An Exploratory Pilot Study on the Integration of Neurodiverse University Students Into Mainstream Learning and Their Performance: Case of Jones Learning Center

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Abstract
This pilot study explores the impact of inclusive classroom on neuro-diverse college students at Jones Learning Center (JLC) - University of the Ozarks, and their consequent academic performance having participated in an integrative process designed to support students who are intellectually capable of obtaining a college degree, but who require support for learning challenges owing to specific LDs, AD/HD, or ASD. The purpose of this work is to explore the overall processes and practices of (JLC) inclusive program, and to identify its effectiveness in supporting the academic performance of enrolled students with learning disabilities following integration into mainstream university learning. The research process begins with testing the first hypothesis directed toward determining the extent to which the academic performance of JLC students did improve after involvement with the program, then proceeds to the second hypothesis directed toward determining the extent to which collective applied knowledge at JLC is distinctive from typical practices in the field. This research uses a mixed methods approach. Data was collected at JLC in the form of secondary data of Grade Point Average, primary data obtained via structured questionnaire administered to students and alumni, and primary data obtained throughout conversational interviews conducted with staff and educators. The significance of this study is that, first, it validates the effectiveness of the special program at JLC for college-level students who learn differently, and second, it identifies the distinctiveness of their mix of techniques, methods, and practices, namely in their comprehensive individualized one-on-one approach.

Keywords: Inclusive Classroom, Neuro-Diverse College Students, Learning Challenges, Academic Performance, Collective Knowledge

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Introduction

The Jones Learning Center (JLC), affiliated with the University of the Ozarks in Arkansas, is renowned for pioneering inclusive classroom programs in the U.S., specifically tailored for college students dealing with learning challenges. The JLC program is designed to serve college-level students with specific documented Learning Disabilities (LD), Attention Deficit/ Hyperactivity Disorder (ADHD), or Autism Spectrum Disorder (ASD) with average or above average intellectual abilities - who can think critically but need additional support in a traditional academic environment.

This work delves into the profound impact of such inclusive environments on neurodiverse students at JLC, particularly emphasizing their academic performance trajectories. While this paper presents a preliminary analysis of the JLC's efficacy in bolstering the academic prowess of students with learning disabilities, it is imperative to note that it forms a segment of a broader research initiative. This overarching project aims to meticulously unpack the multifaceted processes, specialized methodologies at JLC, and involves the discovery, sharing and dissemination of collective knowledge inherent to its program.

Background

The JLC's foundational philosophy is to cater to college students diagnosed with specific Learning Disabilities (LD), Attention Deficit/Hyperactivity Disorder (ADHD), or Autism Spectrum Disorder (ASD). These students, characterized by average or superior intellectual capacities, often necessitate additional scaffolding in conventional academic settings due to their unique learning profiles.

Globally recognized yet diversely interpreted, the terms Neurodiversity (ND) and Learning Disability (LD) serve as broad categorizations. ND encapsulates the myriad ways in which the brain functions, fostering a spectrum of skills, cognitive styles, and challenges. It underscores variations in learning, sociability, attention, and mood without pathologizing these differences. Conversely, LDs are conditions that act as barriers, preventing individuals from assimilating knowledge at a pace commensurate with their age cohorts (Wood, 2019; Armstrong, 2010; Milton, 2012; Fletcher et al., 2007; Grünke & Cavendish, 2016).

Students diagnosed with LDs often grapple with traditional learning paradigms, encountering challenges in reading, writing, listening, and reasoning, among other skills. ADHD and ASD emerge as prevalent disorders associated with LDs. The manifestation of these challenges is multifaceted, with each individual presenting a unique constellation of symptoms and strengths (Kuder & Accardo, 2018; DuPaul et al., 2017; Cortiella & Horowitz, 2014; NASET, 2005; LDA, 2012; Shaywitz et al., 1995; Shroff, 2021).

Neurodiverse students, in addition to their diagnostic challenges, often confront emotional and psychological impediments that can adversely impact their academic trajectories. These challenges are accentuated by deficits in organizational skills, time management, and study strategies. Consequently, such students may struggle with time management, articulating their needs, acclimatizing to the college milieu, and maintaining focus, especially in the face of sensory sensitivities. However, it's pivotal to underscore that many of these students, despite their academic challenges, possess the intellectual acumen requisite for learning (Reaser et al., 2007; DuPaul et al., 2017).

Recent empirical studies illuminate the correlation between positive psychological attributes and enhanced life satisfaction, academic accomplishments, and diminished mental distress, even in neurotypical college students. A salient finding underscores that students who foster robust connections with their academic institutions and peers, irrespective of their diagnostic profiles, report elevated life satisfaction levels. This, in turn, mitigates feelings of stigma and social ostracization, catalyzing enhanced academic outcomes (Casagrande et al., 2020; McLeod et al., 2019). Thus, a pivotal determinant of academic success for neuroatypical students hinges on their social integration within the campus ecosystem and their perceived sense of belonging and contentment within the academic community.

