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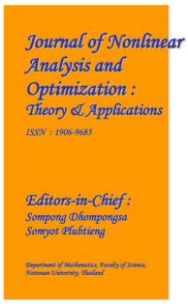

ASSESSMENT AND MEASUREMENT OF STUDENTS' SOCIAL AND EMOTIONAL LEARNING (SEL) COMPETENCIES

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ABSTRACT
Social and Emotional Learning (SEL) plays a crucial role in students' academic success, personal development, and overall well-being. This study aims to assess and measure the development of SEL competencies Self-Awareness, Self-Management, Social Awareness, Relationship Skills, and Responsible Decision Making among higher education students. Utilizing a structured questionnaire based on the CASEL framework, data was collected from a sample of students across various disciplines. The questionnaire measured SEL competencies on a 5-point Likert scale, focusing on students' self-perception of their emotional intelligence and interpersonal skills. The collected data was analyzed using K-means clustering to identify patterns and groupings of students based on their SEL development. The results revealed varying levels of competency across the student population, with higher scores in Social Awareness and lower scores in Self-Management and Relationship Skills. The findings highlight the need for targeted interventions in higher education to enhance these competencies. The study concludes by discussing the implications of SEL assessments for curriculum development, educational planning, and the integration of SEL focused programs within higher education institutions. Recommendations for improving SEL measurement practices and addressing current gaps in assessment are also provided.
Keywords: Social Emotional Learning, higher education, questionnaire, clustering, levels of competency.

1. INTRODUCTION
Social and Emotional Learning (SEL) has emerged as a critical component in fostering students' holistic development. Beyond academic achievement, SEL focuses on equipping students with essential emotional intelligence and interpersonal skills that are fundamental to success in life and work. The SEL competencies are vital for students to navigate complex social interactions, manage emotions effectively, and make responsible choices in both personal and professional settings. The purpose of this study is to assess the SEL competencies of college students using a validated questionnaire designed around the CASEL framework. By collecting and analyzing data on students' SEL development, this research seeks to provide insights into the current state of emotional intelligence and social skills among higher education students. This study aims to highlight the impact of SEL on students' academic performance, mental health, and overall well-being. The findings will inform educational planning, curriculum development, and the integration of SEL-focused programs in higher education. This study will also explore the use of quantitative techniques, including statistical analysis and K-means clustering, to identify patterns in students' SEL competency development. The results will help educators and policymakers understand areas where students excel and where additional support is needed, ultimately leading to more effective and targeted interventions to support student success.

2. IMPORTANCE OF ASSESSING SOCIAL AND EMOTIONAL LEARNING (SEL) COMPETENCIES
Assessing Social and Emotional Learning (SEL) competencies is essential for understanding and nurturing students' emotional and social development. These assessments provide valuable insights

that help educators tailor their teaching strategies to support students more effectively. SEL competencies, such as emotional regulation and interpersonal skills, are linked to improved academic performance, as students who manage stress and emotions tend to stay more focused and engaged. Regular assessment of SEL helps schools maintain a positive climate by addressing conflicts and fostering inclusivity. Assessing these skills helps guide curriculum development and evaluates the effectiveness of SEL programs, ensuring continuous improvement. It also promotes equity by identifying gaps in SEL development among diverse student groups and addressing their unique needs. SEL assessments encourage students to reflect on their growth, set goals, and actively participate in their own personal development, contributing to long-term success both in college and life.

3. LITERATURE REVIEW

A study by Weissberg et al. (2015) found that teachers often feel unprepared and lack sufficient training in SEL assessment strategies. The above authors suggest that the implementation of SEL programs that are explicit as well as integrated into academics and pedagogy within positive school settings is critical for the success of students in any path they pursue beyond high school graduation[1] .Collaborative learning communities and ongoing support have been shown to improve teachers' practices (CASEL, 2013) [2]. McKown and Russo (2012) underscore the need for more robust tools that can accurately measure SEL competencies [7]. In Promoting Social and Emotional Learning, Elias, Zins, and colleagues explore the essential components and benefits of integrating social and emotional learning (SEL) into educational curricula [9].Jennings and Greenberg (2009) highlight that without standardized training, teachers may struggle to apply SEL assessment tools consistently and effectively [13].

4. METHODOLOGY

Define the SEL Competencies

- Responsible Decision-Making
- Self-Management
- Self-Awareness
- Social Awareness,
- Relationship Skills

Select Assessment Tools

- **Surveys and Questionnaires:** Assessing SEL competencies using questionnaires is a widely used and effective method.
- **Self-Report Surveys**: Students assess their own SEL skills using structured questionnaires.
- **Aligns with SEL Competencies**: Include questions related to self-awareness, self-management, social awareness, relationship skills, and responsible decision-making.
- **Uses Clear, Specific Language**: Avoid ambiguous or complex wording.
- **Incorporates Different Question Types**: Use Likert scales (e.g., strongly agree =5 to strongly disagree=1), multiple-choice, and open-ended questions.

5. QUESTIONNAIRES FOR SEL COMPETENCIES

Responsible Decision Making

- I take time to reflect on my values and beliefs before making important decisions.
- I seek feedback from others to improve my decision-making skills.
- I strive to make decisions that are fair and just.
- I gather all relevant information before making a decision.
- I am able to identify and analyze potential problems in a situation.
- I consider both short-term and long-term consequences of my decisions.
- I consider how my decisions affect my community and society.
- I support initiatives and policies that promote social justice.
- I learn from my mistakes and use them to improve future decisions.
- I work collaboratively with others to make decisions.

Self-Management Skills

- I am able to stay focused on my goals despite distractions.
- I use a planner or calendar to keep track of my responsibilities.
- I use healthy coping strategies to manage my stress.
- I maintain a balance between my academic and personal life.
- I seek support from friends, family, or counselors when stressed.
- I resist the urge to engage in activities that distract me from my goals.
- I stay motivated and disciplined in my daily routines.
- I express my emotions in healthy and constructive ways.
- I stay positive and persistent when facing challenges.
- I learn from my mistakes and setbacks.

Self-Awareness Skills

- I understand how my emotions influence my thoughts and actions.
- I can differentiate between various emotions I experience.
- I have a clear understanding of my strengths.
- I am aware of my weaknesses and areas for improvement.
- I learn from my past experiences to improve my future behavior.
- I am honest with myself about my thoughts and feelings.
- I understand how my values influence my decisions.
- I make decisions that align with my personal values.
- I understand how my social identities impact my experiences and interactions.
- I am aware of my personal biases and stereotypes.

