Implementing Augmentative and Alternative Communication in Inclusive Educational Settings: A Case Study

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The purpose of this study was to describe a single case of augmentative and alternative communication (AAC) implementation. Case study methodology was used to describe the perspectives of educational team members regarding AAC implementation for Joey, a high school junior with athetoid cerebral palsy. Benefits included greater intelligibility for Joey and subsequent comfort of the staff. Facilitators of Joey's AAC system use included the team's student-focused disposition and willingness to implement use of the device, Joey's increased intelligibility, peers' acceptance of the technology, and the resulting increase in Joey's socialization. Limited team cohesiveness, problem solving, and communication were the true barriers in this case. Implications of these facilitators and barriers are discussed and recommendations for school-based AAC implementation are made.

Keywords: AAC; Case study; Inclusive settings; Cerebral palsy; Educational AAC teams

INTRODUCTION

Individuals with complex communication needs often require use of assistive technologies (AT) such as augmentative and alternative communication (AAC) systems. One type of AAC system commonly used is a high-tech device called a voice-output communication aid (VOCA). A VOCA requires users to make communication selections by either choosing graphic symbols or typing words, phrases, or sentences that are then produced by an electronic speech output device (Son, Sigafos, O'Reilly, & Lancioni, 2006). A major benefit of high-tech devices is that the audible messages produced may be understood by a wider variety of communication partners. When selecting AAC devices for individuals with complex communication needs, factors such as the user’s physical and cognitive abilities, the device’s symbol system, environments in which communication will occur, social relationships among the communication partners, and purposes of interactions, must be considered (Blackstone, Williams, & Wilkins, 2007). AAC systems are often purchased with high hopes for use by individuals with complex communication needs, but are later abandoned or not used to their full potential. One factor in technological abandonment is a lack of training in how to implement AAC systems (Murphy, Markova, Collins, & Moodie, 1996). Most pre-service and in-service professional development focuses on assessment and training of AAC users, while little instruction is provided in AT services (Bausch, Ault, Evmenova, & Behrmann, 2008), including for the use of AAC systems in educational environments (Williams, Krezman, & McNaughton, 2008).

Persons with complex communication needs often need individualized accommodations designed to facilitate the use of their AAC systems to access the general education curriculum and to meet their communication needs in and beyond classroom environments. Effective accommodations and strategies that support student success with AAC systems have been described in the literature (e.g., Bailey, Parette, Stoner, Angell, & Carroll, 2006; Hunt, Soto, Maier, & Doering, 2003; McNaughton et al., 2008). Implementation of an individual’s AAC system within a classroom setting should focus on both the individual and...
his or her potential communication partners. Consideration of communication aspects such as voice output intelligibility, rate of speech, volume, proximity to communication partners, and message content involves assessing the needs of individuals with complex communication needs and their communication partners in their communication settings.

The importance of teaming roles and responsibilities related to AAC selection and implementation in education settings must be emphasized. Teams must manage many issues as they facilitate AAC system use, including a wide range of familial, cultural, and environmental factors inherent to AAC system implementation (Huer, 1997; Parette, Huer, & Brotherson, 2001; Parette, VanBiervliet, & Hourcade, 2000). Team members’ diverse roles and responsibilities must also be well defined (American Speech-Language-Hearing Association, 2005; Ehren, 2000; Locke & Mirenda, 1992; Parette & Marr, 1997; Prelock, 2000). Much of the professional literature has focused on team participation during the AT assessment process (Beukelman & Mirenda, 2005; Parette, Brotherson, & Huer, 2000) and at the primary school level (Goetz, Hunt, & Soto, 2002; Hunt, et al., 2003; Hunt, Soto, & Maier, 2004; Hunt, Soto, Maier, Liboiron, & Bae, 2004; Soto, Müller, Hunt, & Goetz, 2001a). Fewer studies focus on AT services or implementation in middle and secondary education settings (Bailey, Stoner, Parette, & Angell, 2006; Bausch et al., 2008; Sevcik & Romski, 1995). It is clear that student success depends on the team’s ability to communicate effectively and act quickly to resolve implementation challenges. Soto and colleagues described 13 indicators of success for students who use AAC in inclusive school settings: (a) ownership of the student by the general educator, (b) collaborative teaming, (c) appropriate training, (d) presence of an effective instructional assistant, (e) natural supports from classmates, (f) social interaction between the focus student and peers, (g) academic participation by the focus student, (h) successful use of the device, (i) supports and services in place, (j) focus-student membership and belonging, (k) classroom structure that supports the learning and participation of a heterogeneous classroom, (l) philosophical support of inclusive education at the school district level, and (m) adequate classroom support. There are a few published studies that provide indicators of success for AAC users in inclusive educational settings, describe effective collaborative team strategies, and investigate teaming processes for preschoolers and students in primary school (Hunt et al., 2003; Hunt et al., 2004; Soto, Müller, Hunt, & Goetz, 2001b). However, little research has described AAC implementation in inclusive high school settings. What happens once an AAC system is provided to an AAC user in an inclusive high school setting? The purpose of the current study was to investigate a single case of AAC implementation in an inclusive high school setting. Case study methodology was used to describe the perspectives of educational team members regarding AAC implementation for a high school junior.

