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A SENTIMENT ANALYSIS OF EMERGENCY ONLINE SPECIAL EDUCATION AFTER COVID MASS VACCINATIONS STARTED

KOVİD KİTLESEL AŞILARI BAŞLADIKTAN SONRA ACİL UZAKTAN ÖZEL EĞİTİM: BİR DUYARLILIK ANALİZİ

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Abstract

This study examined people's sentiments toward emergency online special education after mass vaccinations became available through a sentiment analysis to determine whether people had positive, negative, or neutral sentiments towards emergency online special education. The results revealed that most tweets were positive and focused on special needs and special education during emergency online special education. Specifically, most tweets focused on special education, and they included a positive content with average daily sentiment scores never getting smaller than zero. Similarly, special need and special education turned out to be the most frequent expressions used, and topic modeling indicated that target tweets' content focused on the needs of students with special exceptionalities. All these findings suggest that emergency online special education can be a viable alternative during times of crisis and availability of vaccinations at a larger scale may help to create a positive atmosphere thereby informing teacher education and special education research and practice.

Keywords: *emergency online special education, sentiment analysis, mass vaccinations*

Öz

Bu çalışma kişilerin acil uzaktan özel eğitime yönelik duyarlılıklarını kovid kitlesel aşıları başladıktan sonra duyarlılık analizi yoluyla incelemiştir ki amaç kişilerin bu duyarlılıklarının pozitif, negatif ya da nötr olup olmadığını belirlemektir. Sonuçlar incelenen Twitter paylaşımlarının çoğunun pozitif olduğunu ve özel gereksinimler ile özel eğitime odaklandıklarını göstermiştir. Özellikle özel eğitime odaklanan çoğu paylaşımın içerikleri pozitif bulunmuştur ve bunların günlük ortalama duyarlılık puanları hiçbir zaman sıfırın altına inmemiştir. Benzer şekilde, özel gereksinim ve özel eğitim, paylaşımlarda en sık geçen konular olmuştur ve konu modellemesi de paylaşımların içeriklerinin özel gereksinimli öğrencilerin ihtiyaçlarına odaklandığını göstermiştir. Öğretmen eğitimi ile özel eğitim araştırma ve uygulamalarıyla ilintili olarak, bütün bu bulgular göstermektedir ki acil uzaktan özel eğitim kriz dönemlerinde uygun bir seçenek olabilir ve kitlesel aşı uygulamaları pozitif bir atmosferin oluşmasına katkıda bulunabilir.

Anahtar kelimeler: *acil uzaktan özel eğitim, duyarlılık analizi, kitlesel aşılar*

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Introduction

The COVID-19 pandemic has become a serious and threatening health issue greatly impacting people (Embregts et al., 2020) including students, parents, and teachers (e.g., Ewing & Cooper, 2021), and it may even have greater impacts on children with exceptionalities and their parents (Asbury et al., 2020; Dukes et al., 2021; Paulauskaite et al., 2021) since more input is needed for their education (Peñarrubia-Lozano et al., 2021). Likewise, the pandemic conditions may have also been more challenging for people with disabilities (Lebrasseur et al., 2021; World Health Organization, 2020) and their parents and/or caregivers (Iovino et al., 2021; Tsapanou et al., 2020; Willner et al., 2020) since these people could have a significant level of vulnerability to the pandemic's negative effects (Navas et al., 2021). The United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2020) stated that school and university closures around the globe due to COVID-19 have influenced 1.5 billion students. As a result, schools and universities also switched to emergency remote teaching (Hodges et al., 2020). This abrupt change has been challenging for students: college students found lack of technological resources challenging during emergency online education (e.g., Gonzales et al., 2020) while only almost one fifth of students have been satisfied with online education (e.g., Means et al., 2020). Special education was no exception in this regard (e.g., Banks et al., 2021; Bornert-Ringleb et al., 2021; Kim & Fienup, 2021; Parmigiani et al., 2020; Sider, 2020; Smith, 2020; Zaagsma et al., 2020).

Abrupt school and university closures led to what Hodges et al. (2020) describe as emergency remote teaching that had challenges. Despite its advantages including collaboration, training and communication, COVID-19 also caused challenges for the education of students with exceptionalities in online mode (Smith, 2020). According to Bornert-Ringleb et al. (2021), digital learning during COVID-19 was more challenging for special education teachers. Consequently, examining the emergency online special education (EOSE) can provide valuable insights into how to deal with similar situations in the future.

