Using Alexa to Differentiate Instruction in the Special Education Classroom

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ABSTRACT: Access to technologies and understanding the potential uses of technology to differentiate instruction have been a concern for the teachers and students in a local school district located in the southeastern United States. Despite the emergence of digital voice assistants (DVAs) as tools for instructions, teachers lack knowledge and strategies for using DVAs to differentiate instruction in their classrooms. The purpose of this basic qualitative study was to identify teacher knowledge and strategies employed among special education (SPED) teachers using DVAs to differentiate instruction in their classrooms. The concepts of Carol Tomlinson's differentiation theory and Mishra and Koehler's TPACK framework served as the foundation of this study. The research questions examined middle school SPED teachers' perceptions of challenges using DVAs to differentiate instruction, resources, and strategies available to these teachers and their perceived knowledge of using DVAs to differentiate instruction. In this basic qualitative study, data were collected from 6 SPED teachers using semistructured interviews. The findings suggest that teachers had little to no perceived challenges when using DVAs to differentiate instructions. However, the overutilization of DVAs might rob students of their ability to think independently. This study offers several prospects for future research related to the topic and findings. Further research is needed at the elementary and high school levels that may include core content teachers.

KEYWORDS: Special Education, Differentiated Instruction, Learner-Centered, Classroom Instruction, Special Education Learning, Digital Voice Supports.

I. INTRODUCTION

Access to technologies and understanding the potential uses of technology to differentiate instruction has been a concern for the teachers and students in a local school district in the southeastern United States (U.S.) (Assistant principal, personal communication, July 3, 2019). The local school district comprises of 14 schools, including three elementary, three primary, two middle, one middle-high, two high, and three vocational schools. The school district enforces the "bring your own device" (BYOD) policy. This policy enables students to bring personal learning devices to offset the district's lack of technology (Teacher, personal communication, March 6, 2019).

The problem is that despite the emergence of DVAs as tools for instruction, teachers lack knowledge and strategies for using DVAs to differentiate instruction in their classrooms. The local district requires policies and guidance on how DVAs can or should be applied. The local school district does not mandate the use of DVAs; however, with a lack of technological resources and training on how to effectively differentiate instructions, teachers are forced to be creative in incorporating technologies to differentiate instructions to meet a 4.0 rubric requirement (SPED teacher, personal communication, February 2, 2019).

Additionally, Cantrell et al. reported that from a survey conducted, the local school district studied responded to the survey question, "number of schools in each district reporting no 1: 1 computing capability in the school" (para. 3)[1]. A total of seven schools reported having one-to-one student computing capabilities from a total of 14 schools that make up the district. These numbers show that 50% of the total schools do not have one-to-one student computer technologies. The report also stipulated that many districts misunderstood the question related to BYOD versus district-assigned devices. Hence possibly overstating their one-to-one computer technology.

How well teachers differentiate or tailor instructions to meet the need of their students is important to evaluate[2]. Students with learning challenges have varying difficulties, frequently covered up or inconspicuous, that influence learning their entire lives[3].

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There is a remarkable reduction among students with learning disabilities when compared to general education students that use technology to differentiate instructions[3]. Reports indicate that a small proportion of learning-disabled learners receive assistance from computer technology to help their learning results[4]. SPED educators' sentiments of readiness ground their technology usage while working with students with learning challenges[5]. Additionally, research showed that there is a lack of time, resources, and support from the administrative or leadership body of schools, which prompts a lack of computer usage by SPED teachers[5].

AI is not particularly new to the field of education. For example, AI has been used in education to create MOOCs, learning analytics, intelligent tutoring systems, education data mining, and computer-supported collaborative learning (CSCL)[6]. However, with the introduction of AI technologies such as DVAs and chatbots, AI has become an increasingly popular instructional innovation used in classrooms to facilitate different learning experiences[7].

Consequently, these technologies are used within middle school classes to aid pedagogical development[7]. Furthermore, more than half a million students are enlisted in courses designed with AI, such as cognitive tutors in software, web-based applications, or stand-alone interfaces in more than 3,000 schools annually[8]. AI in education is making significant progress in terms of technological advancements[9]. However, its effect on students learning outcomes has little to no data to support its usage in instructions in this school district. Moreover, DVAs inclusive of Amazon Alexa and Google Home, among others, are used in lessons without adequate data to support their benefits in the classroom[10]. Understanding and academic information to assist students and their instructors in the learning process using DVAs is developing[11]. The effects of AI in differentiated classrooms, where instructions tailored to their students' unique learning needs and learning style were obscure or less explored related to SPED instructions[12].

II. METHOD

The purpose of this basic qualitative study was to explore teachers' perceptions, knowledge, and strategies employed among SPED teachers using DVAs to differentiate instruction in their classrooms. Additionally, throughout this study, knowledge gaps and missing/required strategies were exposed to improve implementation. A foundation on which policies and guidance can be developed and implemented within the local context was identified. Understanding the usage of these technologies in the classroom may offer teachers information regarding the benefits and or limitations that DVAs have on pedagogy.

