



Costley, Debra and Clark, Trevor and Bruck, Susan
(2014) The Autism Spectrum Disorder Evaluative
Education Model: a school-based method of assessing
and selecting interventions for classroom use. SAGE
Open, 4 (4). pp. 1-11. ISSN 2158-2440

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The Autism Spectrum Disorder Evaluative Education Model: A School-Based Method of Assessing and Selecting Interventions for Classroom Use

SAGE Open
 October-December 2014: 1–11
 © The Author(s) 2014
 DOI: 10.1177/2158244014556640
 sgo.sagepub.com


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Abstract

Evaluating educational programs and interventions is generally considered a normal part of curriculum development and improvement, and published findings are readily accessible through peer-reviewed journals. Recently, however, researchers and practicing educators have identified a lack of evaluative research regarding Autism Spectrum Disorder (ASD) educational practices in the peer-reviewed literature. Autism Spectrum Australia (Aspect) has an established evidence-informed ASD curriculum that is constantly reviewed and updated to meet the needs of the students in Aspect schools and classes. Through a methodical evaluative process, all educational interventions and support processes and devices undergo a series of Evidence-Based Research Trials and evaluations before they are implemented in classes. This article demonstrates how a workflow model can deliver a systematic method for identifying, evaluating, implementing, and disseminating the research findings of a program or support intervention. The Autism Spectrum Disorder Evaluative Education (ASDEE) model is discussed.

Keywords

autism spectrum disorder, Autism Spectrum Disorder Evaluative Education model, evaluation, education

Autism spectrum disorder (ASD) is a lifelong disability that influences an individual's social, communication, and behavioral interactions and can cause difficulties in educational development and skill acquisition (American Psychiatric Association, 2013). Although ASD can be identified as early as 2 years of age (Corsello, Akshoomoff, & Stahmer, 2013), it is often only identified once children enter the education system (Aspect, 2013b).

The reported prevalence of ASD within the community continues to rise. In England, researchers estimate that there are approximately 1 in 100 people in the population who are diagnosed with ASD (Brugha et al., 2011). In 2014, however, the U.S. Centers for Disease Control and Prevention indicated a much higher community incidence when they reported an estimated prevalence of 1 in 68 8-year-old children are diagnosed with ASD—a 123% increase in the prevalence of ASD since 2002 (Autism and Developmental Disabilities Monitoring Network, 2014).

In Australia, data provided by the Australian Bureau of Statistics show that in 2012, there were 115,000 Australians living with ASD (Australian Bureau of Statistics, 2014), and that almost 81,200 were school-aged children (5-19 years). Of these children, 95% are reported to need specialized education to support their communication, social, or learning difficulties (Australian Bureau of Statistics, 2014). Recent research has also suggested that the majority of these students

are enrolled in mainstream schools and are not participating in specialized intervention programs (Aspect, 2013b).

A diagnosis of ASD can provide an opportunity for parents and therapists to implement evidence-based early intervention programs such as speech pathology (Burgess & Turkstra, 2010; van der Meer & Rispoli, 2010), occupational therapy (Ashburner, Ziviani, & Rodger, 2010), psychological interventions (van der Meer & Weijers, 2013), and behavior modification programs (Stock, Mirends, & Smith, 2013), and much of this research is concentrated on programs and support mechanisms appropriate for pre-school-aged children (Eapen, Črnčec, & Walter, 2013; Warren et al., 2011). There is, however, limited peer-reviewed research available for evaluating school-based interventions (Detrich & Lewis, 2013; Dingfelder, 2011; Kasari & Smith, 2013; Parsons et al., 2013), and this has left the ASD school education community with a shortage of rigorously assessed programs to implement in the classroom (Parsons et al., 2013).

A growing interest in the gap between research and ASD classroom practice has become a key topic of discussion.

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This gap has been attributed to the lack of readily available evidence-based research about genuine classroom interventions (Kasari & Smith, 2013; Kratochwill, 2007; Pellicano, Dinsmore, & Charman, 2013; Stephenson, Carter, & Kemp, 2012) and ASD school curricula (Clark, 2013).

Recently, Wong et al. (2014) published an extensive review of evidence-based practices for people with ASD. This review evaluated more than 450 journal articles that reported intervention practices that addressed a single educational goal with the aim of identifying practices that encourage improved individual educational, behavioral, or developmental outcomes. The majority of the participants in these studies were aged between 3 and 11 years. A total of 58 studies investigated students' performance on tasks that typically occur at schools.

Despite the breadth of studies examined in Wong et al. (2014), 90% of the reports reviewed investigated individual case studies and only 10% were based on studies of two (Harper, Symon, & Frea, 2008; Kuhn, Bodkin, Devlin, & Doggett, 2008) or four children (Laushey, Heflin, Shippen, Alberto, & Fredrick, 2009). The findings from this meta-analysis suggest that although educational ASD interventions are being evaluated and reported, there is a need for larger scale evaluations.

Appropriately evaluated ASD curriculums have been demonstrated to assist in supporting learning outcomes (Costley, Keane, Clark, & Lane, 2012; National Autism Center, 2011) and are documented as a priority for education providers (New South Wales [NSW] Department of Education and Communities, 2011; Simpson, McKee, Teeter, & Beytien, 2007). In 2013, the Australian Government established a National Cooperative Research Centre to research the needs of people living with ASD, and one of the specific goals of the program is to "provide appropriate educational environments and programs to optimise students' social, behavioural and academic success, and equip teachers to manage even the most complex behaviours" (Autism Cooperative Research Centre, 2014).

Aspect is an Australian ASD service provider of educational services, diagnostic assessments, early intervention and outreach programs as well as professional development. It features an ASD-specific school program and delivers an evidence-informed curriculum to more than 1,000 enrolled students. Aspect has a network of eight independent schools and more than 100 satellite classes embedded in mainstream schools across the Australian State of NSW. Programs and interventions are scrutinized through a process of evidence-based research, peer- and self-reviewed evaluation, and a continuous improvement program cycle (Aspect, 2013a, 2013b; Costley et al., 2012; Keane, Aldridge, Costley, & Clark, 2012).