It is within that context that the inclusive pedagogical framework at JLC is being explored, hoping to enable neurodiverse students to better cope in mainstream academic settings. By comprehending the multifarious challenges these students encounter and the determinants that influence their academic outcomes, educational institutions can architect more responsive and inclusive support mechanisms.

Methodology & Data Collection

With a growing emphasis on inclusive education and the need to ensure that all students, regardless of their unique learning needs, are provided with optimal opportunities for success, this research seeks to delve deeper into the specialized programs that cater to this philosophy. Hence, the purpose of this study is to:

- provide a comprehensive exploration of the general process, special techniques, and practices within the Jones Learning Center (JLC) inclusive program; and
- identify and analyze the effectiveness of this process, techniques and practices in supporting the academic performance and success of enrolled college students with learning disabilities at regular classrooms framework.

Accordingly, in the context of understanding specialized educational programs and their impact on student success, and given the specific objectives of the Jones Learning Center (JLC) program, this research narrows its focus lens to primarily concentrate on:

- neuro-diverse college students with documented LD, ADHD or ASD;
- with average or above average intellectual abilities;
- who can think critically but need additional support to demonstrate their abilities within a mainstream academic environment.

To guide this inquiry and provide a structured framework for our exploration, the pivotal questions we seek to address are:

Q1: What are the odds that there is an empirical relationship between the special program at JLC for enrolled college students with learning disabilities and the likelihood of their improved academic performance and success?

Q2: What are the odds that the overall process along with the techniques, methods, and practices at JLC program to support students with learning disabilities are distinctive or different by some means from commonly used practices in the field?

Data Collection

Data collected for the present part of the study came from a structured questionnaire administered to a pilot sample of students and alumni at JLC. The intention is to eventually cover all students enrolled in the last 3-5 years. As a result, the adopted pilot sample involved

32 participants, of which 18 current students and 14 alumni. This represents about 36.1% of current students and 5.6% of alumni population within the aforesaid period. The questionnaire design was influenced by surveys from Gelbar, Shefyck, and Reichow (2015) and West (2019), aligning with the study's scope.

On another note, it is worth mentioning that additional set of primary data is being collected through semi-structured interviews with nearly all staff and educators linked to JLC; using an in-depth conversational approach as outlined by Schober and Frederick (1997). The said data will be mainly used for the other part of this research project, which is not discussed in the present paper, related to knowledge discovery, sharing and dissemination. The exploratory part will not rely on specific conceptual framework, but analysis will follow Braun and Clarke's thematic qualitative method (2006) using deductive approach for identifying themes.

Methodological Background

This research adopts a descriptive statistics approach. Following Leedy and Ormrod (2001), clustering and data reduction techniques, principal components and factor analysis were applied so as to analyze the current state of the phenomenon through observation and correlation. Working hypotheses are employed, following the concept outlined in Oppenheimer and Putnam (1958). These hypotheses are open to further development without committing to their validity or absolute truth. As such, confirmatory data analysis would test these hypotheses rigorously, while exploratory data analysis, as suggested by Tukey (1980), remains speculative and open-minded.

The research adopts a Bayesian perspective to tackle its research queries, contrasting with the frequentist framework in how data and parameters are treated. Bayesian methods consider parameters as random and data as fixed, while frequentist methods view it inversely. This leads to differing approaches to statistical inference. Prominent among frequentist techniques is maximum likelihood (ML) estimation, which boasts attributes like consistency and asymptotic normality, reliant on large sample sizes. In contrast, Bayesian methods, with their unique theoretical underpinnings, do not hinge on large samples. Techniques like Markov chain Monte Carlo (MCMC) in Bayesian analysis prioritize the number of samples over infinite samples. Nevertheless, the authors acknowledge that Bayesian methods do not resolve small sample issues entirely; however, they possess qualities that make them suitable for more conducive to modeling small sample data conditional on the choice of prior distributions.

Preliminary Data Analysis

The questionnaire encompasses sections on General Background, Academic History, Diagnosed Disabilities, and Accommodations provided. We have derived aggregate scores related to metrics such as "Social Integration," "Organizational Integration & Performance," and "Institutional Connectedness." In our pilot sample, males constitute 56.3%, while females make up 43.8%. The majority of respondents fall within the younger age brackets. Notably, 90.6% of participants embarked on their college journey immediately after high school. The reliability of our questionnaire is underscored by a Cronbach’s Alpha value of .8536, indicating strong consistency.

