Examination of Outliers as Mediator Variables Between Resiliency and Academic Performance

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ABSTRACT. In the higher educational setting, measures have been initiated to aid college students in overcoming various setbacks and hindrances that can limit them from academically performing well. Extant literature pointed out the significant role of resilience. Different variables emerged after data analysis, which helped understand the deviant points or outliers/distinct. The present study aims to determine the outliers' profile, resiliency component scores, General Weighted Average (GWA), and outliers' detection criteria, examine outliers using Stem-and-Leaf plots and Scattered Diagrams, and explore outliers' distinct characteristics or emerging themes. The present study assessed 560 students and yielded 15 data outliers that appeared in Stem-and-Leaf plots and Scattered Diagrams. The present study is vital in understanding resiliency and academic performance in the present context. Thus, it recommends the exploration of mediator variables, namely, students' innate intelligence and resiliency behaviors, which are the product of extreme experiences that may affect the relationship between resiliency and academic performance.

1.0. Introduction

Outliers/ distinct data in statistics refer to the data points that differ significantly from other observations. These data points manifest in a plot from different values representing the respondents' data (Salkind, 2010). Understanding the emergence of outliers helped researchers identify unexplained variables. Data Outliers can be identified using the Stem-and-Leaf plots and Scattered Diagram (in SPSS) or points outside the overall distribution pattern. To understand this phenomenon, this study investigated deviant points and explored the underlying students' experiences that cause data outliers. Moreover, Aggarwal and Aggarwal (2017) explained that outliers/distinct data often contain essential information about abnormal characteristics, qualities, or entities that might explain the limitations of the theory generated. Although outliers are bad data points, Osborne and Overbay (2019) argued that the researcher should thoroughly examine and investigate them since this might contain relevant information and valuable insights into the data analysis.

The present study explored resilience as a psychological construct determining the student's ability to bounce back from the adversities and challenges, they encounter in their academic journey (Valladolid, 2021). Several studies assess the role of resilience in building coping strategies addressing the adverse impact of external factors, such as environment and socioeconomic status, that might hinder them from doing well in academics (Pangngay, 2023; Tamayo, 2019).

Several studies yielded different results in which outliers/distinct may affect or mediate other variables in the data generation process (Rao & Krishnamurthy, 2018; Tamayo, 2019). For instance, Sarwar et al. (2010) explored these variables but yielded no statistical correlation between resilience and academic performance. This urged the scientific community to study more complex scenarios where more research is required in this field to explore other factors that might affect resilience in academic settings. Additionally, Britton (2018) researched a resiliency intervention program entitled Project Excel program in Chicago, which was designed for minority students who belonged to the low-income group. Still, the results cannot provide conclusive evidence between resilience and academic performance indicators since the statistical analysis was not strongly correlated. However, conducting and developing the program and integrating resiliency based on cultural norms appropriate for a particular ethnic group or population is recommended. Other emerging variables include the innate characteristics of the students and cultural dynamics, where resiliency is embedded, and where characteristics might affect the low association/ relationship between resilience and academic performance (Rao & Krishnamurthy, 2018).

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In the higher educational setting, measures have been initiated to aid college students in overcoming various setbacks and hindrances that can limit them from academically performing well. Extant literature pointed out the significant role of resilience in addressing the concerns of college students, such as drop-out rates, academic failure, high perceived stress (Solomon, 2013), low school engagement, and poor sense of psychological wellness (Rodriguez-Fernandez et al., 2018). Different variables emerge after data analysis to help understand the deviant points or outliers/distinct.

Relative to this, there are different ways to detect the outliers in the data set, such as stem-and-leaf plots and scattered diagrams in SPSS, which detect outliers/distinct data using these tools. The outlier's detection criteria can be utilized to classify outliers, whether mild or extreme data points. The current study used this method to determine whether the nature and outliers/distinct detection criteria fit the distribution or data set. For example, the mild outliers are any data point beyond either side of the inner fence. In contrast, extreme outliers are considered at any point beyond the outer fence in the standard observation criteria in SPSS (Aggarwal & Aggarwal, 2017). The present study used "distinct participant" to describe the outliers that emerged in qualitative data. The "Distinct" term was supported by Salkind (2010) and Aggarwal and Aggarwal (2017) as a data set that deviated from or was different from the other data set in a normal distribution.