Evidence-based research provides scientific verification of the effectiveness or lack of significant change in outcomes as a result of an intervention. In education, however, a statistically significant basis for implementing a process or support may not be the whole story. In cases where evaluation

by collegial educators, support networks, and other stakeholders identifies student benefits from an intervention, a method of evidence-informed decision making can be valuable (Ciliska, Thomas, & Buffet, 2012). Evidence-informed appraisal has the benefit that it can integrate scientific evidence with informed community opinions (Kohatsu, Robinson, & Torner, 2004).

Aspect uses an evidence-informed program selection process that assesses new products and programs to determine whether an intervention will be included or excluded from the curriculum. The Aspect model of evaluation uses both evidence-based and evidence-informed research to assess the internal validity of a program, that is, to measure the efficacy. Evidence-informed assessment also provides a process for bridging the gap between the practitioner's assessment and classroom practice through external validation by using available resources and translating the suggestions into empirical research (Mercer, DeVinney, Fine, Green, & Dougherty, 2007).

According to the U.S. National Research Council (2001), the education of teachers and school personnel is the primary way of encouraging evidence-based teaching strategies. Researchers suggest that the critical element for translating research into practice is to ensure that there is a high fidelity implementation through a system of regular program review by teachers (Mandell et al., 2013) and through ongoing training for paraprofessionals within schools (Brock & Carter, 2013). An example of a resource that has been developed specifically to encourage practitioners to take a scientific approach to selecting ASD-specific interventions is the *Autism Research Toolkit* (White, Leekham, Shenow, & Gomez de la Cuesta, 2013). This resource suggests that intervention programs implement a research cycle to "predict, test, observe, and explore" the impact of an intervention as a way of evaluating the efficacy of an educational program.

At Aspect, the primary objective is to develop an evidence-informed ASD-specific curriculum that validates the teaching and intervention methods used in the schools and classes. A comprehensive evidence-based review conducted at Aspect identified several educational program elements that were essential to a school program designed to support learning and encourage transition to a more inclusive educational setting. This specialized curriculum is designed by Aspect and based on the literature that focuses on individual student education plans that are designed to evaluate and monitor the pupil's core competencies and their outcomes based on their support needs (Iovannone, Dunlap, Huber, & Kincaid, 2003).

In 2011, a multi-site action research project began to document the information, processes, and procedures used within Aspect schools. The goal was to collect data that showed how the Aspect Comprehensive Approach for Education (ACAE) framework was implemented in the schools. As a result of this process, the ACAE manual was

developed, which provides a comprehensive description on an evidence-based curriculum for teaching children with ASD (Aspect, 2012). The ACAE manual provides a blue print for how each element of the ACAE should be implemented in the Aspect schools. Each section of the ACAE manual provides the theory and current research supporting the curriculum methodology, how to implement the methodology in classroom practice, case studies, lesson templates, and resources. The manual includes a Self-Review Checklist for examining program fidelity as part of a Continuous Improvement Project cycle.

At Aspect, a workflow model has been developed with the aim of providing staff with an easily understandable template for conducting educational evaluations. A workflow model is a visual representation that identifies the procedures of a defined project. Workflow models can characterize how tasks are undertaken with respect to an organization's policies and specific objectives (Alhaqbani, Adams, Fidge, & ter Hofstede, 2013). From an educational perspective, a workflow model can be used to define the research question, describe the sequence of the research evaluation and implementation stages, and identify the educational outcomes and community benefits. A workflow model can provide schools with a consistent system for identifying new educational support devices and strategies, and allow for focus on the reliable and valid assessment of student outcomes in authentic educational environments.

The goal of this article is to describe the Autism Spectrum Disorder Evaluative Education (ASDEE) model and to demonstrate how Aspect manages a process of research into new ASD-specific education interventions.

The ASDEE Model

The ASDEE model shows the flow of the decision-making process for implementing new interventions and supports within the curriculum. The ASDEE model is an overview of the procedures for identifying, piloting, evaluating, and implementing ASD-specific educational programs and classroom supports. It also depicts how evidence-based outcomes are professionally disseminated. Figure 1 depicts the process developed by Aspect to support and evaluate the ACAE curriculum.

When new support devices and technologies become available, parents often ask teachers to implement particular interventions in the classroom, but it can be difficult for teachers to identify which support is likely to benefit the student. One recent example is the Apple iPad (iPad is a trademark of Apple Inc.), which is marketed as a device designed with assistive features for students with special needs, including assistive touch, speech to text features, gesture-based screen readers, and opportunities for reducing the visual clutter on screens (Apple, 2014). There are numerous applications designed and marketed as providing communication, behavioral, or learning support for individuals with ASD.

In response to the questions from parents and teachers, Aspect conducted a research trial on iPad use in Aspect classrooms (Aspect, 2013a). We will use this example to demonstrate how Aspect evaluated the efficacy of a new intervention for potential inclusion in the ACAE manual.

The ASDEE model is divided into two phases: Evaluation and Practice. The Evaluation phase of the ASDEE model includes the assessment and decision-making process undertaken before an educational intervention is implemented. Following a positive evaluation outcome, the educational intervention is implemented within Aspect schools and the findings disseminated. This implementation and dissemination process is shown in the ASDEE model as the Practice phase.

New Support Device or Intervention Identified

The ASDEE model begins with the identification of an innovation that is suggested to be a promising educational support for students (see Figure 1), as a New Support Device or Intervention Identified. The evidence-informed process begins here and establishes the research problem by identifying a program, support device, or intervention that has the potential to provide an improved educational outcome for students with ASD.

For example, when the iPad was first released, several parents approached the Aspect school teachers with the suggestion that these new devices be used in class because they believed that the iPad could provide substantial support to their child's learning. Aspect considered the parents' request and decided to conduct an evidence-informed Small Pilot Study.

Literature Review

The peer-reviewed literature search provides the opportunity for relevant, reliable, and valid studies to be evaluated. This process is the first stage in the evaluation of the intervention.

