structures that are shaped and reinforced by data based arguments; iii) understanding one’s own social location, subjectivity, and political context to develop a sociohistorical and political knowledge of self and how it influences one’s interpretations; iv) evaluating the source, collection and reporting of statistical information and how they are influenced and shaped by the author’s social position and broader discourses, institutions, and historical forces.

An important note to make here before segueing into the notion of writing is that Gal (2004) pointed out the need for individuals to have critical skills in their knowledge base, and a critical stance as part of their dispositions to be statistically literate. In this way Gal’s definition opened the door for the merging of critical and statistical literacy. However, I would like to push beyond Gal’s definition in several ways. For one, Gal focused on adult literacy and I would like to push these notions earlier on into the K-12 setting, where students are first forming the skills and practices of being statistically literate. Second, I would like to foreground the importance of criticality in statistical literacy, and of delving into important sociopolitical issues, not just critically evaluating neutral portrayals of statistical arguments in reading contexts, such as newspapers or reports. Third, I think the notion of enabling action needs to be pushed farther as well, to not only consider enabling action as a result of reading statistics, but to also enabling action by writing the world through statistics. Gal does not ignore the writing or enquiry context of statistics; he does however, choose to focus on the reading context, which he considers the most common and important for adults. As our societies have become increasingly data centric, I do not think reading is enough, there also needs to be a focus on writing as the two are deeply intertwined. Furthermore, I would argue that only being literate in the reading context can only go so far, as reading and writing operate in dialogue, and some experience in writing is necessary to be able to critically read a statistical argument. For example, how does one critically evaluate the method that someone is using to analyze data in an argument without having some experience with using that analysis themselves? I could see someone arguing here that an individual could merely have a technical knowledge of the statistical tests and the assumptions that need to be satisfied for such a test to be robust. However, from the literacy perspective I am taking, the focus is on actions or practices situated in meaningful real life contexts (Giroux, 1993; Steen, 2001). Only having a technical understanding is at odds with the core of this perspective. I assert that the writing or the empirical context of statistical literacy should be foregrounded in statistical literacy as well and this sentiment is shared by others (e.g. Gould, 2010).

Writing in statistics involves actively investigating a phenomenon through a statistical investigation and communicating the results of that investigation to others. The *Guidelines for Assessment and Instruction in Statistics Education* (GAISE) framework (Franklin et al., 2007), outline four components of the statistical investigative cycle: formulate questions, collect data, analyze data, and interpret results. In drawing from this description of the statistical investigative cycle, writing statistics could be defined as, *the ability to formulate statistical questions, collect or find data relevant to statistical questions, analyze data using appropriate graphical and numerical methods, and interpret analyzed data addressing the statistical question(s) being investigated.*

Taking this notion of writing in statistical literacy and intersecting it with critical literacy highlights not only the elements of a statistical investigation, but also how the world shapes decisions individuals make in those elements, and how those decisions can in turn shape the world. Writing within a critical statistical literacy could include: i) using statistical investigations to communicate statistical information and arguments in order to question and reshape institutions and social structures; ii) using statistical investigations to alleviate and resolve sociopolitical issues of injustice; iii) communicating one's social location, subjectivity, and political context to others and describing how it influence and shapes one's meaning making of the world when reporting results of a statistical investigation.

### *Considering Texts*

Given the theoretical perspective I have outlined, texts are important to consider because of the large role they play in shaping the enacted curriculum in mathematics classrooms (Remillard & Heck, 2014) and because of the powerful role they have in shaping and constructing reality in terms of what is possible or acceptable to say and do (Foucault, 1972). Regularities in texts form sets of rules that are often taken for granted that afford or constrain what is acceptable to say, do, or even think in different contexts (Foucault, 1972). For example, if students are only presented with tasks that present fictitious problems with small data sets when being taught statistics in school than are they likely to see statistics as useful for exploring complex issues they experience in their daily lives? Textbooks in schools have a great power in shaping students views of the world as they are official forms of curriculum, presented from a position of authority as sanctioned and official sources of knowledge. The reality portrayed by textbooks however, can create and enforce unjust social structures. For example, consider the following statement in the lesson summary of a unit from the EngageNY curriculum (NYSEDa, 2015) analyzed in this study, "*Categorical data* are data that take on values that are categories rather than numbers. Examples include male or female for the categorical variable of gender" (NYSEDb, 2015, p. 59). This statement only presents the reality that gender is binary either male or female. However, as has been argued for decades gender is far more difficult to define and takes on social and cultural understandings of what it means for an individual to express themselves, generally considered in terms of masculinity and femininity (Butler, 1990). How this statement constructs gender privileges those who clearly identify as male or female while ignoring the existence of people who do not clearly identify as male or female. As Butler (1990) argues gender is dynamic and can change from context to context and an individual's gender does not need to match their biological sex. If the goal of education is democratic equality than statements such as the one discussed, which comes from an officially sanctioned source and serves to create unjust social structures are a serious issue in direct opposition of that goal and should be interrogated. Furthermore, in the context of statistical literacy such statements shape how a statistical question is asked, how data is in turn collected, the type of analysis possible and the interpretations that are made. However if the goal of an investigation is to learn more about a context, to see patterns that could not otherwise be seen, to better understand the world than it is crucial to reflect upon and interrogate the notions that shape and influence how investigations are carried out.