The primary focus of this study is to address several research objectives related to the emergence of outliers. Firstly, it aims to identify the profile of outliers, analyze their resiliency component scores, determine the general weighted average (GWA), and determine the criteria used for detecting outliers. Secondly, the study intends to investigate outliers by utilizing Stem-and-Leaf plots and Scattered Diagrams, providing relevant insights into the data set distribution and its relationship. Lastly, this research delved deeper into the distinct characteristics of outliers to uncover any emerging themes associated with outliers within the data. Through these objectives, the study seeks to enhance understanding and potentially inform strategies for addressing outliers in relevant contexts.

2.0. Methodology

Research design. This paper utilized a sequential explanatory mixed-method research design. In this design, the quantitative data was first collected and analyzed to check the relationship and extent of factors of resilience that influence academic performance. Then, the qualitative data was collected and analyzed to support the quantitative data. The integration of quantitative and qualitative data was processed during the interpretation and discussion stage (Hanson et al., 2005). The standardized instrument survey, Melvin Rave Rave Faye-Academic Resilience Scale (Angeles et al., 2022), was used during the study's quantitative phase.

Respondents and sampling technique. The participants of this study were 560 students from one State College in Camarines Norte who were currently enrolled in the school year 2021-2022. The locale of the study is in Camarines Norte, with 12 municipalities. The state college in the province had nine (9) delivery units offering various courses in accountancy, business, education, agriculture, engineering, and various sciences and arts disciplines.

Research instrument. For the measure of resilience, the MRRF-ARS questionnaire consists of 68 items to assess students' perceptions of their qualities and protective factors relevant to positive and negative coping mechanisms. Two main subscales emerged through factor analysis: Positive coping and regulation and Negative coping and Perception of academics. MRRF-ARS were subjected to a series of validations to establish psychometric properties such as reliability and validity. Participants rated the frequency of each item on a 5-point Likert scale ranging from "never" to "always." The reliability of the questionnaire was evaluated using Cronbach's Alpha coefficient, resulting in a high value of 0.91 based on data collected from 340 students (Angeles et al., 2022). In terms of psychometric properties, the MRRF-ARS exhibited significant correlations with the Academic Resilience Scale (ARS-30) and demonstrated strong internal consistency across all subscales.

Meanwhile, the academic performance was assessed using the GWA of the selected students from the chosen public college/ HEI in the second semester of 2021-2022. The data were requested from the Registrar's Office with the participant's consent.

Data collection and analysis. This study utilized a Sequential Explanatory mixed-method research design to address the research questions. The study has three phases, each requiring a thorough quantitative and qualitative data analysis before proceeding to the other study phases. The Statistical Package for Social Science (SPSS) was utilized to generate the quantitative data from the relevant research instruments. Stem-and-leaf plots and Scattered diagrams in SPSS were used to determine whether the outliers belonged to the mild or extreme data points. The mild outliers are data points beyond either side of the inner fence.

In contrast, the extreme outliers' flags are any point beyond the outer fence in the standard observation criteria (Aggarwal & Aggarwal, 2017).

Second, thematic analysis was used to identify the themes that emerged from the series of FGD responses, which were transcribed verbatim and guided by the documented videotaped media materials for consistency. Line-by-line initial coding was employed to find connections between the codes, statements, and themes (nodes). Similarities and differences in the statements and themes among the codes were analyzed from initial coding to primary codes and general themes. The variation of themes was identified and linked to other themes after the data analysis (Braun & Clarke, 2006).

Data trustworthiness. In quantitative data, instruments such as MRRF-ARS were subjected to several validations to establish psychometric properties such as reliability and validity. The Cronbach's Alpha reliability coefficient assessed from data of 340 students was 0.91 (Angeles et al., 2022). During the instrumentation process, the MRRF-ARS significantly correlated with the Academic Resilience Scale (ARS-30) and established good internal consistency among all subscales. In qualitative data, the themes that emerged were subjected to independent validators. The data will be stored and adequately secured for five (5) years.

Ethical consideration. The Research Ethics Committee mandates that research participants are physically and psychologically protected from forces that may happen during the course of the study. Psychological debriefing of the (15) participants on the FGD was done in the study's second phase. The researcher sought permission to record the FGD sessions in the informed consent. The researcher ensured the data's confidentiality and the participants' safety. Through some FGD excerpts, "alias" was used to ensure that it would not divulge the specific place, name, affiliation, etc., or any sensitive information that emerged in the FGD. The researcher respected any voluntary withdrawal of any participant in the study. Hence, the researcher gathered additional respondents for the study to prepare for the possible refusal or withdrawal, which may affect the validity and reliability of the study.