Social Awareness Skills

- I listen actively and attentively when others speak.
- I show compassion and concern for others' well-being.
- I seek to understand perspectives different from my own.
- I treat everyone with fairness and respect, regardless of their background.
- I am aware of how my tone of voice affects others.
- I use active listening skills to ensure I understand others correctly.
- I advocate for social justice and equality.
- I encourage others to get involved in community service.
- I support my friends and peers in times of need.
- I take responsibility for my actions and their impact on others.

Relationship Skills

- I ask questions to ensure I understand what others are saying.
- I use “I” statements to express my needs and feelings without blaming others.
- I am comfortable giving and receiving constructive feedback.
- I seek to understand the other person’s perspective during a disagreement.
- I use problem-solving skills to find mutually beneficial solutions.
- I apologize and make amends when I am wrong.
- I work well with others to achieve common goals.
- I value the contributions of others and recognize their strengths.
- I show appreciation and gratitude to my friends and peers.
- I invest time and effort into maintaining my relationships.

6. DATA COLLECTION METHODS

Google Forms: More efficient and easy data collection and analysis. Google Forms used to collect survey data. Responses received from the students.

Responses received from Students using Google Forms

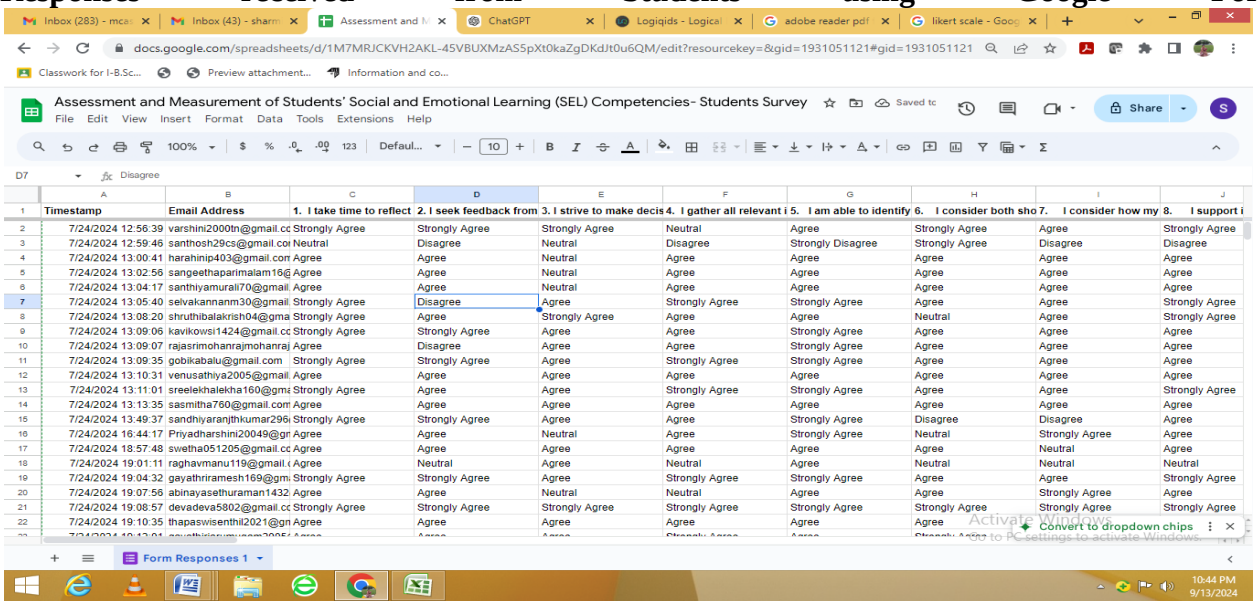

Fig 1: Responses received from Students using Google Forms

7. DATA ANALYSIS

Analyzing data from SEL assessments involves examining the collected information to draw meaningful insights about students' social-emotional competencies. The following are the sep-by-step process for analyze the collected datausing K-means Clustering Algorithm.

Load the CSV file

c1 <-read.csv("C:/Users/admin/Desktop/C1.csv")

This line reads the data from a CSV file located on desktop into a data frame c1(Here c1=Competency1). The function read.csv() reads CSV files in R.

Select Specific Columns

selected_columns<-c1[,c("Avg")]

This line selects the column named "Avg" from the c1 data frame. The result is stored in a new data frame selected_columns. The syntax c1[, c("Avg")] tells R to select the "Avg" column (all rows, only one column).

Preview the Data

head(selected_columns)

This shows the first six rows of the selected_columns data frame so that can check if the correct column was selected.

Scale the Data

scaled_data<-scale(selected_columns)

This line standardizes (or scales) the data. Scaling centers the data around zero and adjusts the values to have unit variance. This step is often necessary for clustering algorithms, such as K-means, as they are sensitive to the scale of data.

Set the Number of Clusters and Perform K-Means Clustering

k <- 3

res<-kmeans(selected_columns, centers =3)

- k <- 3 sets the number of clusters you want to create. In this case, k = 3 means the algorithm will group the data into 3 clusters.
- kmeans(selected_columns, centers = 3) runs the K-means clustering algorithm on the selected data, creating 3 clusters. The result of the clustering is stored in res, which contains information about the clusters (e.g., which data points belong to which cluster, cluster centers, etc.).

Print the K-Means Result

print(res)

This prints the result of the K-means clustering, including cluster centers, cluster assignment for each data point, and other details about the clustering.

Set a Seed for Reproducibility

set.seed(123)

This ensures that the random number generation for the next code block is reproducible. In other words, if run the code again, will get the same random values. It's important for consistent results in simulations and random data generation.

Generate Random Data

```
data<-data.frame( x =rnorm(100), y =rnorm(100))
```

This line creates a data frame called data with 100 random values for x and y, drawn from a normal distribution. However, this random data generation doesn't seem to be used further in the code, so it may be unnecessary here.

Cluster Visualization

```
cluster_plot<-fviz_cluster(res, c1,ellipse.type="norm")
```

fviz_cluster() is a function from the factoextra package that visualizes the results of clustering. Here, it visualizes the clusters from res (the K-means result) on the dataset c1. The ellipse.type = "norm" argument adds ellipses around the clusters to indicate normal variation.

Customize the Cluster Plot

```
cluster_plot +
theme(
axis.title.x = element_text(size = 12),  # Customize x-axis title size
axis.title.y = element_text(size = 12),  # Customize y-axis title size
axis.text.x = element_text(size = 10),   # Customize x-axis tick mark size
axis.text.y = element_text(size = 10)    # Customize y-axis tick mark size
 ) +
labs(
   x = "Sno",  # Customize x-axis label
   y = "Avg"   # Customize y-axis label
 )
```

This part of the code customizes the appearance of the plot.

