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Novice Teachers' Implementation of Evidence-Based Practices in Autism Education: Examining the Roles of Preparation and Perception

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Abstract

Despite the contemporary emphasis on evidence-based practices (EBPs) in autism education, the research-to-practice gap persists. Understanding how newly trained teachers' experiences, knowledge, and beliefs about EBPs influence their instructional decisions is vital to increasing EBP implementation among the next generation of special educators. In this study using a mixed-methods approach, 137 novice special educators in two southeastern U.S. states reported their knowledge, perceptions of social validity, and frequency of use of 12 EBPs for students on the autism spectrum. Follow-up qualitative interviews were conducted with a purposive subsample. Positive behavior supports and visual schedules emerged as the most socially valid and implemented practices. The use of EBPs was primarily driven by teachers' knowledge of the practice and perceptions of its social validity, with teacher preparation experiences shaping both. The results have implications for improving preservice preparation and future implementation of EBPs by attending to teachers' procedural understanding and subjective buy-in.

Keywords

autism, evidence-based practice, social validity, teacher preparation, mixed methods

Contemporary scholars have voiced many concerns about the persistent research-to-practice gap in special education, particularly as it relates to the classroom implementation of interventions for students with autism (see Note 1; Barry et al., 2020; Cook & Cook, 2013; Parsons et al., 2013). Researchers have expended considerable effort designing and testing strategies to support the social, communicative, behavioral, and cognitive development of autistic children and youth (Hume et al., 2021). The resulting evidence-based practices (EBPs) are expected to be used in everyday contexts, including K–12 schools. This transfer of research into practice relies on a teacher workforce with the capacity and commitment necessary to select and use EBPs to meet the needs of students on the autism spectrum (Cook & Cook, 2013).

Instruction based on scientifically validated techniques is required by federal law in both special education (Individuals with Disabilities Education Improvement Act, 2004) and general education (Every Student Succeeds Act, 2015). These requirements are intended to ensure teachers are implementing effective practices rather than relying on tradition or unproven strategies (Cook & Cook, 2013). Researchers have specifically tested focused interventions addressing the developmental and learning profiles of autistic children, with systematic reviews establishing up to 28 individual EBPs, such as visual supports, discrete trial training (DTT), and reinforcement (Hume et al., 2021; National Autism Center, 2015).

Successfully translating this research into practice requires effective dissemination of evidence and careful attention to implementation contexts (Cook & Cook, 2013; Parsons et al., 2013). There are long-standing concerns that EBPs are not being routinely used in the K–12 schools where thousands of students on the autism spectrum are educated every day (McNeill, 2019; Morrier et al., 2011). Many teachers do not receive training in interpreting and applying educational research and, furthermore, have limited physical access to research information due to publication paywalls (Scheeler et al., 2016). Additionally, maintaining fidelity to rigorous research protocols can be challenging in ordinary classrooms and for ordinary teachers dealing with systemic

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limitations on time, personnel, and resources (Barry et al., 2020; Cook & Cook, 2013).

When faced with these potential barriers to implementation, teachers themselves make value judgments to decide which EBPs to use and how. This decision-making process is based on a myriad of factors related to their own knowledge, the needs of their students, and the constraints of their educational context (Parsons et al., 2013). This appraisal of an EBP incorporates the importance of its goals, the acceptability and feasibility of its procedures, and personal satisfaction with its outcomes, collectively referred to as social validity (Wolf, 1978). Research has shown that special educators' perceptions of social validity are associated with their implementation decisions (Hugh et al., 2020; McNeill, 2019). For instance, a recent investigation revealed that special educators were most likely to use the EBPs they viewed as appropriate and practical, with high levels of endorsement of EBPs such as visual supports, modeling, reinforcement, and prompting (McNeill, 2019).

The increased educational focus on EBPs has also coincided with a less-experienced teaching force. According to the most recent national data, with approximately 16% of special educators are in the first 3 years of their teaching careers (Institute of Education Sciences, 2018). These novice teachers are uniquely positioned to improve autistic students' access to EBPs in schools. As preservice teachers, they were trained within the current evidence-based climate and presumably had access to the most up-to-date research (Scheeler et al., 2016). Furthermore, as new professionals, they have the potential to affect students for many years to come.

However, special educators enter the field with varied training experiences specific to autism. Most special educators complete generalist programs tasked with preparing them to teach students with all types of disabilities (Barnhill et al., 2014; Scheeler et al., 2016). There is no standardized requirement for programs to offer training in autism and research suggests that most do not incorporate direct instruction on autism-specific EBPs (Hsiao & Sorensen Petersen, 2019). Even so, a survey found that teachers who had learned about an EBP during their teacher preparation program were more likely to view it as socially valid than those who had completed a workshop, received peer coaching, or learned about the EBP on their own (McNeill, 2019). This suggests that teacher preparation experiences have the power to establish preservice teachers' buy-in to EBPs early, potentially leading to increased implementation.

