Twitter (X) Under Elon Musk and Political Polarization Among University Students

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A thesis presented to the Honors College of Middle Tennessee State University in partial fulfillment of the requirements for graduation from the University Honors College

Fall 2024

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DEDICATION

This study is dedicated to my late Grandpa in Laos. We hope for a future where the world can put aside their differences and cooperate for the good of mankind and for the sake of future generations.

ABSTRACT

Political Polarization has been increasing in prevalence within the last couple of decades, with social media being frequently blamed for its rise. This study examines the use of the social media app X, formally known as Twitter, and whether it correlates to increasing political polarization among university students at Middle Tennessee State University (MTSU). The study was conducted within the context of the 2024 Presidential Election and after the enacted policy changes after Elon Musk's purchase of the app in 2022. Data collection was performed by sending out a survey through email to students at MTSU with the survey gathering a total of 83 student responses (*N = 83)*. The results demonstrated that MTSU students who have used Twitter (X) within the past year displayed greater levels of political polarization with polarization occurring more among participants who politically align on the Left/Liberal.

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I. INTRODUCTION

The rise of social media has resulted in numerous ways to spread information. The spread of information has also led to the presentation of more opinions from people around the world, including political opinions. X, formally Twitter, is one of those social media apps that have exploded in recent years and many people rely on the app for news and opinions. As Elon Musk described it, Twitter is like the modern "town hall" where people with differing opinions can communicate with each other and share opinions that can be open to debate. As a result, many politicians have used Twitter as a campaign tool to express their beliefs and connect with their voters. In other words, Twitter is a very important platform in the political world, and that is why it is important to understand the political beliefs of the people who browse the app.

However, according to observations and studies, there has been a growing phenomenon of political polarization among U.S. citizens (Colleoni, Rozza, and Arvidsson 2014). Many people's political views are going more toward the left or right and less toward the center. According to a Pew Research Center study, people who politically align with either Democrats or Republican view persons who politically align with the opposite party more negatively than others (2022). Experts have claimed that the growing use of social media is a huge cause of this growing polarization as social media allows users to surround themselves with other people who share the same views as them (Colleoni, Rozza, and Arvidsson 2014). This potentially causes an "echo chamber" where people only interact and gain information from people who identify with the same stances as their own,

thus deflecting and ignoring opposing opinions. This occurrence is known as political homophily (McPherson, Smith-Lovin, and Cook 2001). Twitter is one of the main social media platforms that people identify when they discuss this phenomenon (Bail et al 2018). This phenomenon of polarization has been exacerbated after the purchase of Twitter in 2022 by businessman Elon Musk who has altered the app's content moderation policies. This opened the floodgates for people with extremist views to establish a presence within the app.

II. LITERATURE REVIEW

The literature paints differing conclusions on whether Twitter use results in increased polarization amongst its users. One argument supports the notion that Twitter use does increase polarization through political homophily. Political Homophily is defined as the phenomenon where people with similar political views are more likely to interact with each other than with people with different political beliefs (McPherson, Smith-Lovin, and Cook 2001). Because people are only interacting with people with the same political attitudes, it can create a sort of "echo chamber" where these people can limit the information they receive and block differing views from their social group (Colleoni, Rozza, and Arvidsson 2014). The customization that social media sites like Twitter provide could accelerate these feelings of the "echo chamber" and the closed-off social groups can lead to political polarization (Colleoni, Rozza, and Arvidsson 2014). However, some literature points to how the correlation between Twitter use and political polarization is

inconclusive or can vary depending on political orientation or setting (Colleoni, Rozza, and Arvidsson 2014), (Barberá et al. 2015), (Boxell, Gentzkow, and Shapiro 2017).

An argument by Colleoni, Rozza, and Arvidsson (2014) suggests that increased Twitter use leads to increased political homophily depending on the political orientation of the user. Their evidence pointed to the use of big data, machine learning, and social network analysis to organize political tweets and examine the relationship with them according to whether the user is Republican or Democrat (Colleoni, Rozza, and Arvidsson 2014). After conducting the study, they found that Democrats illustrate higher levels of political homophily than Republicans, but Republicans who follow official accounts of news media or politicians have higher levels of homophily than Democrats (Colleoni, Rozza, and Arvidsson 2014). In general, a network of reciprocated followers demonstrates higher levels of homophily than networks that are not reciprocated (Colleoni, Rozza, and Arvidsson 2014). The study was conducted using a Twitter Graph that contains all the nodes and ties on Twitter in 2009 and a sample of 427 million tweets from 20 million users from 2009 (Colleoni, Rozza, and Arvidsson 2014). However, there is a question of whether the conclusions to their study have aged into 2024 as the importance of Twitter as a political tool has changed since 2009 and if their statements on political homophily can be replicated in 2024 after the Musk purchase.

Another study by Barberá et al. (2015) also takes advantage of big data to make a conclusion on the state of polarization on Twitter. In their study, they initiated a latent space model that examines a data set of 150 million tweets concerning 12 different political and non-political topics (Barberá et al. 2015). Correspondence analysis was then used that organizes users in a multidimensional plane with their coordinates corresponding to their

political positions and then presented heat maps of the interaction between users according to retweets along ideological lines or not (Barberá et al. 2015). What Barberá et al. (2015) found is that users on the left were more likely than users on the right to engage in cross-ideological interaction on both political and non-political topics. But when examining the non-political topics, users on both sides have illustrated that they are willing to interact with each other on Twitter (Barberá et al. 2015). Overall, this study demonstrates that the theory of "echo chamber" might be exaggerated for communication involving non-political topics, but there are still signs that people on Twitter tend to spread political information with each other along political lines (Barberá et al. 2015).

Boutyline and Willer (2017) also point to conservatives and more politically extreme users as the most likely group to demonstrate signs of political homophily due to chronic personality traits favoring certainty and reasoning (comment on Jost et al. 2003). The study tests this hypothesis by calculating the homophily rate for 238,943 politically active ego networks on Twitter that have ties with Congress members and nonprofits on the site and found that the data supports their hypothesis (Boutyline and Willer 2017). Next, Choi, Sang, and Park (2014), investigated political homophily on Twitter according to South Korean networks. It investigated Twitter discussions about former South Korean president Myung-Bak Lee through a social network analysis technique by using a tool called Node XL (Choi, Sang, and Park 2014). The tool would collect all the Tweets in the South Korean Twitter network concerning the former president's name and analyze the user data by examining the three types of messages such as followers, mentions, and retweets (Choi, Sang, and Park 2014). What they discovered is that left-leaning opinion leaders dominated the discussions about the former president, opposing many of his right-wing

views. (Choi, Sang, and Park 2014). It demonstrated signs of homophily as their views were mostly exchanged with people with similar political alignments as theirs and were less likely to interact with accounts with opposing viewpoints president (Choi, Sang, and Park 2014). They also discovered that the opinion leaders' stances did not necessarily align with the general public in South Korea (Choi, Sang, and Park 2014). This is an interesting discovery as it could mean that data and conclusions from analyzing just simply Twitter data might not correlate to the attitudes of the outside world.

Bail et al. (2018) also found similar results with increased polarization depending on the political ideology of users. For their study, they had a sample of Twitter users follow a Twitter bot for one month that autonomically retweeted posts from a sample of 4,176 political accounts that were the opposite of the subject's political views (Bail et al. 2018). The subjects were assigned to different treatment groups after they were surveyed about their interest in current events, how much they use Twitter, and their attachment to their political party (Bail et al. 2018). They also had financial compensation for subjects to be invested in the investigation as they were paid $11 to participate and $6 if they paid attention to the context of the retweets (Bail et al. 2018). However, Bail et al. (2018) discovered “backfire effects” where exposure to opposite views can cause users to be more polarized and become more extreme on the political spectrum. They discovered that Republican subjects became more conservative after following the liberal bot while Democratic subjects became more liberal after following the Conservative bot, but only slightly (Bail et al. 2018). However, they did explain that their discovery on the Democratic subjects was not statistically significant (Bail et al. 2018). As a result, Bail et al. (2018) demonstrates that cross-ideological interaction might lead to more polarization and not

less, which differs from other pieces of literature on how closed-off "echo chambers" could lead to political polarization. However, the study does leave the question of whether these results would be replicated in different settings or populations (Bail et al. 2018).

Bodrunova et al. (2019) had a compelling conclusion in their investigation about how polarization cannot be easily categorized into simple "left" or "right" groups. Their research involved examining opinions toward political actors by Twitter users in Germany, Russia, and the U.S. using a mixed methods approach which includes decrypting tweets and clustering (Bodurnova et al. 2019). It found that the clusters instead include specific types of political viewpoints that combine elements of conventional left or right stances (Bodurnova et al. 2019). These clusters include "anti-establishment nationalists" in Russia, "news disseminators" in Germany, and "white blamers" in the U.S. (Bodurnova et al. 2018). With the clusters, the idea of an "echo chamber" phenomenon may also be misleading according to the study as they found that these user clusters intertwine with each other and threads of political debate between the discourse had occurred (Bodurnova et al. 2018).

Finally, Boxell, Gentzkow, and Shapiro (2017) claim that the correlation between polarization and greater social media use is small. Collecting data from the American National Election Studies (ANES) about Internet use, they calculated an index using eight measurements of political polarization used in past research on the topic and divided the subjects according to age groups (Boxell, Gentzkow, and Shapiro 2017). They found that age groups least likely to use the internet display greater polarization than age groups that are more likely to use the internet. This concludes that internet use only explains a small portion of why there is an increase in political polarization (Boxell, Gentzkow, and Shapiro

2017). However, there might be a possibility of a spurious relationship with their conclusion as other variables could have explained the greater polarization in older age groups that are less likely to use the internet. Also, the study involves the Internet as a whole and not just specifically Twitter (Boxell, Gentzkow, and Shapiro 2017).

Twitter has also become a crucial tool for political communication not just with regular citizens but also with elected politicians. The use of the app by politicians was illustrated through a study by Van Vliet, Tornberg, and Uitermark (2020) who investigated the use of Twitter by members of parliament in European countries. With their use of the Twitter parliamentary database and compilation of Tweets using the API system, they discovered that Twitter is used differently depending on the country as some countries' parliamentary members take advantage of different features such as tweeting, retweeting, and mentions while others do not (Van Vliet, Tornberg, and Uitermark 2020). Hashtags were rarely shared by members of different parties and there was little interaction between members of parliament in different countries (Van Vliet, Tornberg, and Uitermark 2020). The study infers that politicians on Twitter demonstrate signs of homophily in both partisan issues and nationality (Van Vliet, Tornberg, and Uitermark 2020).

However, a major shift in the environment of content and users of Twitter has been the acquisition of the app by Elon Musk in 2022. The businessman has overhauled the app's corporate structure and values through the firing of former executives and employees, a rebrand and name change to X, and changes in algorithms, content moderation, and terms of service policies (Dinish and Odabaş 2023). This rebrand has resulted in the increasing presence of users with extremist views on the app with plenty of content espousing racist, anti-Semitic, and bigoted views while also allowing users who share these views to grow

a larger audience since 2022 (Iyer 2024). All of this has led to research concluding that Twitter use has correlated with increasing polarization through the exposure of more divisive content that has been condoned by the new executives running the app after Musk's purchase through their new content moderation policies (Iyer 2024).

As demonstrated here, many studies support the notion that certain political groups demonstrate more homophily on Twitter than others. Many of their studies rely on examining the Twitter database to determine a conclusion on whether the phenomenon of homophily occurs. However, this necessarily might not correlate to polarization outside of the internet for Twitter users. For example, even if a user gets most of their information from a liberal Twitter account, they might still be willing to interact with people with differing political views in real life. These studies also occurred without taking into consideration the setting and population of the users, which as some studies suggest, are variables that could have an impact on the measure of polarization (Boxell, Gentzkow, and Shapiro 2017), (Bodrunova et al. 2019), (Choi, Sang, and Park 2014). The study's contribution to this topic will take into consideration the different populations such as political orientation to determine if they are factors causing political polarization if exposed to Twitter in the context of the 2024 political climate. The study will also analyze if the information they gain from Twitter makes them more polarized in real life outside of the internet.