3.0. Results and Discussion

The present study explored the Outliers/Distinct profiles emerging in the data set. The emergence of outliers/distinct in the data set was considered vital because outliers can open new agenda in scientific conversation and explore possible mediators that might influence resiliency and academic performance.

Profile of the outliers/distinct data

Table 1 shows the profile of the outliers/distinct data. The outliers/distinct data from eight males (53.3%) and seven females (46.7%) were identified

Table 1
Outliers/Distinct profiles emerging from Stem-and-Leaf plots and Scattered Diagram of Resiliency and Academic Performance

Student respondent (Data set number)	Gender (Male=1, Female=2)	Positive Coping and Regulation on Academics	Negative Perception in Coping with Academics	MRRF -ARS Score	GWA	Outliers Detection Criteria
1. Student 93	Male	116	29	145 (L)	87	Mild
2. Student 115	Female	185	68	223 (H)	93	Mild
3. Student 281	Female	183	77	260 (VH)	92	Mild
4. Student 285	Female	187	71	258 (VH)	90	Mild
5. Student 408	Male	166	37	203 (H)	81	Mild
6. Student 409	Male	103	45	148 (L)	85	Mild
7. Student 442	Female	160	34	194 (H)	82	Mild
8. Student 466	Male	48	80	128 (L)	87	Mild
9. Student 482	Female	140	49	189 (A)	80	Mild
10. Student 512	Female	134	43	177 (A)	82	Mild
11. Student 537	Male	180	74	254 (VH)	89	Mild
12. Student 425	Female	189	20	209 (H)	75	Extreme
13. Student 505	Male	140	42	182 (A)	75	Extreme
14. Student 531	Male	152	44	196 (H)	75	Extreme
15. Student 536	Male	142	38	180 (A)	75	Extreme
Mean (M):		148.33	50.06	196.40	83.20	
Std. Deviation (SD)		38.46	19.00	40.22	6.39	

MRRF-ARS Score Legend: *L- Low (3), A- Average (4), H-High, (6) VH- Very high (3)*   *N= 15*

using the Scattered diagram and the Stem-and-Leaf plots approach. Most outliers/distinct (M=196.40, SD=40.22) had six (6) high resiliency scores (16%), followed by four (4) Average scores (26.66%) in resiliency and three low resiliency (20%) and very high resiliency (20%) score. The student's academic performance mean score was 83.20, while 6.39 was the standard deviation.

Mild and extreme outliers in student data

FGD and outliers/distinct investigation was conducted to assess the nature of outliers. There were 15 data outliers/distinct in Stem-and-Leaf plots (Figure 1) and Scattered Diagrams (Figure 2). Eleven

(11) outliers/distinct were identified as mild outliers/distinct, and four were extreme outliers/distinct after the observation was conducted. The mild outliers/distinct are any data point beyond either side of the inner fence. In contrast, the extreme outliers' flags are any point beyond the outer fence in the normal observation criteria (Aggarwal & Aggarwal, 2017). It is evident that four (4) extreme scores were described as having very low academic performance, but the resiliency score fell into the average to high resiliency values. This finding corroborated Rao and Krishnamurthy's (2018) findings that the students' environmental protective factors or innate characteristics helped them develop coping

Figure 1
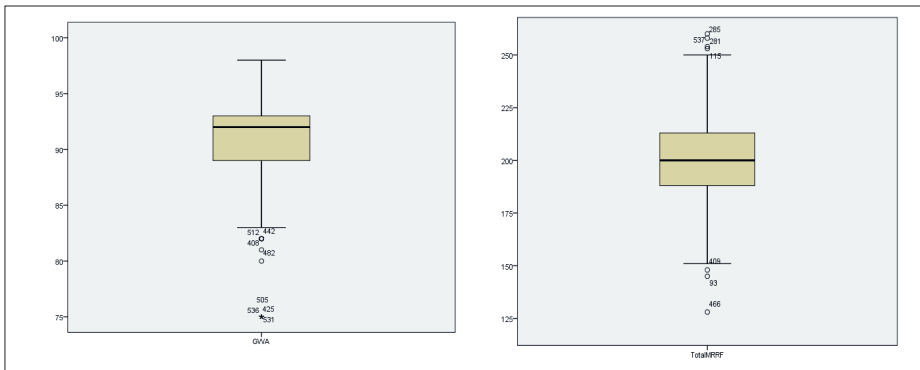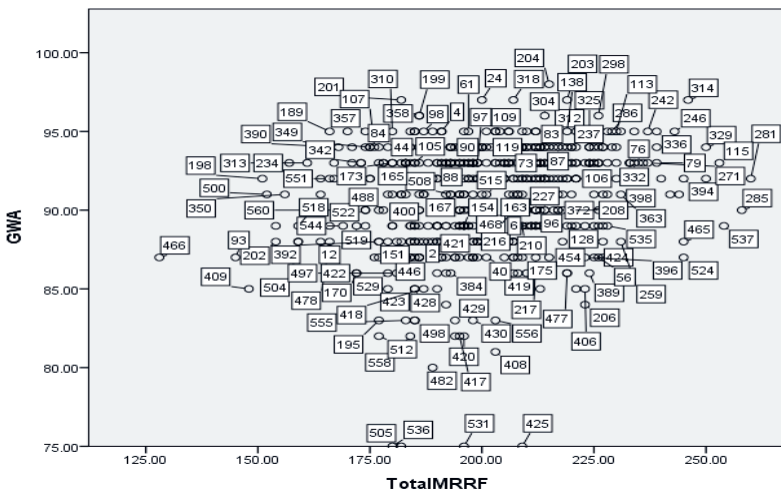Boxplot of Resiliency and Academic Performance