The number of children identified with autism in public schools today is steadily increasing, with national data indicating that autistic students now make up 11% of students receiving special education services in the United States (Hussar et al., 2020). Special educators' increased responsibility for teaching this population makes it increasingly necessary to understand how they are being prepared to use EBPs. Given the contemporary backdrop of the rising rate of autism combined with the EBP movement in education, the perceptions and experiences of teachers just entering the field can illuminate priorities for developing an educator workforce best equipped to address the individualized needs of students on the autism spectrum.

Study Purpose

The purpose of this study was to understand the current state of novice teachers' implementation of EBPs for students with autism and to explore the roles played by social validity, context, and preparation. In addition, this research replicated the methods from the first author's previous survey of special educators of all experience levels (McNeill, 2019). Historically, it has been difficult to directly compare knowledge, use, and social validity of EBPs due to the variety of definitions and instruments used in different research studies (Briesch et al., 2013). By using the same measurement scales as a previous investigation, this replication permitted a deeper analysis of the actions and beliefs of a subset of novice teachers as well as a comparison with those of the broader teacher workforce as measured in the previous study. The research questions were as follows:

Research Question 1 (RQ1): What are the current levels of self-reported knowledge, use, and perceived social validity of EBPs for students with autism among novice special educators?
Research Question 2 (RQ2): How do novice special educators with differing preservice experiences and job characteristics vary in their self-reported knowledge, use, and perceptions of EBPs?
Research Question 3 (RQ3): How do novice special educators describe the influence of training, context, and perceptions on their implementation of EBPs?

Method

This study employed a sequential explanatory mixed-methods design, using a cross-sectional online survey of novice special educators and follow-up interviews of a purposive subsample. This design was selected to quantitatively describe broad trends related to novice teachers' knowledge and use of EBPs and to qualitatively explore teachers' perceptions and other factors that may contribute to those trends.

Survey Participants

Inclusion criteria required that participants (a) were licensed special educators; (b) taught students in Grades K–12 in one of two southeastern U.S. states; (c) currently taught at least one student with autism; (d) were in their second, third, or fourth year of teaching experience in the 2020–2021 school

Table 1. Survey Respondents' Demographic and Professional Characteristics.

Characteristic	*n*	%
State		
North Carolina	102	74.5
South Carolina	35	25.6
Sex		
Female	95	84.8
Male	17	15.2
Race/ethnicity		
White	98	87.5
Black	10	8.9
Hispanic	5	4.5
American Indian/Alaska Native	3	2.7
Asian	1	0.9
Preparation program type		
Bachelor's degree	78	56.9
Master of Arts in Teaching	33	24.1
Alternative licensure	26	19.0
Grade level		
Elementary	60	43.8
Middle	44	32.1
High	33	24.1
Classroom type		
Inclusive	15	10.1
Resource	41	29.9
Separate classroom	64	46.7
Separate school	17	12.4
Number of students with autism		
1–3	84	61.3
4–6	33	24.1
7–9	14	10.2
10+	6	4.4

year; and (e) had completed an initial teacher preparation program in special education (i.e., Bachelor of Arts, Master of Arts in Teaching, or alternative licensure). First-year teachers were excluded as they were unlikely to have had an opportunity to teach in person during the COVID-19 pandemic. One hundred and seventy-three teachers met the criteria based on screener questions. Thirty-six respondents exited the survey before rating their knowledge or use of the EBPs and were therefore excluded. A final sample of 137 responses was retained for analysis. Using publicly available data on the number of novice special educators in the targeted states, the sample size was calculated to represent a margin of error of 7% at a confidence level of 90%. See Table 1 for a summary of participant characteristics.

Survey Procedures

Survey responses were collected between October 2020 and February 2021. Teachers were recruited through purposive, targeted sampling to allow for an ongoing and iterative process of recruiting from specific or hard-to-access populations (Watters & Biernacki, 1989). In this case, the population of novice special educators was targeted through teacher preparation programs, school districts, and professional organizations who emailed the study information to potentially eligible teachers.

The 95-item survey was adapted from McNeill's (2019) instrument used to measure teachers' knowledge, use, and social validity of EBPs. For this sample of novice special educators, questions were added to gather information on preservice experiences in addition to job characteristics. The questionnaire was pretested by nine current and former special educators to ensure that the online survey functioned as intended and to gather feedback on the content validity of questions and response options (Krosnick, 1999). Qualitative feedback from pretesters supported the scalar points used and confirmed the appropriateness of the six items used to represent social validity. Due to concerns raised about ensuring a common understanding of the EBPs, a brief definition was added under the EBP on all rating scales. To avoid potential biases, only the initial screener questions required a response and the order in which EBPs were presented was randomized (Dillman et al., 2014; Krosnick, 1999). Participants completed the survey independently using the online software Qualtrics.

The first part of the survey asked multiple-choice questions about the respondent's demographics, job characteristics (e.g., grade level, classroom type), and teacher preparation experiences (e.g., degree type, certifications, coursework). The second section asked respondents to rate their knowledge and use of 12 key EBPs identified for use with autistic students. The 12 EBPs were selected due to their broad research base and identification in multiple systematic reviews (Hume et al., 2021; National Autism Center, 2015). The chosen practices are highly relevant to teachers as all have evidence of efficacy for academic, communication, and social outcomes across all, or nearly all, age ranges of children and youth from ages 6 to 22 years (Hume et al., 2021). To support a common understanding of each EBP respondents were provided with a brief definition. Respondents reported how much they knew about each EBP, on a 5-point scale, and how often they used each practice with a student with autism on a 5-point scale from *never* to *more than once per day*. Both scales were adapted from the Early Intervention Practices Scale (Paynter & Keen, 2015). Respondents were asked to base these ratings on their use during face-to-face instruction before the COVID-19 pandemic.