The literature review is conducted by reviewing relevant literature, including peer-reviewed journal articles sourced through Google Scholar and EBSCO databases. This review also examines "grey literature," which includes published material from technical reports, specialist professional publications, and manufacturers' or developers' websites.

The criteria for inclusion in the literature review will depend on the educational support to be evaluated. The objective of the literature review is to define the research question and identify who will benefit from the intervention (e.g., students with limited communication skills). Material is included in the literature review if the published outcomes are measureable.

For example, in 2010, after the release of the iPad, students at Aspect schools began to bring the devices into the classroom. Parents noted that their children demonstrated improvements in a variety of skills when using the device.

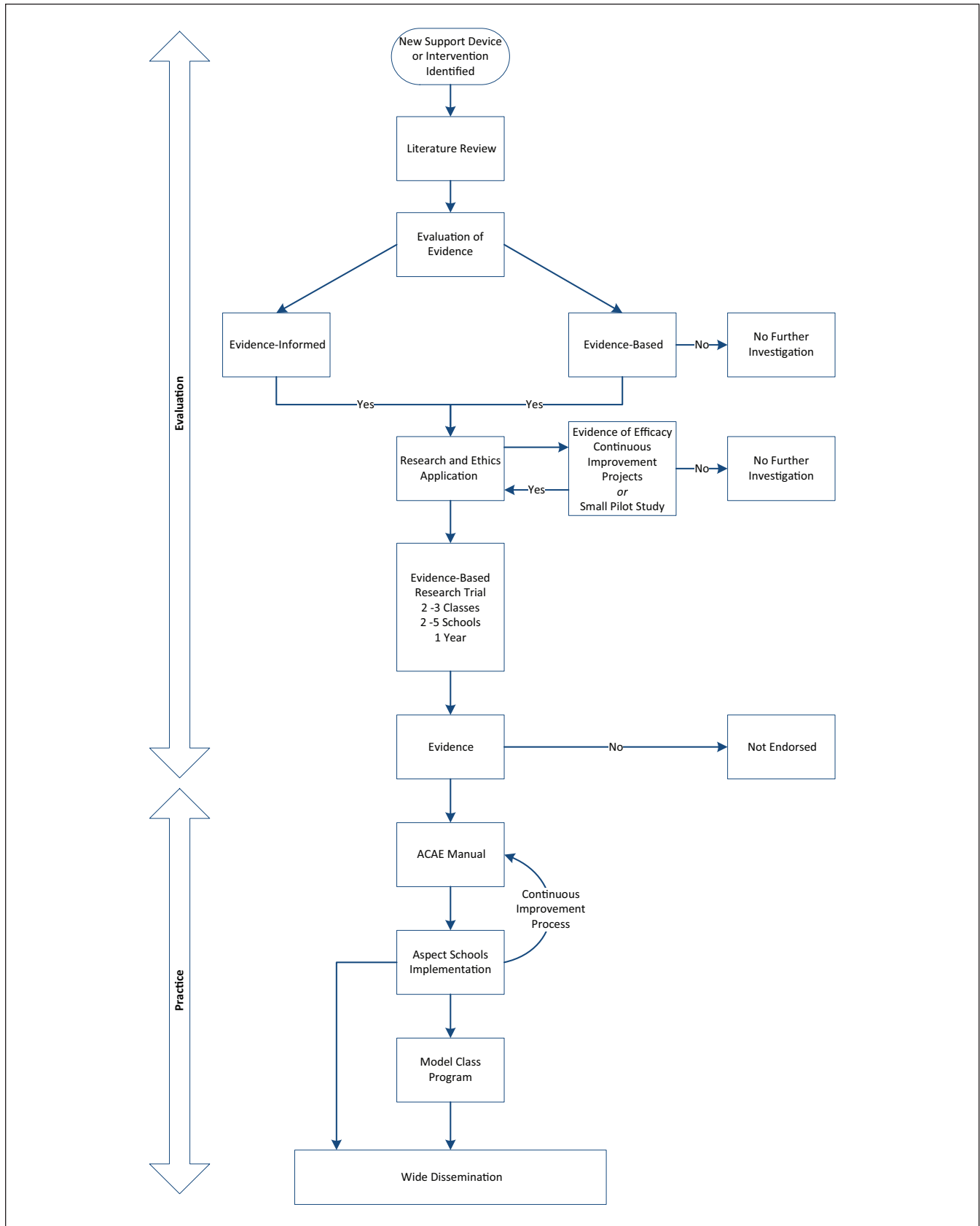


Figure 1. The ASDEE model.

Note. ASDEE = Autism Spectrum Disorder Evaluative Education; ACAE = Aspect Comprehensive Approach for Education.

This raised many questions about the children's engagement in learning activities and whether the benefits were measurable. By 2011, reviews, commentary, and case study reports of how iPads could be used in education started to appear (Geist, 2011; Hutchison, Beschoner, & Schmidt-Crawford, 2012; Oakley, Howitt, Garwood, & Durack, 2013). However, missing from the iPad reports was the rigorous pedagogically founded evidence-based research. Therefore, we conducted a review of relevant literature regarding the use of the iPad with students with ASD.

The literature review for the iPad study was conducted by running a search through Google Scholar and EBSCO databases using the following search words: autism, iPad, education, learning, and teach. In addition to the peer-reviewed literature, relevant "grey literature" including teacher education conference presentations and proceedings were gathered and appraised.

Evaluation of Evidence

After a literature review is conducted, the evidence is evaluated by a team of Aspect teachers and researchers. The purpose of the evaluation is to decide whether sufficient evidence exists to support further exploration of the use of the intervention at Aspect. During the evaluation of evidence process, two possible outcomes are examined: evidence informed and evidence based.

Evidence-Informed Outcome

In cases where peer-reviewed literature does not yet exist but anecdotal evidence is convincing, Aspect encourages a process of evidence-informed decision making with regard to trialling new interventions. The process of evidence-informed research recognizes that large-scale, randomized control studies are not necessarily the most appropriate method of evaluating every intervention. This is especially true for research into educational interventions for individuals with ASD as their requirements can be very individualized, and standardized measurements may not reflect the tolerance levels required for evaluative comparison (Charman et al., 2003; Lord et al., 2005; Odom, Boyd, Hall, & Hume, 2010).