METHOD

Participants

Focus student

The focus student, Joey, was a 16-year-old male with a medical diagnosis of extra pyramidal/athetoid cerebral palsy, characterized by strong dyskinetic, athetoid, and ataxia movements and increased tone and spasticity. Joey had decreased fine-motor skills and impaired oral-motor movements, resulting in poor speech intelligibility estimated during an independent evaluation at “60% intelligible to the careful, unfamiliar listener.” All evaluation reports estimated Joey’s cognitive skills as above average and his reading and math skills at grade level.

Joey had received speech therapy and had been exposed to a variety of types of AT since Kindergarten. It is important to note that early, consistent incorporation of AT was evident from Kindergarten and continued through high school. AT goals were primarily written by the schools’ occupational therapists (OTs); however, special education teachers had occasionally written AT goals during the course of Joey’s school years. His speech goals were written exclusively by speech-language pathologists (SLPs). Joey’s speech therapy had focused on improving articulation, increasing his ability to monitor his own intelligibility and assess listener understanding, and implementing conversational repair strategies, which are “communicative acts that make un- clearly communicated messages better understood” (Stockman, Karasinski, & Guillory, 2008, p. 461). Joey’s preferred mode of communication was verbal speech, and although his speech intelligibility was poor, he consistently used repair strategies such as repetition, over-articulation, and reduced rate when his listeners did not understand. Joey was highly proficient in computer and calculator use, and had developed strong technological problem-solving skills.

We interviewed Joey prior to AAC implementation and noted that either he repaired unintelligible answers or the interviewer clarified them.
His answers to questions about AT were brief, but he indicated excitement and confidence in his ability to operate the Dynawrite™. His experience and confidence with AT was evident when we asked how long it took him to learn a new software program and he replied, "About 5 minutes because I'm used to it [AT]."

Joey was fully included in general education classrooms for all academic subjects. During the case study year, his academic courses included advanced biology and English, math, French, and history. Joey received academic support within his classes from a special education teacher or teaching assistant. Physical therapy, occupational therapy, and speech-language therapy were provided individually, in a separate therapy room. He and four other students with physical disabilities also received instruction from a special education teacher in a separate room for one class period (60 min) per day. This time was devoted to organizing and completing homework assignments and finishing exams that were not completed in the larger class.

Joey had strong social skills. He interacted frequently with his peers and served as a team manager for his high school basketball team. In this role, he attended all practices, games, and tournaments. Several times at school we observed his fellow students greeting him in the hall, joking with him in passing, and being generally interactive and friendly with him. Formal reports throughout his school career indicated that Joey was a delight to have in class, worked well with his peers, and was cooperative in all learning activities.

Joey’s family (mother, father, and older sister) actively supported him. Both parents were professionals and employed full time. Joey’s mother was especially aware of his academic program, monitored and supported his homework and studying, and kept in constant contact with his special education teacher. She was the parent who was more involved at informal team meetings, although Joey’s father was present at all Individual Educational Plan (IEP) team meetings. His sister assisted with homework at times and an uncle tutored him in math as needed. Joey’s family consistently advocated for him throughout school. His parents insisted that he attend his neighborhood school rather than being bussed to a regional school. They closely monitored and supported his academic work and encouraged his involvement in extracurricular activities.

**Educational staff**

Educational staff members who participated in this case study were (a) the SLP, (b) the special education teacher, (c) the teaching assistant, and (d) three general education teachers. To protect all participants’ privacy, including Joey’s, we asked Joey to assign pseudonyms. The SLP, Ms Maria Kirk, was recently hired, had recently completed her university coursework, and was completing a required year of clinical fellowship during the study. The special education teacher, Ms Jennifer Brown, had 14 years of experience, but this was her first year working with high school students whose primary disability was physical impairment. The teaching assistant, Ms Jane Carson, had been Joey’s primary classroom assistant for the past 2 years.

The general education high school staff had different levels of expertise with respect to working with students with physical disabilities (see Table 1). Ms Barb Smith, the history teacher, had taught Joey at the middle school before transferring to the high school and was familiar with the needs of and accommodations for students with physical disabilities. Mr Kevin Vine, the biology teacher, and Ms Amy Duncan, the English teacher, had no previous experience with students with physical disabilities. Each general education teacher, the special education teacher, the teaching assistant, and the SLP were interviewed twice, once before Dynawrite implementation and 12 weeks later, at the end of the semester.

**Therapy staff**

Occupational therapy, physical therapy, and speech support services were provided by therapists from an external agency contracted with the special education association that had provided special education and related services for Joey since kindergarten. The school occupational therapist (OT) had worked with Joey since his entrance into kindergarten, and the PT had worked with Joey for the previous 3 years. Joey received OT and PT in a room outside the general education classroom and did not use the Dynawrite when with these therapists. Consequently, the OT and PT were not directly involved in the research, other than to confirm background information on Joey’s previous experience with AT and/or describe their perceptions of his current AT skills. Both therapists had lengthy, strong, working relationships with Joey and his parents.

**Role of the consultant**

The lead researcher had been a consultant to Joey’s parents during the school year prior to the research. Several changes had been made after weekly and bi-weekly meetings of the IEP team,
which included the parents and the consultant. These changes included (a) IEP revisions that primarily focused on developing appropriate and acceptable accommodations for Joey; (b) agreement regarding levels of support for Joey in general education classrooms; and (c) a different special education teacher for Joey for the project year. During the research year, the consultant met with Joey’s IEP team approximately twice a month and primarily monitored IEP team activities that were focused on instructional accommodations to support Joey’s academic needs. The consultant purposely refrained from involvement in Joey’s or the team’s Dynawrite implementation, other than to be available if assistance was requested. The reason for this purposeful non-involvement was twofold: (a) Joey and the IEP team indicated a high comfort level with the operation of the Dynawrite, and (b) the lead researcher’s noninvolvement provided a more objective opportunity to study IEP team implementation as it naturally occurred. Joey’s IEP team had no official meeting times, other than those which the consultant initiated and scheduled before the school day began to discuss Joey’s academic progress. Therefore, we researchers developed a case study in which the Dynawrite was recommended and attained, but Joey’s IEP team had full control of its use and did not request assistance from the lead researcher.