In this paper, I will focus on two aspects of the discipline of statistics to investigate what contexts and elements of a statistical investigation are present in an American high school written mathematics curriculum. Consistent with the practices of statistics, statistical investigations should be presented as a process including asking statistical questions, collecting data, analyzing data, and interpreting results (Franklin et al., 2007; Wild & Pfannkuch, 1999). Furthermore, context should be an integral part of such investigations, and should be considered and help guide each component

of an investigation (Wild & Pfannkuch, 1999), as after all “data are not just numbers they are numbers with a context” (Cobb & Moore, 1997, p. 801). Connecting back to the theoretical perspective I have been outlining these two elements represent only a portion of the critical statistical literacy perspective I have outlined. Statistical investigations are situated in the notion of writing as I have described it, which is a way for students to both better understand the reality they live in but also provides the opportunity to shape that reality. Context is a crucial consideration here as well because without context (social, political, historical, & spatial) there cannot be elements of a critical literacy to have elements of a critical statistical literacy. In other words context is crucial to the intersection of statistical and critical literacies.

## METHODS

The work reported here is part of a larger project using critical statistical literacy as a lens in a qualitative discursive textual analysis to investigate the how statistics is discursively constituted as a discipline by written high school mathematics curriculum. Because of the brevity of this paper I will focus on discussing the analysis of two aspects of a single curriculum, namely what practices of writing from a statistical literacy perspective are constituted as part of the discipline of statistics and how contexts are positioned to use statistics to investigate.

The curriculum that was analyzed for this paper was the EngageNY curriculum (New York State Education Department [NYSED], 2015a). This curriculum was selected because it is made freely available online to be adapted or adopted by one of the largest and most influential states in the US. Furthermore, this curriculum is designed to be aligned with the CCSSM (NGA Center & CCSSO, 2010), that has mandated the presence of statistics concepts and practices at the high school level and has been accepted by the vast majority of the states in the US.

Analysis was done by reviewing all the student materials for Algebra I and Algebra II. Geometry was excluded because it contained no statistics lessons. In total there were 50 lessons that explicitly focused on statistics standards that were analyzed. Every context/issue that was introduced in a task or problem was recorded as well as if there was data that went with the context, whether or not the data was real, and the depth of the interaction with the context the tasks required (described in Table 1). I am using the term context here to represent the situations described that are measured.

Table 1. Levels of interaction tasks require with the context of the task.

|  |
|--|
| Low  |
| A context is present in the task, but is not integral to making sense of the task. The context is presented in a superficial sense and could be easily interchanged without changing the task itself.  |
| Medium   |
| A context is presented in the task and some consideration of the context is required to answer the task. Consideration of context does not require students to learn more about the context using statistics or to make decisions about the context. |
| High   |
| A context is presented in the task and is a critical component in making sense of the task and must be considered to answer the task.  |

Furthermore, each lesson was coded in terms of what elements of a statistical investigation were present in the lesson in terms of the definitions of the practices of writing from a statistical literacy perspective outlined earlier drawing from Franklin et al. (2007).

## RESULTS

In this section I will discuss the results around analyzing the contexts and the elements of a statistical investigation that were present in the statistics lessons from the EngageNY (NYSED, 2015a) curriculum. I will begin by discussing results relate to how contexts are positioned to use statistics to investigate followed by discussing results around what practices of writing from a statistical literacy perspective are constituted as part of the discipline of statistics.

### Considering Context

The vast majority of the tasks in the lessons and problem sets of the curriculum are situated in contexts, rather than merely considering the calculations and practices in abstraction with decontextualized sets of values, which is promising due to the importance of context in statistical investigations (Wild & Pfannkuch, 1999). Unfortunately many of the tasks barely take the students beyond the application of calculations in the contexts, and rarely require the students to interact with the contexts at more than a superficial level (Shown in Table 2). More than three quarters of the 226 contexts presented across the 50 statistics lessons could easily be substituted with another, with little to no effect on the task. For example, in the first lesson of the Algebra I student materials the following problem was presented,

1. Twenty-five people were attending an event. The ages of the people are as follows:

3, 3, 4, 4, 4, 4, 5, 6, 6, 6, 6, 6, 6, 6, 7, 7, 7, 7, 7, 7, 16, 17, 22, 22, 25.

a. Create a histogram of the ages using the provided axes. (NYSED, 2015b, p. 8)

Though the context of an event is presented where the ages of people attending is the variable being measured, the task, which only asks students to create a histogram, does not require students to actually consider the context, which could be replaced with another context such as the ages of students in a classroom or the shoe sizes of a group of children.