III. THESIS STATEMENT

With the growing importance of Twitter in spreading political ideas, there has been much written and discussed about the topic of increasing political polarization on the app over the last decade. The purpose of this research study is to determine the extent to which the use of social media app Twitter (X) affects the amount of political polarization people portray in their attitudes. This research will focus on university students at Middle Tennessee State University (MTSU). In the age of digital communication, social media apps have become the most popular way to communicate on political issues. However, if university students have become more polarized because of their time on social media, then it could compromise the democratic process in the future and inhibit communication of information if people become less tolerant of opposing viewpoints. As a result, my research question will ask, does Twitter use increase political polarization among its users? This study will contribute to the existing literature by providing survey data from college students in 2024 and examining if exposure to content on the app correlates to more extreme and polarizing political beliefs.

IV. RESEARCH APPROACH AND METHODOLOGY

A survey was used to gather participant responses to questions and political statements that will form the basis of the data for the purpose of developing this thesis study. The surveys were conducted using the Microsoft Forms platform. First, the survey and research proposal underwent an extensive IRB approval process by the MTSU IRB committee to determine the potential risks of the survey for participants (See Appendix C for the IRB approval letter). After IRB approval, the surveys were then sent through email to students from a variety of colleges within Middle Tennessee State University (MTSU) including the Political Science and Global Affairs, History, and Communications departments asking whether they would like to participate in this research study. The survey asked participants about their political orientation and how many hours per day they have used Twitter within the last year to categorize them into participant groups for analysis between the groups. All questions and political statements asked in the survey are presented in the appendix (See Appendix A).

The next section of the survey will display a set of 12 statements about various political topics (See Appendix A Treatment Survey Political Statements Questions 1-12). Several of the political statements used were taken and then slightly edited from previous studies on polarization (Bail et al. 2018). The 12 statements will ask the respondents to rate whether they disagree or agree with the statement on a 7-point scale with 1 representing a "strongly disagree" answer, 4 representing a "neutral", and 7 representing a "strongly agree" answer (Bail et al. 2018). The 12 items are divided in half according to political alignment with 6 of the statements leaning toward the left while the 6 other statements lean toward the right (Bail et al. 2018). The statements will be numbered from 1 to 12 with

statements 2, 4, 7, 9, 10, and 11 appealing toward people that politically align themselves on the left while statements 1, 3, 5, 6, 8, and 12 appealing toward individuals that politically align themselves on the right. This is to have a political variety of statements to maintain the integrity and impartiality of the study and to ensure a sufficient measurement of polarization (Bail et al. 2018). Statements 1 through 10 are about divisive political issues to measure ideological polarization based on policy (Bail et al. 2018) while statements 11 and 12 concern feelings toward people depending on their political orientation to measure affective polarization based on emotional feeling toward people (Pew Research Center 2022). Then, the next section of the survey asks 3 open-response questions about the participant's social media behaviors to inquire more specifically about their feelings toward people and views that disagree with their own (See Appendix A Open Response Questions 1-3). These open-ended questions are intended to go more in-depth about the respondents' political feelings about other people and other methods of social media. This gives the study qualitative data to further analyze specific causes of political polarization in social media between the participant groups.

Using Microsoft Excel, a table was created to display all the participant responses to all the items asked in the survey. To analyze and present the results of the 12 multiple-choice political statements on the 7-point scale, the study aggregated the total responses to each of the answers on the 7-point scale. This is to determine the frequency of each of the answers according to the participant groups based on political orientation and Twitter (X) use within the last year. The participant groups created based on the participant responses to the initial categorization question include participants who have used Twitter (X) the past year and have not used Twitter (X) within the past year. Those same participants were

also categorized by political orientation with groups of participants, creating participant groups that align on the Left/Liberal, Right/Conservative, Center/Independent, and those who are not politically engaged. Participant Groups combining both the participants' political alignment and Twitter use were also formed for analysis. These combined groups focus more on participants that identify either with the Left/Liberal or Right/Conservative to better develop conclusions on whether partisan political leanings affect how politically polarized a person is if they have used Twitter (X). The results are then displayed as bar graphs according to their participant group. On the vertical bar graphs, the x-axis represents the categories of answers from the political statements in the survey from most extreme to least extreme to most extreme and the y-axis represents the frequency for each answer category. The answer categories to those political statements were created as a combination of answers on the 7-point scale. The answer categories include the neutral answer of 4, the combination of answers 3 and 5, 2 and 6, and the most extreme answers of 1 and 7.

According to Fiorina and Abrams in their study of political polarization in the American Public (2008), polarization is the "presence of opposing or conflicting principles, tendencies, or points of view" (Fiorina and Abrams 2008). When it comes to politics, polarization illustrates that people are more extreme in their political attitudes rather than being more neutral or in the center (Fiorina and Abrams 2008). As a result, the answer categories were created to facilitate more productive data analysis of the frequencies of more extreme answers and neutral answers to better visualize the distribution of political polarization. Horizontal bar graphs are also created to visualize the relative frequencies of each of the answer categories by % Total of Responses to better analyze and compare the answer distribution for each participant group. For the horizontal bar graphs, the x-axis

represents the % Total of Responses rounded to the nearest whole % value while the y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. Correlation coefficient values (*r*) are also calculated for the participant group distributions to determine the strength of correlation between the frequency of responses concerning how extreme the answers were for the examined participant group with r values closer to 1 illustrating a strong correlation. All the figures and tables such as bar graphs, charts, and the correlation coefficient values were created and calculated using Microsoft Excel.

To analyze the open response data, I organized the responses according to participant groups based on their reported Twitter use and political orientation similar to the analysis of the multiple-choice responses. Then, I will observe general patterns and common sentiments among the measured participant groups through similar words and answers as well as presenting outliers. The study also took into consideration conclusions made from their responses in the multiple-choice section of the survey to help formulate more developed conclusions about political polarization among MTSU students in relation to social media use.

V. RESULTS

I. PARTICIPANTS

The data collection period occurred from October 1st, 2024 to October 16th, 2024. The survey set was sent through the school emails of students from the Honors College, Political Science and Global Affairs, History, and Communications departments at Middle Tennessee State University (MTSU). The survey received a total of 83 responses with some opting out of responding in the open response questions ($N = 83$). The collected sample size of the participants was skewed toward respondents who politically align on the Left or liberal and people who relatively use Twitter sparingly. The sample split of the participant groups that categorized the participants demonstrated that 43% of respondents politically align themselves to the left while 86% of respondents used less than one hour of Twitter (X) per day within the last year. Further analysis of the participation sample presents that 36 respondents orientate toward The Left/Liberal, 14 identify as Center/Independent, 16 orientate toward The Right/Conservative, and the remaining 17 respondents answer that they are not politically engaged (See Figure 1). Due to the survey being conducted at a university, it corroborates studies that show university students politically gravitating more toward the Left, with that leaning influencing the composition of the participant pool in this study (Pew Research Center 2016). Meanwhile, according to the categorization based on Twitter (X) use; 37 respondents say that have not used Twitter within the last year, 35 answered that they have used Twitter only less than an hour to an hour per day, 9 responded that they have used Twitter for 2-3 hours, none say that they have used the app for 4-5 hours per day, while 2 responded by explaining that they have used the app for more than 5 hours per day within the last year (see Figure 2). To counteract this unbalanced response

rate to the amount of Twitter use per day, the study combined the responses to answers that indicated that they have used Twitter (X) at least once to better balance the participant groups for efficient data analysis. Despite the skewed sample size, the results still illustrated some trends about the participants' social media and Twitter (X) use, and their attitudes on certain political topics.

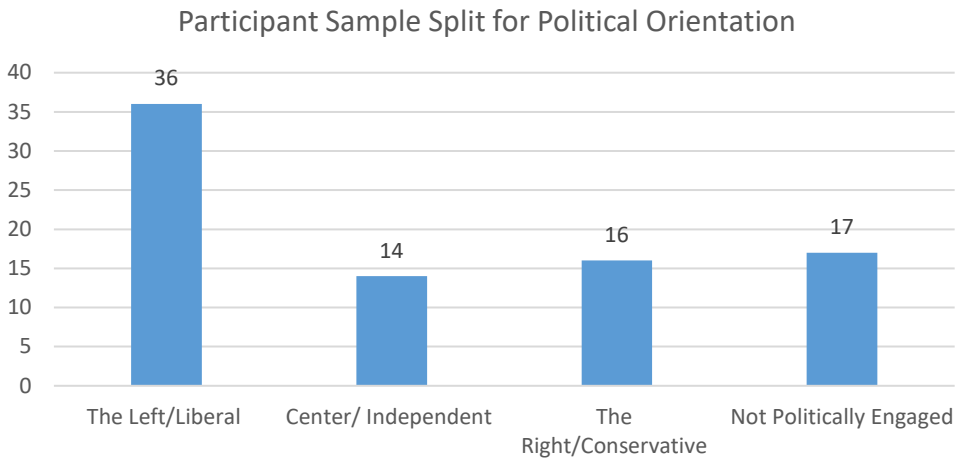

Figure 1. The sample split for participants in this study according to their self-reported political orientation. The x-axis represents the political orientation of participants. The y-axis represents the total number of responses for each political orientation of the study participants.

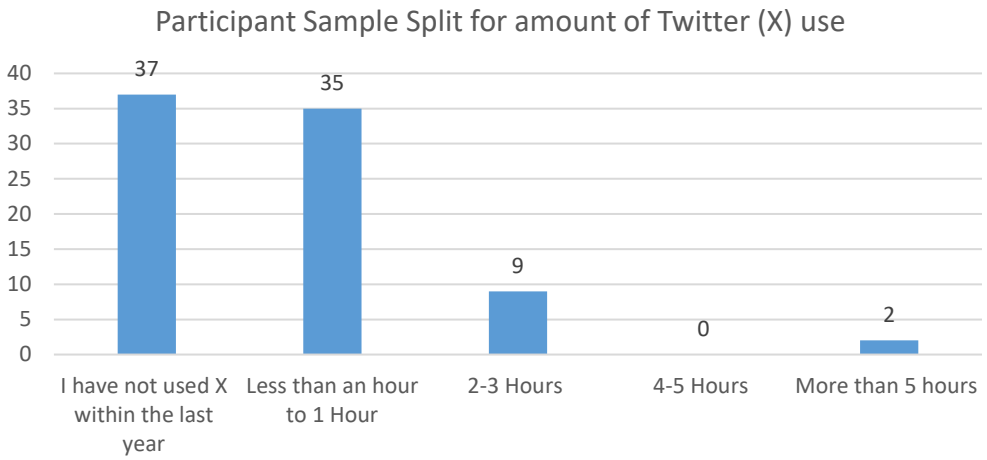

Figure 2. The sample split for participants in this study according to the amount of Twitter use per day within the past year. The x-axis represents the amount of Twitter use per day within the past year for participants. The y-axis represents the total number of responses of participants in the study for each of the answer groups according to amount of Twitter use.

II. QUANTITATIVE DATA/MULTIPLE CHOICE FINDINGS

To analyze the quantitative responses to the 12 political statements in the survey, bar graphs were composed from aggregates of each of the quantitative responses from the participant groups that are categorized by the amount of Twitter use per hour within the last year and Political Orientation. A table of all the number of answers for each of the values on the 7-point scale based on the measured categorical groups is provided in the appendix (See Appendix B for Table 1). Figures 3-22 below are graphs that display the distribution of aggregate answers according to the categories of extremes based on the 1-7 scale with the neutral 4 answer being the least extreme response while 1 or 7 being the most extreme response.