In the final portion of the survey, the respondent was presented with a set of follow-up questions addressing social validity and training experiences for all practices previously rated as at least 2 (i.e., *I know a little about this practice*) on the knowledge scale. Teachers were not asked to

rate practices with which they were unfamiliar to avoid unreliable data. The six questions comprising the social validity scale were selected from the Usage Rating Profile-Intervention–Revised (URP-IR), based on high factor loadings for the categories of acceptability (i.e., utility for meeting student needs, personal enthusiasm), feasibility (i.e., procedural complexity, time allocation, and material resource dedication), and system climate (i.e., administrative approval; Briesch et al., 2013). Respondents also selected the primary type of training they had received for each practice, adapted from the Autism Treatment Survey (ATS; Morrier et al., 2011).

The survey results were screened for missing data before analysis. Ineligible and incomplete responses were removed from the data set and listwise deletion was employed for missing data appearing as randomly skipped items. All quantitative analyses were conducted using Stata 16 statistical software.

Interview Participants

From the survey respondents who indicated willingness to participate in a follow-up interview, a subsample of 10 individuals was selected, using a purposive, maximum variation sampling technique (Marshall & Rossman, 2016). The subsample was selected to represent teachers from both states with varied combinations of preparatory experiences and current teaching contexts. All participants were assigned pseudonyms for confidentiality throughout analysis.

Interview Procedures

All interviews were conducted virtually by the first author in February 2021. Participants were asked to introduce themselves, describe their teaching context, and define evidence-based practice in their own words. Participants were then invited to explain why they used a subset of EBPs most frequently and a second subset rarely or never. These subsets of three to four EBPs were identified for each participant using their survey responses. As needed, participants were asked follow-up questions for clarification and to elicit more in-depth responses. Questions were displayed on a shared screen for the interviewee to reference as needed. The protocol integrated a modified member checking procedure in which the interviewer briefly summarized the participant's general considerations in EBP implementation and provided an opportunity for the interviewee to clarify or expand upon themes (Creswell & Creswell, 2018). The interviewer maintained field notes to record nonverbal observations such as body language and tone (Marshall & Rossman, 2016). Participants were compensated US$35 for participation.

Interviews were recorded and automatically transcribed using Zoom. The first author then reviewed and corrected each transcription. A codebook was developed to operationalize theory-driven codes, data-driven codes based upon the survey instrument, and researcher-generated codes added after the interviews were conducted. Two coders conducted line-by-line coding using NVivo software. During consensus coding, the coders compared individual coding assignments and discussed and resolved discrepancies. On initial independent coding, intercoder reliability ranged from 62% to 89% agreement. Following discussion, the coders reached full consensus. The coders also employed constant comparative analysis procedures across interview transcripts (Creswell & Creswell, 2018). Once consensus was reached on all 10 transcripts, the coders discussed emerging themes within each coding category, combined overlapping codes, and identified thematic clusters and linkages.

Results

The combined quantitative and qualitative findings revealed trends and relationships among knowledge, social validity, preparation, and implementation of EBPs within the sample of novice teachers. Descriptive, inferential, and thematic results are reported in the following.

Knowledge and Use of EBPs

Participants indicated having at least a good understanding of a median of eight EBPs. At either extreme, only four participants (3%) were not knowledgeable about any EBPs, while 22 (16%) reported having a good amount of knowledge about all 12 EBPs. The median number of EBPs a teacher used at least once per day was six EBPs.

See Table 2 for the percentage of participants reporting knowledge and daily use of each EBP. Most participants had at least heard of most EBPs. Nearly all EBPs were used at least occasionally, although more than one quarter of participants reported never using each of three EBPs (i.e., Picture Exchange Communication System [PECS], technology-aided instruction and interventions [TAII], and peer-based instruction and interventions [PBII]).

Social Validity of EBPs

A combined social validity variable was calculated by averaging the respondent's ratings of six social validity items. One item was reverse coded. The scale exhibited an appropriate level of internal consistency ($\alpha = .83$) to represent social validity as a single construct. The scale comprised a 6-point range, with ratings between 1 and 3 representing *negative responses* to the social validity statements and ratings between 4 and 6 indicating *positive responses*.

The mean social validity rating for all practices fell above 4, indicating an overall positive evaluation. Means on the combined scale of social validity ranged from 4.26 (video

Table 2. Respondents' Levels of Knowledge and Use of Evidence-Based Practices.

