



A review of Learning Efficiency for Students with Autism Spectrum Disorder in Classroom Environment

Fansong Huang*

Pennsylvania State University, Pennsylvania, 16801, United States

* Corresponding author. Email: fansong.huang@yahoo.com

Abstract. Autism Spectrum Disorder (ASD) also known as Autism is a developmental disability usually appear among kids before the age of three and can continuously develop even after adulthood if no efficient measure is taken. The most iconic symptoms would be having problems with social communication and interaction either with their peers or parents. This symptom challenges the learning efficiency to those who have ASD in a normal classroom setting as they can not learn or pay attention to the teachers attentively. Now the question is, is it fair to put students with ASD and students who don't have in the same classroom environment? There must be a gap due to the uneven learning ability, but how would it affect the grades in standardized exams and what can we do to help the students who have ASD? This review paper included 10 related papers that specifically talked about students with ASD in a school classroom environment and their learning efficiency.

Keywords: Academic performance, ASD, teaching, college

1 Introduction

Statistics from National Center for Education Statistics shown that in 2020, there are 49.4 million students attended PK-12 education program. This is a standardized education program which is designed for all students in the United States. However, according to CDC surveillance website of autism spectrum disorder, there is 1 in an average of 44 eight-year-old have ASD in 2018 and this number will be rising thorough out the years. If we narrow down to 8 years old with ASD, it would still be a huge group of children in a macro view. Children with ASD usually have learning disability and communication problems. These are two critical symptoms that would cause lower study efficiency. If the learning efficiency is measured using the same standardized test, there would be a difference within students and a huge disadvantage toward those who have ASD. There are major downsides for those students and the school. Students with ASD will feel frustrated if they constantly receive lower score comparing to their peers and eventually lost the interest studying. It would be a vicious cycle which leads to even lower academic performance. At an early stage of development, a motivated learning habit is critical for future development. For the school and teachers, it is hard to communicate with children with ASD without proper professional training. The students

would still have trouble learning even if the teacher already know the children have ASD and pay special attention. If the teacher performance is assessed by student's academic performance (standardized testing score), it would be unfair to those teachers who have trouble dealing with ASD children. This raised a question: How can we create a fair and efficient learning environment for both ASD students and normal students? This question is multidimensional and let's start with how to create a fair learning environment for ASD students. There are couple ways to create academic fairness in a normal classroom setting: altered grading rubric for ASD students and extra guidance for ASD students. However, these compromises from the school can be controversial as it breaks the standardized grading system. Extra guidance would be time consuming and require huge amount of teaching resource. Another solution would be sending children with ASD to special education school or private school. It might be a less stressful environment for ASD children as they are taken care of uniquely but the problem with that is the cost. Special education can be pricy and not all family can afford that. In this paper, we will use statistics to see what the academic performance gap between students with ASD and students is who do not have ASD and what is the possible solutions to provide quality education for ASD students.

2 Major findings about ASD student efficiency and possible ways to help ASD students to succeed

In this paper, Several paper were selected which include statistical data and empirical studies. These previous researches laid the foundation for future studies. In the follow sections, we will dive into ASD or even high-function ASD students of different educational level and compare their academic performance with their typical development (TD) peers and we will be looking at different ways to help students with ASD to succeed.

3 Comparing ASD students' academic performance with their peers.

This section mainly focuses on how the symptoms of ASD affect academic performance and in what extent does it affect students. The following content will compare students in different educational level including university students and K-12 students.

3.1 Academic performance of K-12 students with ASD comparing to their peers.

The procedure of K-12 is from kindergarten to 12th grade. The age group of this population would be around an average entrance age of 5 till the age of 18. Research conducted in 2016 revealed the academic performance gap between different groups of children ASD comparing to their peers [1]. To distinguish the impact of ASD to students' ability, different categories will be applied for different sublevel of ASD. ASD

stands for the population of children that has intellectual disability caused by autism spectrum disorder. HFASD stands for High-Function Autism Spectrum Disorder which represents the population of children without intellectual disability. While ASD usually comorbid with ADHD, the author also included two subgroups under HFASD which is HFASD-H meaning children with HFASD but also meets the criteria of high ADHD symptoms[2]. HFASD-L stands for children with HFASD who also comorbid ADHD symptoms but in a lower (fewer) symptom. TD stands for Typical-Development children who are not diagnosed to have either ASD or ADHD. In the study, academic performance is measured using Wechsler Individual Achievement (WIAT-III). According to official site of Pearson, WIAT-III has already come to its fourth edition. The series of test are taken individually and mainly measures academic achievements in different fields such as reading, writing and math. Children were given 10 minutes to handwrite an expository essay. Result of the test after analyzation using WIAT-III scale were further scored into three subscales: overall score, word count, theme development and text organization [1]. Data compared the academic performance within the three different subscales. For the overall writing, overall writing scores of children with HFASD-H were lower comparing with their typical developing peers. Children with ADHD perform a little bit better than those with HFASD-H. Children with HFASD-L perform only slightly lower than their TD peers and was the best within the groups if comparing to TD group. For the word count subscale data, children within three clinical groups ADHD, HFASD-H, HFASD-L all perform significantly lower comparing to their TD peers. For the theme development and text organization subscale scores, the pattern is almost identical towards the data of overall writing subscale scores. HFASD-H and ADHD children receive significantly lower scores than their TD peers while HFASD-L children perform much better than the other two clinical groups.