Table 2. Levels of interaction tasks require with the context of the task.

| Level of Interaction | Description   | Count/Proportion |
|----------------------|---|------------------|
| Low                  | A context is present in the task but is not integral to making sense of the task and could be easily interchanged without changing the task itself. | 178/226          |
| Medium               | A context is presented in the task and some consideration of the context is required to answer the task.  | 48/226           |
| High                 | A context is presented in the task and is a critical component in making sense of the task and must be considered to answer the task.               | 0/226            |

Of the unique contexts presented, 46 did have students interact with the context at a medium level. For example, later on in the same context mentioned previously related to an event, students were later asked, “What event do you think the twenty-five people were attending? Use your histogram to justify your conjecture” (NYSED, 2015b, p. 8). This task required student to interact with the context of an event by using the data to conjecture about what type of event it might be. In this way the text has primarily positioned context as relatively trivial in the how it constitutes the discipline of statistics as little interaction with the contexts present is required by the vast majority of the tasks.

Another issue is that none of the tasks that required a medium level of interaction with the context of the task were based around societal issues, such as migration, social (in)equality, crime, poverty, or human rights. Some of the contexts did hold promise for dealing with such societal issues as health and nutrition (relationship between sodium and calories in fast food meals) and demographic differences (comparing the distribution of ages of US adults to adults in Kenya). However, they only had students interpret results using the language of the context, not actually delving into the social structures or relationships that might be producing such results, or considering the implications of the results for the context/issue or society more broadly. Furthermore, most of the data sets are fictional, with only 36/226 based on real data or studies. This is a serious issue if the goal of education is to prepare students to be critical citizens, because this textbook series is not presenting student with real data to consider situated in contexts and issues relevant to them. This is not to say that fictitious data sets don’t have a role in texts and tasks for teaching statistics. There are certainly cases where a fictional data set constructed to emphasize specific concepts or practices are useful. However, to have the overwhelming majority of tasks

based on fictitious data is excessive if students are to be prepared to deal with real data in their lives outside of school.

Another issue is that the data sets that are provided in raw form are all small ( $n < 30$ ), except for a single instance where 506 SAT scores are given as a data set. Almost all of the contexts consider only one or two variables, except for several categorical data sets that provide summarized count statistics on three variables. For the most part, the only large data sets students deal with are in the form of categorical variables, where the students are given counts or simulation data, not the raw data. What this means is that the tasks in the curriculum are not providing any experiences for student to deal with the messiness of real data. If we are to prepare students to deal with issues in society, they need to have experiences with the types of data sets that are commonly available, which are generally large, with many variables of differing types, and missing entries to consider (Ridgeway, 2015).

In summary, the tasks do not require students to make sense of a data so much as they are being told to do very specific operations to small set of quantities, without much consideration as to the context of those quantities. Interestingly, even though the EngageNY (NYSEDa, 2015) curriculum is completely online and only available in digital format, no digital data resources such as data sets in excel or comma separated values format are provided for easy analysis using technology. This seems to be a serious limitation given that almost all publically available datasets related to societal issues are provided in such digital formats and professional statisticians rely heavily upon computer based software to explore and analyze data.

### *Considering Writing*

As described earlier statistical investigations are also an important component of teaching and learning statistics (Franklin et al., 2007) and a significant aspect of the work of professional statisticians (Wild & Pfannkuch, 1999). The predominant elements of a statistical investigation that were present in the statistics lessons were analyzing data and interpreting results, which were both present in almost every lesson. The tasks never provided experiences for open-ended inquiry based on student's own questions. In fact, the tasks almost never asked students to write questions at all, with only 4 of the 50 lessons including any tasks asking students to write questions. In the few cases that they were asked to create questions, they were given very specific data or analysis results, and asked to formulate a question that such data or results could be used to answer. Though students were given almost no opportunity to formulate their own questions, some of the tasks did provide statistical questions to drive students' interpretation of data provided.

Another aspect of a statistical investigative cycle that was frequently absent is the collection of data. This aspect was only touched on superficially, though a few tasks asked students to think about why data was collected in a certain way, they focused mostly on representativeness and random selection for sampling. Furthermore, students are only given one opportunity to collect their own data outside of technology based simulations, and the activity does not give students any agency over the process, it merely has them following prescribed directions. There are also no tasks that have students try to find available data to investigate an issue. This is another issue if the goal is to prepare students to be critical citizens as most individuals do not have the resources to collect their own data to investigate sociopolitical issues. However, there is a wealth of publically available data that can be used to investigate such issues that students should have experiences with finding.