We conducted this case study at Joey’s high school, located in a Midwestern city in the USA of approximately 175,000 people and which served 1368 students. Joey had been fully included in his public school district since kindergarten. During his elementary and middle school years, he did not attend his home district schools due to physical accessibility issues; programs for children with physical disabilities were provided at schools that were more accessible. However, at the high school level, his parents insisted that Joey attend his neighborhood school. He and four peers with physical disabilities began attending their local high school as freshmen (i.e., first year of high school).

At the end of Joey’s freshman year, the lead researcher had been hired by Joey’s parents to serve as educational consultant. Several difficulties related to Joey’s inclusion in the high school’s general education program had prompted the family to seek outside assistance. Many of the issues centered on a lack of or inconsistent use of IEP-recommended accommodations and modifications to support Joey’s academic progress in general education settings.

### Table 1: Demographic Information for Educational Staff

<table>
<thead>
<tr>
<th>Staff member</th>
<th>Experience</th>
<th>Involvement with Joey</th>
<th>AAC experience</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maria Kirk, SLP²</td>
<td>First year (completing clinical fellowship) No previous experience with students with disabilities</td>
<td>Pull-out therapy, 30 min/wk</td>
<td>College courses</td>
<td>²SLP = Speech-language pathologist.</td>
</tr>
<tr>
<td>Jennifer Brown, SEA³</td>
<td>14 years; first year in high school setting 4 years supporting children with physical disabilities</td>
<td>Responsible for all academic adaptations and modifications; support during biology and English classes, and study hall</td>
<td>³Training in Alpha Talker™</td>
<td>³SEA = Special Education Assistant.</td>
</tr>
<tr>
<td>Jane Carson, TA⁴</td>
<td>2 years; both spent assisting students with physical disabilities in special education program at Joey’s high school</td>
<td>Support during algebra, French, and history classes</td>
<td>None</td>
<td>⁴TA = Teaching Assistant.</td>
</tr>
<tr>
<td>Barb Smith, history teacher</td>
<td>10 years Supported students with physical disabilities in previous placement</td>
<td>Classroom teacher for one class period</td>
<td>None</td>
<td>⁵Alpha Talker is a trademark of Prentke-Romich, located in Wooster, CT.</td>
</tr>
<tr>
<td>Kevin Vine, biology teacher</td>
<td>6 years No experience with students with physical disabilities</td>
<td>Classroom teacher for one class period</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Anne Duncan, English teacher</td>
<td>First year No experience with students with physical disabilities</td>
<td>Classroom teacher for one class period</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

1Experience includes number of years of work experience within the staff member’s profession and type of experience the staff member has with students with disabilities. 2SLP = Speech-language pathologist. ³SEA = Special Education Assistant. ⁴TA = Teaching Assistant. ⁵Alpha Talker is a trademark of Prentke-Romich, located in Wooster, CT.
educational consultant was to ensure that Joey was obtaining appropriate access to instructional materials, receiving required assistance in his classrooms, and that Joey’s IEP was being implemented with integrity.

During the course of her consultation with Joey’s IEP team, the lead researcher found that a Dynawrite had been previously recommended for Joey, following an AAC evaluation, through a private SLP consultant. This recommendation was based on several factors, including Joey’s physical and cognitive characteristics. During the spring semester of Joey’s sophomore (second) year, the lead researcher contacted a Dynavox Mayer-Johnson representative; obtained a Dynawrite on loan; and approached the representative, Joey’s parents, and the school district to initiate the current case study.

Gaining Access and Team Interactions

By the time this case study began, family-school tensions had been reduced and Joey was entering his junior (third) year of high school. The educational team, including new staff members (specifically, a special education teacher and an SLP), voiced a willingness to engage in renewed efforts to benefit Joey’s academic progress in his general education classes. The lead researcher approached the school district’s and local university’s Institutional Review Boards (IRBs), Joey’s parents, Joey, the Dynavox Mayer-Johnson representative, and selected school district administrators and staff to explain the case study’s purpose and protocol. Approval by the IRBs, the school district, and the individual participants’ was obtained prior to beginning the study.

Prior to the hiring of the consultant, Joey’s IEP team (special education coordinator, special education teacher, SLP, OT, PT, and Joey’s parents) had not had team meetings other than for annual IEP reviews. There was no school structure to support collaborative teaching, no time allocated for team meetings other than during annual IEP reviews, no identification of team roles and responsibilities, and no leadership that required or supported team meetings. Formal team meetings requested by the consultant did not include the general education teachers. Any collaboration that occurred among team members was informal. Informal collaboration activities primarily consisted of occasional discussions about accommodation issues that occurred between special education and general education teachers. Once the lead researcher was involved with Joey’s case, IEP team meetings were held at her request to resolve issues related to accommodations, assistance in the classroom, and access to instructional materials. Joey had complete access to the Dynawrite and took it home frequently. However, according to Joey and his parents, Joey seldom used his Dynawrite at home because his family members were consistently able to understand his speech.