An intervention can earn evidence-informed status when there is evidence from reliable sources such as professional conferences, expert implementers, and/or teachers, occupational therapists, and parents who may have observed improvements after trialling a new support or intervention. If the intervention meets the criteria for evidence-informed status, the decision can be made to conduct a research project and submit a Research and Ethics Application. In the example of the iPad evaluation, the peer-reviewed literature suggested that this device had the potential to provide social and academic benefits (Alexander, Ayres, Smith, Shepley, & Mataras, 2013; Burton, Anderson, Prater, & Dyches, 2013).

In addition, a teacher education conference presentation one of the Aspect teachers attended also demonstrated evidence of using the iPad as a communication tool that could facilitate routine classroom activities for students with cognitive impairment (Conley, 2012).

Evidence-Based Outcome

This decision underlines the ACAE principles that a comprehensive ASD-specialized program includes a variety of educational approaches designed to meet the range of individual needs of all students at all times (Australian Advisory Board on Autism Spectrum Disorders, 2010). The ACAE acknowledges that within a set of standard procedures and core curriculum, different teaching tools, interventions, and techniques may be used at different times during a child's development. If the evidence meets the criteria of the ACAE curriculum, the evaluation can proceed to the Research and Ethics Application and approval process. To meet the criteria of the ACAE curriculum, the program must meet the requirements of the syllabus regulator, the Board of Studies NSW, Australia; show evidence of significant outcome benefits as determined by the student's individual educational plan; and be affordable within the school budget, as assessed by the senior educational management team.

In the situation where there is no clear evidence that meets the ACAE criteria, the evaluation process is discontinued and no further investigation takes place. When there is substantiated peer-reviewed evidence of improved outcomes, ASD specific or not, a valid assessment of the intervention can lead to the decision to progress to the Research and Ethics Application and approval process for clearance to trial and evaluate an intervention. After the Small Pilot Study shows positive outcomes for the students involved, an Evidence-Based Research Trial can be designed and conducted in two classes in each of three Aspect schools over a period of 1 year.

Research and Ethics Application and Approval Process

All research conducted at Aspect requires ethics clearance prior to commencing a research study with students, staff, or clients. The ethics approval process ensures that research is appropriately conducted and that the welfare, rights, dignity, and safety of participants are protected. The process of applying for ethics clearance not only provides an opportunity for the application assessors to evaluate methodological rigor and scrutinize potential risks and benefits to participants, but it also ensures that the researcher considers and manages any risks and benefits associated with the study while developing the research methodology. The application process also provides an opportunity for the researcher to outline the study's contribution to the wider ASD community.

The Research and Ethics Application and approval process is applicable to the Evidence-Based Research Trials, Small Pilot Studies, and Continuous Improvement Projects. The process is clearly mapped with application forms easily accessible through the Aspect intranet and Internet website. The Research and Ethics Application requires details about the research questions, methodology, risks/benefits analysis, and expected outcomes. Small Pilot Studies and Continuous Improvement Projects are assessed by the Aspect Research Approvals Committee, which is made up of a team of experienced human research ethics advisors. Research approval is generally granted for 1 year.

The ASDEE model shows the flow of direction from the Research and Ethics Application process to the research studies options—Evidence-Based Research Trial, Small Pilot Study, or Continuous Improvement Project.

Evidence of Efficacy

The aim of conducting research at Aspect is to provide relevant improvements in educational processes and outcomes for students. Small-scale study evaluations with valid and reliable methodology provide an opportunity to assess the efficacy of an intervention. Evidence of efficacy can be explored by conducting a small research project. At Aspect, there are two options: the Continuous Improvement Project and the Small Pilot Study. Often, Continuous Improvement Projects or Small Pilot Study research studies are conducted prior to Evidence-Based Research Trials.

The first option is the Continuous Improvement Project. The purpose of the Continuous Improvement Project at Aspect is to improve service provision and to annually monitor compliance with national and state curricula requirements. They are conducted each year on a selection of programs that are identified by the school managers. Each Continuous Improvement Project runs over 1 school year. The Continuous Improvement Project requires ethics and research clearance from the Aspect Research Approvals Committee before commencement as well as signed informed consent from participants or parents/guardians on behalf of student participants. The Continuous Improvement Project is designed for small, short-term studies and is usually a one-off or pre-/post-program questionnaire about the effectiveness of an intervention and may be directed to parents, teachers, or students. Findings from a Continuous Improvement Project can only be distributed internally within Aspect. At the end of the Continuous Improvement Project, a participant-de-identified written report is prepared by the evaluator/s. The findings are reported to Aspect managers and executives, shared with teaching staff across the organization, and are used to improve practice.

The other option is the Small Pilot Study, in which an intervention is evaluated and results can be publicly disseminated. The Small Pilot Study is designed as a research project with rigorous methodology. The Small Pilot Study may be

undertaken as a trial and may have peer-reviewed evidence-based support or anecdotal indication of an evidence-informed practice.

As a result of the collation of some evidence-informed material and evidence-based iPad literature (Geist, 2011; Rayner, 2010), a Small Pilot Study was developed to test whether there was evidence of improved educational outcomes for children with ASD. Aspect worked in partnership with researchers from the University of Wollongong who supported additional data collection, analysis, and reporting. In all, 33 students aged between 5 and 7 years participated in a study that evaluated communication, behavior, and social skills development after using appropriate iPad applications for 1 full school year. In this study, the teacher evaluated the student's baseline measures at the beginning of the school year and again at the end of the school year. The encouraging results from the Small Pilot Study enabled further investigation into the iPad as an educational tool through an Evidence-Based Research Trial.

In the ASDEE model, when outcomes from the Small Pilot Studies provide evidence of efficacy, the decision to move to an Evidence-Based Research Trial can be undertaken. If after the Small Pilot Study there is no evidence of an improved outcome, then the intervention is not implemented at Aspect schools.