First, figures 3-6 present the responses of the participant groups according to their indicated Twitter (X) use in the survey (See Appendix A Question 2 Initial Categorization Section). Figure 3 illustrates the frequency of answers for the group of participants that stated that they have not used Twitter (X) within the last year *(n = 37*). Figure 4 illustrates the same group but in relative frequency out of the total number of responses within the group. The data demonstrates that the most frequent response to the 12 political statements is either 3 or 5 on the 7-point polarization scale, with 135 responses or 30% of participants in this group answering 3 or 5. Meanwhile, the 2nd most frequent response is the most extreme answer in 1 or 7 on the 7-point polarization scale with 27% of the participants, followed by the least extreme response in 4 with 23%, then the rest 19% answering 2 or 6. When calculating the correlation coefficient to determine the relationship between the most extreme answers and the number of responses, it provided a value of $r = 0.005983092$. This demonstrates that within the participant group that has not used Twitter within the past year, there is a weak positive relationship for polarization as the most common answer to the statements is the lesser extreme answer of either 3 or 5 with the R-value being closer to zero than 1. More than half of the responses (53%) are also on the lesser extreme side, with the majority of respondents answering 4, 3, or 5 on the 7-point scale within participants that do not use Twitter. However, there are still some signs of polarization within this group as the 2nd most frequent answer is the most extreme 1 or 7 category with 120 total answers for these two responses.

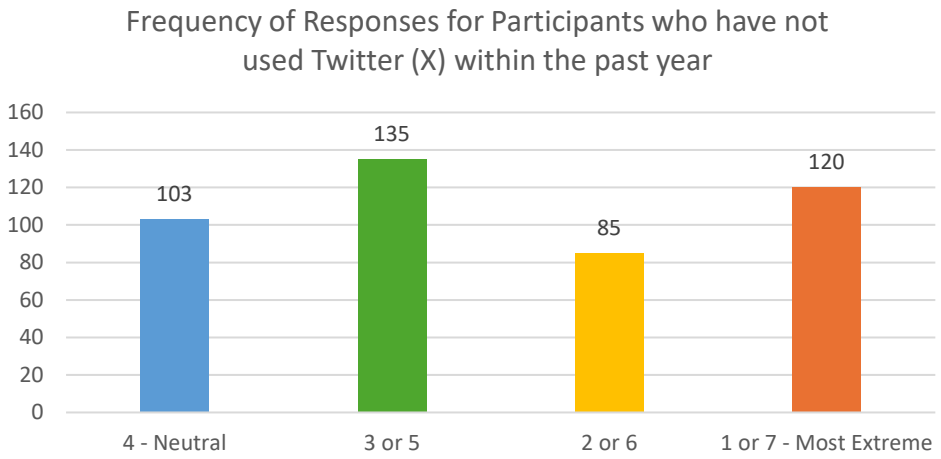

Figure 3. Frequency of Responses from Participants who have not used Twitter (X) within the past year. n = 37. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses for each answer category.

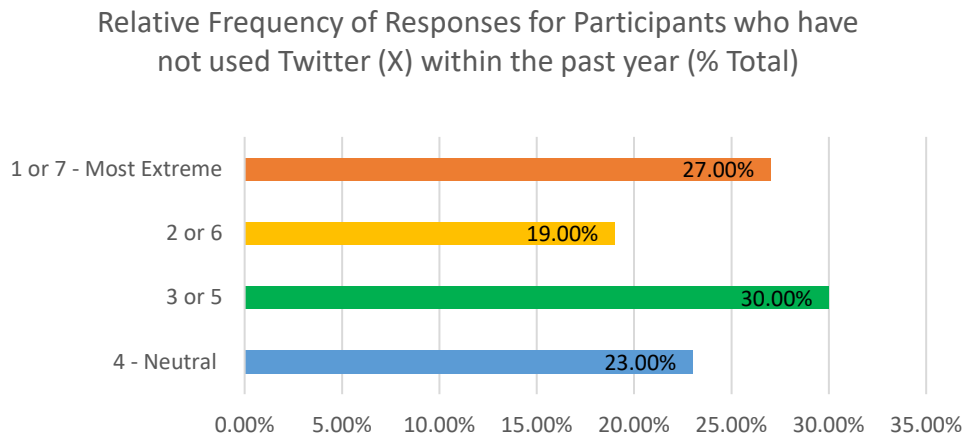

Figure 4. Relative Frequency of responses for Participants who have not used Twitter within the past year. n = 37. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Next, Figures 5 and 6 help display the findings from participants who have used Twitter within the last year ($n = 46$). Figure 3 shows the total number of responses from participants who have used Twitter at least once for each of the answers on the 1-7 scale, while Figure 4 demonstrates the data group in percentages out of the total number of responses. In this group, the most frequent response for the participants is the most extreme answers of 1 or 7 with 176 responses comprising 32% of the total responses within the group of participants that have used Twitter within the past year. The next frequent response is the more extreme option of 2 or 6 with 144 responses and 26% of the total response count within this group. As a result, 58% of the responses are on the more extreme side of the 7-point scale, indicating strong political polarization among participants who have used Twitter within the past year. The correlation coefficient value also indicates strong polarization as the value was calculated as $r = 0.992859462$. This demonstrates that the r value is close to 1 with the greater category of extremes having a strong correlation with the number of participant answers to the political statements. To round out the distribution set, the next largest category is the lesser extreme answer of 3 or 5 with 23% of the respondent count. Then, with the least answered category being the neutral answer of 4, it illustrates that this participant group is less likely to feel neutral about a political statement than feel extreme, indicating signs of political polarization.

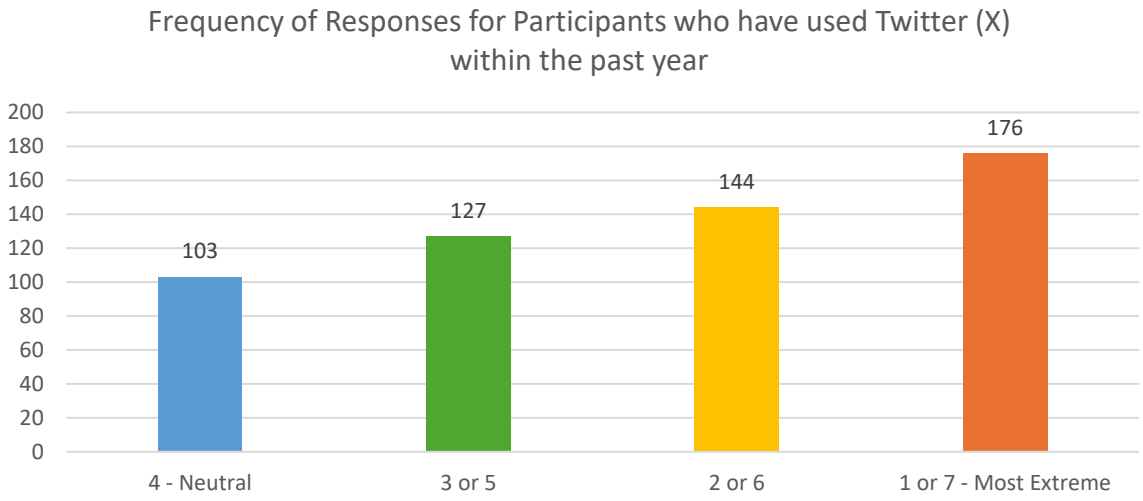

Figure 5. Frequency of Responses from Participants who have used Twitter (X) within the past year. n = 46. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

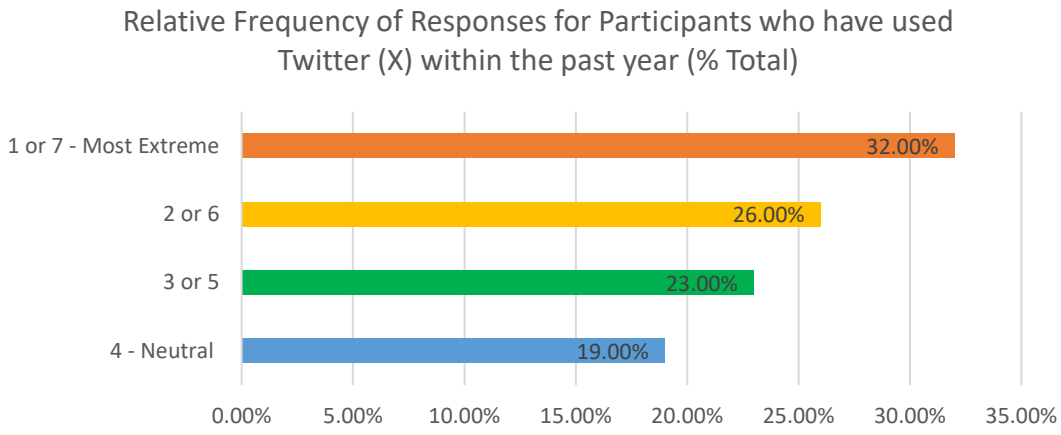

Figure 6. Relative Frequency of responses for Participants who have used Twitter within the past year. n = 46. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Moving on to the group categorization based on political orientation, Figures 7-14 display the data distribution of participant responses according to their self-identified political orientation on the survey (See Appendix A Question 1 Initial Categorization Section). Figure 5 exhibits the frequency of responses of participants that aligned on the Left or Liberal, while Figure 6 displays the same Left/Liberal group but according to the relative frequency of responses by percentage ($n = 36$). The data distribution within this group demonstrates strong signs of political polarization as the most frequent response is the most extreme answer category of 1 or 7 with 174 total responses of 1 or 7 on the political statements. Meanwhile, the relative frequency illustrates that 41% of participants who align on the Left felt the most extreme toward the political statements in the survey, the highest percentage among the response categories. Furthermore, combining the response category of 2 or 6 with the 1 or 7 response category, demonstrates that 64% of participant responses felt more extreme or the most extreme in their responses toward the political statements. On the other hand, the least frequent response was the least extreme neutral answer of 4 with 52 total responses for that category and only 36% of responses among participants on the Left feeling less strongly about the statements. The calculated correlation coefficient value of $r = 0.937764342$ also provides evidence of strong levels of political polarization within this participant group as there is a strong positive correlation between more extreme answers and the frequency of responses. As a result, participants on the Left/Liberal are very polarized with more than half of their responses strongly disagreeing or strongly agreeing with the political statements in the survey.

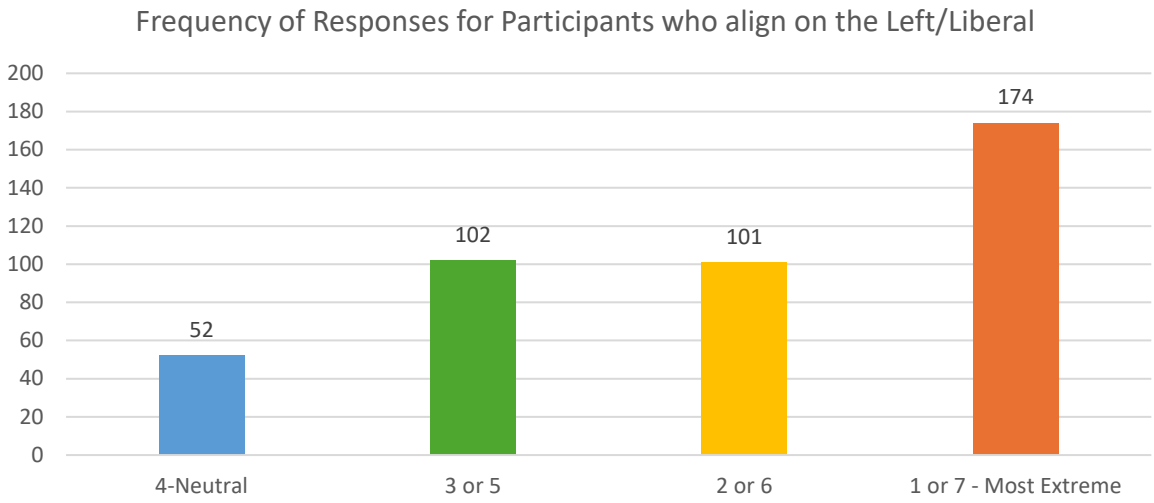

Figure 7. Frequency of Responses from Participants who align on the Left/Liberal. n = 36. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