Emergency Online Special Education

Students with exceptionalities can be as successful as their peers without any exceptionalities in online education (e.g., Richardson, 2017). However, the pandemic significantly influenced education in general and special education specifically (Kim & Fienup, 2021). Special education confronted more and more daunting challenges: "... equity issues for students, providing instruction in a virtual environment, and providing special education services as determined in student individual education plans" (Smith, 2020, p. 167). These challenges for special education were also witnessed in rural areas in addition to existing difficulties (McFayden et al., 2021; Tremmel et al., 2020). After all, switching to emergency remote teaching (Hodges et al., 2020), was very challenging to do in a short time (Smith, 2020), and was not easy for "underresourced, underserved rural schools" (Tremmel et al., 2020, p. 201). Likewise, McFayden et al. (2021) noted that most services provided before the pandemic could not be delivered during emergency remote teaching, and a significant majority of students with exceptionalities could not receive enough remote education. Further, Yarimkaya and Esenturk (2020) claimed that online education would not always be useful for students with exceptionalities including autism spectrum disorder since staying at home would decrease physical activity. Similarly, Alhuzimi (2021) reported that the COVID-19 pandemic negatively influenced stress and emotional well-being of parents of children with autism spectrum disorder, which aligns with Asbury et al.'s (2020) finding that the pandemic led to mental health and behavior issues for parents and their children with exceptionalities. The precautions taken worldwide to prevent the pandemic's spread had impacts on other stakeholders including direct support staff (Embregts et al., 2020).

Bornert-Ringleb (2021) claimed that the challenges of EOSE had extra issues and barriers for special educators. During the pandemic, special educators came across daunting challenges including equity problems, online instruction, and meeting individual education plan requirements (Smith, 2020). After all, health concerns disrupted in-class, face-to-face education largely for students. Moreover, research on the success of EOSE led to inconclusive results. For instance, Battisti et al. (2021) reported that while parents and special education professionals reported a high level of satisfaction with a distance support program, parents' satisfaction was higher. The authors claimed that this difference would be due to the extra workload the program caused for the professionals. These different results may also be because of the multiple factors that impact distance education: Bornert-Ringleb (2021) found that while teachers' self-efficacy and attitudes relate to frequency, student self-regulation and parental support relate to implementation. Accordingly, it is not surprising that teacher collaboration with parents and caregivers is important for EOSE (e.g., Montanari et al., 2021).

Access to resources is a main problem for students with exceptionalities (Kim & Fienup, 2021). Three basic concerns of the parents of children with exceptionalities were: (a) not having access to services; (b) deteriorated education and health conditions; and (c) employment issues (Paulauskaite et al., 2021). In Yazcayir and Gurgur's (2021) study, parents also reported similar issues including that their children could not learn on a national educational informatics network-based TV and could not participate in online classes. There was also a lack of enough teacher feedback and collaboration, and a lack of access to computers and the internet, and support services (Yazcayir & Gurgur, 2021). In this respect, assistive technologies can be of great help (Smith et al., 2020). Smith et al. (2020) highlighted that assistive technologies are essential to increase the quality of life for people who need them especially when there are less service and support opportunities.

Individualization of instruction was also more prominent in EOSE, and it can help students progress depending on available parental support (Ewing & Cooper, 2021). Monitoring progress is crucial given that students with exceptionalities can show poorer performance in online courses (e.g., Richardson, 2010, 2017). Riggleman (2020) suggested that data collection applications can empower keeping track of student data and progress in early childhood education. Likewise, successful EOSE needs to address not only academic but also communication needs of students (Katz, 2021). Katz (2021) further highlighted the importance of communication for students with autism spectrum and prompting for these students in EOSE by using especially the screen-sharing aspects of web conferencing tools. Further, teacher preparedness which was already a concern before the pandemic (Smith et al., 2016) is important. After all, due to the quality of teaching linked to the lack of enough training in K-12 online education, student performance is a concern in regions where there is not sufficient internet access or people do not have digital tools and there are high-needs or disadvantaged populations (Catalano et al., 2021).

Given the lack of clear online special education policies and guidelines (Basham et al., 2016), the challenges above are not surprising. Specifically, among the US states and territories having online public schools, (a) only 36% had documentation ensuring accessibility for students with exceptionalities; (b) while 16% offered individual education plan development guidance; and (c) none referred to parental involvement (Basham et al., 2016). According to Carver and Rowe (2021), preparing teachers for online special education is also a concern, which would go together with cultivating self-regulation skills of students (Rice & Carter, 2016). Similarly, highlighting that school staff did not have enough preparation, Montanari et al. (2021) also claimed that EOSE had negative effects on students with exceptionalities and who needed extra support. Therefore, parent involvement can be crucial. For instance, due to no professional staff with special training and no enrolment in special schools, involving parents

in online reading instruction for their children would be beneficial (Grindle et al., 2019). The researchers reported that an online reading program led by parents can improve reading skills of students (Grindle et al., 2019).