	Good or great deal of knowledge	Uses at least once per day
Evidence-based practice	% (*n*)	% (*n*)
Reinforcement (R)	89.8 (123)	83.2 (114)
Visual schedules (VS)	88.3 (121)	78.1 (107)
Modeling (M)	86.9 (119)	86.1 (118)
Prompting (P)	83.9 (115)	86.9 (119)
Social narratives (SN)	71.5% (98)	38.0% (52)
Antecedent-based interventions (ABI)	70.1% (96)	41.6% (57)
Time delay (TD)	58.4 (80)	43.1 (59)
Video modeling (VM)	56.9 (78)	27.0 (37)
Discrete trial training (DTT)	54.0 (74)	25.5 (35)
Peer-based instruction and interventions (PBII)	53.3 (73)	26.3 (36)
Technology-aided instruction and interventions (TAII)	50.4 (69)	47.4 (65)
Picture Exchange Communication System (PECS)	48.2 (66)	33.6 (46)

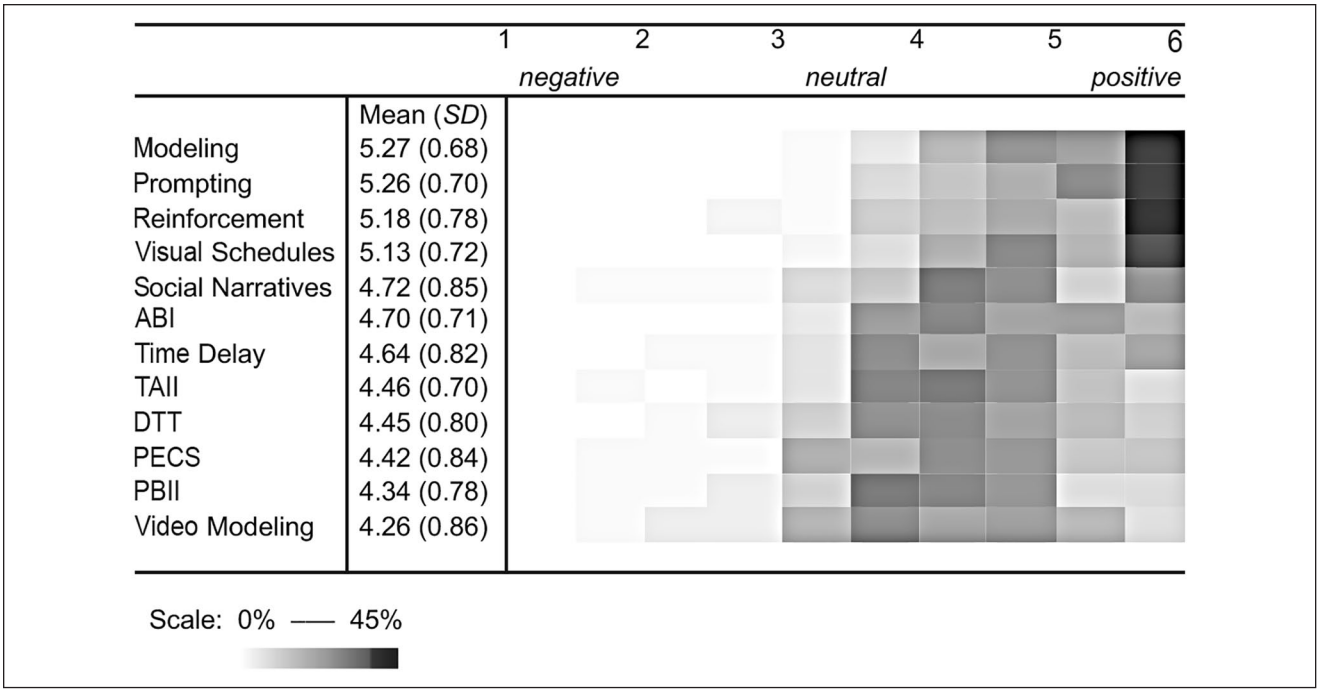

Figure 1. Social Validity Heat Map.
Note. ABI = antecedent-based interventions; TAII = technology-aided instruction and interventions; DTT = discrete trial training; PECS = Picture Exchange Communication System; PBII = peer-based instruction and interventions.

modeling) to 5.27 (modeling). With standard deviations ranging from 0.68 to 0.86, variability was evident in social validity across individuals. The heat map in Figure 1 provides a visual depiction of the distribution of social validity ratings for each EBP, with darker colors representing a higher percentage of participants rating the EBP at that level. Most ratings fell into the right half of the chart, with modeling, prompting, reinforcement, and visual schedules displaying a markedly high concentration of ratings at the most positive level.

Training Experiences

Participants reported the extent to which they learned about autism, research methods, and EBPs during their preparation and training. Thirty-seven percent of respondents had taken one or more courses specifically focused on autism during their teacher preparation program and 18% had completed either an autism minor or certificate program. Eighty percent had completed a course on educational research. Across all EBPs, teacher preparation was the most selected primary

Table 3. Predictors of Evidence-Based Practice Knowledge, Social Validity, and Use.