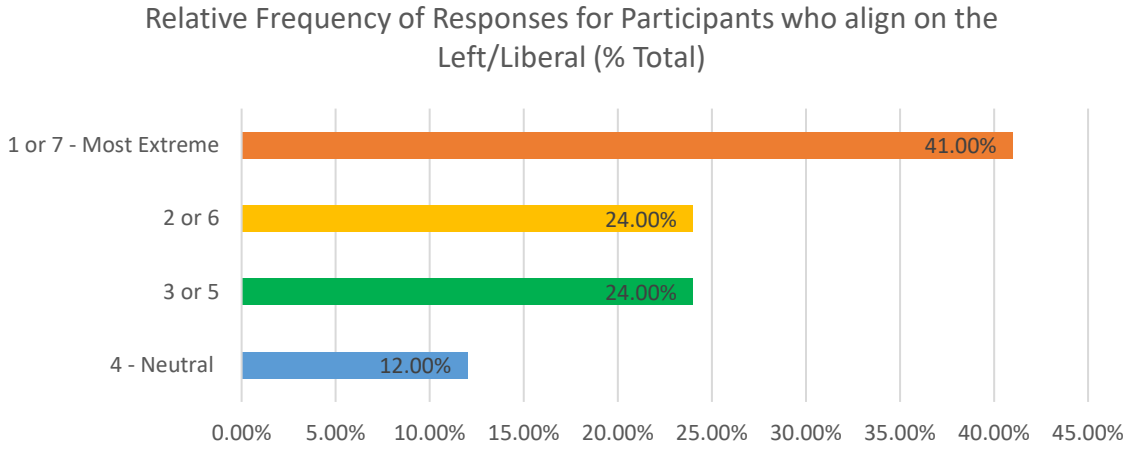

Figure 8. Relative Frequency of responses for Participants who align on the Left/Liberal. n = 36. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Participants who politically align with the Center or are Politically Independent are presented in Figures 9-10 (*n = 14)*. Figure 9 displays the frequency of responses on a bar graph while Figure 10 displays the relative frequency of responses by percentage. The distribution of responses within this group illustrates that the most frequent response is the lesser extreme 3 or 5 response category with 51 total responses and a relative frequency of 30%. However, despite that category being the highest amount, the responses are split between the more neutral responses of 4 and 3 or 5 and the more extreme responses of 2 or 6 and 1 or 7. Within participants that align in the center, half of the participants display political polarization while the other half displays little polarization. The data illustrates that the MTSU participants that align on the center have some issues they view strongly about while in some issues participants have a more neutral view.

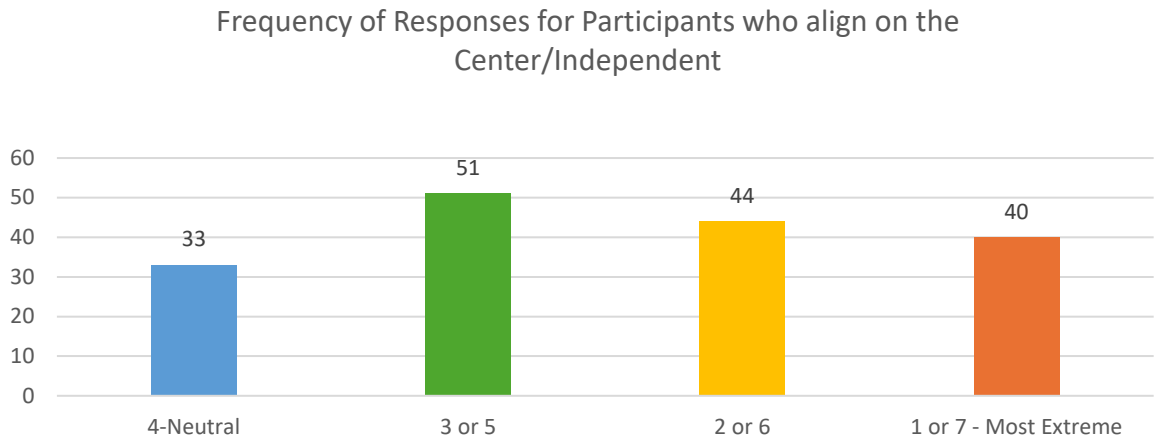

Figure 9. Frequency of Responses from Participants who align on the Center/Independent. n = 14. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

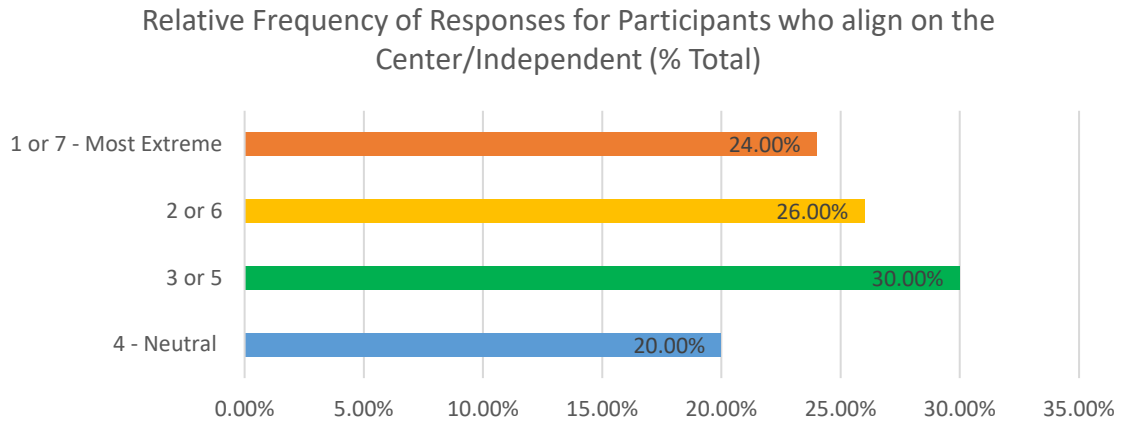

Figure 10. Relative Frequency of responses for Participants who align on the Center/Independent. n = 14. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Next, participants who align themselves as Conservatives/The Right (*n = 16)* are graphed with the frequency of their responses in Figure 11. The relative frequency of responses from participants that identify on the Right is exhibited in Figure 12. Analyzing the responses from participants who identify on the Right demonstrates a relatively even split between each of the response categories. Slightly half of the responses (51%) are the more extreme 2 or 6 and 1 or 7 responses while slightly less than half (49%) are more neutral 4 or 3 and 5 responses. The participants on the right illustrate that some political issues on the survey they felt more extreme about while other issues they are more neutral, similar to the participants that align in the Center or Independent. The results in this group demonstrate that a portion of the participants on the Right are more politically polarized while others are not polarized as much.

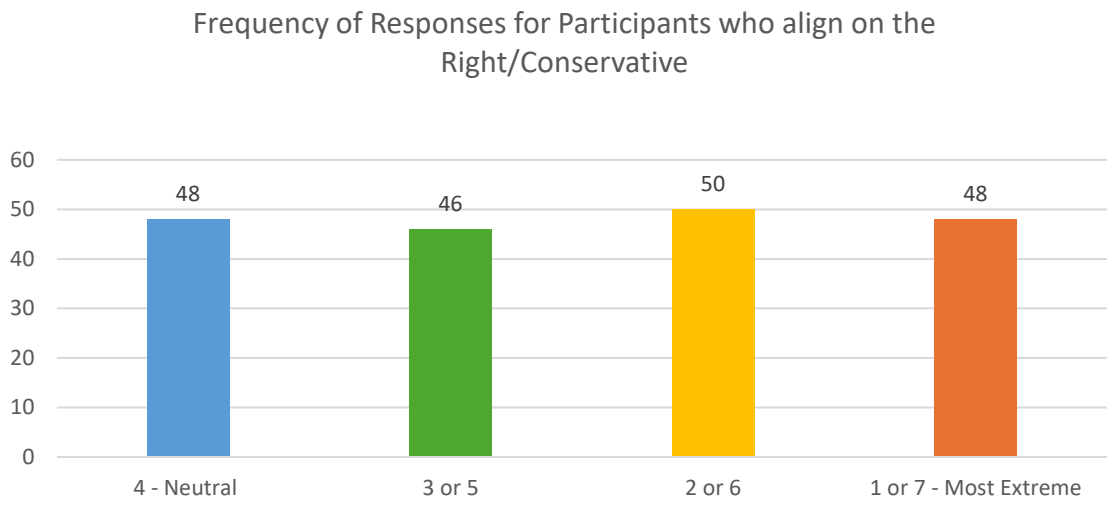

Figure 11. Frequency of Responses from Participants who align on the Center/Independent. n = 16. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

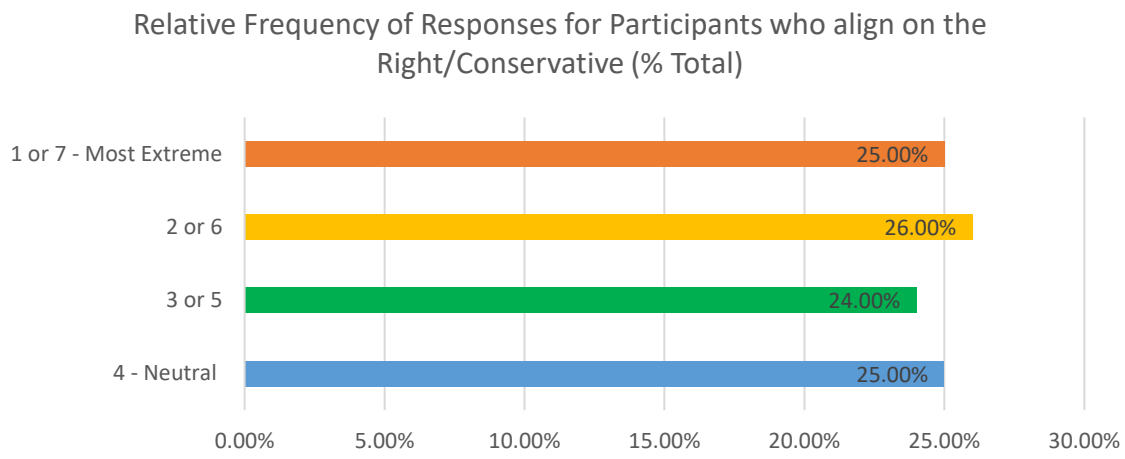

Figure 12. Relative Frequency of responses for Participants who align on the Right/Conservative. n = 16. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Lastly, the final categorization group based on the participant's political orientation is people who are not Politically Invested or Engaged (*n = 17)*. Figure 13 presents the frequency of responses for each of the answer categories on a bar graph while Figure 14 displays the distribution of participant responses in this group according to relative frequency. The distribution of the data demonstrates that participants within this group show little polarization since the most frequent response to the political statements in the survey is the neutral response of 4 with 73 responses comprising of a relative frequency of 36%. The 2nd most frequent response is the lesser extreme responses of 3 or 5 with a frequency of 63 responses comprising of a relative frequency of 31%. Combining the more neutral responses of 4 along with 3 and 5 illustrates that 67% of responses were more neutral than the extreme answers of 2 or 6 and 1 or 7. To corroborate this finding, the correlation coefficient was calculated for this group and returned as *r = -0.940078681*,

demonstrating a strong negative correlation between more extreme answers and frequency of responses. Because of this, it reveals that participants who are not politically engaged are not as polarized on political issues within the survey with many feelings neutral or having less strong opinions about the statements that were asked. This conclusion is understandable since participants in this group do not follow politics often and thus would be less likely to have stronger attitudes than people who are engaged in politics.