Evidence-Based Research Trial

The Evidence-Based Research Trial is larger in scope than the Continuous Improvement Project and the Small Pilot Study. The participant-de-identified findings from these projects may be disseminated through peer-reviewed journal articles, conference presentations, conference proceedings, workshops, fact sheets, the Aspect Model Class Program, and other media sources. The findings from the Evidence-Based Research Trial are also used to review and revise the ACAE and accompanying manual. Evidence-Based Research Trials are conducted over the course of 1 school year. The trials are piloted in up to five schools, with each school conducting the program in two or three classes. Evidence-Based Research Trials are granted ethics approval from an independent accredited Australian University Human Research Ethic Committee as part of the evaluation process.

Once the intervention has been evaluated and the outcomes reported to the Education and Research Committee, a decision is made as to whether the intervention will be incorporated into the ACAE manual. This decision to include an intervention in the ACAE manual is dependent upon evidence of a significant benefit to the student, budgetary considerations, and how it complies with government educational curriculum requirements.

In the iPad study, an Evidence-Based Research Trial was conducted and piloted in three schools. The results from the trial have been disseminated through Aspect's professional development workshops, and journal articles are currently

under peer-review. The iPad Model Class Program is successfully running in one school and the program is incorporated into the ACAE manual and implemented in Aspect classrooms across the school network.

ACAE Manual

The Continuous Improvement Project, Evidence-Based Research Trial, and Self-Review Checklist findings are collated annually and contribute to the ACAE manual. The aim of the ACAE manual is to provide Aspect educators and the wider community with an evidence-based educational resource specifically for supporting students with ASD. The manual provides sections on implementation of the intervention in classroom practice, resources, case studies, and the ACAE Self-Review Checklist.

The purpose of the ACAE Self-Review Checklist is to maintain fidelity of the educational approach and to provide improved quality, consistency, and standards of education for the students with ASD. The ACAE Self-Review Checklist is administered in Aspect schools on an annual cycle.

Aspect Schools Implementation

Once there is an evidence-base for supporting implementation of an innovation, a staff Learning and Development Program is offered to teachers from all Aspect schools, including those who were not involved in the research. Each of the eight Aspect schools trains several staff members, including the school coordinator (senior teacher) to use the intervention, and they are then responsible for supporting the implementation in their school. Usually the school principal will initially nominate one or two classes, so that the teachers can develop teaching strategies and resources that suit their classes. These classroom teachers in turn support the adoption of the new intervention across the school.

Aspect Model Class

The Aspect Model Class Program was developed to showcase a specific innovation. Each Aspect school has at least one classroom that is set up to demonstrate a specific innovation. The class teacher and teacher's aide are trained in the implementation of the intervention and are supported by the school coordinator who ensures that the intervention is included in the class program and the Individual Education Plans of the students. Each Model Class is supported with classroom resources, and professional development workshops, including pre-service and in-service teacher training and learning support team programs. Parent information fact sheets are also available for all Model Classes.

Aspect currently has six different Model Classes as part of the Model Class Program. Each Model Class is based on the outcomes of a research evaluation carried out over the last 5 years by Aspect. Each Aspect school hosts a different Model

Class Program, based on the evidence-based research evaluation in which they played a lead role. Some examples of Model Classes are as follows: iPad Technology, Language Acquisition through Motor Planning (LAMP) program (Bedwani, Winchester, Simmons, Roberson, & Costley, 2013); Pivotal Response Training Intervention (Kilham & Costley, 2012); Secret Agents Society social skills program (Beaumont & Sofronoff, 2013); Treatment and Education of Autistic and related Communication-handicapped Children (TEACCH)-structured teaching intervention (Kilham & Williams, 2011; Mesibov, Shea, & Schopler, 2004), and the ACAE in Practice Model Class.

Dissemination

Information about the Evidence-Based Research Trials is disseminated through various means. Within Aspect, evidence of program efficacy is regularly reported through professional development workshops, Model Classes, and newsletters. Parents are informed about the school practices through the Model Classes, newsletters, and program updates. Parents whose children participated in research trials receive summary reports about the findings when reports are published.

Aspect research information is also disseminated to the public in other ways. Aspect regularly conducts community professional development workshops for families and professionals who support children living with ASD. These workshops share information about working with evidence-based programs for children with ASD. Peer-reviewed journal articles are published with the findings, and we encourage researchers who conduct the studies to present their findings at relevant education conferences.

The summary findings from the iPad study have attracted widespread interest from the Aspect school community. In addition to Aspect staff professional development workshops, the summary findings from the iPad study have so far been distributed to families who participated in the research and through newsletter updates to the Aspect education community. Once the refereed journal articles have been published, community and professional workshops and conference presentations are planned.

Discussion

The gap between research and school implementation in ASD education has highlighted the need for more rigorous evaluation of interventions and supports (Kasari & Smith, 2013; Parsons et al., 2013; Parsons & Cobb, 2011; White et al., 2013; Wong et al., 2014). The ASDEE model presented in this article provides a systematic process for ethically trialling, rigorously evaluating, and reliably implementing an educational support or intervention for children with ASD. This model has been tested through a series of Continuous Improvement Projects, Small Pilot Studies, and Evidence-Based Research Trials. The

findings from the Evidence-Based Research Trials have been published in peer-reviewed journals (Baldwin, Costley, & Warren, 2014; Keane et al., 2012; Power & Costley, 2014), books (Costley et al., 2012), and Aspect-published and distributed fact sheets, e-newsletters (Bedwani et al., 2013; Kilham & Costley, 2012; Kilham & Williams, 2011), and community and professional development workshops.