	Knowledge			Social validity			Frequency of use		
Predictor	OR	*SE*	*p*	Coef	*SE*	*p*	OR	*SE*	*p*
Knowledge	—	—	—	0.23	0.03	**.000**	3.22	0.43	**.000**
Social validity	—	—	—	—	—	—	3.12	0.42	**.000**
Frequency of use	—	—	—	0.21	0.02	**.000**	—	—	—
Grade level[a]	0.87	0.23	.592	–0.11	0.08	.150	0.90	0.19	.620
Classroom type[b]	1.89	0.57	**.034**	0.06	0.09	.531	1.32	0.31	.234
Initial preparation program type[c]	1.44	0.50	.295	0.04	0.10	.714	1.19	0.32	.526
Licensure area[d]									
Adapted/severe	2.11	0.74	**.033**	0.01	0.10	.954	0.77	0.20	.306
Categorical	2.30	1.08	.077	–0.05	0.14	.708	1.10	0.39	.786
Autism specialization[e]									
Autism course	2.51	0.87	**.008**	0.00	0.10	.971	0.67	0.17	.110
Autism minor/certificate	1.73	0.66	.154	–0.24	0.11	**.030**	1.66	0.47	.072
Research course	1.47	0.48	.246	–0.20	0.10	**.047**	1.86	0.50	**.021**
EBP learned in teacher prep	1.78	0.32	**.001**	–0.08	0.04	.057	0.84	0.15	.326

Note. OR = odds ratio; EBP = evidence-based practices.
[a]1 = elementary, 2 = secondary. [b]1 = resource/inclusion, 2 = separate classroom/school. [c]1 = traditional (BA or MAT), 2 = alternative. [d]reference category = general curriculum. [e]reference category = none.
$p < .05$ values appear in bold.

training type (44.2%). A quarter of respondents identified "peer coaching" as their primary mode of learning about an EBP. Seventeen percent learned the practice in a workshop and 13% indicated they were "self-taught" through books, articles, or web-based information.

Predictors of Knowledge, Use, and Social Validity

Mixed-effect regression models were constructed to determine significant predictors of knowledge, use, and social validity across all EBPs (see Table 3). After controlling for state, these models used seven fixed effects of the potential predictors with a crossed random effect for each EBP crossed with each participant. Due to violations of the proportional odds assumption for ordered logistic regression, knowledge was collapsed to a binary dependent variable of *low* and *high* knowledge. Frequency of use was collapsed to a binary dependent variable of *less than daily* and *at least daily* use. Social validity score was a continuous dependent variable. No multicollinearity was detected among independent variables using variance inflation factors.

Four significant predictors of high knowledge of an EBP emerged: (a) teaching in a separate special education setting, (b) holding adapted/severe disabilities licensure, (c) having taken an autism course, and (d) having learned about the EBP during a teacher preparation program.

Participants were more likely to use an EBP daily if they reported greater knowledge of the EBP or higher ratings of its social validity. Completing a course in research methods was also significantly predictive of daily use.

Across EBPs, greater knowledge and more frequent use were associated with higher ratings of social validity by participants. Conversely, earning an autism minor or certificate or having taken a research course were predictive of *lower* ratings of an EBP's social validity.

Qualitative Themes

As previously outlined, the 10 interviews were recorded, transcribed, and coded using constant comparative analysis techniques. Brief profiles of each interviewee appear in Table 4. The coding process resulted in the identification of five primary themes representing common drivers of and barriers to implementation.

Implementation Is Knowledge-Dependent. Eight interviewees cited their unfamiliarity with an EBP as a primary reason for their lack of implementation. When discussing the practices she rarely or never used, a teacher expressed, "I haven't really heard of many of them, or I don't have enough information to, kind of, successfully provide to my students" [T10]. Some interviewees had no frame of reference for some EBPs, whereas others had a general understanding but did not know *how* to implement the EBP fully. One middle school resource teacher further implicated a lack of preparation in her response: "I just don't know much about it [PECS] or have any training in it" [T7]. Mirroring the six EBPs with the lowest rates of knowledge among the survey sample, multiple interviewees directly voiced unfamiliarity with DTT, PBII, video modeling, time delay, TAII, and PECS.

Table 4. Interviewees' Demographic and Professional Characteristics.

ID	State	Teaching context	Initial preparation program type	Years teaching	Age in years	Race/ethnicity/gender
T1	1	Elementary inclusion	Master's degree	1	30	Black woman
T2	1	Elementary resource	Bachelor's degree	2	25	White man
T3	2	Elementary separate class	Bachelor's degree	2	24	White woman
T4	2	Elementary separate class	Master's degree	2	25	Hispanic man
T5	1	Elementary separate school	Alternative licensure	2	27	White woman
T6	1	Middle school inclusion	Alternative licensure	3	34	White woman
T7	1	Middle school resource	Bachelor's degree	3	26	White/Hispanic woman
T8	1	Middle school resource	Alternative licensure	3	32	White woman
T9	1	High school resource	Bachelor's degree	3	28	White woman
T10	2	High school separate class	Bachelor's degree	1	23	White woman

Implementation Is Goal-Directed. When discussing their use of EBPs, all 10 interviewees invoked at least one specific student outcome as being effectively addressed by one or more EBPs. Four described addressing challenging behaviors using EBPs such as reinforcement, modeling, and antecedent-based interventions. Others expressed the alignment of EBPs with teaching social skills, executive functioning skills, communication, and activities of daily living. For example, two secondary-level teachers described visual schedules as a particularly valuable tool for transition-related goals. Several teachers spoke at length about their use of social narratives to prepare students for novel situations or changes in routine. Social narratives were also twice endorsed for preparing students for emergency drills and specifically referenced as a tool to support students' return to in-person learning following the shift to virtual instruction during the COVID-19 pandemic.