- theme() adjusts the size of the axis titles and tick marks.
- labs() customizes the axis labels, changing the x-axis label to "Sno" (Serial Number) and the y-axis label to "Avg" (Average).

The complete code performs K-means clustering on the "Avg" column of a dataset and visualizes the results using ellipses to show the clusters.

8.RESULT AND DISCUSSION

Responsible Decision Making

K-means clustering with 3 clusters of sizes 158, 278, 21

Cluster means:

```
[,1]
1. 4.610127
2. 3.963309
3. 2.947619
```

OUTPUT FOR RESPONSIBLE DECISION MAKING

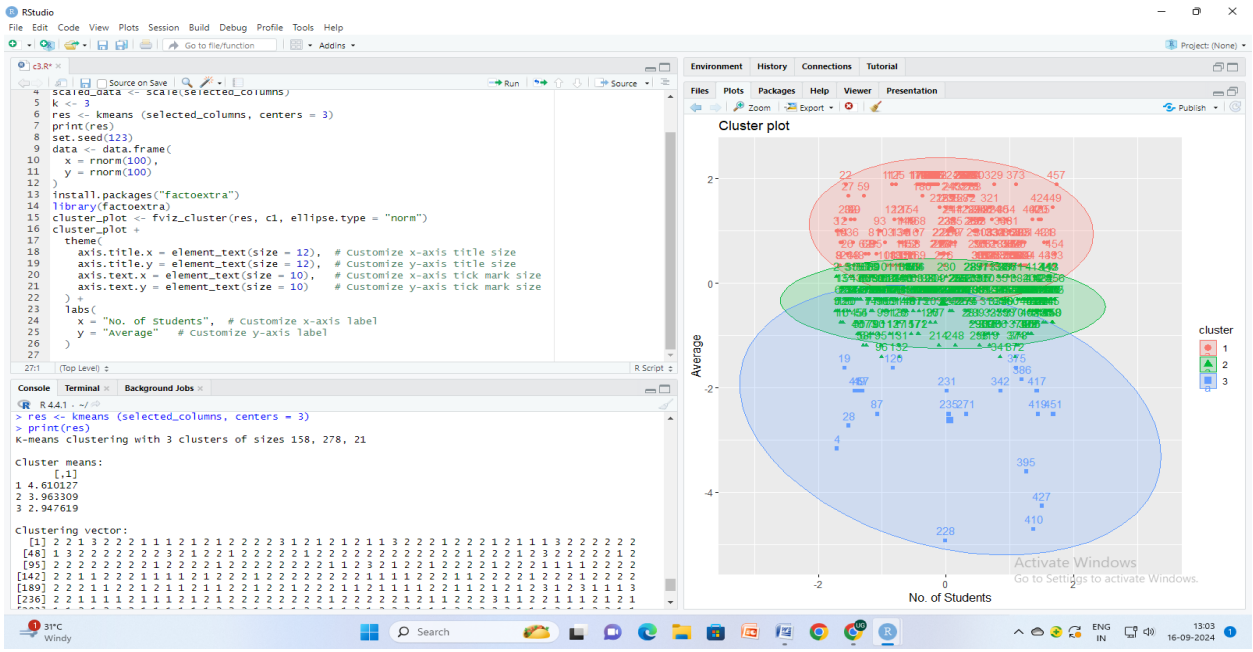

Fig 2: Responsible Decision Making

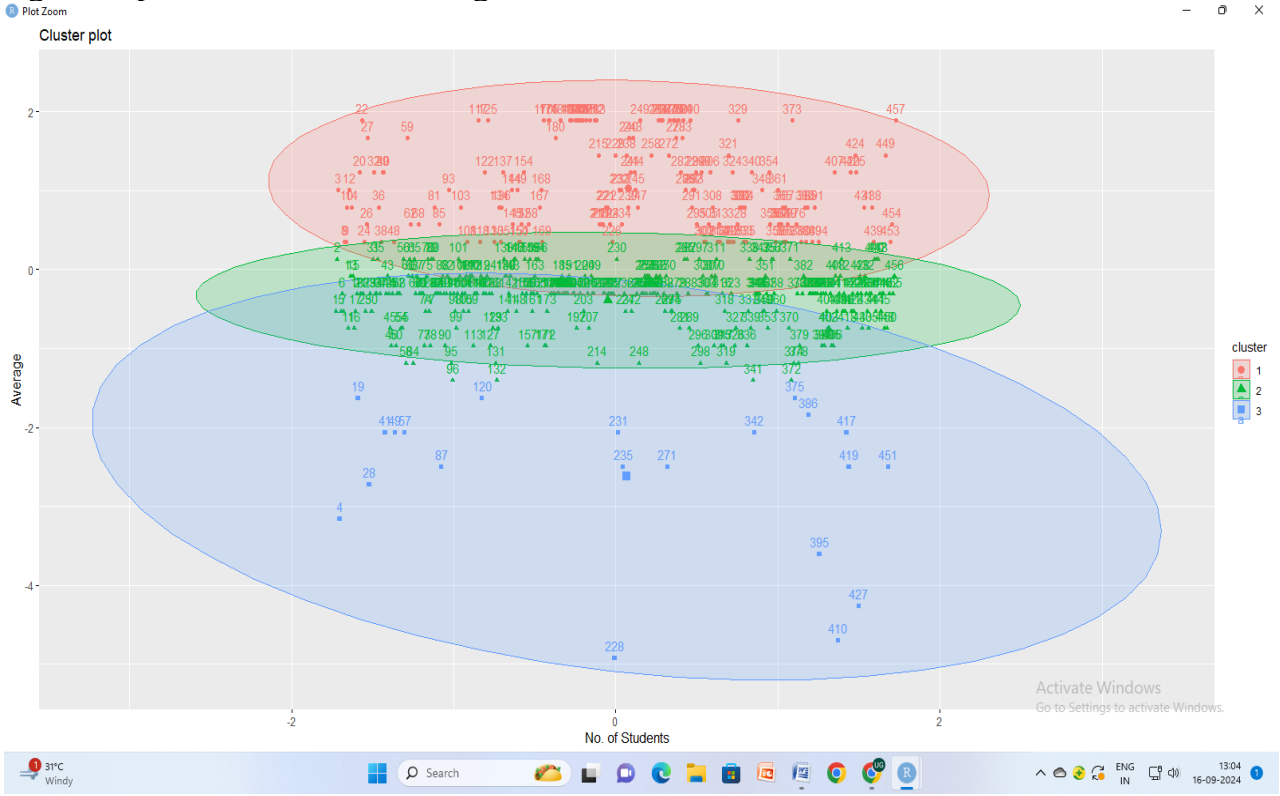

Fig 3: Cluster Plot

IMPLICATIONS

- **Cluster 1** represents high-performing data points (e.g., students with strong social-emotional skills, or high academic performance). These individuals may require different interventions, such as enrichment or leadership opportunities, to sustain their growth.
- **Cluster 2** represents the largest group, with average performance or mid-range values. These individuals are typical of the population and may benefit from general instruction or moderate interventions.
- **Cluster 3** consists of the lowest-performing data points. The small size and lower mean indicate that this group might require targeted support or interventions to improve their performance, as they are significantly behind the other two clusters.