Despite all the challenges and barriers of online special education, students with exceptionalities can be successful while learning online. According to Richardson (2017), for instance, students with autism spectrum disorder can complete online modules and achieve good grades. Likewise, even though students with autism spectrum disorder and additional exceptionalities may not complete online modules they start, they can be as successful as their peers in the online modules they complete. Richardson (2010) also reported that students with more than one exceptionality finished fewer courses with lower grades compared to those without any exceptionalities. Consequently, it is essential to know the online education strategies useful for students with autism spectrum disorder (Katz, 2021). Moreover, technologies used in online special education matter as well. For instance, according to Montanari et al. (2021), technologies are crucial for successful implementation since they make it possible for students with exceptionalities to participate.

The multi-faceted nature of issues caused by the pandemic and emergency remote education (e.g., Aristovnik et al., 2020; Gonzales et al., 2020), decreased student satisfaction dramatically. For instance, only 19% of students were satisfied with online learning experiences while the majority was concerned about any impacts on their future learning (Means et al., 2020). Consequently, instructors adjusted their courses in different ways and changed course requirements (Johnson et al., 2020). All these challenges and adjustments looked similar in different areas of education including special education (e.g., Parmigiani et al., 2020; Sider, 2020). However, when mass vaccinations started, people's level of satisfaction started to increase as shown by previous sentiment analyses (e.g., Caskurlu et al., 2023).

Analyzing sentiments can provide strong insights into how to enhance online special education during times of crisis and social media can be a useful research arena to do so: social media are online platforms where people share insights (Ozturk & Ayvaz, 2018), present their opinions and ideas (Ding et al., 2020), and they provide quick access to information (Nazli et al., 2021). Consequently, researching sentiments towards EOSE after vaccines started to become highly available is reasonable to understand whether emotional costs were decreasing. To serve this purpose, the present study addresses the following main questions:

- What were people's sentiments towards emergency online special education on X/Twitter when mass vaccinations started?
- How did those sentiments change over time?
- What were the relevant terms most frequently used in the target tweets?
- What were the main topics mostly discussed in the target tweets?

Method

Data Sources and Tools

We used the Python programming language to create scripts that collect and analyze Twitter/X data programmatically. The collected tweets were stored in a MS SQL Server database for processing and data analysis. For sentiment analysis and data preprocessing, we utilized Natural Language Toolkit that is a widely known open-source package in Python and processes text data.

Data Collection. The research dataset was collected through Twitter/X Application Programming Interface (i.e., API) allowing for collecting public tweets in real-time, which

makes it a strong venue for opinion mining. The tweets related to the hashtags below were collected and stored in a relational database. Several hashtags were searched among all the tweets from January 10, 2021, until August 16, 2021, using the following hashtags: "#specialeducation, #specialneeds and #studentswithdisabilities". In total, 49.692 tweets were collected. Eliminating the duplicate tweets resulted in 46.785 tweets.

Data Preprocessing. The data preprocessing focused on missing values, removing duplicates, numbers, punctuation, and links, removing stop-words, and tokenization of text. From a text mining perspective, the sentences were treated as documents. Each document in text mining was considered as a bag of words or terms. No missing values were detected. However, there were duplicated records due to retweets and multiple use of hashtags, and all these duplicates were removed, and uppercase letters were converted to lowercase characters to prevent duplications. Consequently, sentences were converted to tokens and stop-words were removed.

Sentiment Analysis. Sentiment analysis is extracting subjective opinions and sentiments from text data. Sentiments can be categorized into various groups. We classified texts as positive, neutral, or negative sentiments to identify the dominant opinion expressed in each tweet. The total sentiment score of a tweet was computed by aggregating polarity scores of positive and negative terms, and individual tweets were labeled using these total sentiment scores. Furthermore, sentiment tweets were illustrated using visualization libraries of matplotlib and wordcloud in Python language.

Topic Modeling. Topic Modeling is an unsupervised learning method to identify underlying groups of terms and topics in a collection of text (Silge & Robinson, 2017). Many text mining methods were developed for discovering the topics in text automatically including probabilistic latent semantic analysis (PLSA) (Hofmann, 1999), latent semantic analysis (LSA) (Deerwester et al., 1990), and latent Dirichlet allocation (LDA) (Blei et al., 2003).