Table 1 below delineates the categories of statements along with the count of statements in each category. These statements are assessed using Likert scale evaluations.

Category	*Number of Statements*
Background	3
Academic Background	13
Disability	3
Accommodations	3
Social Integration	4
Organizational Integration	6
Institutional Connectedness	3

Table 1: categories in questionnaire with number of statements

As such, Table 2 here below presents selected data extracted from Spearman's correlation coefficients, specifically for statements D1 – D2 and S1 – S10. The most interesting information is found in the 'cluster' of coefficients which can be observed ranging horizontally from D1 to S3 and vertically from the "Count of years at JLC" to "Diagnosed with ADHD." This cluster provides valuable insights that will guide the construction of our model and shed light on the relationships between variables.

Statement	*D1*	*D2*	*S1*	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*	*S8*	*S9*	*S10*
Gender	**1**											
Age		**1**										
Academic status		**0.730**	**1**									
Credit enrolled			**-0.497**	**1**								
Credit completed		**0.635**	**0.888**	**-0.379**	**1**							
GPA end of high school						**1**						
GPA 1st term JLC						**0.424**	**1**					
Current GPA						**0.565**	**0.732**	**1**				
Started college directly after HS									**1**			
Attended a college										**1**		
Count of Years in JLC		**0.595**	**0.696**		**0.650**						**1**	
Graduated		**0.659**	**0.910**	**-0.712**	**0.738**						**0.518**	**1**
Major	**0.499**											
Diploma		**0.709**	**0.885**	**-0.693**	**0.726**						**0.538**	**0.973**
Currently working		**0.684**	**0.854**	**-0.668**	**0.686**						**0.482**	**0.938**
Diagnosed ADHD		**-0.384**	**-0.406**									**-0.376**
Diagnosed ASD												
Diagnosed LD												
Count accommodations			**-0.368**									
Accomm. like HS												
I have the social skill to succeed												
I have made new friends in college			**0.523**									**0.462**

Table 2: extract from correlation matrix, Spearman's correlation coefficient estimate, D1-D2 / S1-S10

Further, the below Figure 1 displays the outcomes derived from the Agglomerative Hierarchical Clustering (AHC) algorithm. Both the K-means and AHC algorithms pinpoint two distinct clusters. Notably, it is particularly troublesome that one cluster solely encompasses the statement related to the "Count of Accommodations." This is likely a reflection of the collinearity present among the variables.

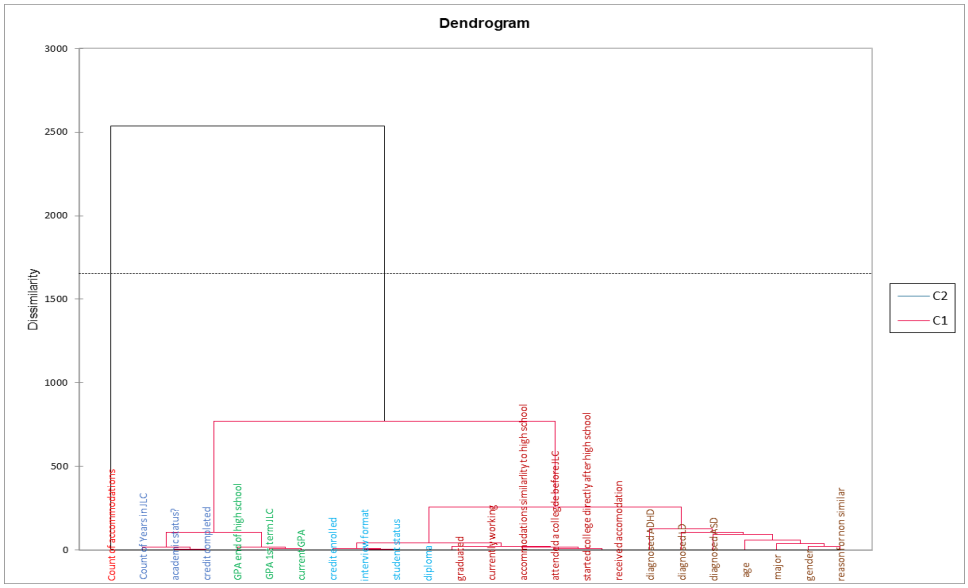

Figure 1: Dendrogram for variables considered in JLC analysis

Figure 2 presents the Scree plot derived from the Principal Component Analysis (PCA). The PCA suggests that the majority of the variation is encapsulated within the initial two principal components. This observation further substantiates the presence of collinearity.