Data Collection

Two forms of data were collected: (a) copies of all academic and related personal records including IEPs, multidisciplinary reports, outside evaluations, correspondence, and data sheets depicting Joey’s Dynawrite use at school; and (b) pre- and post-AAC system implementation interviews with Ms Kirk (SLP), Ms Brown (special education teacher), Ms Carson (teaching assistant), Ms Smith (history teacher), Mr Vine (biology teacher), and Ms Duncan (English teacher).

Copies of all records from kindergarten through Joey’s current high school year were obtained. These records were analyzed for educational settings and placements, description of AAC use in each classroom, IEP goals and objectives associated with AT and speech, correspondence regarding AT, and external evaluations or recommendations regarding AT. Document analysis was conducted for purposes of triangulation of interview data. Ms Brown and Ms Carson kept a tally of the number of times Joey used the Dynawrite during the first 3 weeks of implementation. Additionally, Ms Brown and Ms Carson documented comments that might assist the research team in understanding the environments in which Joey used the Dynawrite. Unfortunately, these data were collected inconsistently and were deemed unsuitable for formal analysis. However, the written comments on the data sheets were used to confirm reports of Joey’s AAC use and reactions of peers in Joey’s classes.

We conducted 12 semi-structured 30-min interviews prior to and after Dynawrite implementation (i.e., two interviews with each staff member). Interview questions (see Appendix A) were developed to address the study’s research questions. On the basis of Kvale’s (1996) suggestion that semi-structured interview protocols include a sequence of questions while maintaining a feeling of openness to follow up on other themes of interest that may emerge during the interview process, we followed up on participant comments for clarification or additional information.

The first interview was shorter than the second and questions focused on descriptions of the staff’s interactions with Joey and descriptions of their classrooms or therapy sessions. The second interview was considerably longer since
it occurred after the Dynawrite had been implemented for a semester. The second set of interview questions focused on Joey’s device use in general and factors that facilitated or hindered his use of the Dynawrite. All interviews were audio taped and transcribed verbatim.

Data Analysis

The research team consisted of two faculty members in the Department of Special Education and one faculty member in the Department of Communication Sciences and Disorders at a large Midwestern university in the USA. A multiple coding approach (Barbour, 2001) was used to organize the data once the interviews had been transcribed. Specifically, all three researchers independently coded all interviews line-by-line using NVivo (Richards, 2002), a data management software program, to organize the interview data. The research team placed the line-by-line codes into categories, continually returned to the data for analysis, and used the constant comparative method as an overall methodological framework (Charmaz, 2000). During this process categories were refined, expanded, and/or deleted. Disagreements about the line-by-line codes or category development and/or refinement were resolved by systematically returning to the interview data and discussing the disagreements until concordance was reached (Barbour, 2001). Barbour described this process as a “core activity” of research team meetings, which adds value to the data analysis by allowing different interpretations to emerge and “alerting researchers to all potentially competing explanations” (p. 1116).

Confirmability

We evaluated confirmability of the findings through triangulation methods. Triangulation is the process of corroborating evidence from different individuals, different types of data, and different methods of data collection (Creswell, 2002). In this study, corroboration occurred when themes emerged across participants. For example, when Ms Brown, Ms Carson, Ms Smith, and Ms Duncan all reported that desk space was a barrier to Joey’s use of the Dynawrite, the barrier of space restrictions was confirmed. Different types of data, such as multiple years of IEP records, personal communications, and external evaluation reports, also served as corroborating evidence. For example, we reviewed an external evaluation report to confirm a participant report that an AAC device had been previously recommended.

FINDINGS

Staff Roles Prior to Implementation

Prior to the introduction of the Dynawrite, teachers and staff were interviewed about their experiences with AAC, the concerns they had with implementing AAC, and their thoughts regarding AAC in general. Special education staff members were included as interviewees. The special education teacher, Ms Brown, and the teaching assistant, Ms Carson, had contact with Joey throughout the school day, assisting him in several general education classes. Neither the certified special education teacher nor the teaching assistant was responsible for direct instruction to any students in the class, including Joey. Instead, they were responsible for making accommodations such as enlarging font; placing devices such as the computer, calculator, or Dynawrite within Joey’s reach; and assisting him with any other needs. Joey had two other academic courses: math and French. The French and math teachers were not interviewed since it was unlikely that the Dynawrite would be used extensively during either of these classes. Joey also received small-group instruction 5 times per week from Ms Brown in a separate classroom, where he worked on homework and/ or finished any exams that required extended time.

Interviews Prior to Dynawrite Implementation

Two major themes emerged from interviews conducted prior to the introduction of the Dynawrite for Joey’s use: (a) all staff expressed a positive attitude toward Joey and his use of the device, and (b) all staff stated specific concerns about the device, their role in its implementation, and the effect of device use on Joey. Staff members were aware of the lead researcher’s role as consultant to Joey’s IEP team.

Joey had been in the teachers’ classrooms for approximately 3 months before the Dynawrite was acquired. All teacher interviewees expressed a genuine fondness for Joey. Ms Duncan described Joey as an inspiration:

He’s willing to participate, he’s...well, I mean, there’s not one negative thing I could think to say about him. He really is just one of those amazing people. He has a sense of humor. He’s always laughing. He wants to raise his hand. We were doing the Crucible, it’s a play. I thought I would give him a smaller part so he didn’t have to strain himself but he didn’t mind. He did it and he had a fun time.
All staff expressed a willingness to incorporate Joey’s use of the AAC device into their classrooms or therapy sessions. This appeared to stem from a desire to understand Joey’s speech, which was largely unintelligible.