The following research questions addressed the basic qualitative study:

RQ1: What are the perceived challenges faced by middle school SPED teachers using DVAs in differentiating instructions in SPED classrooms?

RQ2: What resources and strategies are known to be available to prepare middle school SPED teachers for differentiating instructions in SPED classrooms using DVAs?

RQ3: What is the perceived knowledge of middle school SPED teachers related to the usage of DVAs to differentiate instructions in the classroom?

Sampling

Using purposeful sampling, participants for this study included high a selected sample of 10 to 12 SPED teachers to participate in the study; however, six teachers ultimately engaged in face-to-face or virtual semistructured interviews to collect data on their perceptions of the use of DVAs in instructions. Also, insight into how SPED teachers planned and incorporated this innovation to individualize instructions and cater to the needs of unique learners was explored. The study was conducted in a rural school district; there were three middle schools with 18 SPED teachers. The study population was limited to the middle school level and SPED teachers; any further limitation may have hindered or affected the number of participants in the study. Since the available pool of eligible teachers to participate in the study was small, it was only realistic to recruit an acceptable amount of 10 to 12 participants to participate in the study.

Data Collection

In this study, semistructured interviews were conducted with SPED teachers to gauge their perspective on using DVAs in their instructions. Interviews enable the researcher and subjects to dig deeper and uncover a more personal and descriptive understanding of the phenomenon investigated that may not be identified easily from observations[13]. These were semistructured interviews that were face-to-face and virtual for participants' convenience.

The face-to-face interviews lasted between 25 and 40 minutes, while the virtual interviews lasted between 23 and 30 minutes. The Otter app equipped with AI technology was used to record and simultaneously transcribe interviews. For the face-to-face interviews, an iPad pro with the Otter app was used installed to record and transcribe the interviews. However, for the virtual interviews, Facetime or Zoom on the iPad Pro was used for loud, crisp, and clear sound quality and recorded and transcribed on a

cell phone with the Otter app installed. Member checking was conducted by providing the completed transcriptions to the participants for verification and accuracy and an accurate representation of their perspectives.

III. METHODOLOGY

During the data analysis phase, five overarching themes emerged. These themes were: (a) differentiation in SPED content, (b) selecting appropriate technology, (c) DVAs in action, (d) TPACK and differentiation, and (e) preparing and training teachers with technologies. The following themes emerged:

Research Question 1

The first research question was: *What are the perceived challenges faced by middle school SPED teachers using DVAs in differentiating instructions in SPED classrooms?* After analyzing the interview questions that corresponded with this research question, the findings suggested that teachers had little to no perceived challenges when using DVAs to differentiate instructions in SPED classrooms. However, participants' challenges were a lack of independence, disruption, technology failure, and privacy. Participants believed that the overutilization of DVAs might rob students of their ability to think for themselves. Since students ask the questions, and the device responds without probing, or follow-up questions like teachers do, there is no need for them to use brainpower to process information. This finding is consistent with current literature. Only a few of the publicly available apps discovered in the instructional segment of app stores had significant evidence to support the design and overall effectiveness towards learning outcomes but rather concentrating on rote academic abilities (memorization of picture-word association, numbers) instead of focusing on existing core curriculum materials and or instructions[14].

Additionally, if not appropriately implemented, DVAs can be disruptive. The device may not understand a question asked by students, and students usually increase their voice levels and become frustrated in such instances, disrupting the classroom. Also, if there is more than one device in the room with the same wake word, such as "Hey Google" or "Alexa," this will trigger the device(s) that might not be in use. Also, the findings indicated that participants were not concerned about privacy, except for one participant who reported that "privacy is always an issue whenever you are using something that is attached to the internet," but has not had any issues as it relates to privacy. This finding does not correspond with the current literature. When one interacts with Alexa, the Echo streams sound to the cloud. The storage space of Alexa's raised a plethora of concerns around privacy and security[15]. However, participants suggested that when these devices are not in use, they are unplugged and muted, so they are not listening, and Siri is not always listening because it is manually activated.

Research Question 2

The second research question was: *What resources and strategies are known to be available to prepare middle school SPED teachers for differentiating instructions in SPED classrooms using DVAs?* After analyzing the interview questions that corresponded with this research question, the findings suggested that teachers have not received any training from their school leaders or district. Since the school district has limited resources, the district does not provide teachers with DVAs. As such, all strategies used to implement these devices to inform their instructional practice and cater to the need of their learners were self-taught. Teachers pulled from their experiences with personal devices used at home and knowing the students they have to engage them in the classroom with DVAs. The findings echoed the sentiments of the need for support from school leaders and or administrators. While educators direly need this fundamental knowledge and skillsets to differentiate instructions effectively, the administrators and department heads likewise need to realize how best to support teachers with cutting-edge practices to deliver rigorously and DIs[16]. Schools or school districts with limited technological resources constitute a significant blow to teachers' effective implementation of technology in the classroom[17].