Self-Management Skills

K-means clustering with 3 clusters of sizes 343, 97, 17

Cluster means:

[,1]
1. 4.274344
2. 3.687629
3.2.858824

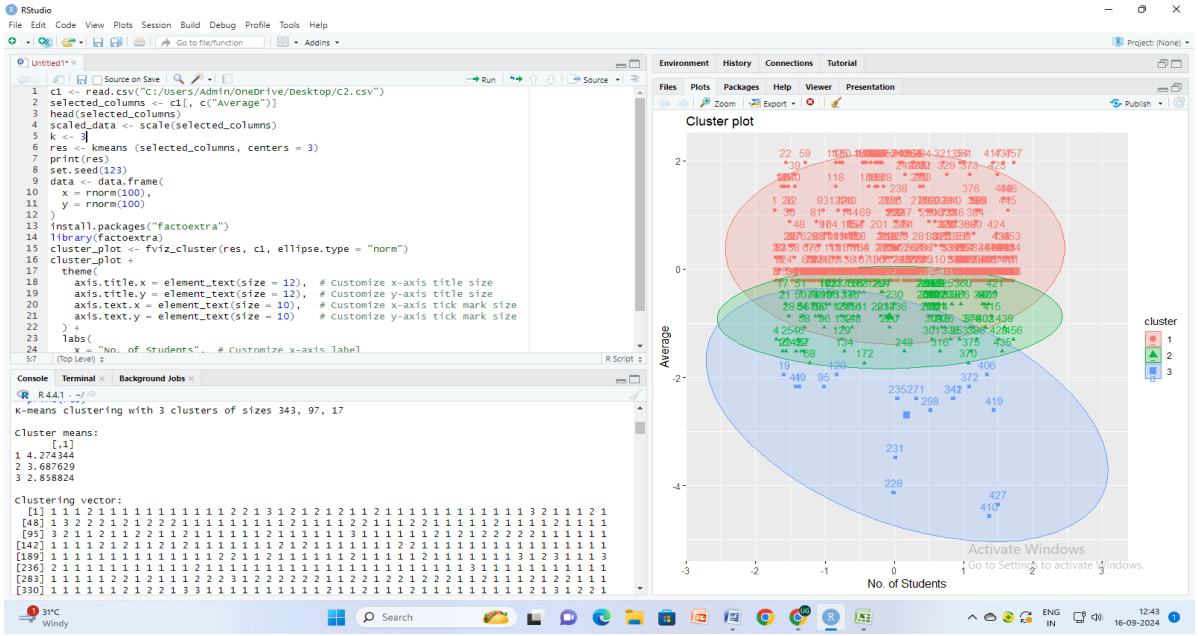

Fig 4: Self-Management Skills

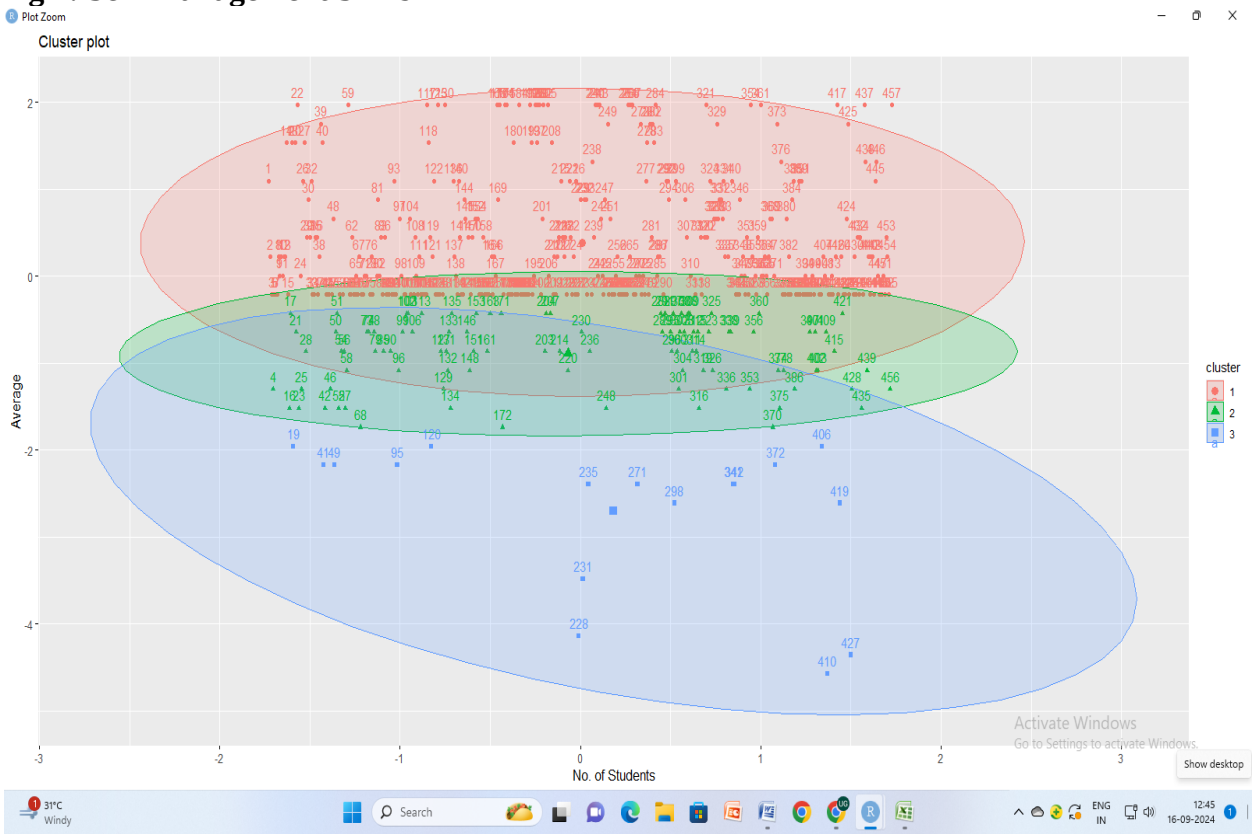

Fig 5: Cluster Plot for Self-Management Skills

IMPLICATIONS

- **Cluster 1** represents the **high-performing group**, with strong scores or values for the feature being assessed. This is the largest group, and these individuals may require advanced learning opportunities, leadership roles, or enrichment to sustain their high performance.
- **Cluster 2** represents a **moderate-performing group**. They perform well but are below the level of Cluster 1. These individuals may benefit from balanced instruction and some personalized interventions to help them improve their performance and catch up with the higher performers.
- **Cluster 3** is the **low-performing group**, with the smallest number of individuals but the most significant need for support. These individuals likely require **targeted interventions**, such as personalized instruction or additional resources, to help them improve.

Self-Awareness Skills

K-means clustering with 3 clusters of sizes 156, 254, 47

Cluster means:

[,1]