In this study, LDA, a widely known and efficient probabilistic topic modeling technique, was utilized (Blei et al., 2003). The LDA determines the underlying topics based on co-occurrence of terms. In LDA, the terms are considered as the basic units of topics, in which a group of terms are associated with latent topics in the documents. It assumes that a document can contain a collection of topics with varying degrees of relevance. Namely, the documents in LDA are represented with overlapping topics as opposed to mutually exclusive labelling (Silge & Robinson, 2017).

We developed the LDA models by using the Gensim library built in Python (Rehurek & Sojka, 2010). The necessary preprocessing tasks such as term tokenization, term matrix and corpus generation processes were performed on the text data before applying LDA methods. The model parameter of the number of topics was chosen as 10 in the LDA models for both languages.

For the visualization of model outputs, we utilized LDAVis, which is an interactive tool for displaying the latent topics and associated terms (Sievert & Shirley, 2014). To select relevant terms in topics, LDAVis utilizes the measures of relevance (Sievert & Shirley, 2014) and saliency (Chuang et. al, 2012). Saliency is estimated by using the equation 1 (Chuang et. al, 2012):

$$saliency(term\ w) = frequency(w) * [\Sigma\ p(t \mid w) * log(p(t \mid w) / p(t))] \quad (1)$$

where *t* represents topics, *p(t)* stands for the probability of topic *t*, and *p(t |w)* denotes the conditional probability of term *w* occurring in the topic *t* (Chuang et. al, 2012).

On the other hand, the relevance measure is calculated by using the equation 2 (*Sievert & Shirley, 2014*):

$$relevance(term\ w \mid topic\ t) = \lambda * p(w \mid t) + (1 - \lambda) * p(w \mid t) / p(w) \quad (2)$$

In the equation, lambda λ, represents the weight, which takes a value between 0 and 1, assigned to the probability of the term *w* occurring in topic *t* and the term lift. The expression $p(w \mid t) / p(w)$ denotes the lift, which measures the ratio of the conditional probability of term *w* occurring under topic *t* relative to likelihood of *w* occurring in the corpus. It is important to note that some terms very frequently occur in general and may not be specific to any topics. By the relative frequency of terms in the corpus, the lift simply normalizes the importance of terms to specific topics and reduces the weights of generally used terms.

When assigning a lambda to 1, the relevance measure solely considers the terms with high frequency of occurrence in the corresponding topics. On the contrary, when setting lambda to 0, the model ranks the relevance of terms to topics based on their lift only. Optimum lambda value may differ depending on datasets. As it was proposed by Sievert and Shirley (2014), assigning lambda to 0.6 also appeared to work well in our evaluations.

Results

Sentiments in Tweets

The most frequent hashtag was "#specialneeds" (27.297, 58.30%) followed by "#specialeducation" (19.158, 41%) and "#studentswithdisabilities" (330, 0.70%) (Figure 1).

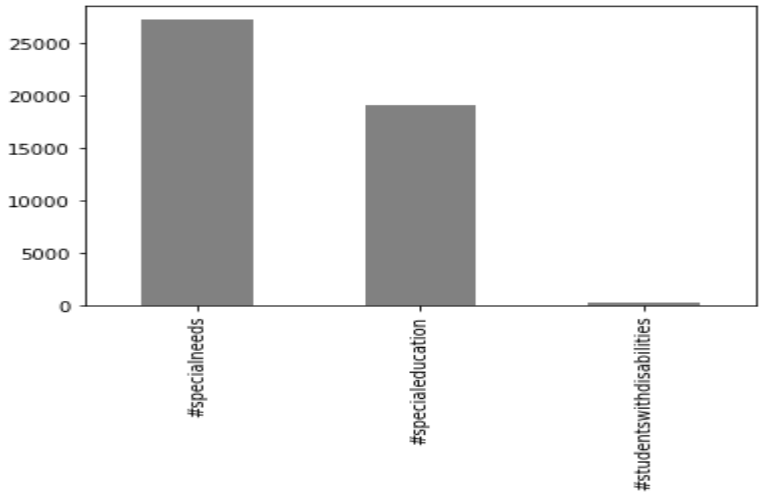

Figure 1. *The Number of Tweets Collected per Hashtag*

Sentiment analysis of these tweets revealed that the majority had positive sentiments (32.000, 68.40%). In addition, 12.000 tweets were neutral (25.60%), and 2785 tweets were negative (6%) (Figure 2).