The strength of the ASDEE model is that it provides the Aspect staff with a consistent method for evaluating the latest technology or intervention. The gap between research and classroom practice can be managed through a methodical evaluation of a variety of evidence, as well as ethically conducted and evaluated evidence-based research studies directly in the classroom. By assessing new intervention programs or support devices in a trial class (Small Pilot Study), and more widely through multiple classes in several schools (Evidence-Based Research Trial), the participant sample size for the research will be large enough to adequately represent the population, within the context of students with ASD, and therefore draw reliable conclusions from the findings (Odom et al., 2005). By evaluating several classes, across two or more schools, the studies aim to mitigate against introducing a bias when interpreting the results from individual case studies and very small group studies. At present, there is no definitive sample size within the refereed ASD educational literature that is considered to have statistical power as variability of the student's educational requirements needs different research methodologies to evaluate efficacy (Odom et al., 2010; Odom et al., 2005).

The ASDEE model offers a resource-efficient method for operating within the classroom. The resources and effort used in evaluating an intervention are based around educational principles that are identified in the ACAE. The ASDEE model demonstrates how evidence can be assembled from traditional peer-reviewed academic publications or from evidence-informed or anecdotal sources. This flexibility in identifying evidence allows for evaluation of new interventions before peer-reviewed articles are available. It also provides the opportunity to evaluate interventions that have been trialled by parents or professionals, such as occupational or speech therapists, with promising results.

One of the difficulties that the evaluation programs face is resistance from students, parents, and teachers. All too often, the potential participants feel they are evaluated too frequently and this can lead to a lower percentage of the student, parent, or teacher cohort being involved. To overcome this feeling of evaluation fatigue, researchers must adequately explain the benefits of the evaluation to the students, as well as the risks. It is also imperative that the evaluations do not involve overly time-consuming surveys for parents and teachers. In our experience, we find that short pre-intervention and post-intervention surveys with targeted questions are a successful method of evaluation.

The future of the ACAE is a cycle of Continuous Improvement Projects. Schools regularly undertake the ACAE

Self-Review Checklist, and the school's collated results feed into the frequently updated manual. As new interventions and support devices are developed, the workflow processes of the ASDEE model are monitored and the findings are disseminated. The staff are encouraged to submit Research and Ethics Applications, to conduct research, and to share their findings through the delivery of workshops and peer-reviewed forums such as journals and conference presentations.

The ASDEE model is one step toward closing the gap between the research laboratory and the classroom. It provides a clearly defined pathway for educators to identify, evaluate, and implement new innovations that appear to offer support to students with ASD in a shorter time frame.

Conclusion

This article suggests that the gap between research and classroom practice in ASD education is a problem that can be managed through regular classroom program evaluation and reporting. The ACAE is a systematic curriculum methodology that is regularly evaluated and updated. By adhering to the workflow ASDEE model, educators can identify evidence of a new educational intervention, conduct an evaluation, identify effective programs, implement the innovation, and share and disseminate the findings. Through methodical evaluation and continuous improvement processes, better student outcomes can be achieved.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research and/or authorship of this article.

References

- Alexander, J. L., Ayres, K. M., Smith, K. A., Shepley, S. B., & Mataras, T. K. (2013). Using video modeling on an iPad to teach generalized matching on a sorting mail task to adolescents with autism. *Research in Autism Spectrum Disorders, 7*, 1346-1357. doi:10.1016/j.rasd.2013.07.021
- Alhaqbani, B., Adams, M., Fidge, C., & ter Hofstede, A. (2013). *Privacy-aware workflow management*. Retrieved from http://www.researchgate.net/publication/228627602_Privacy-Aware_Workflow_Management
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Apple. (2014). *Special education*. Retrieved from <http://www.apple.com/education/special-education/ios/#motor-skills>
- Ashburner, J., Ziviani, J., & Rodger, S. (2010). Sensory processing and classroom emotional, behavioral, and educational outcomes in children with autism spectrum disorder. *American Journal of Occupational Therapy, 62*, 564-573. doi:10.5014/ajot.62.5.564