1. 4.581410

2. 3.986614

3.3.246809

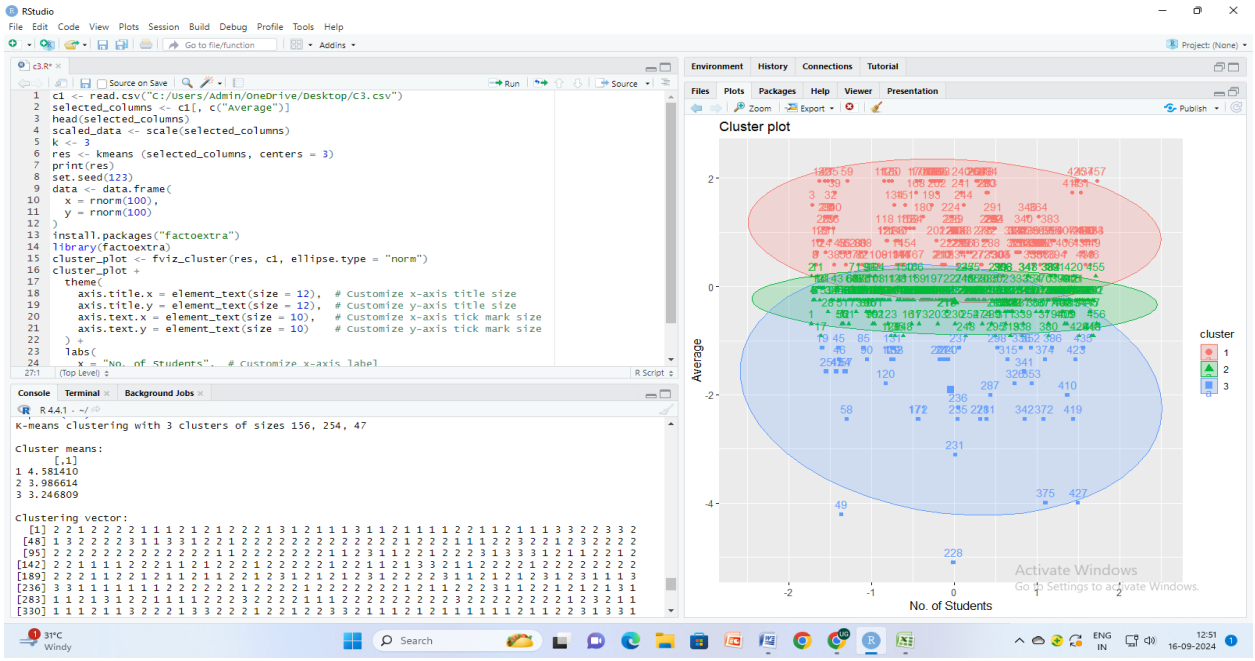

Fig 6: Self-Awareness Skills

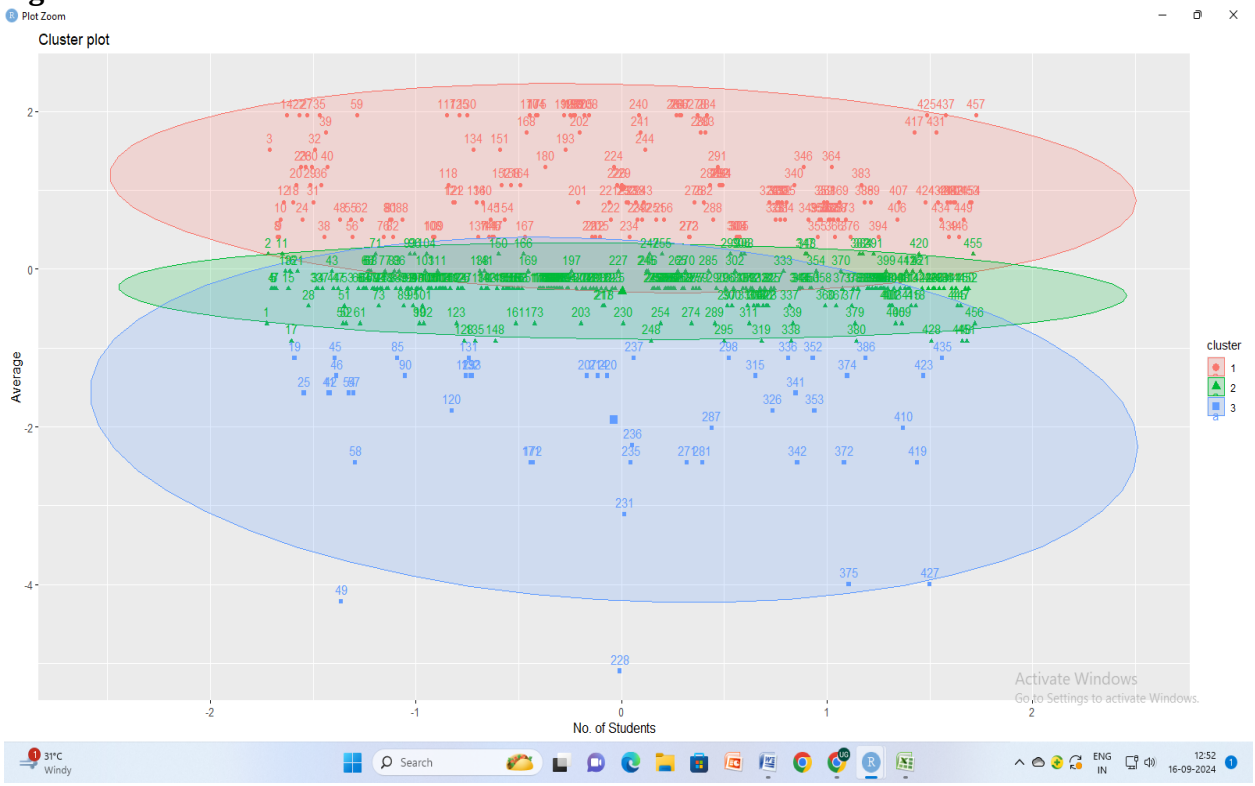

Fig 7:Cluster Plot

IMPLICATIONS

- **Cluster 1 (High Performers)**: The individuals in Cluster 1, with the highest mean score (4.58), are likely those who excel in the measured feature. These high performers may benefit from advanced opportunities, leadership roles, or challenges that can help them sustain and expand their abilities.

- **Cluster 2 (Moderate Performers)**: Cluster 2 represents the majority of the data points (with a mean of 3.99), falling just below the high-performing group. This group is likely performing well but could benefit from interventions or activities to help them reach the level of Cluster 1.
- **Cluster 3 (Low Performers)**: Cluster 3, with the lowest mean value (3.25), contains individuals who might be struggling or performing below average. These individuals could benefit from focused interventions, such as personalized instruction, additional resources, or support services to enhance their performance.

Social Awareness Skills

K-means clustering with 3 clusters of sizes 275, 153, 29

Cluster means:

[,1]