While all of the general education teachers expressed frustration with Joey’s unintelligible speech, their responses to him differed. For example, Mr Vine had a direct response: “Yeah, well, a lot of times I would just tell him, Y’know, Joey, I didn’t understand.” However, Ms Smith seemed to feel some personal responsibility when she did not understand Joey: “And part of it is me too, because I have such a hard time understanding him.” A true student-centered focus was evident, in that all of the general education teachers admired Joey, appeared to value his presence in their classrooms, and expressed a willingness to work with staff to facilitate Joey’s Dynawrite use in their classes.

The general education teachers had minimal experience with AT, yet expressed only minor concerns about incorporating the Dynawrite into their classes. Most of these concerns centered on how Joey could use the device to interact during class activities, how he could participate in class presentations, and if the Dynawrite would require any changes in class structure. Overall, the teachers appeared to be excited about the opportunity to work with the device and more than willing to incorporate it into their classes.

Initial interviews with the special education teacher and the teaching assistant prior to the implementation of the Dynawrite yielded similar themes, with subtle differences. They were both willing to incorporate the Dynawrite into the inclusive classroom settings and expressed a student-centered focus and genuine affection for Joey. Ms Brown, the special education teacher, had some previous experience with AAC and she summed up her willingness and indicated her understanding of the future impact of using the Dynawrite: “Yeah. It’s imperative that he’s successful here and that he gets what he needs out of these high school years. If I can help him in any way, you know, that’s my job, to make sure he gets that.” However, this was her first year teaching in an inclusive academic high school setting. Both special education personnel were familiar with speech patterns of students with cerebral palsy, had some experience with AT, and were focused on Joey’s present and future educational needs.

This is not to say that there were no issues to manage. The special education staff expressed their concerns about the AAC implementation process. These concerns centered on training for them and for Joey, when during the school day the Dynawrite would be used, and what responsibility they would have in the research project. Ms Brown and Ms Carson asked about the purpose of the study, data collection, and training. The first author answered these questions before the process of implementing the Dynawrite began.

Implementation of Dynawrite in School

The first author provided training for Joey during one, 1-hr session. Joey’s technology skills were strong and he readily learned and operated the Dynawrite within the hour. The team decided that Joey would then teach the staff, specifically Ms Kirk (SLP) and Ms Brown (special education teacher). The Dynawrite manual was made available to all staff members and Dynavox Mayer-Johnson provided technological support by phone as needed. The lead researcher was not involved in the staff training because the team had decided they would learn from Joey and contact the lead researcher only if they needed assistance. No team members made any requests throughout the course of the study. All of the general education teachers and the special education teacher reported that Joey used the Dynawrite frequently after it was initially introduced but his use gradually decreased as the semester continued. A primary exception was when Joey used the Dynawrite for specific tasks that required lengthy speech, such as class presentations. Mr Vine surmised that Joey decreased his Dynawrite use because Mr Vine gradually increased his understanding of Joey’s speech as the semester went on:

He used it a lot when he first got it. Like I said, he would ask a question, and I would wait for a couple of seconds and either he’d press ‘play’ or whatever it was. He had some stuff stored in there, like ongoing jokes in the class and stuff like that. But, towards the end of the year he did more of just raising his hand and trying to communicate through talking. The use waned a little bit. He used it; he just didn’t use it as much. I think maybe that had to do with me being able to understand his voice a little bit better than the device.

Ms Brown, the special education teacher, offered a different explanation:

It started out very strong and what I would consider consistent. He used it to answer questions mostly in English. In biology he used it to talk to friends. His sports friends
are in biology. He didn’t really have any friends in English and well, you answer more questions in English. Biology is more of a lecture type thing. He uses it in study hall sometimes, to the point where it gets on your nerves because he repeats the same thing over and over again. It all started out real strong but then faded. He wouldn’t use it when we’d get it out. I can’t determine if the opportunities decreased or if it was just...he’s not one to volunteer an answer. If he’s called on he’ll answer, but he never really volunteers an answer. He still uses it I think more socially than academically.

Whatever the reason, the novelty of the device appeared to wane and Joey’s Dynawrite use decreased over time; Joey relied on his vocal production as his primary mode of communication.

Interviews After Dynawrite Implementation

Facilitators of Joey’s Dynawrite use

Analysis of staff interviews yielded the following facilitators of Joey’s AAC system use: (a) teachers’ willingness to implement device usage; this willingness stemmed from their student-focused paradigm; (b) Joey’s increased communication intelligibility and subsequent staff comprehension; (c) Joey’s peers’ interest in the technological aspects of the device, acceptance, and overall positive attitude; and (d) the resulting increase in Joey’s socialization, with both teachers and, especially, peers.

The primary facilitator of Joey’s Dynawrite usage, as identified by all interviewees, was that it significantly improved their ability to understand Joey’s communicative attempts and interactions. Interestingly, Joey used the Dynawrite differently in each class and appeared to develop strategies for himself, since no formal plan had been made as to how he was going to use the device. In English class he used it to answer questions. Ms Duncan described how she incorporated Joey and the Dynawrite during questioning for comprehension tasks:

It’s been useful when I’m asking the whole class the same question, and then I realize he’s typing. And I wait until I know his answer is typed in, and then I ask him, and then his answer is already typed out. It has been effective for that.