Figure 2
Scattered Diagram of Resiliency and Academic Performance

mechanisms to survive academically. Despite a high resiliency score, the academic performance remained low. Therefore, it is suggested that an investigation is vital in understanding these outliers/distinct. An in-depth analysis and a thorough investigation of the outliers/distinct data should be employed in the FGD (Aggarwal & Aggarwal, 2017). Valuable information might arise that might explain further the phenomenon. The table below shows valuable information to help counselors understand why these outliers/distinct appeared in the data set.

Themes that emerged from examining the outliers

Table 2 shows the summary of themes that emerged from examining the outliers and were distinct from the data. The present study conducted FGD on the identified outliers/distinct to determine the underlying phenomenon in the extremely high or low values observed from the overall values pattern. There are fifteen outliers/distinct data evident from the participants' responses. The themes that emerged were varied: Traits and Personalities, Personal and Family Concerns, Student Academic Inclination, Emotional State and Management, External Environmental Factors, Innate IQ/ Intelligence, and Study Efforts.

The Varying Traits and Personalities of the participants might mediate or intervene between resiliency and academic performance. One respondent stated that:

> "For me, each one has a distinct characteristic different from another. Our behaviors and manners are different from each other". (Participant 2, personal communication, January 13, 2023)

One respondent highlighted the diverse traits and personalities that may influence the data because each student has a different personality trait pattern that governs their perception and behavior. Another respondent added,

> "For me, I think one factor is the social skill, and what do you call that…the personality, and our conversation which described him suitably" (Participant 4, personal communication, January 13, 2023).

Even their socialization skills and personality, which are necessary to connect with people, might hinder external factors from manifesting if they do not leave their comfort zone. This dynamic factor might mediate between resiliency and academic performance. This affirms the findings of Deng et al. (2020) that a combined analysis of all personality factors significantly affects psychological resilience. Hence, data should be checked and cleared.

Another respondent highlighted that Varying

Table 2
Summary of varied themes from Outliers/Distinct Data.

	General Themes	Sample Statements
A.	Varying Traits and Personality	*"For me, each one has a distinct characteristic different from another. Our behaviors and manners are different from each other."* (Participant 2, personal communication, January 13, 2023).
B.	Varying Personal and Family Concerns	*"I do not let my family problem affect me because I'll not be able to carry out the teaching task. We, teachers, are different, and others cannot handle their personal problems, thus affecting the teacher's teaching performance"* (Participant 1, personalcommunication, January 13, 2023).
C.	Varying Student Academic Inclination	*"I prefer written …my friends prefer recitation for s/he speaks well but does poorly in written answers but written answers could be improved."* (Participant 5, personal, communication, January 13, 2023)
D.	Emotional State and Management	*"I see why others have low academic resiliency…perhaps they could not separate their personal problems from academic difficulties me…I know how to separate my personal problems from school matters."*(Participant 6, personal communication, January 13, 2023).
E.	Varying External Environmental Factors	*"The external environment affects us like the internet connection is a big factor,especially now that we have online classes. Your friends affect you, more so, if your circle of friends does not do the required acceptable things, your grades will be affected too."*(Participant 8, personal communication, January 13, 2023).
F.	Innate IQ/ Intelligence	*"And sometimes, they have high resiliency but low in academics or low in resiliency but high in academics…I have friends who take things easy as though they are not pressured, rationalizing-+the deadline is still far away, I will work later…" but they can pass they get good grades… that is how I see it."*(Participant 7, personal, communication, January 13, 2023).
G.	Study Efforts Vary from Individual	*"For me, it is the effort that matters even if you are not intelligent; even other people may say "There are no dumb people; all persons are intelligent." I think it is the effort that counts; if you exert more time and effort in your study, you will be able to surpass anything regardless of its difficulty as long as you are focused and you submit all requirements needed because there is a term known as "output-based."You will fail if you do not have the output, but if you submit your output, you will pass."*(Participant 3, personal communication, January 13, 2023).