1. 3.945091
2. 4.605882
3. 3.020690

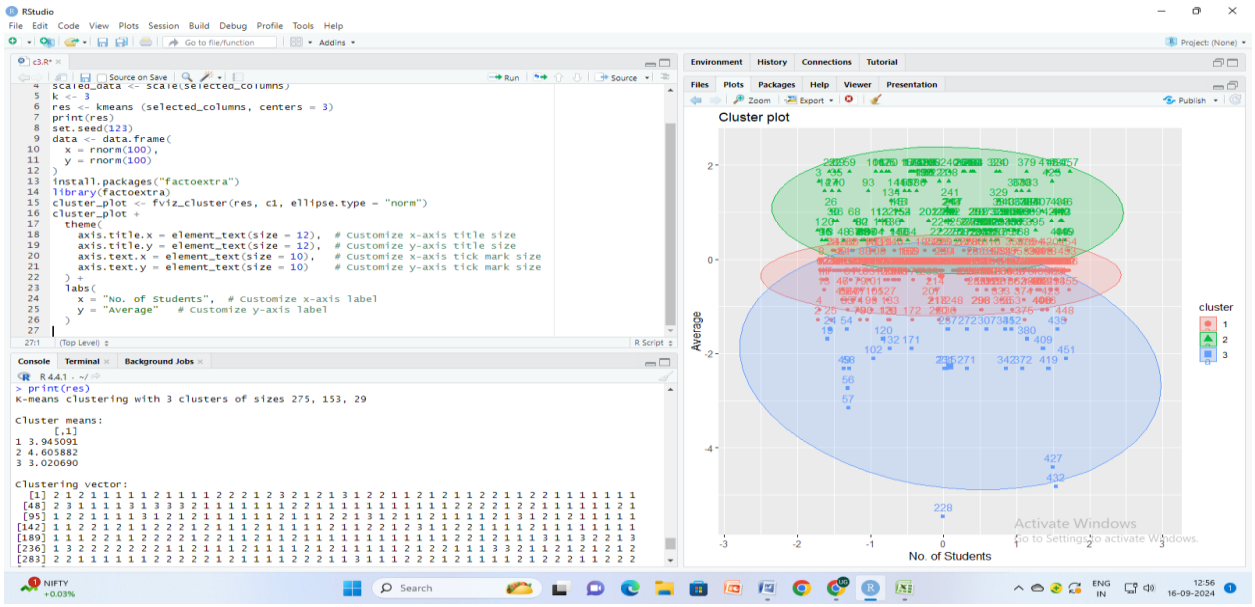

Fig 8: Social Awareness Skills

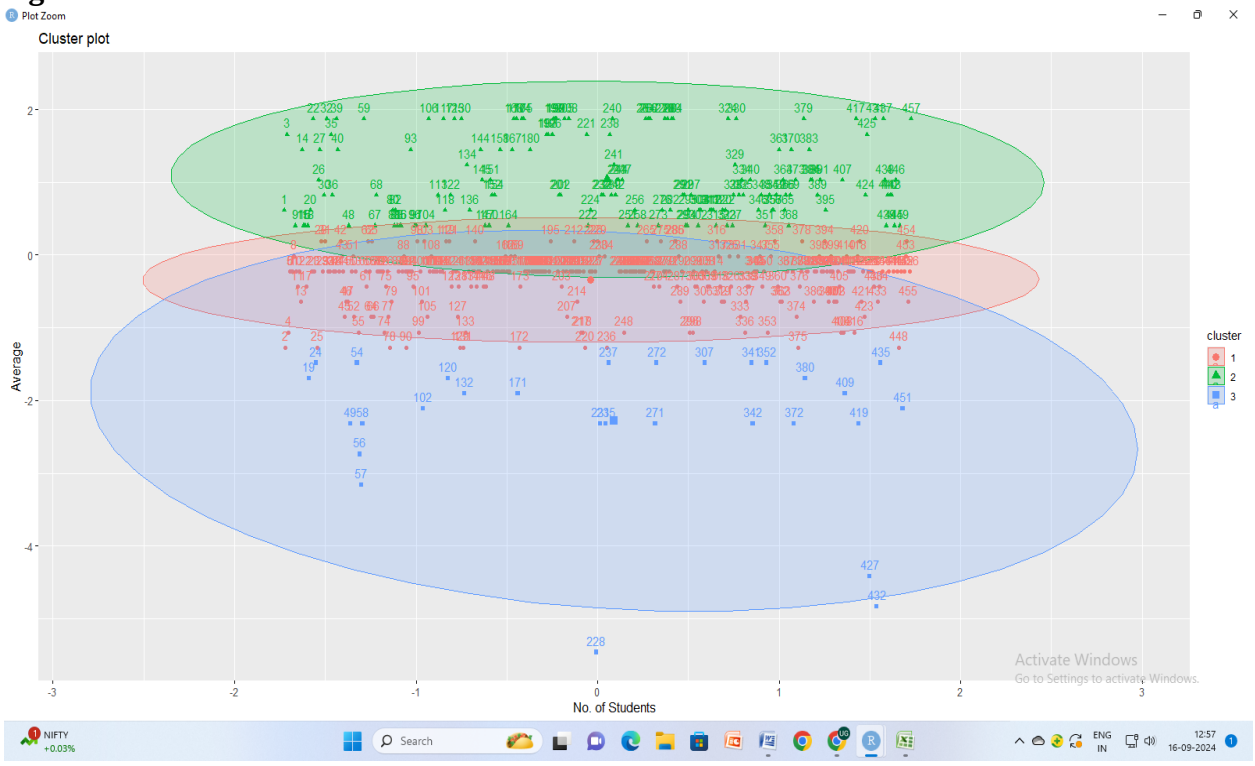

Fig 9: Cluster Plot

IMPLICATIONS

- **Cluster 1 (Moderate Performers)**: With a mean score of **3.95**, Cluster 1 represents the largest group of individuals who are performing moderately. These individuals could benefit from regular instruction or generalized support to maintain and potentially enhance their performance.
- **Cluster 2 (High Performers)**: The individuals in Cluster 2 have the **highest mean score** of **4.61**, indicating that they are performing **above average**. This group may need **enrichment programs, leadership opportunities**, or other advanced initiatives to sustain and further develop their high performance.
- **Cluster 3 (Low Performers)**: Cluster 3, with a mean score of **3.02**, consists of the **lowest performers**. These individuals may need **targeted interventions**, such as personalized coaching, tutoring, or additional resources, to help improve their performance and move closer to the other clusters.

Relationship Skills

K-means clustering with 3 clusters of sizes 86, 358, 13

Cluster means:

[,1]