Mr Vine required his students to deliver formal slide presentations to the entire class. Joey decided to present on cerebral palsy; he brought the braces he had worn in first grade, and attempted to coordinate the Dynawrite with his slide presentation. While the presentation was minimally successful, the Dynawrite allowed Joey to meet the same performance standards as his peers. Mr Vine noted some problems with this presentation.

He tried to keep his voice thing (voice output component of the Dynawrite) with the Power Point, and at times they weren’t together. But that would be hard to do for anybody, not just him. When the sentences started running together and stuff, I think he actually had a hard time figuring out where he was. But, overall it went fine. The only thing is if he could separate the thoughts, especially for a big presentation like that.

In Ms Smith’s history class, Joey used the Dynawrite to participate in a discussion of the Cuban missile crisis.

Today they were finishing up on the Cuban missile crisis, and each group had their own option to present to the President today. Each person in each group is an expert of some sort: a foreign relations expert, a historian, a spokesperson. He has a certain role. I know he has typed up what he is going to discuss today. It affected me as far as being able to understand him better. I obviously don’t have to ask him to repeat anything. That is a hard thing for me because I don’t always hear things and then with the difficulty understanding him, it makes it even worse. I could understand a lot better, it was wonderful.

Ms Brown, the special education teacher, also appreciated Joey’s improved intelligibility with the Dynawrite: “Well, sometimes I can’t understand him, so I say ‘use the Dynawrite, that is what it’s there for. Why are you talking to me without it?’ You know, for clarity!” Furthermore, it freed Ms Brown from constantly being the person expected to interpret Joey’s unintelligible speech. She explained: “So definitely for clarifying when his speech was unintelligible. I think that it made me feel less pressured, because I wouldn’t have to interpret. Sometimes people would look at me when they didn’t understand him.”

An additional benefit occurred during class, specifically, if Joey wanted to ask Ms Brown a question: “Sometimes we used it to talk back and forth during times when we couldn’t talk out
loud. So if he had a question he would type it in, and show me without pressing the speech thing.” Apparently this was Joey’s idea and it proved effective since the Dynawrite allowed them to communicate without including the entire class.

Perhaps the strongest facilitator and motivator of Joey’s use of the Dynawrite was social interaction. Joey had many friends at the high school but he always sat by himself at lunch, perhaps due to the fact that he left class a few minutes before the other students in order to arrive early so his lunch tray could be set up. Once the Dynawrite arrived, a portability issue arose. There was simply not enough room for Joey to fit the device in his backpack with his computer and books. Ms Brown asked one of his friends to carry the Dynawrite to the lunchroom and give it to Joey. The friend agreed, and within a week he asked Joey to eat at the table with the “rest of the guys.” This seating arrangement continued throughout the school year.

The Dynawrite gave Joey a means of expressing his sense of humor. Ms Carson, his teaching assistant, related an incident that occurred during French class. One day, he typed in, and played at the beginning of the class, “There is no homework today. This is a message from God.” The entire class and the French teacher laughed, and this simple act demonstrated that Joey was not only a typical high school student but also an appropriate center of attention. The Dynawrite allowed Joey to participate not only in academic activities but in social activities as well. Ms Brown stated:

He still uses it, I think, more socially than academically. Now there were times when his friends would use it. It would get passed around. I didn’t always think that was good. We [Mr Vine and I] wouldn’t allow that. It was inappropriate, the things that they were saying. He [Mr Vine] would say, ‘Number one, you can’t say that in here. Number two, Joey, that is your machine, and anything that comes out of it, you are going to get in trouble for.’ He kind of put a stop to that. It has decreased, but the social [use], I think, is more than the academic.

**Barriers to Joey’s Dynawrite use**

When asked to identify barriers to Dynawrite usage, all interviewees identified similar issues of desk space and intelligibility of voice output.

Additional barriers identified by special education staff were portability, accessibility, and volume control. Although the barriers were readily identified, taking action to address them was minimal.

In history and English classes Joey moved from his wheelchair to a regular student desk and needed his laptop computer and Dynawrite on his desk. Mr Vine did not mention desk space problems in biology class, where the students could sit at long lab tables. Ms Smith described the space problem in history class:

But it was also difficult to have a computer and that [Dynawrite] at the desk at the same time. He really needs a bigger surface where maybe he would have used it more if he had a bigger surface. I was always kind of afraid that was going to be a problem. I don’t know, maybe in another class he has the bigger surface.

Ms Brown described the desk space issue in English class as follows:

There’s not room for the computer, the book, and the Dynawrite. There is room for two things. He can have his computer and the Dynawrite, or his reading book and the Dynawrite. I don’t know that there would ever need to be three. I don’t know if there was an issue with that or not. Probably not.

Unfortunately, while both the general and special education staff recognized the space constraints, they didn’t discuss finding a solution, so the problem apparently continued throughout the school year.

Intelligibility of the Dynawrite voice output itself was an issue for Mr Vine (biology teacher) and Ms Carson (teaching assistant), both of who said they had difficulty understanding the device’s voice output. Mr Vine specifically identified difficulty understanding the voice output during a long presentation:

The worst was when he did his presentation. I think it helped a whole lot, but I don’t know if it was the way he put it in, but there were no breaks between thoughts, so it was one huge long sentence. That got a little bit confusing. The kids, I could tell, were really listening to what he was saying. But at parts it was really hard to understand, because the thoughts didn’t break up. That is the only way that I think it is hard to understand. I don’t know if there is a way you can punch in spaces.