Interviewees connected EBPs to academic goals less frequently. One teacher was a board-certified behavior analyst (BCBA) but perceived a lack of alignment between school-based goals and DTT specifically. He stated, "I think with what teachers are oftentimes asked to teach, it doesn't quite lend itself as well to like a DTT program" [T2]. A teacher of students with significant support needs in a separate special education school spoke the most about using EBPs in academic instruction, including modeling sentence structure and using time delay to teach vocabulary. Teachers in less restrictive classroom settings seemed to emphasize using EBPs primarily for behavioral, functional, and social goals with less application to academic outcomes.

Implementation Is Student-Centered. Teachers also discussed implementing EBPs based on specific student characteristics or needs. One summarized this differentiated use with, "it really depends on the kids" [T6]. Students' levels of functioning, cognitive ability, verbal skills, attention spans, and interests were all noted as considerations. For example, three interviewees felt that relying on peers to provide instruction using PBII would be difficult for their students with more significant support needs. TAII was mentioned by two teachers as a motivating strategy for students interested in technology. Multiple interviewees expressed not needing to use PECS due to exclusively teaching students who used verbal communication. Notably, teachers did not conceptualize EBPs as only appropriate for students in one grade range or educational setting, but instead made their decisions based on the unique, individualized needs of their students.

Implementation Is Individually Evaluated. Interviewees frequently provided subjective appraisals of EBPs, many of which mirrored aspects of social validity. This personal evaluation process included judgments of feasibility, relative advantage, and generalizability.

Teachers valued EBPs they viewed as "easy for me to implement" [T7]. More specifically, interviewees referenced having limited time to create materials, train peers or paraprofessionals, or deliver one-on-one instruction. One described creating video models as "time-consuming" [T2] and another noted, "a lot of them require so many materials to be made that it can make it difficult" [T5]. No participants mentioned financial barriers. Aspects of feasibility also often drove teachers' determination of one EBP's advantage over another. Two interviewees described preferring to use "regular" modeling as opposed to more resource-intensive video modeling. Despite working primarily in inclusive general education settings, one middle school teacher elected to use more teacher-driven strategies over PBII because "it's a lot of effort on my point to teach a peer how to deal with them [autistic students] for an instructional purpose" [T6].

These teachers were most enthusiastic about using practices they viewed as generalizable across students and contexts. Positive behavior supports, such as reinforcement, prompting, modeling, and antecedent-based interventions, were described as "basic classroom management" [T9] and "a natural part of teaching" [T7]. Visual schedules were also valued as a fundamental component of classroom structure. Similarly, teachers serving caseloads of students with varied disabilities viewed EBPs, namely, positive behavior

supports, visual schedules, and social narratives, as broadly applicable for "any student . . . not just students with autism" [T10]. Six of the 10 interviewees voiced a similar belief that EBPs designated for use with students with autism also benefit others.

Implementation Is Inconsistently Supported. Finally, teachers shared a wide variety of preservice and in-service training and support, highlighting the inconsistent and often self-directed nature of learning about EBPs. None of the teachers strongly endorsed their teacher preparation program as a primary source of training in EBPs. One lamented that her dual licensure bachelor's degree program leading to certification in both elementary and special education felt like a "catch-all" [T7], without an opportunity to specialize in autism or any other area. Other appraisals of preparation programs' coverage of EBPs included "a little bit of information" [T10] and "not a whole lot" [T3] in undergraduate programs and "it's not even talked about" [T8] in an alternative licensure program.

In-service professional development was similarly variable, with positive experiences serving to close the preparation gap for some, but not all, teachers. Trainings were frequently characterized as generic or basic. As a second-year elementary teacher shared, "a lot of it's been stuff that we kind of already know, and kind of more general and broad" [T3]. The most beneficial professional development opportunities were accessed through external organizations, including universities, Autism Society chapters, local service providers, and TEACCH. The one interviewee who taught in a separate special education school described the most comprehensive training and support provided directly by their school.

Finally, these novice teachers were motivated to continue learning but all too often felt on their own to do so. Less than 4 years after receiving their initial teaching certification, five of the 10 teachers were enrolled in or had completed a master's degree, BCBA certification, or autism endorsement. More informally, interviewees described learning from experienced teachers, speech-language pathologists, and applied behavior analysis (ABA) therapists. They also referred to independently accessing educational resources. A second-year teacher expressed, "a lot of it's just been kind of me, my own initiative, going out, doing some research" [T3], a self-directed approach echoed throughout the interviews. Teachers mostly described acquiring information online, with specific references made to Pinterest, resources available on the Autism Speaks website (https://autismspeaks.org), and training modules from the Autism Focused Intervention Resources and Modules (AFIRM) website (https://afirm.fpg.unc.edu).