From the previous researcher, result shown that high-function ASD with high ADHD comorbidity can relate to a much lower academic performance. In a word count setting, ADHD and HFASD-L have almost identical academic performance but still much lower than their TD peers. HFASD-L have the highest academic performance among all three clinical groups. This pattern is easy to predict since high function ASD do not have intellectual ability affection. However, the potential problem with this research is that it only measures verbal ability since the task is letting the participants to write a paragraph. WIAT-III can also be used to measure reading comprehension, math fluency, mathematics, oral language, and many other essential abilities for academic success [3]. This research only investigated writing, vocabulary and verbal usage categories which can only represent part of the children's academic performance.

After reviewing this study, question might be raised for example: What if we crossed out groups with ADHD comorbidity group? Would there be a math achievement gap between ASD students comparing tot heir TD peers? What is the factor that cause difference in academic achievement? Another recent research conducted in 2020 investigated how academic achievement and attention in children differ between ASD groups and TD peers. In research conducted by Emily and her colleagues, only children with ASD are solely selected. Children that have a diagnosis of ADHD confirmed by parent reports were not eligible to participate to ensure accuracy of the data. TD children with potential learning difficulties were also not eligible to participate. Measurement of

attention used Test of Everyday Attention for Children [5]. The result of the study indicated that while the group of Autistic children is older than the TD children, their cognitive and academic performance are significantly lower comparatively. IQ, reading achievement and math achievement were also lower comparing to TD children. The result of TEA-CH indicate that TD children have significantly higher divided attention scores than ASD children but did not have much gap in sustained or selective attention [4].

From these two studies, the academic performance gap is obvious. According to the second study, divided attention could be one of the main reasons that caused lower academic performance. While ASD have a high rate of comorbidity, ADHD with its other symptoms might aggravate learning difficulties. There is far more potential causation for ASD children to have a lower academic performance, but the gap is real and learning difficulty can be one of the impacts of ASD symptoms.

3.2 Academic performance of university students with ASD comparing to their peers.

After looking at some studies regarding academic performance among K-12 ASD students, further research should be made to see how higher education students deal with ASD symptoms and how ASD affect them in an academic setting. Comparing to K-12 students who usually have parental guidance, college students are more socially independent. The transition from high school to college can be challenging to students with typical development not to mention to ASD students. A study conducted by Emily and her colleagues revealed in what extent ASD students had a gap academically or socially comparing to their neurotypical peers [6]. Participants were recruited from 14 different institutions scatter around Indiana, US. Approximately 3216 students completed the survey which includes survey questions regarding their academic performance, college experience, classroom behaviors, feelings of belonging, social relationship, and health condition. Students who are diagnosed with Autism are required to complete several additional survey questions regarding their disability accommodation, disclosure, and autism identity [7]. The result indicated that neurotypical students had higher GPA than ASD students or students with disabilities. They also have a lower rate of failing a class, taken a remedial course or report academic difficulty. On the other side, statistics shown that ASD students have a much lower rate of participating in career related activities such as internship and field placements. This is probably caused by the deficient communication ability caused by the syndrome. Additionally, ASD students reported a higher rate of being the victim of verbal bullying, rumors, or social exclusion than their neurotypical peers. The school can be a crucial factor to decrease rate of discrimination and bullying on ASD students or other students with special needs. ASD students reported poorer health condition than their neurotypical peers. The health condition in this extent includes physical health and mental health (depression level, anxiety level, stress). This might be because of the academic pressure and social pressure caused by ASD. An exception regarding health conditions is that ASD students have a lower rate of drinking problems comparing to neurotypical students. In all, college students with

ASD face even more challenges in academic settings. Social and mental health can be another two big aspect that caused worse academic performance.

4 Ways to help students with ASD in academic setting

After reviewing how ASD can affect students in different academic levels, ways of supporting should also be included. There are several angels to think of. First, will the teacher quality affect learning efficiency? While public school does not usually have trained teacher to deal with ASD students individually, will a certificated teacher with autism related training boost the students' academic performance?