- Aspect. (2012). *Aspect comprehensive approach for education: Action research study and development of a user manual*. Retrieved from <https://www.autismspectrum.org.au/content/aspect-comprehensive-approach-education-action-research-study-and-development-user-manual>
- Aspect. (2013a). *Using iPads to facilitate learning, communication, social skills and positive behaviour in children with ASD*. Sydney, Australia: Autism Spectrum Australia (Aspect).
- Aspect. (2013b). *We belong too*. Retrieved from <https://www.autismspectrum.org.au/content/we-belong-key-findings>
- Australian Advisory Board on Autism Spectrum Disorders. (2010). *Education and autism spectrum disorders in Australia: The provision of appropriate educational services for school-age students with autism spectrum disorders in Australia* (Position Paper). Australian Advisory Board on Autism Spectrum Disorders. Sydney, Australia. Retrieved from <http://www.autismadvisoryboard.org.au/>
- Australian Bureau of Statistics. (2014). *Prevalence of autism 4428.0*. Retrieved from <http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4428.0Main%20Features52012?opendocument&tabname=Summary&prodno=4428.0&issue=2012&num=&view=>
- Autism Cooperative Research Centre. (2014). *Autism Cooperative Research Centre for living with autism spectrum disorders*. Retrieved from <http://www.autismrc.com.au/about-us>
- Autism and Developmental Disabilities Monitoring Network. (2014). Prevalence of autism spectrum disorder among children aged 8 years—Autism and developmental disabilities monitoring network, 11 sites, United States, 2010. *Morbidity and Mortality Weekly Report: Surveillance Summaries*, 63(2), 1-21. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/24670961>
- Baldwin, S., Costley, D., & Warren, A. (2014). Employment activities and experiences of adults with high-functioning autism and Asperger's disorder. *Journal of Autism and Developmental Disorders*, 44, 2440-2449. doi:10.1007/s10803-014-2112-z
- Beaumont, R., & Sofronoff, K. (2013). Multi-modal intervention for social skills training in students with high-functioning ASD: The Secret Agent Society. In A. Scarpa, S. Williams White, & T. Attwood (Eds.), *CBT for children and adolescents with high-functioning autism spectrum disorders* (pp. 173-198). New York, NY: Guilford Press.
- Bedwani, M.-A., Winchester, E., Simmons, T., Roberson, J., & Costley, D. (2013). *Evaluation of the Language Acquisition through Motor Planning (LAMP) program with children with autism spectrum disorders (ASD)*. Retrieved from <https://www.autismspectrum.org.au/content/research-insights>
- Brock, M., & Carter, E. (2013). Effects of a professional development package to prepare special education paraprofessionals to implement evidence-based practice. *Journal of Special Education*. Published online before print September 13, 2013. doi:10.1177/0022466913501882
- Brugha, T., McManus, S., Bankart, J., Scott, F., Purdon, S., Smith, J., . . . Meltzer, H. (2011). Epidemiology of autism spectrum disorders in adults in the community in England. *Archives of General Psychiatry*, 68, 459-466. doi:10.1001/archgenpsychiatry.2011.38
- Burgess, B., & Turkstra, L. (2010). Quality of communication life in adolescents with high-functioning autism and Asperger syndrome: A feasibility study. *Language, Speech and Hearing Services in Schools*, 41, 474-487. doi:10.1044/0161-1461(2010/09-0007)
- Burton, C. E., Anderson, D. H., Prater, M. A., & Dyches, T. T. (2013). Video self-modeling on an iPad to teach functional math skills to adolescents with autism and intellectual disability. *Focus on Autism and Other Developmental Disabilities*, 28, 67-77. doi:10.1177/1088357613478829
- Charman, T., Howlin, P., Aldred, C., Baird, G., Degli Espinosa, F., Diggle, T., . . . Wolke, D. (2003). Research into early intervention for children with autism and related disorders: Methodological and design issues autism. *Autism*, 7, 217-225. doi:10.1177/1362361303007002008
- Ciliska, D., Thomas, H., & Buffet, C. (2012). *An introduction to evidence-informed public health and a compendium of critical appraisal tools for public health practice (Revised)*. Hamilton, Ontario, Canada: National Collaborating Centre for Methods and Tools. Retrieved from http://www.nccmt.ca/pubs/IntroEIPH_compendiumENG_web.pdf
- Clark, T. (2013). *Education and the student with an autism spectrum disorder—Where is the research? Where is the evidence?* Asia Pacific Autism Conference, Adelaide, Australia, 8-10 August 2013.
- Conley, J. (2012). Can the iPad address the needs of students with cognitive impairments by meeting IEP goals? In P. Resta (Ed.), *Society for Information Technology and Teacher Education International Conference* (pp. 3986-3990). Chesapeake, VA: Association for the Advancement of Computing in Education.
- Corsello, C. M., Akshoomoff, N., & Stahmer, A. C. (2013). Diagnosis of autism spectrum disorders in 2-year-olds: A study of community practice. *Journal of Child Psychology and Psychiatry*, 54, 178-185. doi:10.1111/j.1469-7610.2012.02607.x
- Costley, D., Keane, E., Clark, T., & Lane, K. (2012). *A practical guide for students with an autism spectrum disorder in secondary school*. London, England: Jessica Kingsley.
- Detrich, R., & Lewis, T. (2013). A decade of evidence-based education: Where are we and where do we need to go? *Journal of Positive Behavior Intervention*, 15, 214-220. doi:10.1177/1098300712460278
- Dingfelder, H. (2011). Bridging the research-to-practice gap in autism intervention: An application of diffusion of innovation theory. *Journal of Autism and Developmental Disorders*, 41, 597-609. doi:10.1007/s10803-010-1081-0
- Eapen, V., Črnčec, R., & Walter, A. (2013). Clinical outcomes of an early intervention program for preschool children with autism spectrum disorder in a community group setting. *BMC Pediatrics*, 13, Article 3. doi:10.1186/1471-2431-13-3
- Geist, E. (2011). The game changer: Using iPads in college teacher education classes. *College Student Journal*, 45, 758-768.
- Harper, C., Symon, J., & Frea, W. (2008). Recess is time-in: Using peers to improve social skills of children with autism. *Journal of Autism and Developmental Disorders*, 38, 815-826. doi:10.1007/s10803-007-0449-2
- Hutchison, A., Beschoner, B., & Schmidt-Crawford, D. (2012). Exploring the use of the iPad for literacy learning. *The Reading Teacher*, 66, 15-23. doi:10.1002/TRTR.01090
- Iovannone, R., Dunlap, G., Huber, H., & Kincaid, D. (2003). Effective educational practices for students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities*, 18, 150-165. doi:10.1177/10883576030180030301