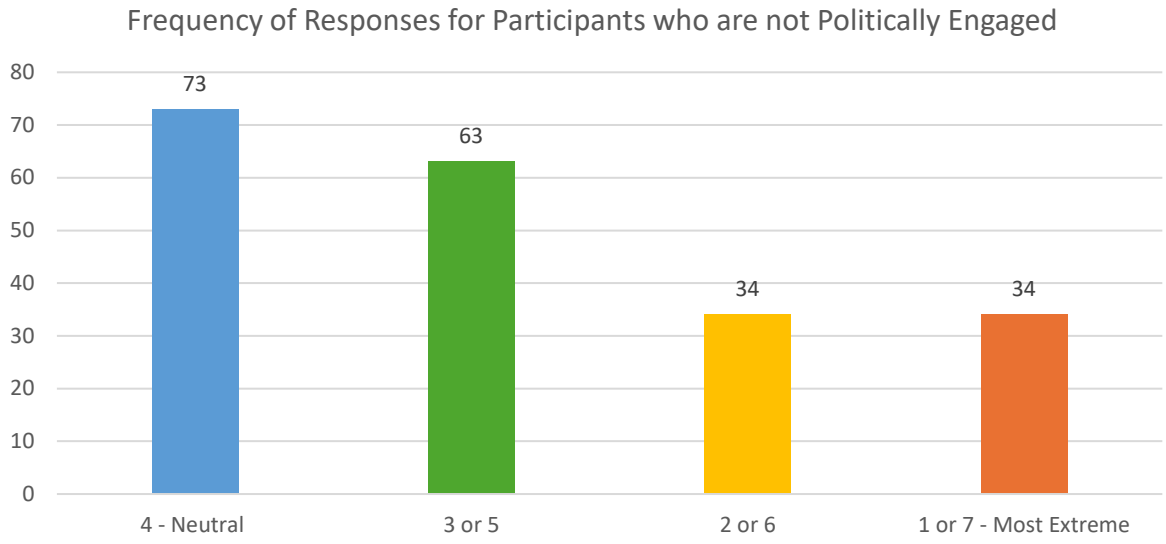

Figure 13. Frequency of Responses from Participants that are not politically engaged. n = 17. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

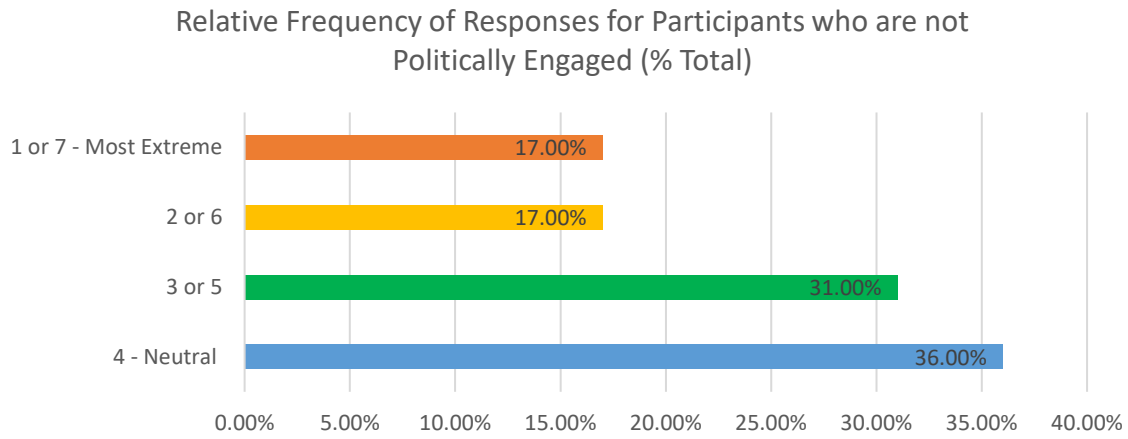

Figure 14. Relative Frequency of responses for Participants who are not Politically engaged or invested. n = 17. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Now, the study will measure participants according to both their political orientation and whether they have used Twitter (X) or not within the last year. Figures 15-22 below present the results from the survey based on the categorization of self-identified political alignment and Twitter use within the past year. Figure 15 displays the frequency of responses for participants who politically identify on the left and have not used Twitter within the last year, while Figure 16 presents the same group but according to relative frequency on a pie chart (*n = 15)*. The distribution of the responses in this group illustrates that the most frequent response is the most extreme answer in 1 or 7 on the 7-point scale with 66 responses in that category comprising of a relative frequency of 37%. Then, the 2nd most frequent response is the lesser extreme answer of 3 or 5 comprising 32% of the total response count with participants that identify on the left and have not used Twitter. However, in terms of relative frequency, 55% of participants within this group responded

with more extreme answers of 2 or 6 and 1 or 7, illustrating more polarized attitudes toward the survey's political statements. Within the group, the least number of participants portray neutral attitudes about the political statements from the survey as the most neutral answer of 4 is the least frequent response with only 22 responses for that category. When calculating the correlation coefficient between the more extreme answers and the frequency of responses, the value comes out as $r = 0.668032772$, illustrating a relatively strong correlation between more polarizing answers and the frequency of responses. As a result, we can conclude that there are indications of high levels of political polarization among participants who align on the Left/Liberal and have not used Twitter within the last year.

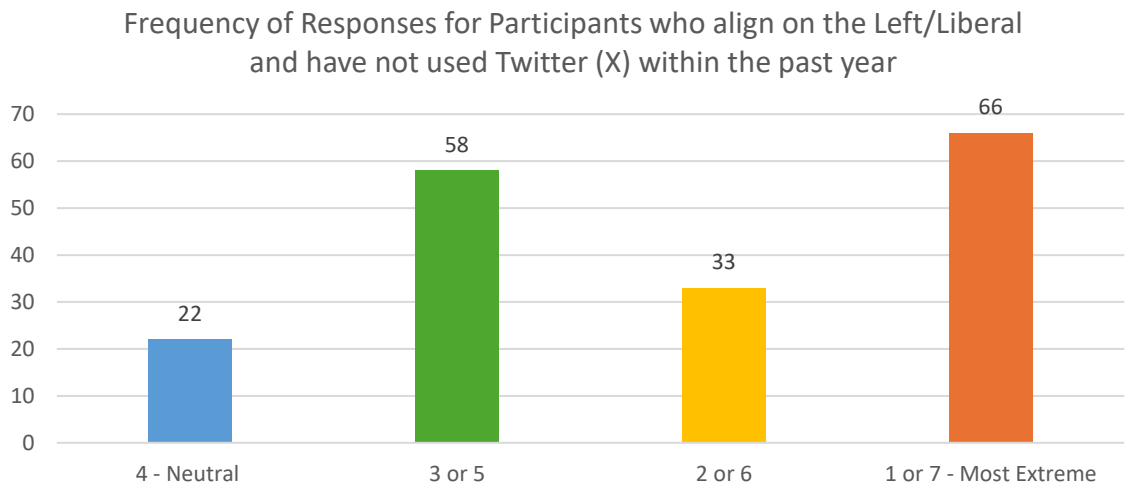

Figure 15. Frequency of Responses from Participants who politically align on the Left/Liberal and have not used Twitter (X) within the past year. n = 15. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

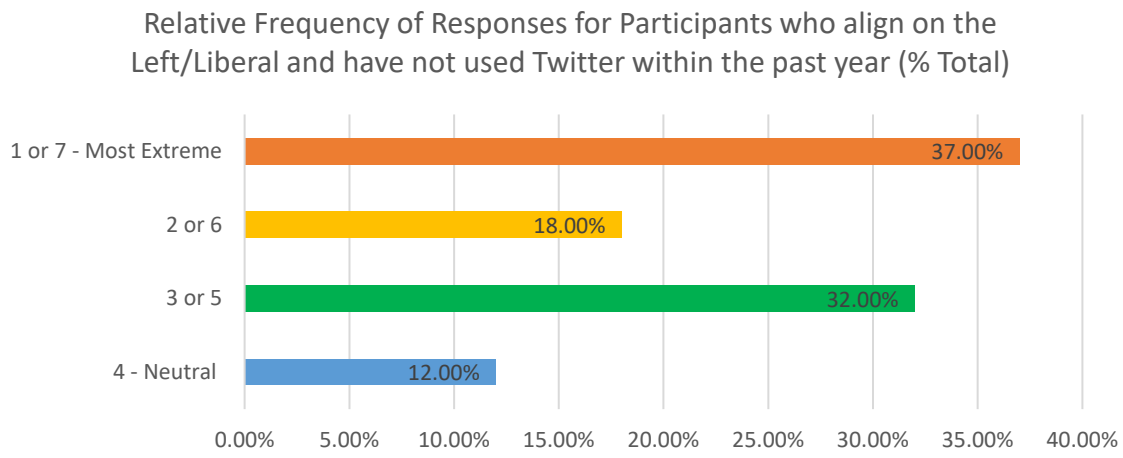

Figure 16. Relative Frequency of responses for Participants who politically align on the Left/Liberal and have not used Twitter (X) within the past year. n = 15. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Then, the study also measured results from participants who politically align on the Left/Liberal but had used Twitter (X) within the last year (*n = 21)*. Figure 17 presents the frequency of responses for participants who politically align on the Left and have used Twitter (X) within the last year, while Figure 18 displays the same results but with respect to relative frequency. The distribution of responses presents a strong indication of political polarization as the most frequent response within this group is the most extreme answer of 1 or 7 with 108 responses for that category while the 2nd most frequent response is the more extreme answer of 2 or 6 with 68 responses for that category. Combining these categories demonstrates that 70% of responses from this participant group illustrate stronger attitudes toward political statements on the survey than neutral attitudes. The correlation coefficient value also supports the notion of strong political polarization within

this group as the calculated value of $r = 0.975287677$ describes a very strong correlation between more polarizing answers and the frequency of responses for the polarizing answers since that value is close to 1. The study can conclude that there is strong evidence of high political polarization among participants in this study who used Twitter at least once and politically identify as the Left/Liberal.

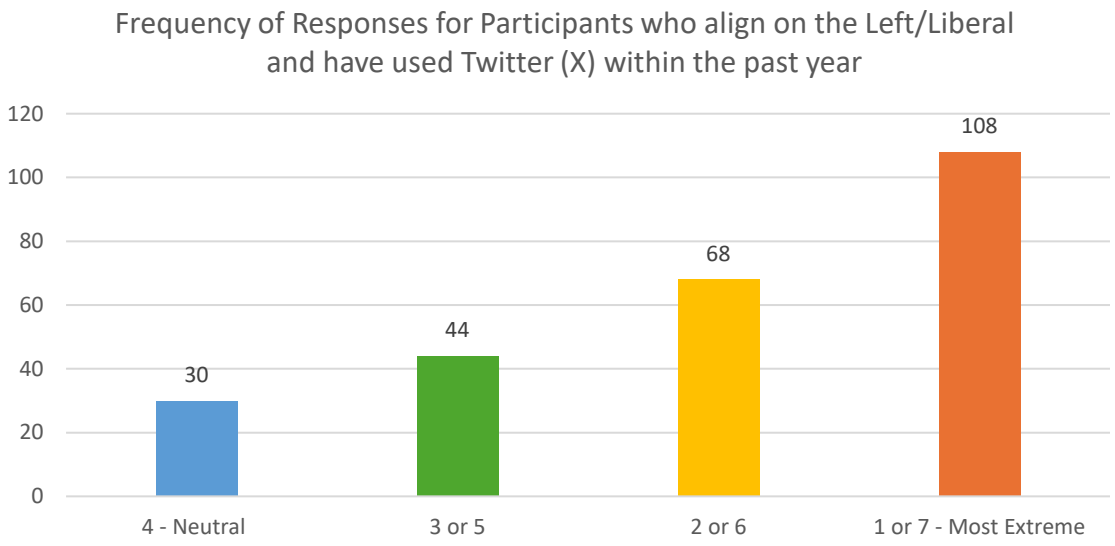

Figure 17. Frequency of Responses from Participants who politically align on the Left/Liberal and have used Twitter (X) within the past year. n= 21. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