A study conducted by Samantha and her colleagues investigated how the teacher's certifications will affect students' academic outcome [8]. Participants were school aged students from grade four through eight who have ASD and have been receiving special education services from North Carolina. Measurement of academic achievements are from NC ELA (North Carolina English language arts). Three versions of assessment were created: Regular ELA with mathematic assessments, Modified assessments with mathematic assessments, and alternate assessments with mathematic assessments. Regular assessments are designed for students demonstrated grade-level standards with accommodations. Modified assessments are designed for students demonstrated lower than grade-level standards on the regular assessments even with the accommodation. Alternative assessments are designed for students with serious cognitive disabilities. These students have severe trouble and disability restricting them form taking the regular curriculums even with the support of normal accommodations. Teachers were categorized in three different groups: certified teachers in the field of special education, certified teachers in the field of general education and certified teachers in both field of general education and special education. Participants (students) received special education service during three academic years either from 2010 to 2012 or from 2011 to 2013. Same assessments were taken by participants each year to retrieve data. The expected result should be students will achieve better academic outcomes if they were taught by teachers with both general education and special education certificates. However, data suggest that there is no significant difference between three different types of teachers with certificates [8]. According to the data, students who took the modified assessments reported to have lower grades when taught by teachers only with special education certificate comparing to those students who were taught by general education teacher or dual-certified teachers. We can interpret this signal into, even though students who took modified assessments might have more academic difficulty comparing to their peers, content knowledge would be more useful to boost their performance rather than using special education skills.

According to the authors, limitations of this study can be one of the causes of the result. If we use this standardized assessment into a larger population, result can be different. Also, education systems are different with each other. For example, the result might work in the United States education system but might not accommodate education systems in China or Japan. When applying the finding of this study into a real-life

setting, comorbidity of ASD among children and the culture gap between them should be taken into consideration.

5 Conclusion

After reviewing studies regarding ASD student's academic performance, researchers shown that there is a gap comparing to their typical development peers. While there is no identical severity of ASD symptoms among children, findings of the population should not be generalize and applied into a specific case. Students with ASD or High-Function ASD also have social problems including bullying or isolation from their peers [7]. Mental disability was measured among college ASD students, data shown a higher level of pressure and anxiety comparing to their TD peers. According to a study conducted among university students in Malaysia, stress have a significant and negative impact on academic performance [9]. For students with ASD, learning to cop with the stress is crucial and should be taught by special education specialists. For those with HFASD, school should pay more attention on education skills as they need special accommodations to help them learn better in a classroom setting. As for teacher certificates, while the school should make sure the teacher hired are qualified and can produce quality teaching contents, they also need to look for those who know skills to coop with ASD students. According to the paper about teacher certificates, the content is more important than teaching skill to ASD students in a majority situation. HFASD students would need dual-certificated teachers to accommodate with their leaning progress.

The limitations of the literature reviewed is that more controlled variables to ensure high internal validity. For example, students from different socioeconomic background can have different severity of symptoms. Another direction of the study would be, how the academic difficulty changes while students in a specific socioeconomic background transit from high school to college. Also, since most of the participants are all recruited from the United States, geographical difference should be taken into consider when trying to apply the findings in a real-life setting.

References

1. Zajic, M. C., McIntyre, N., Swain-Lerro, L., Novotny, S., Oswald, T., & Mundy, P. (2016). Attention and written expression in school-age, high-functioning children with autism spectrum disorders. *Autism*, 22(3), 245-258. doi:10.1177/1362361316675121
2. Gargaro, B. A., Rinehart, N. J., Bradshaw, J. L., Tonge, B. J., & Sheppard, D. M. (2011). Autism and ADHD: How far have we come in the comorbidity debate? *Neuroscience & Biobehavioral Reviews*, 35(5), 1081-1088. doi:10.1016/j.neubiorev.2010.11.002
3. Burns, T. G. (2010). Wechsler Individual Achievement Test-III: What is the 'Gold Standard' for measuring academic achievement? *Applied Neuropsychology*, 17(3), 234-236. doi:10.1080/09084282.2010.499803
4. McDougal, E., Riby, D. M., & Hanley, M. (2020). Profiles of academic achievement and attention in children with and without autism spectrum disorder. *Research in Developmental Disabilities*, 106, 103749. doi:10.1016/j.ridd.2020.103749

5. Manly, T., Robertson, I. H., Anderson, V., & Nimmo-Smith, I. (1999). *The test of everyday attention for children*. London: Battley Brothers.
6. White, S. W., Ollendick, T. H., & Bray, B. C. (2011). College students on the autism spectrum. *Autism*, 15(6), 683-701. doi:10.1177/1362361310393363
7. McLeod, J. D., Meanwell, E., & Hawbaker, A. (2019). The experiences of college students on the Autism Spectrum: A comparison to their neurotypical peers. *Journal of Autism and Developmental Disorders*, 49(6), 2320-2336. doi:10.1007/s10803-019-03910-8
8. Goldman, S. E., & Gilmour, A. F. (2020). Educating students with autism spectrum disorders: Is teacher certification area associated with academic outcomes? *Journal of Autism and Developmental Disorders*, 51(2), 550-563. doi:10.1007/s10803-020-04561-w
9. Elias, H., Ping, W. S., & Abdullah, M. C. (2011). Stress and academic achievement among undergraduate students in Universiti putra Malaysia. *Procedia - Social and Behavioral Sciences*, 29, 646-655. doi:10.1016/j.sbspro.2011.11.288

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