Ms Carson felt that since she knew Joey so well, she understood his natural speaking better than the voice output of the Dynawrite.
Personally, I think it [the Dynawrite] is hard to understand. I have to really concentrate on what it's saying to understand it. I don't know about the students, but I can understand him verbally. I mean, he's not as loud as the Dynawrite, as far as everyone in the class being able to hear, but just one on one, I do better with him verbally speaking. But I mean I'm around him a lot more than other people, too.

The intelligibility of the voice output on the Dynawrite is adjustable; pauses could have been inserted to increase intelligibility. Again, however, none of the staff reported addressing this problem.

The special education staff, Ms Brown and Ms Carson, also identified barriers that were related directly to Joey’s physical disability: limited accessibility and portability. Joey did not have the physical capability to remove the Dynawrite from his backpack and position it on his desk. Therefore, this was categorized as an accessibility issue. Ms Carson stated that “Somebody has to be there to get it out for him. He physically cannot do that.” Similarly, portability was an issue due to the many materials Joey carried with him from class to class, which included his backpack with four classes’ worth of books, a calculator, a laptop computer, a bookstand, and notebooks. Ms Carson also described this problem:

Maybe make it more portable for him, so that I don’t have to be there. I don’t know how that would be. A place next to him to have it next to him, instead of having me following behind him. It may not be possible that someone is going to be there all the time.

While the accessibility issue was not addressed, the portability issue, at least during lunch, was addressed when Ms Brown recruited a peer to take it to Joey during lunch.

The last identified barrier appeared to be due to the design of the Dynawrite. The volume control must be adjusted by accessing the device’s menu, which takes time. Ms Brown expressed a desire for a more user-friendly and efficient method of volume control:

It’s so hard sometimes to get in there and change the volume. I wish there was a thing on the side where you could change it. Sometimes it needs to be loud for the teacher and sometimes it needs to be soft for me. Sometimes it’s appropriate to talk loud, but when you’re in small groups, that group over there doesn’t want to hear him. I wish the volume control was easier to access.

Joey used the Dynawrite with minor difficulties. Interestingly, it was the relationships between Joey and his peers, and the teaming relationships among special and general education staff, Joey, and his teachers, that either facilitated or inhibited Joey’s use of the Dynawrite. Even when specific issues related to the device itself emerged, staff appeared to make minimal attempts to solve the issues. Consequently, problems were identified and solutions were never addressed.

DISCUSSION

This case study exemplifies the benefits of AAC as well as the barriers to its effective use in a classroom setting by a high school student with complex communication needs. Benefits included greater intelligibility for this student and subsequent comfort for the high school staff as they interacted with the student during classroom activities. Several researchers have noted AAC's potential to change the lives of students with complex communication needs (e.g., Beukelman & Mirenda, 2005; McNaughton et al., 2008). Others have advocated for strong involvement of all educational team members during assessment and selection of AAC devices (Angelo, Kokoska, & Jones, 1996; Bailey et al., 2006; Beukelman & Mirenda, 2005; Parette et al., 2000) and have described indicators of successful AAC in inclusive educational settings (Soto et al., 2001a). However, once an appropriate device has been selected to meet individual student needs, the work of the team has just begun.

Joey, the student in this case study, had many areas of strength. He had above-average cognitive capabilities, strong social skills, and had been exposed to AT in various forms since kindergarten. These strengths served him well when implementing his AAC device in this high school setting. Yet, as skilled as he was, he needed his team to be proactive in identifying challenges associated with the use of his device and, perhaps even more importantly, responding to these challenges. For example, the volume control barrier was a technical issue that could have been easily resolved simply by some type of cueing system. The teaching assistant or special education teacher, whoever was assisting Joey during class, could have signaled the general education teacher that the volume was high enough for Joey to audibly respond to a question. Another solution may have involved Joey and his assistant working out a signal that communication between them should occur without volume.

A student’s age and developmental level are often listed as considerations in the AAC device
Joey was the individual on his educational team who had the knowledge and skills to successfully implement his AAC device - and he did, for a limited period of time. Joey’s declining use of AAC is not surprising. Williams and colleagues (2008) stressed that individuals with complex communication needs require “more than one device, one communication partner, one communication strategy, and one communication environment” (p. 196). Joey used the device the most when it was novel, increased attention from his peers, and offered him an opportunity to communicate in multiple environments. However, Joey had relied on verbal communication for 15 years and this was his preferred mode, although his speech was not entirely intelligible to unfamiliar listeners. A review of his IEP speech goals confirmed the time and effort that were focused on his speech; many of the goals in the last years of his K-12 education targeted repair strategies, such as recognizing the need for repair, and over-articulating or restating when his listener did not understand him. Fortunately, Joey had the communicative competence to adjust his communication strategy by using his device when others did not understand him.

