

Development of a Scale Assessing a Math Tracking Program Using Convergent Parallel Mixed Methods Approach

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Introduction

- Tracking refers to grouping students according to their academic abilities while differentiating instruction suitable to their needs.
- Tracking programs can increase both student achievement level and self-esteem since groups are provided with modified curricula and instruction aligned to their ability level.
- Tracking focus on the improvement of students with learning disabilities and mathematical difficulties, providing quality education to all students regardless of academic ability and performance.
- While tracking has been practiced for years, its effectiveness remains a topic of debate.

Objective

- Develop a scale to assess a math tracking program focusing on students' and teachers' perceptions and attitudes
- Identify needs and concerns of students across advanced and regular math groups
- Describe the characteristics and best practices of the tracking program

Methodology

- Convergent parallel mixed methods design was used to analyze both qualitative and quantitative data from the participants' experiences of the math tracking program.
- Results were compared and related to one another for the interpretation of findings of the study.
- Purposive sampling was used where only students who experienced the Math Tracking Program for at least one year were selected.
- Qualitative: comprehensive viewpoints of teachers and students
- Quantitative: survey questionnaire

Scale Development

- A five-point Likert-type scale was used to determine the participants' attitudes and opinions toward the program.
- Content validity was established by aligning its questions with the identified features of the Math Tracking Program and having experts assess their relevance and content for improving the program.
- Baseline data were used to formulate **37 scale response items** which focused on the characteristics and best practices of the Math Tracking Program
- Participants: **334 JHS learners** (138 advanced and 196 regular math)

Data Analysis

- Cronbach's alpha is 0.965, high internal consistency level
- May signify that scale response items are **highly correlated** to one another and may indicate that there exist redundant statements.
- Item-total statistics was then determined to improve the reliability of the scale.
- Results showed that possible Cronbach's alphas when an item would be deleted were either 0.964 or 0.965.
- Since items were acceptable, exploratory factor analysis was established.

Exploratory Factor Analysis

- EFA through Principal Component Analysis using Promax rotation
- There exists a **significant relationship** between the variables.
 - KMO Measure of Sampling Adequacy = 0.950
 - Bartlett's test of sphericity is $p < 0.001$
- Factor analysis was used to investigate the instrument further in order to identify the underlying variables among the scale response items.

Results

- Five (5) components were extracted through Principal Component Analysis (PCA) using Promax rotation

Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.846	45.531	45.531	7.306	19.746	19.746
2	3.284	8.875	54.405	6.023	16.277	36.023
3	1.603	4.332	58.737	4.871	13.166	49.189
4	1.218	3.291	62.028	3.020	8.163	57.352
5	1.060	2.865	64.892	2.790	7.540	64.892

Factor Analysis

- Factor 1 is labeled **Learning Materials** as item loading on this factor represents how students view the provided *learning materials* as resources and how they are essential when learning the subject matter.
- Factor 2 is labeled **Instructional Delivery** as item loading on this factor describes how students view the *teaching strategies* and methods of teachers' delivery of lessons in class.
- Factor 3 is labeled **Mastery** as it corresponds students' opinions on how they understood varied *mathematical processes* aligned to the required academic competencies for their grade level and master *math concepts* and *problem-solving skills*.

Factor Analysis

- Factor 4 is labeled **Application** as item loading on this factor represent students' opinions on connecting what they have learned to real-life situations where authentic learning is encouraged.
- Factor 5 is labeled **Perception** as item loading on this factor represent how students be protagonists of their own learning and how students work and learn math with their group.

Factor Analysis

- Six (6) statements were removed
 1. I learned to work independently and be responsible for my own learning. (Perception)
 2. Class interaction enhances my understanding of the lesson. (Instructional Delivery)
 3. I am satisfied with the group I belong to. (Perception)
 4. I can approach my teacher for any concern or question that I have. (Perception)
 5. Learning materials are sufficient, extensive, and readily available to us. (Learning Materials)
 6. I feel reassured when I have the same level of understanding with my classmates. (Perception)

Findings

- Initial scale: 37 items, Improved scale: 31 items
- After refining the scale, the internal consistency was found to be 0.961, confirming that the scale is reliable for assessing the math tracking program.
- Scale response items with cross-loadings indicate that they are a combination of multiple themes (learning materials, instructional delivery, and perception).

Findings

- Closely related items could not be found among the scale response items through factor analysis.
- Although factor loadings are valid, collected qualitative data must still be considered and be associated with the quantitative data to form a collective interpretation of the results of the study.

Conclusion

- The scale could help in identifying strengths and weaknesses in existing math tracking programs, leading to a more effective program design.
- It can provide a standardized way to measure the effectiveness of tracking programs to inform decisions on resource allocation, program implementation, and student placement.
- The developed scale can be used in helping to reduce the stigma associated with low ability groups, promoting positive and inclusive tracking programs and contributing to improve educational outcomes for all students, regardless of their background or ability level.

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listening!**