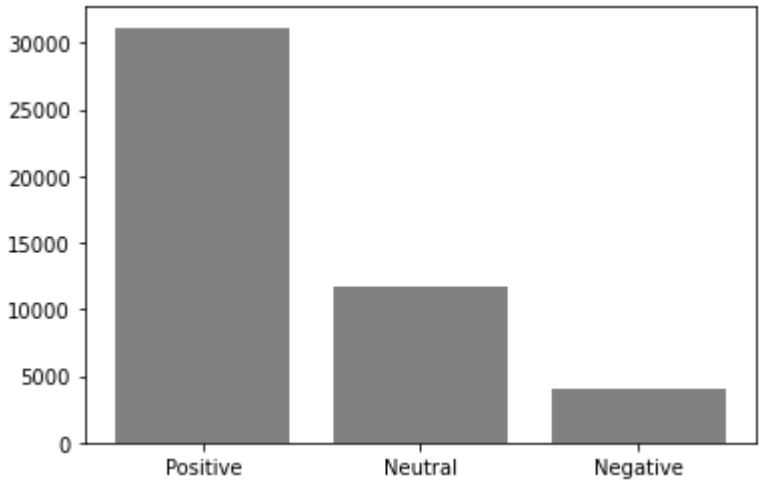

Figure 2. *Distribution of Tweet Sentiment Categorie*s

Analysis of sentiment categories by hashtag also revealed that positive tweets were the most frequent one followed by neutral and negative ones per hashtag (Figure 3). Further, the number of positive tweets were highest for "#specialeducation" while the number of neutral and negative ones were highest for "#studentswithdisabilities".