One of the benefits of Joey’s inclusion in general education classrooms at his neighborhood high school was that he developed new social relationships. He was also able to continue to enjoy social relationships that he had previously established at his middle school. Opportunities for communicating with many partners, both peers and adults, is essential to the development of communicative competence (Simpson, Beukelman, & Sharpe, 2000; Williams et al., 2008). As a positive footnote, Joey was admitted to a 4-year university and will soon graduate with a college degree. He continues to use the Dynawrite in his college classes or in situations where he anticipates that his communication partners may not comprehend his speech. Effective AAC implementation requires much more than conducting thorough assessments, carefully selecting an appropriate device, and providing effective team training in the operation of the device. Team members in this case study expressed a student focus and clearly demonstrated authentic caring for Joey. They were eager to implement the device and their intentions seemed sincere. However, classrooms present many demands and the school staff involved in this study had many responsibilities. No single team member took ownership for the implementation of the Dynawrite across environments. Ms Kirk made sure Joey knew how to enter his presentations into the device, but did not proactively evaluate the communicative environments in which he would use the device (i.e., the need for pauses in the presentation). Ms Kirk had a large caseload, provided SLP services at two other schools, and could allocate only a limited amount of time to Joey. Yet, AAC device implementation should have been a priority for at least one member of the staff. It seemed that team members relinquished responsibility of the device use to Joey and special education staff members assigned to assist him in his general education classes. These limitations in the area of AT implementation are consistent with reports in recent literature (i.e., Bausch & Ault, 2008; Bausch et al., 2008). Interestingly, while all team members identified similar barriers, only one of them took responsibility to address one of the barriers. Ms Brown provided a simple solution to the portability issue by asking one of Joey’s peers to carry the Dynawrite to the lunchroom for Joey. An unintended social benefit emerged from this action: Joey eating lunch at a table with “the guys.” AAC device usage enhanced Joey’s social interaction in his classrooms, and the by-product was increased acceptance of Joey by his peers. This underscores the importance of communication as a basic human right and freedom (Beukelman & Mirenda, 2005; Light, 1997; Wehmeyer, 2005; Williams et al., 2008), and emphasizes the increased potential for social interaction that can result when all communicative partners can adequately express themselves.

Joey’s use of the Dynawrite might have been more effective if team members had communicated about his device use across learning environments and if any one team member had made the commitment to AAC implementation. Joey was ready and willing to use AAC at the beginning of the semester but began to use AAC less and less as the school year continued; use of the device could have increased with the appropriate supports. In the USA, in the age of No Child Left Behind (NCLB, 2001) legislation,
mandates of the Individuals with Disabilities Improvement Act (IDEIA, 2004), and Response to Intervention (RTI) initiatives that support students with disabilities in accessing learning in the general education curriculum, the success of students like Joey should be a priority for all school staff members.

It is apparent that not all of Soto et al.’s (2001a) indicators of successful AAC implementation were in place to ensure Joey’s successful use of his Dynavrite. Additionally, those indicators that were in place clearly varied in strength across his learning environments. Even though Joey was proficient at AAC device use, he could not problem-solve classroom issues that were under the control of education professionals. This study emphasizes the necessity of collaborative teaming even when an AAC user demonstrates technological proficiency. Consistent collaborative teaming was not present in Joey’s case, and AAC was not fully and effectively implemented.

Limitations and Directions for Future Research
A limitation of this study is the involvement of the lead researcher as the consultant to the IEP team on issues of accommodations, assistance in the classroom, and access to materials; it may have inhibited team members’ requests for assistance in Dynavrite implementation or affected some team members’ responses to the interview questions. However, at the time of the study, relationships between parents and the educational staff had improved, and two of the IEP team members – the special education teacher and the SLP – were new to the team when the study began.

This case study focused on one student and one IEP team in an inclusive high school setting. Generalization to other students or teams is limited. Accuracy of staff members’ recording of when and how Joey used his Dynavrite was sometimes problematic; staff members were busy in their classrooms and the researchers purposefully did not collect observational data. A more systematic monitoring of data collection may have yielded more information.

The research team interviewed Joey before AAC implementation and then 4 years later. The initial interview was limited by Joey’s intelligibility and, perhaps, typical teenage reticence when interacting with adults. The later interview was focused on topics for another study, and Joey’s responses to questions about the Dynavrite were focused more on his current than previous use of the device. Joey’s perspectives during his high school AAC implementation were not directly elicited.

Future research should focus on investigating AAC implementation in inclusive settings at the high school level, since the majority of research has been conducted at the primary school level. Peer perspectives on AAC use at the high school level would also be valuable to determining the perceived effect of AAC device use on the social-pragmatic skills of individuals who use AAC. As transition from school life to adult life nears, more attention needs to be devoted to effective AAC implementation, with an emphasis on transition planning (e.g., as required by IDEIA, 2004, in the USA), so that it may continue once support from school staff is no longer available.

Declaration of interest: The authors report no conflicts of interest. The authors are responsible for the content and writing of the paper.

Note
1 DynaWrite is a registered trademark of Dynavox Technologies, located in Pittsburgh, PA.

References


APPENDIX

Interview Questions

Questions for First Interview

(1) Describe your experiences with students with physical disabilities.

(2) Describe your experience with assistive technology.

(3) Describe your interaction with N [the case study student].

(4) Describe your feelings about the assistive technology available to N [the case study student].
Questions for Second Interview

(1) How would you rate Joey’s intelligibility?
(2) Do you understand Joey’s speech?
(3) Do you think others understand his speech?
(4) Can you describe his use of the Dynawrite™ this year?
(5) Okay, can you describe the use of the Dynawrite™ in each of those classes (for special educator and paraprofessional)?
(6) How has the use of the Dynawrite™ affected you as a teacher/therapist?

(7) Describe any problems, issue, or concerns with the use of the Dynawrite™?

Any other issues?

(1) If you were talking to a brand new teacher/therapist, would you have any suggestions as far as assistive technology or the Dynawrite™?
(2) Has the Dynawrite™ influenced his interactions with his peers?