In summary the practices of writing that are predominantly focused on are those of analyzing data and interpreting results. This means that these texts are not constructing the practices of writing from a statistical literacy perspective in a holistic manner. Unfortunately, the practice that serves as the driving force of an investigation, formulating a question, is mostly absent from the image of the discipline of statistics that is constructed by the texts. Furthermore, the importance of collecting data or consider how it has been collected is also almost completely absent.

### IMPLICATIONS

The results reported here are somewhat disappointing as the tasks in the curriculum analyzed did not ask students to deeply engage in investigating important societal contexts. If the

goal is to prepare students to be critical citizens they need to have experiences with the contexts that are relevant and meaningful to their daily lives and society. This work has implications for statistics and mathematics curriculum development as it highlights some of the current deficiencies in written curriculum, by not providing experiences investigating societal issues, using real data, in authentic statistical investigations, consistent with the discipline of statistics. The findings also show some of the issues and barriers that are present in secondary mathematics curriculum related to student's experiences of statistics and data about social phenomena that can guide curriculum design and educational planning consistent with the first topic of the conference's theme. The call for using real data in the teaching and learning of statistics is not new (Cobb & Moore, 1997). However, much of this work has been focused at the college level with only some infiltration into the high school setting (e.g. Franklin et al., 2007). AP statistics in the US context has made strides in bringing real data into the classroom, but this is still only for a small proportion of advanced mathematics students. If we as statistics educators want to prepare students to be critical citizens, we need to contribute to modifying and creating instruction materials that foster a critical statistical literacy in all students.

Written curriculum should be designed to engage students in every aspect of statistical investigations including writing questions and collecting data (Franklin et al., 2007). Furthermore, the curriculum analyzed did not provide students with opportunities to have agency over their own statistical investigations driven by their own questions. Problem posing is an important aspect of critical pedagogy (Freire, 1970) and having students formulate their own statistical questions is a key element in statistical investigations for developing statistical literacy in students (Franklin et al., 2007). It will be no easy task to bring experiences investigating societal issues using real data in authentic statistical investigations into the K-12 mathematics curriculum for a number of reasons. For one, many mathematics teachers have little to no prior experience with teaching or learning statistics themselves (Franklin et al., 2015; Shaughnessy, 2007). Great strides will need to be made in teacher education programs to provide pre-service teachers with experiences investigating sociopolitical issues with statistics, as well as how to create such experiences for their students. There also needs to be large scale professional development provided for those teachers already in the classroom. Another issue is that as past research on the statistics content of mathematics texts in the K-12 setting have shown, statistics content is often put in a single standalone unit, and generally makes up only a small portion of the overall text in comparison to other content areas such as number and quantity (Jones et al., 2015; Jones & Tarr, 2010). It is important that statistics content is integrated more into the mathematics curriculum so it is not easily skipped or ignored, but becomes an integral component of the mathematics curriculum. Furthermore, it is important that statistics educators are present and heard when decisions are being made for creating K-12 mathematics curriculum, standards and other policy documents. In this sense we as statistics educators need to be active in advocating for the importance of statistics in the K-12 mathematics curriculum as it is what is initially shaping students perceptions and dispositions towards statistics, which may then influence whether or not they choose to take statistics courses in the future or to use statistics in their daily lives.

In a broader discussion, I would like to encourage statistics educators to reflect on and consider what their goals are for education and what they view as "good" citizenship in their work. Our focus on education is clearly evident in the name of our field, yet I would argue we do not all have the same ideas of what the goals of education should be or what it should consist of. I don't think this is a problem, in fact it is important to have a diversity of perspectives to deal with the complex issues we face. However, I believe it is important to make our perspectives clear in our work as it shapes everything we do. Furthermore, I think such reflection is important to gain perspective at times on why are we doing what we are doing. It is easy to lose perspective when digging deep into an issue and reflection is a way of regaining that perspective. I have attempted to clearly lay out my perspectives in this paper as a way of laying out my chain of reasoning, which is a crucial element of research (Shavelson & Towne, 2002).

I would like to end with a quote that I think captures well how the critical perspective contributes to the theme of promoting understanding of statistics about society,



“If educational practice and research are to be critical, they must address conflicts and crises in society. Critical education must disclose inequalities and suppression of whatever kind. A critical education must not simply contribute to the prolonging of existing social relationships. It cannot be the means for continuing existing inequalities in society. To be critical, education must react to the critical nature of society.” (Skovsmose, 1994, p. 22).

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