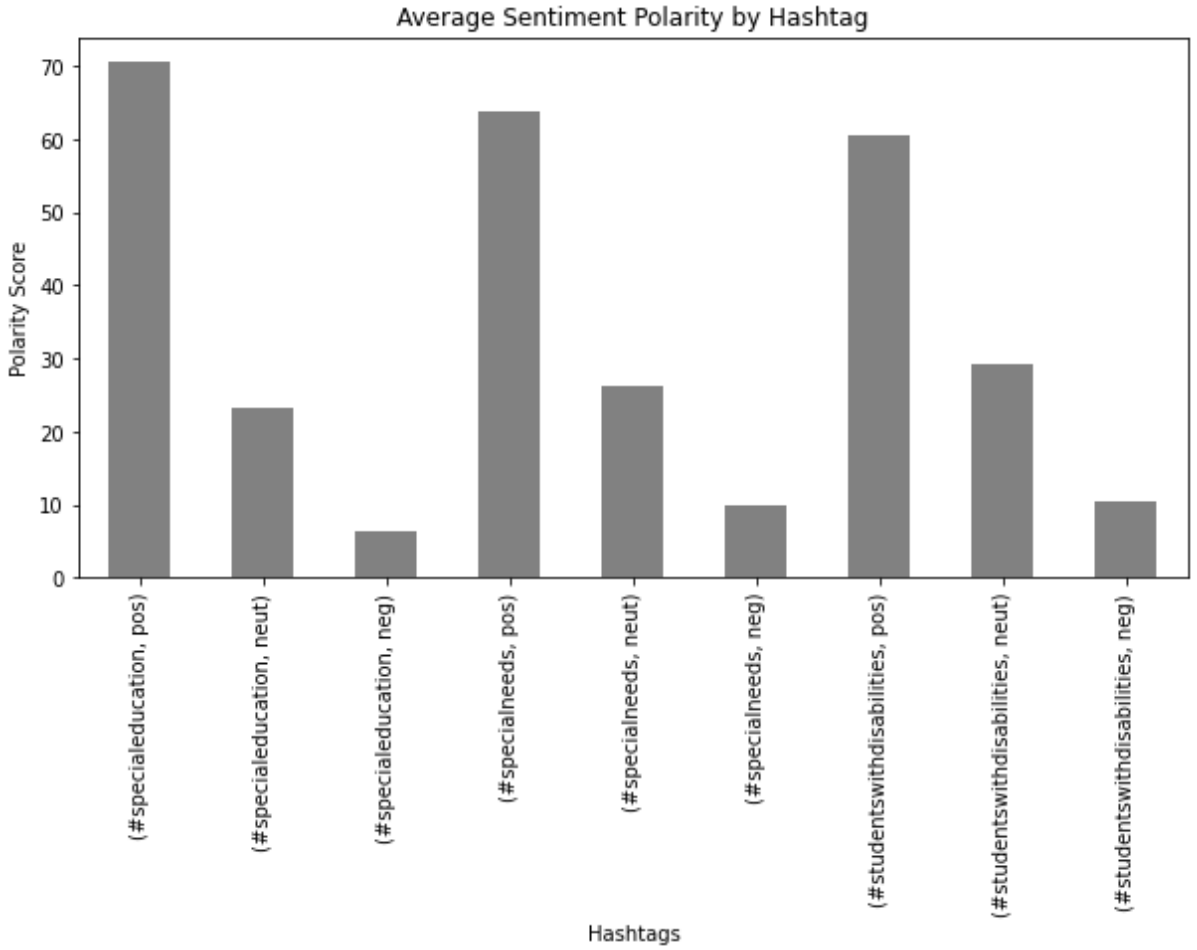

Figure 3. *Distribution of Sentiment Polarity Scores per Hashtag*

We also explored how the sentiments changed during data retrieval. Figure 4 presents the daily average sentiment scores. The highest average sentiment score per day was observed on August 10, 2021, while the lowest average sentiment score per day was observed February 16, 2021.

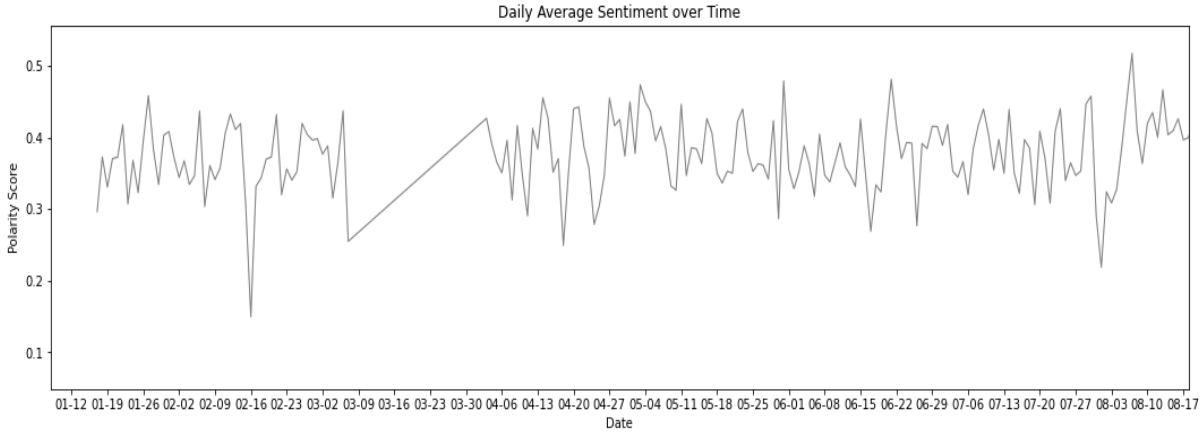

Figure 4. *Average Daily Sentiment Scores of Tweets over The Study Period*

Word Cloud Analysis: Frequent Terms in Tweets

Word clouds were generated to determine the most frequent terms in the target tweets (Figure 5). The most frequent terms were “special need” and “specialeducation” or “special education” as well as “kid”, “school” and “student”.