This finding confirms the literature on the support teachers needs to implement technology in their instruction effectively. Teachers should receive step-by-step instructions on how to differentiate in their classrooms and provide teachers with access to data necessary to differentiate instructions effectively[17]. Teachers influence students' engagement in the classroom by using technology-aided devices and tools[18]. Interactive writing activities, as well as educational games contribute to increased student engagement. Used to assist in the teaching and learning process, technology infuses learning environments with cutting edge learning devices, for instance, personal computers (PCs) and smart devices; broadens interactions in online courses, experiences, and learning materials; supports learning 24/7; produces 21st-century skills; extends students responsibility and motivation, and also speeds up the learning process[19].

Research Question 3

Research question three was: *What is the perceived knowledge of middle school SPED teachers related to the usage of DVAs to differentiate instructions in the classroom?* After analyzing the interview questions that corresponded with this research question, the findings suggested that teachers are very knowledgeable of their students, the content they teach, and the materials and technology they select for use in SPED classrooms. The findings indicated that teachers possess the requisite

technological, pedagogical, and content knowledge needed to implement and use DVAs to differentiate instructions successfully; however, they noted that more formal training is necessary to iron out the nuances when implementing and using these devices. The literature suggested that the teaching of content-specific information and abilities necessary in the differentiation process incorporate learning about a plethora of pedagogical models and instructional strategies and tips on how to execute and modify these lessons to meet the specific learning needs of students[15,18,20]. This finding also aligns with Tomlinson's (2014) four tenets of the differentiation process: content, process, material, and learning environment.

Additionally, the TPACK framework serves as a lens that educators can use to understand technology integration as the interplay between technology, pedagogy, and content[21]. The knowledge of technology, pedagogy, and content helps guide educators on the tendencies, affordances, and limitations of technologies, allowing them to be better suited for specific tasks over others[21].

IV. IMPLICATIONS FOR FUTURE RESEARCH

As AI and DVAs are rapidly expanding in the consumer market as well as in the field of education, there has been an increase in the usage of these devices to inform and differentiate. The education field is a pioneer in adopting technology to meet the high demands and create opportunities for learning in the 21st century and beyond. The outcome of this study has the potential to guide school and district leaders in developing policies, protocols and arrange training and or professional development for teachers to differentiate instruction with modern assistive technology effectively.

Moreover, teachers support the use of DVAs, as they believe it responds to a demonstrated need. However, the data suggested that teachers need more support from leaders to aid them in implementing differentiation to help students be successful. Also, the state 4.0 rubric used to assess teachers on their instructional practice focuses on using technology and differentiation as a grading point for teacher evaluations. Therefore, to affect positive social change, schools and school district leaders should consult with teachers to increase the availability of DVAs for instruction and provide training and professional development. The data presented that only one of six participants reported school district professional development support. Not only are teachers insufficiently supported, what teachers have learned on their own is not being shared with other teachers. Hence, this study sets the precedence for social change by offering both the opportunities for teachers to participate in professional development activities as well as teachers on the leading edge could lead professional development initiatives to share their knowledge with colleagues.

Furthermore, the schools or school districts could appoint expert teachers proficient in the use of DVAs, and differentiation to training new and struggling teachers. From this initiative, schools could develop a mentorship program. A professional development session to be productive and successful, the teachers should be actively involved in taking their different learning needs and actively be part of various opportunities for learning that specifically focused on their school, and continuously support a collaborative teaching and learning process[20].

Finally, the data suggested that teachers did not have a voice in selecting the technology for use in their classrooms. However, they expressed their preference for being a part of the technology selection process. Since learners are so diverse, it would be desirable to get teachers involved in choosing the most effective technology that complements their skill set as well as what caters to their learners' needs. This research study may provide school leaders with an understanding of the importance of the teacher's voice when selecting classroom technology for differentiation in their classroom instructions based on students' needs. As such, school leaders may develop a committee to gather data on teachers' opinions on selecting new or currently used technologies that may impact the learners' success in their classrooms.

V. CONCLUSIONS

The data presented in this study came from semistructured interviews conducted with six SPED teachers in a rural school district in a southeastern state. The data were analyzed to identify teachers' perceptions, knowledge, and strategies employed among SPED teachers using DVAs to differentiate instruction in their classrooms. The data signaled that teachers use these devices to cater to the needs of their students based on their learning styles. Teachers using DVAs with their auditory learners expressed the most benefits. Additionally, teachers reported that using DVAs to differentiate instruction acknowledged that the devices engaged students more in the lesson or activity it is being used for. Learners tended to pay more attention or got quiet to interact and listen to the responses coming from DVA devices. Also, teachers suggested that using DVAs can afford SPED learners with the ability to be independent, which is relying on the teacher less when they have specific questions.

However, the data presented that prolonged or overuse of these devices may rob students of their independence to think for themselves. The data suggested that teachers had little to no concerns about the privacy issues with using these devices in an educational setting. For teachers to successfully implement DVAs in the classrooms, they recommended setting up strict classroom rules and protocols before using these devices to differentiate or any instructional purpose. The data also presented

that teachers have not had any formal training in using DVAs for instructional purposes and suggested that schools or district leaders look into the possibilities of adopting these technologies and train teachers on how to use them on the possibility of meeting the needs of students with learning disabilities by harnessing the power of technology.

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