Cohen's κ was utilized to determine the agreement between two independent raters on the themes that emerged on the examination of the outliers/distinct that manifested in the detailed transcription. It was found that there was an almost perfect agreement between the two rater's judgments, κ = 1.00 (95% CI,0.81–1.00), p < .005.

Personal and Family Concerns also influence the association of resiliency and academic performance. Risk factors like family problems and concerns may affect the association since all participants have different family backgrounds and monthly incomes. This appears in a respondent statement, emphasizing that:

> "I do not let my family problem affect me because I'll not be able to carry out the teaching task. We, teachers, are different, and others cannot handle their personal problems, thus affecting the teacher's teaching performance" (Participant 1, personal communication, January 13, 2023).

Although the scores fall into the average to high resiliency, academic performance is still low in the data set. The data tell us the underlying effect of family concerns that will affect the performance of the students. Lee's (2009) and Ecang and Petalla's (2022) findings revealed that several at-risk students perceived the absence of support and care from external factors, although resiliency protective factors were present in the students.

Consequently, Varying Student Academic Inclination, such as student subject preferences, learning style, and inclination to oral and/or written assessment, could be outliers/distinct data affecting the findings. The respondents reported that they preferred oral over written output, while others preferred written over recitation assessment, although the resiliency scores were high in values. As stated by one respondent,

> "I prefer written …my friends prefer recitation for s/he speaks well but does poorly in written answers but written answers could be improved" (Participant 5, personal communication, January 13, 2023).

This clearly showed that students' inclination to perform well in academics is hindered by their preferences. Varying students' preferences and profiles might affect the association between resiliency and academic performance, which are the recommendations and limitations of Sarwar et al.'s (2010) study.

Relative to this, Varying Emotional States and Management are significant factors mediating the association between resiliency and academic performance. A respondent's statement supports this,

> "I see the reason why others have low academic resiliency…perhaps they could not separate their personal problems from academic

difficulties …I know how to separate my personal problems from school matters" (Participant 6, personal communication, January 13, 2023).

The statement emphasized the need to explore the emotional state and experiences of the respondent while taking the MRRF test. Although resiliency protective factors are present, the students might be unable to handle emotional concerns. The respondents identified these emotional concerns and subthemes as anxiety, depression, emotional regulation, overthinking, and nervousness. Although it is proven that emotional regulation positively enhances resilience, the danger lies in the client's inability to regulate emotion (Schafer et al., 2020). Consequently, the findings paralleled Mat Ruzlin et al.'s (2021) argument that several mental health concerns and emotional states, such as anxiety, stress, and depression, might affect resiliency. In this case, the mental health practitioner or counselor should be observant if a student needs intervention from a professional, as it augments resiliency and academic performance.

Varying external environmental factors included differing upbringing/culture in the family, pressure from the family, internet connection, and friends, which were considered outliers. This validates that the absence of external variables might also affect the association between the latter variables. The respondents perceived this as an outlier/distinct that might impact the data if several participants did not have access to an internet connection since the learning modality was given online. The physical absence of friends limits the socialization of the students, particularly during a pandemic. A respondent elaborated on this:

> "The external environment affects us, like the internet connection, which is a big factor, especially now that we have online classes. Your friends affect you, more so, if your circle of friends does not do the required, acceptable things, your grades will be affected too" (Participant 8, personal communication, January 13, 2023).

Students who developed extreme coping from extreme experiences like family problems might contribute to high resiliency factors such as coping, although they scored low in academic performance. Similarly, Rao and Krishnamurthy (2018) revealed that distinct experiences help develop coping mechanisms to address hindrances, but low academic performance opposed coping efforts.

Another identified cause of outliers/distinct data is the Innate intelligence quotient of the students. A respondent explained:

> "And sometimes, they have high resiliency but low in academics or low in resiliency but high in academics…I have friends who just take things easy as though they are not pressured, rationalizing that the deadline is still far away. I will just work later…" but they can pass, and they get good grades… that is how I see it" (Participant 7, personal communication, January 13, 2023).