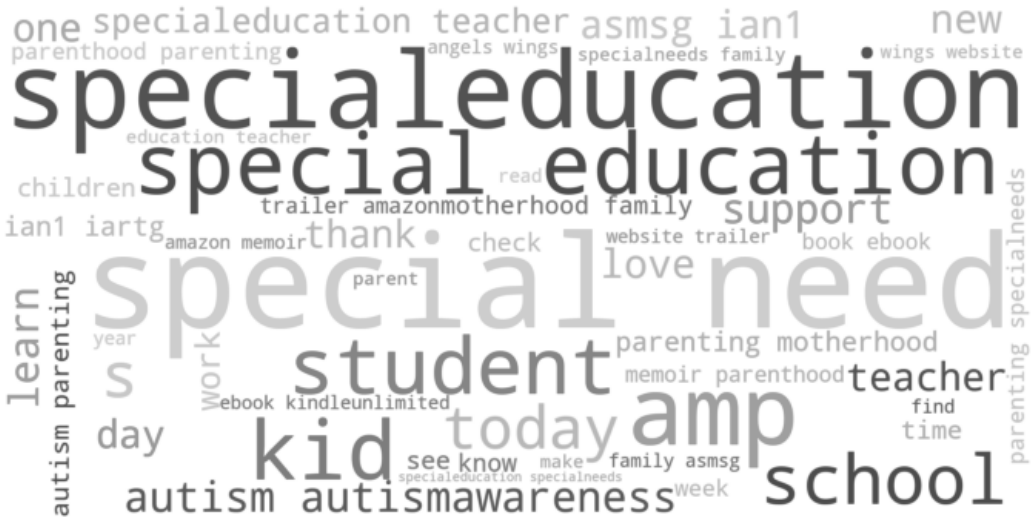

Figure 5. *Word Cloud Representations of Frequent Terms in Tweets*

Topic Modeling

The topic modeling task provided results for five prominent topics discussed by people who tweeted using selected hashtags. Table 1 demonstrates principal topics discovered by the LDA model in the tweets. The main themes of the topics were assigned manually based on the most frequent terms associated with the topics.

When observing the results of the topic modeling in the tweets, it was noticed that among the most discussed topics in the modeling results, the most relevant terms to the first topic were “special”, “needs”, “autism”, “education”, “children”, and “school”. We can

interpret that the first topic focused on the primary components of special needs education and the educational process. The second topic included terms “autism”, “specialneeds”, “disabilities”, “students”, “parents”, and “learning”. These topics appear to be related to learning needs of special students with Autism or disabilities. The third mostly discussed topic was mainly about special education needs of kids and their support at home.

On the other hand, the fourth topic was found to be associated with the institutional aspect of special education. The mainly discussed keywords included “school” and “teachers”. We noticed that the tweets consider the role of school and teachers in special education. It was observed that the last topic covered the discussion about parenthood and the experiences of parents with kids in special education.

Table 1. *Primary Topics in Special Education Tweets*

Topic No	Percentage	Relevant Terms	Main Theme
1	*24.8%*	*“special”, “needs”, “autism”, “education”,“children”, “school”*	*Special Needs of Children in Education*
2	*20.8%*	*“autism”, “specialneeds”, ”disabilities”, “students”, “parents”, “learning”*	*Learning Needs of Students with Autism and Disabilities*
3	*19.5%*	*“specialeducation”, “autism”,”needs “kids”, “home”, “support”*	*Special Education Needs of Kids and Home Support*
4	*18.2%*	*“specialeducation”, “school”,”sensory”, “teachers”, “autism”, “education”*	*Role of School and Teachers in Special Education*
5	*16.7%*	*“education”, ”memoir”, “book”, “parenting”, “motherhood”, “parenthood”*	*Parenthood and Experiences of Parents in Special Education*

Discussion, Conclusions and Suggestions

This study examined people’s sentiments toward EOSE after mass vaccinations for COVID pandemic started, which goes beyond the early pandemic period of uncertainty combined with fear and lack of hope (Caskurlu et al., 2023) right after the pandemic broke out. In other words, this way, research insights gained into people’s sentiments would be much more mature or informative since it is reasonable to expect the early sudden adoption of online education to be over (Caskurlu et al., 2023), and that teachers would have started much more informative decisions on special online education. These points become much more relevant given that special education teachers, students, and their families may have faced bigger challenges than others. Specifically, for instance, the need for parental involvement in online special education when it comes to students with intense exceptionalities especially, would have brought up more and more compelling challenges. Accordingly, it is highly likely that mass vaccinations would have provided some levels of relief for those involved in special education, which has also been supported by the results of this study.

The most frequent hashtag was “#specialneeds” and it was followed by “#specialeducation”. These two most frequent hashtags seem to suggest that special education

stakeholders' focus was on special education and its special needs in a larger sense. This point is further supported by the finding that the hashtag "#studentswithdisabilities" was the third most frequent one; however, the number of tweets it covered was slightly more than 300 while the other two hashtags addressed thousands. In other words, these numbers imply that when mass vaccinations started to become largely available, stakeholders involved in special education was focusing more on possible needs of all those involved in special education rather than individual students with special exceptionalities. After all, it is reasonable to assume that those needs were speaking to and/or emanating from the experiences of students with special exceptionalities. This insight aligns with the possibility that the pandemic would have had larger influences on students with exceptionalities and parents (e.g., Paulauskaite et al., 2021) since larger influences may have been a driving force for the focus on needs. Finally, as discussed in the following paragraphs, the focus on special education needs was accompanied by a positive sentiment, which suggests that EOSE had been serving people's needs to a certain extent.