- Kasari, C., & Smith, T. (2013). Interventions in schools for children with autism spectrum disorder: Methods and recommendations. *Autism, 17*, 254-267. doi:10.1177/1362361312470496
- Keane, E., Aldridge, F., Costley, D., & Clark, T. (2012). Students with autism in regular classes: A long-term follow-up study of a satellite class transition model. *International Journal of Inclusive Education, 16*, 1001-1017. doi:10.1080/13603116.2010.538865
- Kilham, C., & Costley, D. (2012). *An independent outcome of a Pivotal Response Training (PRT) intervention for children with autism*. Retrieved from <https://www.autismspectrum.org.au/content/research-insights>
- Kilham, C., & Williams, M. (2011). *An independent outcome study of a "treatment and education and related communication-handicapped children" (TEACCH) intervention for children with autism*. Retrieved from <https://www.autism-spectrum.org.au/content/research-insights>
- Kohatsu, N. D., Robinson, J. G., & Torner, J. C. (2004). Evidence-based public health: An evolving concept. *American Journal of Preventive Medicine, 27*, 417-421.
- Kratochwill, T. (2007). Preparing psychologists for evidence-based school practice: Lessons learned and challenges ahead. *American Psychologist, 62*, 829-843. doi:10.1037/0003-066X.62.8.829
- Kuhn, L., Bodkin, A., Devlin, S., & Doggett, R. (2008). Using Pivotal Response Training with peers in special education to facilitate play in two children with autism. *Education and Training in Developmental Disabilities, 43*, 37-45.
- Laushey, K., Heflin, L., Shippen, M., Alberto, P., & Fredrick, L. (2009). Concept mastery routines to teach social skills to elementary children with high functioning autism. *Journal of Autism and Developmental Disorders, 39*, 1435-1448. doi:10.1007/s10803-009-0757-9
- Lord, C., Wagner, A., Rogers, S., Szatmari, P., Aman, M., Charman, T., . . . Kasari, C. (2005). Challenges in evaluating psychosocial interventions for autism spectrum disorders. *Journal of Autism and Developmental Disorders, 35*, 695-708. doi:10.1007/s10803-005-0017-6
- Mandell, D., Stahmer, C., Shin, S., Xie, M., Reisinger, E., & Marcus, S. (2013). The role of treatment fidelity on outcomes during a randomized field trial of an autism intervention. *Autism, 17*, 281-295. doi:10.1177/1362361312473666
- Mercer, S. L., DeVinney, B. J., Fine, L. J., Green, L. W., & Dougherty, D. (2007). Study designs for effectiveness and translation research: Identifying trade-offs. *American Journal of Preventive Medicine, 33*, 139-154. doi:10.1016/j.amepre.2007.04.005
- Mesibov, G., Shea, V., & Schopler, E. (2004). *The TEACCH approach to autism spectrum disorders*. New York, NY: Springer.
- National Autism Center. (2011). *Evidence-based practice and autism in the schools: A guide to providing appropriate interventions to students with autism spectrum disorders (Manual)*. Randolph, MA: Author.
- National Research Council. (2001). *Educating children with autism: Committee on educational interventions for children with autism* (C. Lord & P. McGee, Eds.). Washington, DC: National Academies Press. Retrieved from http://www.nap.edu/openbook.php?record_id=10017&page=R1
- New South Wales Department of Education and Communities. (2011). *Australian school funding arrangements*. NSW Department of Education and Communities. Sydney, Australia. Retrieved from: http://www.google.com.au/url?sa=t&rct=j&q=australian%20school%20funding%20arrangements&source=web&cd=8&cad=rja&uact=8&ved=0CEMQFjAH&url=https%3A%2F%2Fwww.det.nsw.edu.au%2Fmedia%2Fdownloads%2Fabout-us%2Fnews-at-det%2Fannouncements%2Fdiscussion-paper.pdf&ei=HV1AVIWXFsSOuATX74CQBw&usq=AFQjCNFoHdj92_QPI7eX3-b4USEfunuVIQ&bvm=bv.77648437,d.c2E
- Oakley, G., Howitt, C., Garwood, R., & Durack, A.-R. (2013). Preservice teachers' interventions to support young children with autism. *Australasian Journal of Early Childhood, 38*(3), 86-96.
- Odom, S. L., Boyd, B. A., Hall, L. J., & Hume, K. (2010). Evaluation of comprehensive treatment models for individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders, 40*, 425-426. doi:10.1007/s10803-009-0825-1
- Odom, S. L., Brantlinger, E., Gersten, R., Horner, R., Thompson, B., & Harris, K. (2005). Research in special education: Scientific methods and evidence-based practices. *Exceptional Children, 71*, 137-148.
- Parsons, S., Charman, T., Faulkner, R., Ragan, J., Wallace, S., & Wittmeyer, K. (2013). Commentary—Bridging the research and practice gap in autism: The importance of creating research partnerships with schools. *Autism, 17*, 268-280. doi:10.1177/1362361312472068
- Parsons, S., & Cobb, S. (2011). State-of-the-art of virtual reality technologies for children on the autism spectrum. *European Journal of Special Needs Education, 26*, 355-366. doi:10.1080/08856257.2011.593831
- Pellicano, L., Dinsmore, A., & Charman, T. (2013). *A future made together—Shaping autism research in the UK*. London, England: Institute of Education, University of London, Centre for Research in Autism and Education.
- Power, A., & Costley, D. (2014). Preservice teachers' learning among students with autism spectrum disorder. *Australasian Journal of Special Education, 38*, 34-50. doi:10.1017/jse.2014.6
- Rayner, C. (2010). Video-modelling to improve task completion in a child with autism. *Developmental Neurorehabilitation, 13*, 225-230. doi:10.3109/17518421003801489
- Simpson, R., McKee, M., Teeter, D., & Beytien, A. (2007). Evidence-based methods for children and youth with autism spectrum disorders: Stakeholder issues and perspectives. *Exceptionality, 15*, 203-217. doi:10.1080/09362830701655717
- Stephenson, J., Carter, M., & Kemp, C. (2012). Quality of the information on educational and therapy interventions provided on the web sites of national autism associations. *Research in Autism Spectrum Disorders, 6*, 11-18. doi:10.1016/j.rasd.2011.08.002
- Stock, R., Mirends, P., & Smith, I. (2013). Comparison of community-based verbal behavior and pivotal response treatment programs for young children with autism spectrum disorder. *Research in Autism Spectrum Disorders, 7*, 1168-1181. doi:10.1016/j.rasd.2013.06.002
- van der Meer, L., & Rispoli, M. (2010). Communication interventions involving speech-generating devices for children with autism: A review of the literature. *Developmental Neurorehabilitation, 13*, 294-306. doi:10.3109/17518421003671494
- van der Meer, L., & Weijers, D. (2013). *Educational psychology research on children with developmental disabilities using expensive ICT devices*. Retrieved from <http://responsible-innovation.org.uk/torrii/resource-detail/1182>

- Warren, Z., McPheeters, M., Sathe, N., Foss-Feig, J., Glasser, A., & Veenstra-VanderWeele, J. (2011). A systematic review of early interventions for autism spectrum disorders. *Pediatrics*, *127*, e1303. doi:10.1542/peds.2011-0426
- White, L., Leekham, S., Shenow, S., & Gomez de la Cuesta, G. (2013). *The autism research toolkit*. Cardiff, UK: The Wales Autism Research Centre, Cardiff University.
- Wong, C., Odom, S., Hume, K., Cox, A., Fettig, A., Kucharczyk, S., . . . Schultz, T. (2014). *Evidence-based practices for children, youth and young adults with autism spectrum disorder*. Chapel Hill: Frank Porter Graham Development Institute, University of North Carolina, Autism Evidence-Based Practice Review Group.

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