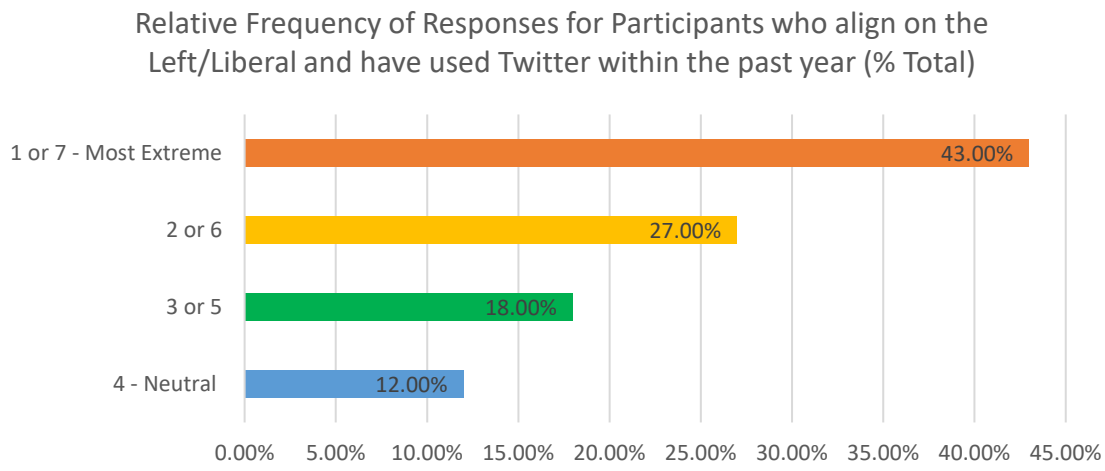

Figure 18. Relative Frequency of responses for Participants who politically align on the Left/Liberal and have used Twitter (X) within the past year. n =21. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Transitioning toward measurements of participants who politically align on the Right/Conservative, the study also divides these participants among people who have not used Twitter (X) and those who have used the app within the last year (*n = 5)*. Figure 19 presents the frequency of responses for participants who politically identify as Right/Conservative and have not used Twitter within the past year. Figure 20 displays the relative frequency for the same group of participants that politically identify with the Right/Conservative and have not used Twitter within the past year. The distribution of responses in this group demonstrates weaker evidence of polarization as the most frequent response is the neutral answer of 4 with 19 responses while the least frequent response is

the most extreme answer of 1 or 7 with 11 responses in that category. Further analyzing the response distribution demonstrates that 52% of responses within this group of participants demonstrate more neutral attitudes toward the political statements in the survey than extreme attitudes, providing more evidence of weaker polarization. The correlation coefficient value of $r = -0.569209979$ for this distribution of responses also demonstrates a weaker polarization correlation within this group of participants. The distribution of the responses explains that among participants who politically align on the Right and have not used Twitter (X) within the past year, there is a weaker indication of political polarization as most of the responses among these participants are more neutral.

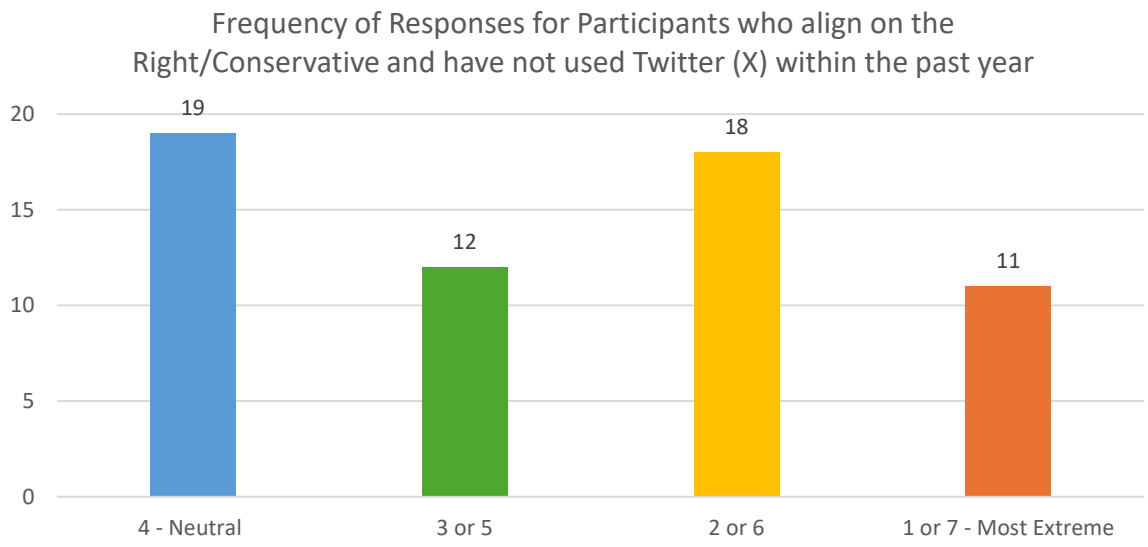

Figure 19. Frequency of Responses from Participants who politically align on the Right/Conservative and have not used Twitter (X) within the past year. n = 5. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

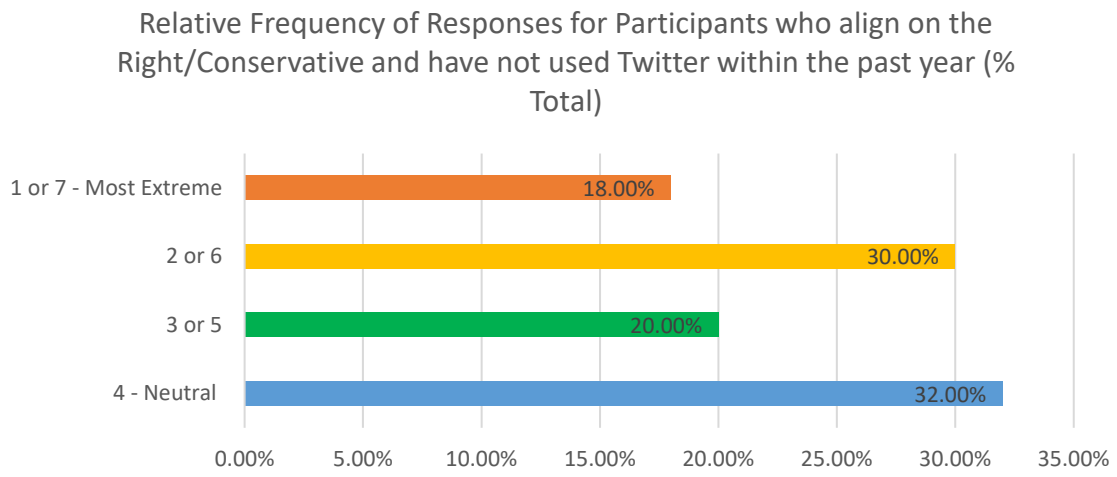

Figure 20. Relative Frequency of responses for Participants who politically align on the Right/Conservative and have not used Twitter (X) within the past year. n = 5. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

Lastly, for the last set of participants who politically align on the Right/Conservative, the following analyzes the frequency of responses for participants who have used Twitter (X) within the last year in Figure 21 and the same responses according to relative frequency in Figure 22 (*n = 11)*. The most frequent response with this distribution is the most extreme answer of 1 or 7 with 37 responses comprising 28% of the relative frequency within this response distribution. Slightly half of the responses within this group (52%) are the more extreme answers of 2 or 6 and 1 or 7, demonstrating that participants within this group are more likely to demonstrate extreme attitudes toward the

political statements in the survey. When calculating the correlation coefficient for the distribution, it returns a value of $r = 0.843661488$, illustrating a strong correlation between more extreme answers and the frequency of responses for those answers. This indicates that there is some evidence that political polarization is occurring among participants who have used Twitter (X) within the past year and politically identify as Conservative or on the Right.

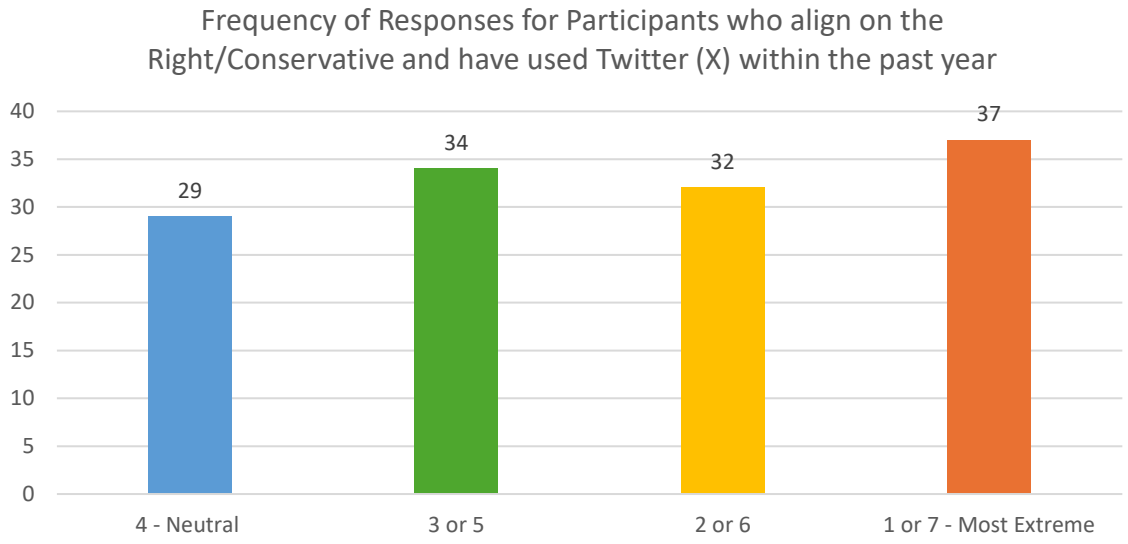

Figure 21. Frequency of Responses from Participants who politically align on the Right/Conservative and have used Twitter (X) within the past year. n = 11. The X-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale. The Y-axis represents the frequency of responses.

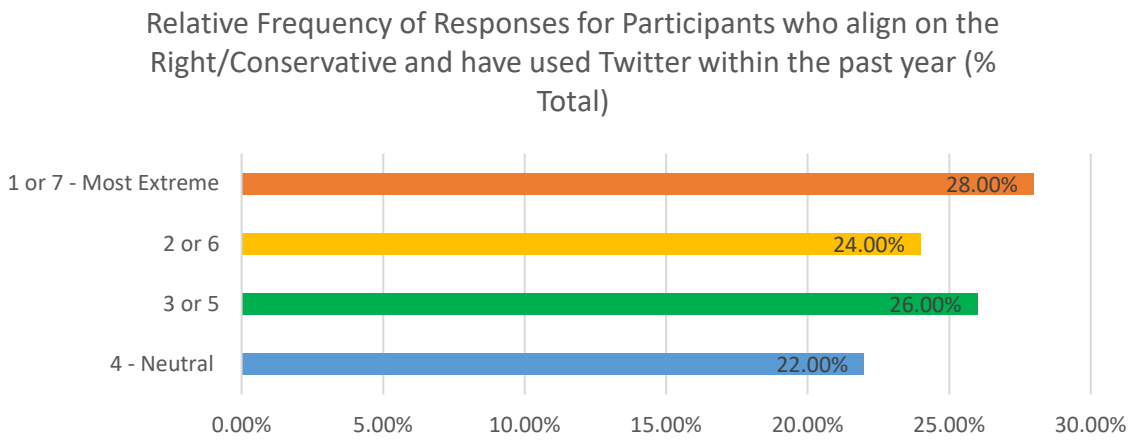

Figure 22. Relative Frequency of responses for Participants who politically align on the Right/Conservative and have used Twitter (X) within the past year. n = 11. The x-axis represents the % Total of Responses rounded to the nearest whole % value. The y-axis represents the participant response according to the categories of answers from least extreme to most extreme based on the 7-point scale.