Discussion

This study was designed to connect elements of novice teachers' preparation and perception to their implementation of EBPs. The survey results revealed variation in teachers' use of different EBPs although knowledge and social validity emerged as important precursors to implementation. Taken together, the quantitative and qualitative findings highlight the highly personalized nature of teachers' implementation decisions.

Current State of Implementation

The survey findings were congruous with previous research establishing teachers' frequent use of prompting, modeling, reinforcement, and visual schedules (Knight et al., 2019; McNeill, 2019). This sample of novice teachers reported a distinct difference in implementation between these four EBPs and the other eight practices surveyed, suggesting an early focus on using such foundational practices. This may be due to their alignment with theoretical frameworks commonly adopted by special education preparation programs, such as ABA and positive behavior support (Barnhill et al., 2014), and/or to the practices' utility to classroom management beyond the population of students with autism (Hsiao & Sorensen Petersen, 2019).

The use of the same measurement scales as a previous survey of special educators at all experience levels (McNeill, 2019) allowed direct comparison between the two samples. In general, our novice teachers reported having less knowledge of all 12 EBPs. However, their mean social validity ratings were higher than the broader sample for all EBPs except TAII and PECS. These differences indicate that novice teachers may only hold more positive views of EBPs but simultaneously have lower confidence in their own understanding. Comparisons of social validity ratings across EBPs were remarkably similar to previous findings. These results again confirm the most positive perceptions of visual schedules and foundational behavioral practices and less favorable views of DTT, video modeling, and PBII (McNeill, 2019). Nevertheless, our novice teachers' overall acceptance of EBPs as evidenced by generally positive social validity ratings is promising for the future of EBP implementation in special education.

When compared with McNeill's (2019) sample of teachers at all experience levels, a greater proportion of the novice teachers in this study reported daily implementation of six specific EBPs (i.e., visual schedules, modeling, antecedent-based interventions, time delay, video modeling, and PBII). They also reported more daily use of EBPs in general than Knight et al.'s (2019) sample of 535 special educators. If, as the direction of research findings from the past decade (Knight et al., 2019; McNeill, 2019; Morrier et al., 2011) suggests, more teachers are using EBPs consistently *and* teachers are embracing EBPs early in their careers; hence, the access to evidence-based instruction for autistic students appears to be on a positive path forward.

Role of Social Validity

Establishing positive perceptions of EBPs is essential to improving implementation as demonstrated by the significant association between social validity and daily use. It is important to note that the relationship between social validity and use was bidirectional. That is, teachers were more likely to use EBPs they viewed as more socially valid, but also rated an EBP as more socially valid if they used it regularly. Teachers may buy into the abstract idea of an EBP and then decide to use it in their own teaching practice based on their belief that it will be feasible, appropriate, or effective. On the contrary, teachers may begin using an EBP for reasons other than personal approval, such as a course assignment or an administrative requirement. These teachers may develop a positive perception of an EBP's social validity over time as a result of continued experience using it in practice. Therefore, encouraging conceptual buy-in *and* providing opportunities for applied practice should be viewed as mutually reinforcing approaches with great potential to improve overall implementation.

The qualitative data expanded upon the survey instrument's conceptualization of social validity. The survey quantified an EBP's social validity through its perceived utility for meeting student needs, its procedural complexity and resource intensity, administrative approval, and the teacher's overall enthusiasm about the practice. However, interviewed teachers further described decision-making factors such as weighing the relative advantage of one practice over another and assessing the ability to generalize an EBP across varied students, settings, and goals. These qualitative results illustrate the complexity of social validity beyond simple consumer satisfaction (Leko, 2014). Rather than professing a one-dimensional opinion of "liking" or "disliking" an EBP, participants developed highly personalized judgments of acceptability and feasibility that were fundamentally connected to their individual context, resource availability, and students.

Complex Role of Preparation

Preservice preparation primarily affected implementation indirectly as mediated by knowledge. For instance, although learning about an EBP primarily during teacher preparation contributed to knowledge levels, it was not independently predictive of daily implementation. This supports the notion that teachers will implement the EBPs with which they are most familiar, whether that knowledge is gained from preservice or in-service training (McNeill, 2019). The completion of a research course, however, was associated with daily use of EBPs. Perhaps taking such a course served to "demystify" research, improving preservice candidates' ability to interpret and apply the evidence as informed consumers of research. The inclusion of a research course could also be a barometer of a preparation program's overall philosophical orientation. In other words, these programs may prioritize inquiry skills and integrate research, including EBPs, across their curriculum.

Alternatively, completion of a research course was negatively associated with social validity, as was earning an autism minor or certificate. These relationships were unexpected, as autism specialization and research training in the preservice period are generally viewed as positive elements of preparation (Scheeler et al., 2016). Specialized programs such as minors or certificates can be highly variable due to a lack of comprehensive guidelines or standard competencies, making programs difficult to compare (Barnhill et al., 2011). It is possible that special education programs offering autism minors or certificates are less cohesive, presenting autism as a standalone issue. With qualitative data highlighting the importance of viewing EBPs as generalizable to other student populations, this segmentation of preparation may harm social validity perceptions.