The respondent believed that students with innate high IQ/ intelligence can succeed academically without resiliency intervention. Hence, future research can also use this to monitor if IQ can mediate as a predictor between resiliency and academic performance. Rao and Krishnamurthy's (2018) findings support the present findings that the innate scholastic abilities of the students may affect how a student performs academically. They also explained in their study that students perform well despite risk factors such as state of distress and other environmental risk factors. The same variables emerged in Delestre's (2016) study, which found that students' natural intelligence might affect the relationship. An IQ test is necessary to determine whether this variable mediates resiliency and academic performance.

Furthermore, Study Efforts may vary among individuals, which was identified in the thematic analysis. It revealed that the frequency and consistency of efforts matter to become academically successful. One respondent stated,

> "For me, it is the effort that matters even if you are not intelligent; even other people may say, "There are no dumb people; all persons are intelligent." I think it is the effort that counts; if you exert more time and effort in your study, you can surpass anything regardless of its difficulty as long as you are focused and submit all requirements needed because there is a term known as "output-based." You will fail if you do not have output, but if you submit your output, you will pass" (Participant 3, personal communication, January 13, 2023).

The respondent elaborated that there are resilient students, but they cannot perform well in school because they lack study habits. Hence, most FGD respondents emphasized that complying with the subject requirements marks good performance.

Lee (2009) also confirmed that high academic performance is achieved despite low resiliency scores when much effort is exerted by increasing the number of study hours. The present findings suggest that positive results are achieved when conscious study effort is maximized.

Further research and analysis are essential in understanding distinct characteristics and behaviors of individuals by considering 15 outliers: four (4) extreme outliers and eleven (11) mild outliers accounted for the outlier's detection criteria. Researchers should understand the nature of outliers/distinct data because they might hold a new understanding of the phenomenon being studied. It might open a new agenda in scientific conversation and explore possible mediators' variables that might influence resiliency and academic performance.

4.0. Conclusion

The present study is vital in understanding resiliency and academic performance in the present context; thus, it recommends the exploration of mediator variables, namely, students' innate intelligence and resiliency behaviors, which are products of extreme experiences that may affect the relationship between resiliency and academic performance. Stress, motivation, culture, and socioeconomic status were other mediator variables that surfaced because students had varying backgrounds and experiences. These mediator variables may affect the association between resiliency and academic performance. Innate resiliency qualities and experiences of the college students were not empirically associated. Despite the elevated score in resiliency, academic performance remains low.

Conversely, Innate IQ mediates despite the absence of positive resiliency factors, resulting in high academic performance. Moreover, similar reports from quantitative and qualitative data implied that varying family and community support and unstable technological connections must be rigorously studied since these are new mediator variables apparent in this research. Future studies must adequately assess the role of resilience in academic outcomes.

5.0. Limitations of the Findings

The present study may be limited to one state college in terms of its context and locale. Future research can expand the scope and generalizability of the study. The MRRF-ARS can also be administered to other State Colleges and Universities (SUCs) to further establish the norms and validity of the questionnaire. Also, academic performance must be assessed using different tools since the present study only used the general weighted average (GWA).

6.0. Practical Value of the Paper

The outliers FGD results can be based on instrument development using the sequential exploratory mixed-method research design since several themes that emerged in the study have yet to be supported by research findings. The developed instruments constructed on themes will undergo validation and standardization for broader generalizability and applicability. The tool can be used for counseling and academic intervention by the educational community, addressing students' academic problems and disengagement.

7.0. Directions for Future Research

Understanding the outliers/ distinct data opens a scientific conversation about the new phenomenon that holds the key to resiliency and academic performance. Exploring outliers helps assess whether these variables emerge and can be identified as possible mediators' variables. Future direction can include this as part of the model/ dynamics of resiliency and academic performance. The present study suggests that the relationship between resiliency and academic performance may be directly related. However, it is crucial to understand how innate resiliency qualities and IQ might affect the association. The varying personality, environmental factors, and even innate qualities are essential considerations. This will help the researcher assess and standardize new measures and instruments to establish this study's findings further. Norming the instruments through cross-cultural study and culture sensitivity instruments can increase their psychometric properties. Examining the outliers and understanding their causes present the new agenda in scientific conversation.

8.0. Declaration of Conflict of Interest

The authors declare no conflict of interest.

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