III. QUANTITATIVE DATA/MULTIPLE CHOICE ANALYSIS

After presenting the quantitative results from the surveys, the study can analyze several conclusions and patterns about the sample selection of MTSU students that participated in this survey and how Twitter use affects their political attitudes. First, the survey results support the hypothesis that Twitter use results in greater amounts of political polarization (Colleoni, Rozza, and Arvidsson 2014). Among all the categorical groups, groups that contained participants who used Twitter (X) within the last year illustrated greater indications of political polarization than groups that have not used Twitter. For example, the participant group that was composed of participants that align on the

Left/Liberal and have used Twitter (X) within the last year had 70% of the responses answering more extreme with either a 2 or 6 or either a 1 or 7 than answered more neutral and had a strong positive correlation score of $r = 0.975287677$ for a relationship between more extreme answers and frequency of responses (See Figures 15 & 16). The participant group that was comprised of anyone with any Twitter use also indicated strong evidence of political polarization with 58% of responses being more extreme than neutral and a strong positive correlation value of $r = 0.992859462$ (See Figures 3 & 4). Comparing this group to the participant group that stated that they had no Twitter use within the last year demonstrates weaker evidence of correlation since 54% of responses within that group displayed more neutral attitudes toward the political statements in the survey (Figures 1 & 2). Based on the results, the study observes the pattern that MTSU students within this sample size display greater levels of political polarization when using Twitter than when not using Twitter.

Next, when analyzing the participant groups according to political orientation, it demonstrates compelling conclusions based on the literature. First, the participant group that identified as being the Left/Liberal illustrated the greatest levels of political polarization among groups by political orientation in this study. Participants who politically align on the Left had 64% of their responses being more than extreme answers of 2 or 6 or either 1 or 7 (See Figures 5 & 6). The distribution of responses within this group also returns a strong correlation value of $r = 0.937764342$, demonstrating a strong positive correlation between more extreme answers and the frequency of responses. Meanwhile, the participants that align on the Right illustrate weaker indications of political polarization since only a slight 51% of responses within this group portrayed more extreme attitudes

toward the political statements on the survey while also having a weaker positive correlation coefficient value of $r = 0.316227766$ (See Figure 9 & 10).

The results in this study contrast with literature such as from Boutyline and Willer (2017) who concludes that conservatives are the most likely group to illustrate indications of political homophily on Twitter that would lead to political polarization. However, these results would support conclusions from Colleoni, Rozza, and Arvidsson's study (2014) that Democrats portray higher levels of political homophily that would lead to political polarization. Liberals being more polarized than conservatives within this study sample can be justified due to the greater sample size of Liberal participants in the study as the more liberal-leaning environment at MTSU might have had a role in making liberal students more polarized. The participants are also all university students of MTSU, and the institutional pressures of college along with the upcoming 2024 elections could cause more extreme answers to the political statements in the survey among students on the Left then students on the right. The group composed of participants who are not politically engaged demonstrated the lowest levels of political polarization with 67% of the responses answering more neutrally toward the political statements in the survey than extreme (See Figures 11 & 12). The response distribution in this group also calculated a strong negative correlation coefficient value of $r = -0.940078681$, demonstrating low indications of political polarization as there is a strong negative correlation between more extreme answers and the frequency of responses. The results among people who are not politically engaged can be explained due to the nature of the people who are not invested in politics and would not feel as strongly on political topics since they are likely not well versed and knowledgeable about these political statements. Overall, conclusions can be formed from

the results that among the MTSU students sampled in the study, students who align on the Left/Liberal side illustrate greater evidence of political polarization than students who align on the Right/Conservative. MTSU students who are not politically engaged, meanwhile, illustrated the lowest indication of political polarization based on their responses in the survey used in this study.

Lastly, this study examined the participant groups according to both political alignment and Twitter use. Aligning with previous patterns within these results, the participant groups with people who have used Twitter within the last year display more levels of political polarization than participant groups that have not used Twitter. However, also aligning with other patterns, participant groups that align on the Left and have used Twitter have stronger amounts of political polarization than groups that align on the Right and have also used Twitter. Even among groups that have not used Twitter, the survey results illustrate greater amounts of political polarization within the Left/Liberal Group than the Right/Conservative groups that have not used it within the last year. For example, 70% of responses from the participant group that have used Twitter within the last year and politically align on the Left/Liberal displayed more extreme attitudes toward the political statements on the survey by answering either 1 or 7 or either 2 or 6 (See Figures 15 & 16). Compared to the participant group that politically aligns to the Right, only 52% of responses displayed more extreme attitudes toward the political statements (See Figures 19 & 20). The patterns demonstrated here, explain that MTSU students within this study present higher levels of political polarization if they have used Twitter within the past year and politically align on the Left than students that do not use Twitter and politically align on the Right.

IV. QUALITATIVE/OPEN RESPONSE DATA FINDINGS

The next section of the survey sent to participants involved three open response questions about specific social media use, changing of beliefs due to social media, and attitudes toward opposing people with opposing beliefs (See Appendix A Open Response Questions 1-3).

This study will first present the open responses from the participant group that stated that they have not used Twitter within the past year (*n = 37).* Among this group, the general responses for Question 1 of the Open Response questions explain that they do not comment on political social media posts, but only read or observe political posts. Since this is the participant group that has not used Twitter within the last year, most observe social media posts through other social media sites such as Facebook, Instagram, TikTok, and YouTube. Several respondents within this group describe that they don't look at political content at all but observe other posts such as comedy, animals, and keeping up with friends and family. Concerning the responses to the 2nd open response question, the general pattern within this participant group is that their opinions do not change when seeing a post that is politically different from theirs. However, there are several responses stating that they are open to changing their stance if the post's evidence is compelling enough to warrant a shift in opinion. Some responses even explain how their stances and political alignments have changed from being aligned more conservatively to more liberal because of posts on social media. When it comes to whether participants in this group are comfortable with interacting with people who have different political opinions than them, most generally do feel comfortable interacting with people of opposing beliefs from them. Further explanations

within these responses illustrate the sentiment that politics are only a small part of a person's personality, and one can avoid divisive topics if you do not want to get into an argument. Other explanations to this question include explaining their political beliefs to others to see how others feel about them, while some believe it is a positive thing to have differing opinions and communicating with others about their differing beliefs is good for society.

Next, this study will present the open response questions on the survey for the participant group that has used Twitter within the past year (*n = 46)*. On the first question, the patterns observed include participants who do engage with political social media posts along with other types of content and participants who don't engage in methods such as commenting but would watch political content or share posts they agree with. However, among the responses that explained that they don't directly engage in political content, they stated that they do engage in other types of content with responses including sports, pop culture, comedy, and news. Responses to the 2nd open response question were observed to be split between people's opinions that have changed and haven't changed because of a post on social media or in other places. Of the responses that did say that their opinions have changed, many describe how some content on social media gives them better context about situations in the real world that caused them to shift their stances. Meanwhile, responses that express how posts did not change their opinions describe how they are either not politically engaged or are firm on their beliefs and do not let social media posts influence their opinions. On the responses to the 3rd open response question, most participants are comfortable engaging with people that have opposing viewpoints from them. However, many participants explained that it usually depends on whether the people they are talking

to are respectable and civil and are likely to not turn the conversation into a heated argument and make them feel unsafe. These circumstances are the same explanations for why the participants who stated that they do not feel comfortable communicating with people with opposing beliefs since it can cause conversations to turn uncivil.

Now, participant responses will be discussed according to groups categorized by political alignment and Twitter (X) use within in the past year. The open response answers for the participant group that indicates that they politically align on the Left/Liberal and have not used Twitter within the last year are presented in the following (*n = 15)*. Their responses to the 1st open response question on the survey generally explain that they do not engage with political content on social media, but they sometimes would scroll past it and watch political content on sites such as Instagram and TikTok. The 2nd open response question demonstrates that participants within this group are more split between their political beliefs changing due to social media and not changing. For participants within this group who have had their opinions changed from social media, some responses explain that the evidence was compelling enough for them to shift some of their stances while some responses express that it is good to understand greater context on issues on social media to further determine your political stances. The other participants who did not have their minds changed expressed that social media should not be fully trusted and remained resolute in their beliefs. For the last open response question, many participants within this group indicated that they are comfortable with interacting with people who politically oppose them with a common sentiment being that it is good for society to have face-to-face conversations to discuss divisive topics to decrease the polarizing atmosphere within the world.

The following presents open response answers from participants who are also politically aligned on the Left/Liberal but have used Twitter (X) within the last year (*n = 21)*. Responses to open response question 1 illustrate that participants within this group do engage with political content on social media through the viewing and liking of videos, clips, and posts alongside other types of content on social media. For question 2, there is a relatively balanced number of participants who did change their minds from a post on social media and did not with similar explanations as to why they did or did not change their attitudes. When asked if they were comfortable interacting with people with differing political beliefs from them in question 3 of the open response section, this participant group generally responded that they are comfortable communicating with people with opposing political attitudes. A frequent sentiment among the responses is that they are open to interaction but are somewhat apprehensive if the discussion with these people devolves into an uncivil discussion and their political beliefs become the main part of their character.

Next, this study will present the findings of the open responses from participants who politically align on the Right and have not used Twitter (*n = 5)*. Concerning their responses to the 1st open response question, all 5 participants in this group explained that they do not engage with political content through commenting on political social media content but only view and like posts. In the 2nd open response question, the participants within this group overall responded that their beliefs have not altered through something they have seen on social media. The one response that described a change in some of their stances explained that posts portraying differing beliefs from them can create compelling arguments to warrant a shift in opinion. With the 3rd open response question, this participant group generally feels comfortable interacting with people who have political

beliefs with whom they disagree. Some express that they are not as knowledgeable about certain political topics so they have an incentive to listen to people who they disagree with while one response explaining how politics are a small aspect of a person's personality and should not be the determining factor in whether you interact with them or not.

Finally, the following presents responses from the participant group consisting of participants that align on the right and have used Twitter within the last year (*n = 11)*. For the responses to the 1st open response question, the participants within this group widely expressed that they do engage with political content on social media, particularly through sharing and viewing but not generally commenting on political posts. The participants within this group are generally split on whether their opinions have changed through posts on social media when responding to the 2nd open response question. Some expressed distrust of social media posts for why their opinions have not changed, while others have used social media to gain more knowledge about political issues and then form their opinions from there. When asked if they are comfortable communicating with people with opposing political attitudes from them in question 3, participants are overall comfortable with interacting with people with differing beliefs. They share similar sentiments as participants in other groups about how it is good for society to engage with people with opposing viewpoints as long as the discussion is kept civil and respectable. However, one response explains that they do not politically communicate with people who have opposing beliefs since they see their own beliefs as a trigger for political arguments and the participant wants to avoid alterations altogether.

V. QUALITATIVE/OPEN RESPONSE DATA ANALYSIS

The results from participants' responses to the open response question can be analyzed to illustrate several patterns and conclusions about social media use and its influence on political polarization among MTSU students in the study. First, the responses for the 1st open response question among all measured participant groups demonstrate that most people encounter political posts on social media and sometimes choose to like or share the post but generally choose not to directly engage in the post and avoid leaving comments. Since this study sample size is based on university students who are often busy with coursework, this common response can be explained as to why relatively few students among the participant sample engage directly on political social media posts. As a result, many MTSU students are exposed to political content on social media and their responses to the multiple-choice section of the survey may have been influenced by political content on social media.

Analyzing the results from the 2nd open response question, it is observed that there is a general split response on whether their minds have changed on issues due to social media posts. Explanations for whether some of their stances have changed vary, with some expressing distrust among political social media content and some being open to hearing other stances on issues through social media and helping them gain better context on certain political topics. Because the responses to this question were relatively even between their opinions changing or not because of social media, it is difficult to form a conclusion about which participant groups display greater evidence of changed opinions due to social media than other groups. However, the participant group comprised of people who politically align on the right and do not use social media did have a majority of responses that

expressed that posts in social media did not change an opinion that they had or had relatively little effect on their opinions. Because this participant group displayed low levels of polarization based on the multiple-choice responses, it could be concluded that MTSU students who align on the right and do not use Twitter are more likely to continue to stay more neutral on an issue than be more polarized, based on the sample of MTSU student used in this study.