The lower social validity ratings by teachers who had completed a course on educational research are even more surprising because these teachers were ultimately more likely to use EBPs daily. Perhaps these teachers had built more of a critical stance on research and EBPs through their preparatory experiences (Harrison et al., 2006), leading to greater discernment in their ratings of acceptability and feasibility. It should be noted, however, that all EBPs were rated positively on the social validity scale by more than three fourths of survey respondents, with eight EBPs rated positively by more than 90% of teachers. Therefore, most of the variance in ratings exists between neutral opinions and the most positive opinions. *Less positive* ratings by teachers with specific preparatory experiences should not be misconstrued as evidence of *poor* social validity.

Implications for Teacher Preparation

With autistic students now making up the fourth-largest category of students receiving special education services (Hussar et al., 2020), *all* special educators are likely to teach at least one student on the autism spectrum. They must be prepared to do so with effective, evidence-based strategies. The 12 EBPs used in this study are uniquely valuable in their evidence of effectiveness for students with autism across ages and skill domains (Hume et al., 2021). With an expansive research base supporting EBPs that address the unique patterns of strengths and needs characterized by autism, preparation programs must develop educators who rely on this evidence in their instructional decision-making. Initial preparation programs should integrate autism-related content and EBPs throughout the full range of coursework, ensuring all candidates are equipped with the knowledge of and buy-in to these practices. Field

experiences can also be leveraged to increase preservice teachers' opportunities to practice using EBPs. However, cooperating teachers, most of whom were likely trained before the EBP movement, must be carefully chosen and supported to effectively model and coach preservice teachers in EBP implementation.

Ultimately, special educator preparation programs exhibit a high potential to proactively bridge research and practice. EBP implementation can be hindered when veteran teachers value tradition over research (Cook & Cook, 2013). Making evidence the norm in preservice teachers' training, however, promotes the growth of a teacher workforce for whom EBP *is* the tradition.

Study Limitations

In designing and implementing this study, efforts were made to ensure generalizable results within the population and to limit measurement error. The global COVID-19 pandemic introduced some unavoidable obstacles to quantitative data collection. School research moratoriums coupled with increased demands on teachers' time during school building closures affected recruitment and sample size. However, the survey sample was broadly representative of novice teachers in the two surveyed states, with balanced demographics, professional contexts, and preparatory experiences. A second limitation arising from COVID-19 school building closures was the collection of data on teachers' EBP use during the previous school year. Retrospective reporting introduced potential measurement error but was necessary to collect data representative of the provision of EBPs during typical in-person instruction.

Because of the survey sample size, some individual variable categories represented very low proportions of respondents. This was most evident in elements of preparation, such as a small number of participants holding an autism minor or certificate. With this sample's limited geographic range, these groups may represent graduates of only a few preparation programs, which could have other similarities not measured by the survey. Finally, the knowledge rating scale was self-reported and therefore does not represent an objective measurement of knowledge. Observations or other objective measures of understanding were beyond the scope of this study and the knowledge ratings must be interpreted as a subjective construct.

Future Research

Continued research should capitalize on the wisdom of teachers themselves as experts in the realities of teaching. The participants in this study clearly had unique expertise in the complex considerations related to using EBPs in authentic contexts. In addition to contributing to broad investigations of teaching practices, teachers can contribute valuable insights to research studies involving the design, adaptation, and evaluation of EBPs in context (Parsons et al., 2013; Stahmer et al., 2012). These mutually beneficial partnerships can concurrently serve as effective dissemination of research to practitioners and as meaningful opportunities for researchers to understand the "real worlds" of teachers and students.

Additional research is also needed to understand the most effective techniques for teaching EBPs during preservice training. For example, because teachers who learned about an EBP during their teacher preparation program reported greater knowledge than teachers who did not, researchers should explore the efficacy of the methods and resources employed by preparation programs to teach about EBPs. Longitudinal study would also support an understanding of how teachers' knowledge and beliefs change over the course of their preparation. Administering social validity measurements at multiple time points during the preservice period could pinpoint the effects of specific courses or field experiences on EBP buy-in.

Conclusion

This research contributes to a growing body of evidence suggesting that teachers' EBP implementation relies on subjective judgments that are shaped, at least in part, by their preparatory experiences and their individual circumstances. What teachers choose to do in their classrooms stems from what they know, what they value, and what contexts they work within. Narrowing, and eventually closing, the research-to-practice gap will require a holistic approach to cultivating not only teachers' capacity for implementing EBPs but also their overall commitment to using practices with strong evidence of effectiveness. Furthermore, building these habits of mind and foundations of knowledge early, during the preservice period, has the power to prevent the gap from ever appearing at all.

Note

1. We acknowledge the complexity of language related to autism; the strong, often polarizing, beliefs about person-first and identity-first language; and the lack of consensus among autistic people, people with autism, families, and professionals in the field (Kenny et al., 2016). In this article, we have adopted Robison's (2019) stance that "autism is a highly heterogeneous condition, and the proper descriptive language is heterogeneous too" (p. 1006) and therefore use the phrases "on the autism spectrum," "autistic," and "with autism" interchangeably throughout.

Authors' Note

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