1. 3.681395
2. 4.282961
3. 2.800000

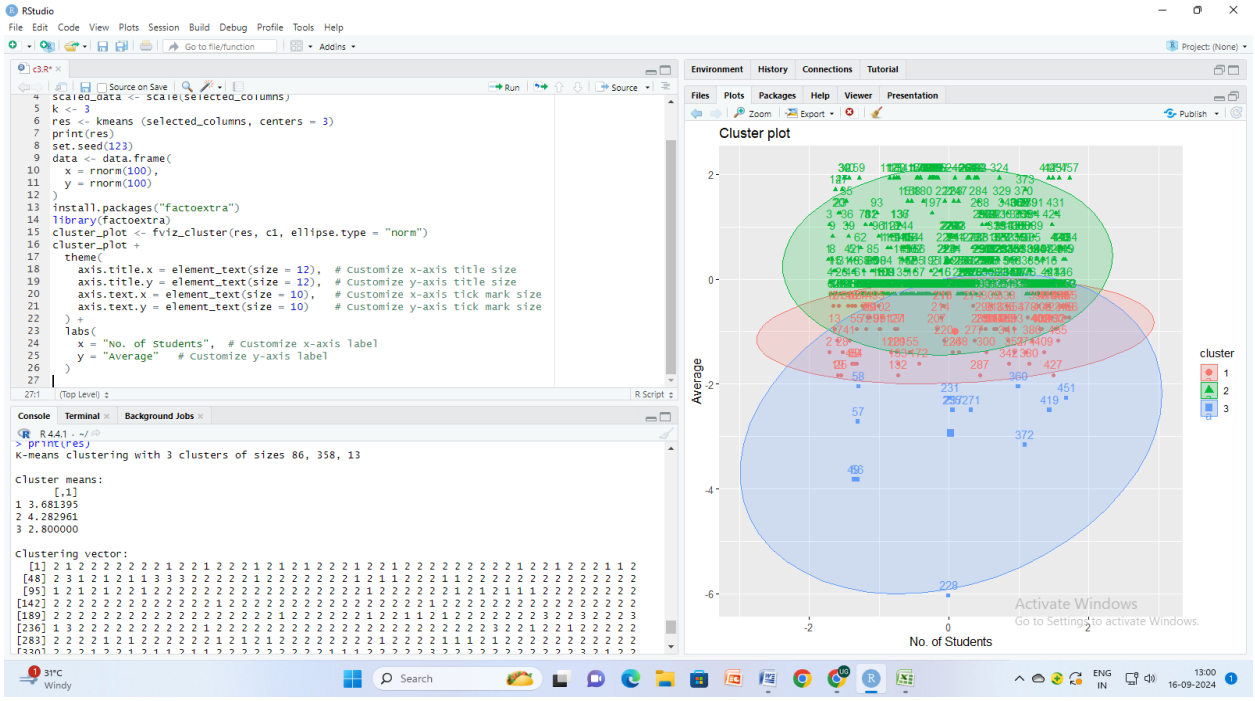

Fig 10: Relationship Skills

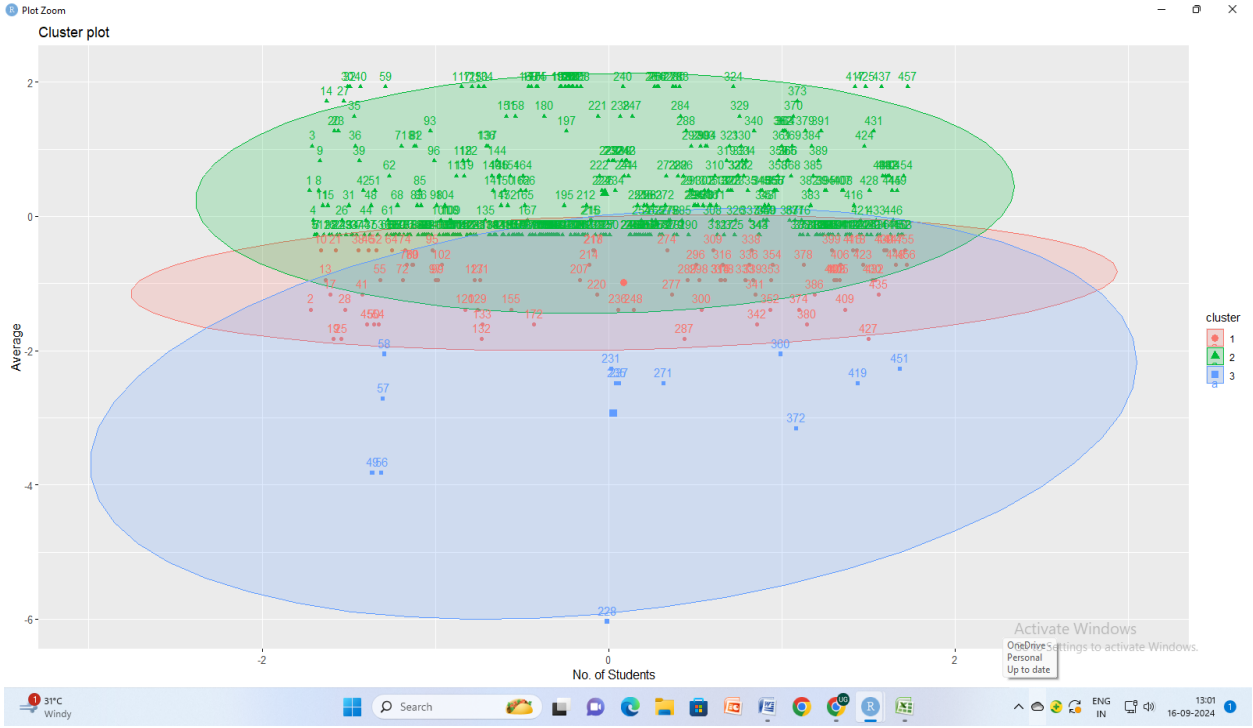

Fig 11: Cluster Plot

IMPLICATIONS

- **Cluster 1 (Moderate Performers)**: With a mean score of **3.68**, Cluster 1 represents a group of individuals performing at a **moderate level**. These individuals are doing reasonably well, but could benefit from targeted interventions or strategies to push them closer to the high performers in Cluster 2.
- **Cluster 2 (High Performers)**: Cluster 2, with a mean score of **4.28**, contains the **largest group** of individuals and represents the **highest performers**. These individuals are excelling in the measured feature and might benefit from enrichment activities or leadership roles to continue their development.
- **Cluster 3 (Low Performers)**: Cluster 3, with a mean score of **2.80**, contains the **smallest group** of individuals and represents the **lowest performers**. These individuals may need personalized support, tutoring, or other interventions to help them improve their performance.

Overall SEL Competencies

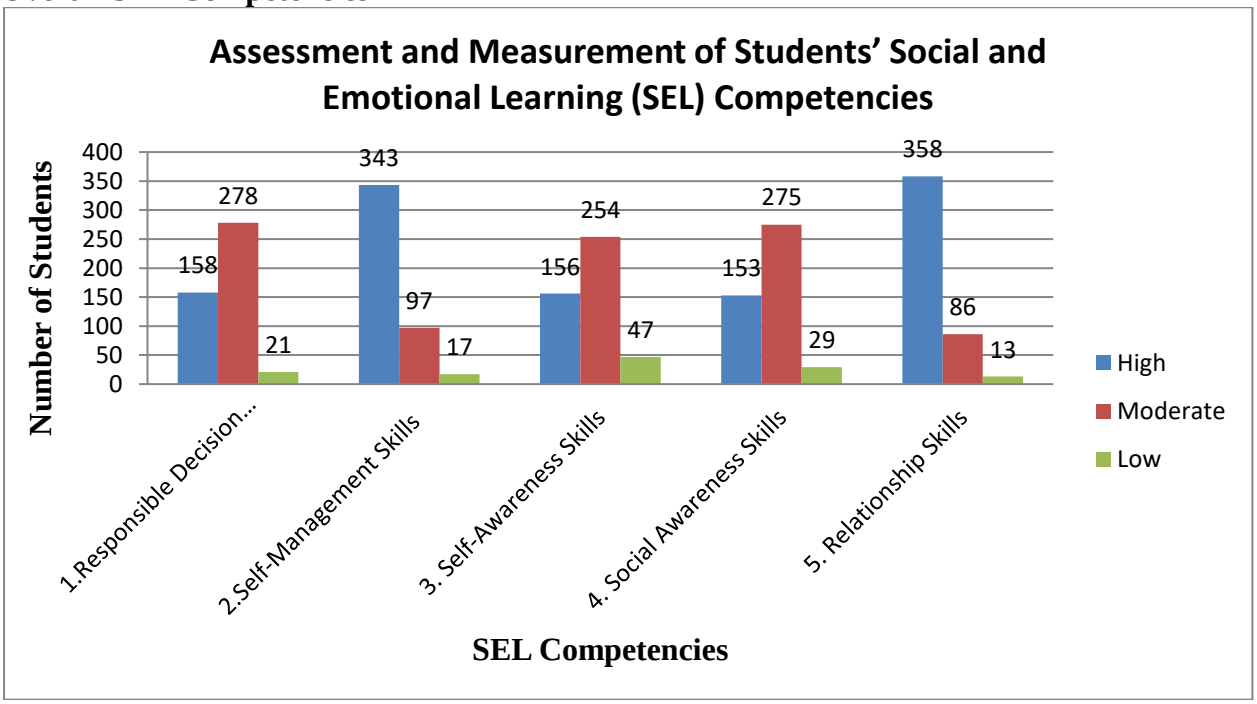

Fig 12: Overall SEL Competencies

9. CONCLUSIONS

Using questionnaires to collect data on Social and Emotional Learning (SEL) competencies offers an efficient and practical method for understanding students' emotional intelligence, interpersonal skills, and decision-making abilities. By providing a structured format for data collection, questionnaires allow educators and researchers to gather quantifiable insights from a large group of respondents, making it an ideal tool for assessing SEL competencies on a broad scale. The customizable nature of questionnaires ensures they can be tailored to suit various educational contexts, while their scalability, especially when administered digitally, enables efficient data collection across large populations. Furthermore, the data gathered from these questionnaires offer valuable insights for identifying trends, evaluating the effectiveness of interventions, and designing tailored support for students who may need extra guidance. In addition to providing educators with actionable data, questionnaires encourage students to reflect on their own social and emotional development, promoting self-awareness and personal growth. Ultimately, the use of questionnaires for assessing SEL competencies forms the foundation for data-driven decision-making, helping educator's foster students' holistic development and overall well-being.

FUTURE ENHANCEMENT

To enhance the effectiveness of using questionnaires for assessing Social and Emotional Learning (SEL) competencies, several future improvements can be implemented. Implementing real-time feedback systems will enable educators to quickly access and act on SEL data, enhancing the effectiveness of interventions. Advanced technologies like artificial intelligence and machine learning can be employed to analyze data more deeply, uncovering patterns and trends. Ensuring the validity and reliability of questionnaire items through regular updates will improve measurement accuracy.

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