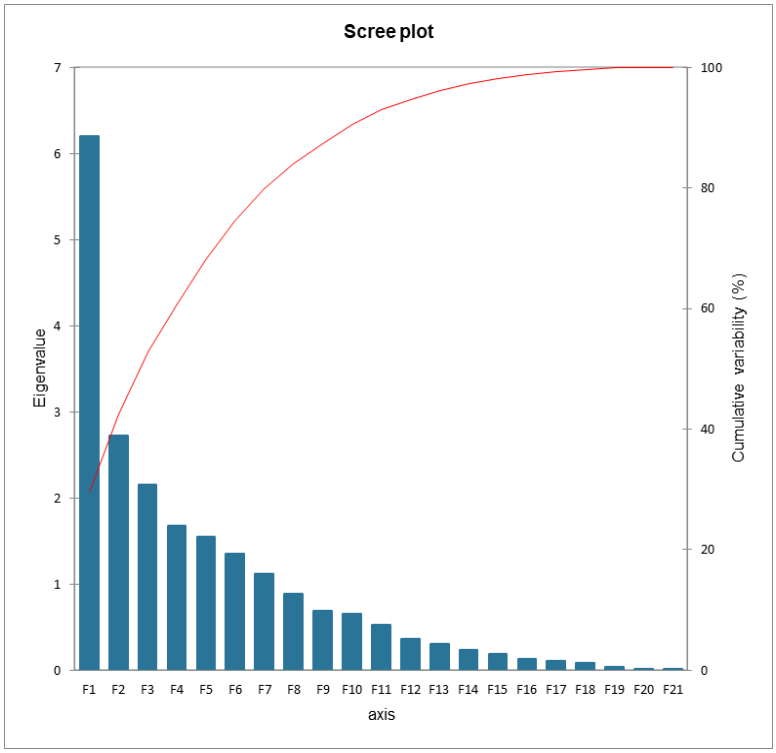

Figure 2: PCA Scree Plot

In Table 3 below, it's worth noting that comparison between estimated coefficients (Model 1) and posterior medians (Models 2 and 3) shows that the Bayes medians are relatively similar. However, clear differences emerge in terms of magnitude. Conducting tests concerning priors, especially when additional scientific information is introduced, could provide valuable insights. Particularly intriguing are the results associated with the 'Diagnosed' variables. These consistently fall below zero, suggesting that the average ordered logit for these variables being in an elevated category decreases when other model variables remain constant.

Statement	*Coefficient Model 1*	*Median Model 2*	*Median Model 3*	*Average Models 2 and 3*
Gender	1.486685	1.815221	1.838857	1.827039
Age	.101438	-.1580154	.066655	-0.04568
Academic Status	1.154742	1.238989	1.239599	1.239294
Count of years in JLC	-.9412441	-.9645586	-1.041351	-1.00295
Diagnosed ADHD	-.1368063	-.3159668	-.235952	-.27596
Diagnosed ASD	-.5669814	-.3159668	-.7322394	-.73085
Diagnosed LD	-.7936337	-.8469059	-.9331018	-0.89

Table 3: Comparison between estimated coefficients and posterior medians

Ethical Considerations and Limitations

Maintaining integrity, transparency, and confidentiality is paramount in this research. To ensure this, all questions were pre-shared and approved by the management at Jones Learning Center (JLC). Additionally, to uphold participant confidentiality, individual identifications were encrypted. This measure restricted full data access solely to the research team, and all collected data was securely stored.

Generally, study limitations refer to design or methodological constraints that can influence the interpretation of research outcomes. The primary limitation of this study pertains to the sample size and selection criteria. The second limitation arises from the diverse perspectives and theories within the realm of special education, which can introduce varied interpretations. Lastly, the third limitation concerns the academic background of the researchers. Their expertise predominantly lies in business and management, rather than in the specialized field of special education.

Conclusions

This study underscores three primary insights: firstly, it reasonably offers an affirmation on the effectiveness of the special program at JLC for college-level students who learn differently, and second, it underscores the pivotal role of certain survey variables, and third, it delineates the unique blend of techniques, methodologies, and practices employed at JLC, particularly their comprehensive, individualized one-on-one approach.

However, several considerations emerge from the preliminary findings of this pilot study. The pilot data revealed the existence of collinearity, which could potentially mask the true relationships between variables. Addressing this collinearity in future research endeavors will be crucial to bolster the accuracy and validity of the results. Based on this, collecting insights from the pilot study has prompted an ongoing effort to refine and enhance the questionnaire to better capture relevant data.

Furthermore, to ensure a more comprehensive and representative understanding, there's an intention to expand the sample size. The aim is to encompass students who have been part of JLC over the past 3-5 years. This expansion seeks to bolster the generalizability of the results and offer a more encompassing view of the experiences of neurodiverse students at JLC.

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