The current findings further indicated that most tweets included positive sentiments followed by neutral and negative ones, and that all the three hashtags above had more positive sentiment scores than neutral or negative. Similarly, the average sentiment score over the course of the study was always positive and relatively stable being higher than 0.1. By itself, this finding suggests that after mass vaccinations started, special education stakeholders' sentiments toward EOSE were largely positive. This is a paradoxical finding in that just the opposite would have held true due to people's increasing hope of going back to classroom just because vaccinations would make it safer to do so. Therefore, the finding should be approached with caution since it might be partly related to people's general optimism getting higher. In contrast, more positive sentiments despite the availability of mass vaccinations or increasing chances of returning to normal schooling can also suggest that the finding is a strong one. In other words, schools started to open in some countries after and during mass vaccinations became more available, which does not seem to have deteriorated positive sentiments towards EOSE. Further, the existence of both neutral and negative tweets (almost 32% in total) decreases the likelihood of people's general optimism mainly driving the positive sentiments toward EOSE. Still, the exact answer or answers to this point of discussion is unfortunately beyond the scope of the present data set that included data drawn from social media only. Overall, given the challenges people had during EOSE (e.g., Bornert-Ringleb, 2021; Smith, 2020; Yazcayir & Gurgur, 2021), more positivity in sentiments is significant and aligns with people's positive sentiments toward emergency remote teaching during the pandemic (e.g., Caskurlu et al., 2023).

Results of the word cloud analysis also pointed to a strong focus on special needs and special education in general. However, the same word cloud results also showed that most of the tweets also focused on students or kids and schools that are main stakeholders in special education. In other words, people's tweets seem to be concerned more about students in special education in general rather than individual students. Alternatively, a substantial number of people outside the special education world would have also contributed tweets thereby explaining this larger focus. Moreover, topic modeling results also referred to a focus on the needs of students with exceptionalities: The first three main themes were all related to needs of these students while the last two main themes addressed the roles of schools, teachers, and parents in special education. Schools, teachers, and parents are all key stakeholders and play crucial roles in special education when it comes to meeting student needs especially. Thus, it is not surprising that the main topic themes touched on the needs of students with exceptionalities as well as the role of schools, teachers, and parents. This result is also in line with earlier claims that the pandemic may have been more arduous for people with special needs (e.g., Lebrasseur et al., 2021) and people who took care of them (e.g., Iovino et al., 2021). Furthermore, the overall focus on special needs is understandable given that some services were not available

during the pandemic and remote education was not accessible for a lot of students with special exceptionalities (e.g., McFayden et al., 2021). Here, the involvement of parents deserves special attention since their role in online special education need to be understood better, and it is not clear how students with exceptionalities would engage in online special education without their parents' support at home.

Implications for Future Research and Practice

The target hashtags used in the presence study were selected by the authors by reviewing potentially relevant hashtags and the tweets associated with them. Even though the hashtags were chosen after a careful review process, the tweets whose content used in the present study are limited to those chosen contexts. Consequently, we might have missed and/or omitted some relevant tweets that were not associated with our target hashtags. Furthermore, there was a significant amount of spam and advertorial tweets associated with our target hashtags, which is something typical to happen in social media data. To the best of our knowledge, we did our best to eliminate these extraneous tweets and hashtags as much as possible. Accordingly, future research would include a wider variety of hashtags. After all, teacher education research in general and special education research specifically can use social media as an inquiry arena that would provide a natural and unobtrusive way of collecting data.

As for topic modeling, since tweets' content can relate to multiple topics, it is a challenge to determine that main topics, which happens naturally in topic modeling. Therefore, as a research team, we collaborated on determining the main topics together through discussions after one researcher came up with the initial results. Closely related, we examined the tweets posted in English only; therefore, the findings may not be generalized to other languages. Interestingly, the target tweets may not be directly limited to English-speaking countries only either since it is possible that people with different languages would have posted their tweets in English. All these insights indicate that further research, which would be interested in such country-specific data or similar data, would anonymously look at not only tweets in different languages but also some demographic data belonging to those whose tweets will be used.

From a practical perspective, the current results suggest that sentiments analyses done on social media would inform various stakeholders including decisions makers and policy makers about the public's reactions during times of crisis, which would be part of an evaluation plan. Specifically, gaining insights into people's sentiments would provide concrete insights into how to handle EOSE when it is needed again in the future. Accordingly, teacher preparation in special education can incorporate online education of students with exceptionalities thereby going beyond assistive technologies and getting ready for another world-wide crisis. Overall, the results indicated that people had positive sentiments toward EOSE after mass vaccinations started. They also focused on special education in general and the needs of students with exceptionalities. These findings further suggest that EOSE turned out to be an acceptable alternative to in-class special education especially after the introduction of mass vaccinations, which needs to be covered in special education and teacher preparation programs to better prepare future teachers.

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