Finally, the responses to the 3rd open response question concerning whether participants feel comfortable communicating with people who have opposing political viewpoints can assist in determining conclusions based on the MTSU participant sample. A frequent response among all participant groups is that they are comfortable communicating with people with opposing beliefs, but their discussions need to stay civil and respectable. Several respondents agree that it is a positive thing for society for people with opposing views to share their opinions freely to help diffuse negative divisions within society. Generally, many MTSU students in this study would like to avoid political confrontations with others which could be an explanation for why MTSU students tend to avoid commenting on political social media posts in fear of starting heated and uncomfortable discussions. Overall, this demonstrates that MTSU students generally do not seek out "echo chambers" and only interact with people with similar political beliefs to them. However, participants, particularly people who have used Twitter (X) and align on the Left, would express apprehension in developing further relationships with people who have opposing views from their own in fear of discussions becoming uncivil. Even among responses who state that they are comfortable interacting with these people, the mention of potential instances of a discussion becoming uncivil demonstrates greater fears

of political arguments and the impression that society has become more politically polarized. Considering the conclusions formed from the multiple-choice questions-- that MTSU students that align on the Left and have used Twitter (X) within the past year illustrate greater levels of polarization--an explanation can be developed about evidence of "backfire effects" among MTSU students. This is because while participants generally feel comfortable communicating with people who possess opposing beliefs, MTSU students on the Left and have used Twitter offered more extreme answers in the multiple-choice political statements than more neutral, indicating a greater amount of political polarization. This pattern corroborates literature from Bail et al. (2018) which concluded that exposing people to opposite beliefs than their own can cause greater polarization, signifying "backfire effects". In this study, MTSU students do not avoid interactions with people who have different political views than them, but their comfortability and exposure to opposing beliefs, among students who are on the Left and who use Twitter, can lead to their political attitudes becoming more polarized. The results also align with literature demonstrating that people are still comfortable interacting with others about non-political topics, even if they have differing political opinions (Barberá et al. 2015). This is supported by the results that demonstrate how MTSU students are willing to communicate with people of differing political beliefs and only avoid discussion if they devolve into uncivil political arguments, inferring that noncontroversial, non-political topics are okay as topics of discussion despite potential political differences. Overall, the result from the 3rd open response question illustrates that MTSU students are comfortable communicating with people despite political differences as long as the discussion stays civil and friendly.

VI. LIMITATIONS OF THE STUDY

There are a few limitations to this study and the conclusions made. One limitation, which was discussed when examining the participant split, is that the participant sample for each participant group is unbalanced. Since the survey gathered participants from a public university, the participant split according to political orientation is skewed toward participants who align on the Left with not as many participants who identify on the Right participating. Other than the study being conducted in a university, the survey was also only sent to students that are part of the Honors College, Political Science and Global Affairs, History, and Communications departments. Because of this, the study may not be the greatest representation of students at MTSU since students in different college departments can have specific political orientations and social media behaviors. This can influence the composition of the participant sample and affect the impartiality of the conclusions made from the study.

There is also a limitation concerning potential measurement error from the political statements in the survey. While several of the political statements were taken from previous studies of polarization, some were edited to better fit this investigation and make it relevant to current political issues. However, some statements and questions could still be confusing and be misinterpreted by college students. This incentivizes the need in a future study that will use this method to make wording in the survey items more specific, digestible, and include less strong wording to reduce the possibility of measurement error.

VII. CONCLUSIONS

The purpose of this study is to determine the extent to which the use of social media app X (Twitter) influences the amount of political polarization people display in their ideological attitudes. After conducting a survey at MTSU and gathering participants from four college departments at the university, the study finds that MTSU students that have used Twitter (X) within the past year illustrate the highest levels of political polarization among measured participant groups in the study with the phenomenon of political polarization being more prevalent in students who politically align on the Left/Liberal. The results demonstrated that student participants who have used Twitter and politically identify on the Left were more likely to answer more extreme answers of 1 or 7 and either 2 or 6 indicating that they more strongly disagree or strongly agree with the 12 political statements asked in the survey, thus signifying evidence of strong political polarization among those participant groups. Analyzing the three open-response questions asked in the survey, the general patterns in the responses were that participants are exposed to political content on social media but usually avoid directly engaging with that content by not commenting. The respondents generally express comfort in communicating with people of opposing beliefs but will have reservations if the conversation devolves into uncivil political argument. Considering the finding that MTSU students that align on the Left and have used Twitter expressed more apprehensiveness about fears that people with opposing views can cause discourteous discussions, it illustrates evidence of "backfire effects" in social media as demonstrated by Bail et al. (2018). Referencing the findings of the multiple-choice responses, the evidence of "backfire effects" resulting in increased political polarization appears to be more prevalent among Liberals since they both have

been exposed to political content on social media and generally feel comfortable communicating with people who have differing political views. Meanwhile, the phenomenon of participants being in “echo chambers” is not evident based on the results, since participants stated that they are comfortable with communicating with people with opposing beliefs from them. Another conclusion that the study can formulate is that political environments that students are in can influence political polarization. With these results, students who align on the Left/Liberal made up the most participants in the sample set while also illustrating the highest levels of political polarization and extreme answers. Based on this study, the more liberal-leaning environment of MTSU students correlated to the increased political polarization among students who align on the Left/Liberal. Also, consider the changes made on Twitter (X) since the app’s purchase by Elon Musk in 2022. With more extremist and divisive content on Twitter due to Musk’s content moderation policy changes (Iyer 2024), the “backfire effects” could have facilitated greater political polarization among Liberals who use the app as they become more exposed to opinions that they disagree with.

VIII. IMPLICATIONS FOR FUTURE RESEARCH

With the findings from this research study generating evidence of increased political polarization correlating with Twitter use with the past year, it can be used as a methodological framework for future research within the field of social media and its effects on political polarization. Future studies concerning political polarization and social media among students could be conducted in different universities in different parts of the country to analyze if the same conditions can be observed. This research approach could potentially be conducted with other population groups outside of university students as well as with other popular social media apps such as YouTube, TikTok, Instagram, and Facebook and compare it with the conclusions formed in this study to better illuminate the role of social media in polarization. Also, with the survey being conducted against the backdrop of the divisive 2024 Presidential election, it highlights the role of social media apps such as Twitter in influencing political information among its users to either stabilize or shift the political bases of each candidate. While the study observes a correlation that Twitter has an influence in causing greater political polarization, future studies can further analyze the causes within Twitter such as types of accounts and specific content that facilitate the phenomena of political polarization among users. Understanding social media's influence on the increasing trends of political polarization can help reduce the mechanisms that result in greater political divisions within the U.S that harm the stability of its institutions and national unity. Fortunately, the study demonstrated signs that people are still willing to communicate with each other across ideological lines and discuss their differing beliefs openly, so there is optimism that social media has not damaged societal interactions due to polarization. Elon Musk's management of Twitter will also be a topic

that could be observed and if his content moderation policies could exacerbate the phenomenon of political polarization in the future and influence results of similar studies such as this in the future.

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X. APPENDICES

I. APPENDIX A: SURVEY ITEMS

Initial Categorization Section:

1. Do you politically align on the left, the right, near the center, or are you not politically engaged?
    - The Left/Liberal
    - Center/Independent
    - The Right Conservative
    - Not Politically Engaged
2. Around how many hours have you spent on the social media app X (Twitter) per day, within the last year?
    - I have not used X within the last year
    - Less than an hour to 1 Hour
    - 2-3 Hours
    - 4-5 Hours
    - More than 5 hours

Treatment Survey Political Statements:

Rate whether you agree or disagree with the following statements on a scale of 1 to 7 with 1 being “strongly disagree”, 4 being “neutral”, and 7 being “strongly agree.”

1) “Stricter environmental laws and regulations cost too many jobs and hurt the economy.”

2) “Government regulation of business is necessary to protect the public interest.”

3) “Abortion is a morally wrong practice that should be outlawed.”

4) “Immigrants today strengthen our country because of their hard work and talents.”

5) “Government spending is almost always wasteful and inefficient.”

6) “The best way to ensure peace is through military strength.”

7) “Racial discrimination is the main reason why many minorities can’t get ahead these days.”

8) “Affirmative Action Policies are unnecessary and do more harm than good.”

9) “Business corporations make too much profit.”

10) “The LGBTQ+ community should be accepted by society.”

13) “People that politically align themselves on the right are immoral.”

14) “People that politically align themselves on the left are immoral.”

Open Response Questions:

1) Do you engage with political content on social media? If not, then what type of content do you engage with on social media?
2) Have you ever changed your mind on something because of a post written from a different political perspective than your own? Explain why or why not.

3) In general, are you comfortable communicating with people that you politically disagree with? Explain why or why not.

II. APPENDIX B: TABLE 1

Table 1. Chart of total count of Participant Answers for the Multiple Choice Section of the Survey

	Total Count of Participant Answers on the 1-7 point scale						
Participant Group	1	2	3	4	5	6	7
I have not used X within the last year	73	41	57	103	78	44	47
Less than an hour to 1 Hour	63	68	55	70	49	47	66
2-3 Hours	14	18	8	22	13	9	24
More than 5 hours	5	0	1	11	1	2	4
Have not used Twitter (X) within the last year	73	41	57	103	78	44	47
Have used Twitter (X) at least once within the last year	82	86	64	103	63	58	94
The Left/Liberal	84	63	45	52	57	38	90
Center/ Independent	28	23	19	33	32	21	12
The Right/Conservative	23	25	22	48	24	25	25
Not Politically Engaged	20	16	35	73	28	18	14
Left/Liberal that has not used Twitter (X) within the last year	37	18	24	22	34	15	29
Left/Liberal that has used Twitter (X) at least once within the last year	47	45	21	30	23	23	61
Right/Conservative that has not used Twitter (X) within the last year	6	9	6	19	6	9	5
Right/Conservative that has used Twitter (X) at least once within the last year	17	16	16	29	18	16	20

III. APPENDIX C: IRB APPROVAL LETTER

Outlook

[EXTERNAL] IRB-FY2025-16 - Initial: Initial Exempt Protocol Approval Letter

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From do-not-reply@cayuse.com <do-not-reply@cayuse.com>

Date Thu 9/26/2024 1:43 PM

To Kendall Thirakul <kt5p@mtmail.mtsu.edu>; Robb Mcdaniel <Robb.Mcdaniel@mtsu.edu>

Office of Research Compliance
2269 Middle Tennessee Blvd.
Sam H. Ingram Bldg (ING) Room 010A
Box 124
Murfreesboro, TN 37132
www.mtsu.edu/irb

Date: September 26, 2024

PI: Kendall Thirakul

Department: Political Science Intl Relations

Re: Initial - IRB-FY2025-16

X (Twitter) and its influence on Political Polarization among University Students in the United States

The Middle Tennessee State University Institutional Review Board has rendered the decision below for the above referenced study.

Decision: Exempt

Category: Category 2.(i). Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) if at least one of the following criteria is met: The information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects;

Findings:

Research Notes:

Please note that even though your proposed study is deemed exempt from further IRB review, the following apply to your approved study:

1. In accordance with 45 CFR 46.110, expiration dates do not apply to research eligible for Exempt Review under the Common Rule, and continuing review is not required by the IRB.
2. Any unanticipated harm to participants or adverse events must be reported to the Office of Compliance.
3. All modifications to the approved study must be submitted for review through Cayuse IRB for approval before their implementation. Adding new researchers constitutes a modification to the protocol. Per MTSU Policy, a researcher is defined as anyone who handles the data or interacts with participants. Everyone meeting this definition for this project must have completed the required CITI training and received IRB approval prior to becoming actively involved in the project.
4. Closure of the study must be submitted within Cayuse when the study ends or when personal identifiers are removed from the data and all codes and keys are destroyed.
5. All research materials must be retained by the PI for at least three (3) years after study completion and then destroyed in a manner that maintains confidentiality and anonymity.

Sincerely,

The Middle Tennessee State University Institutional Review Board