Data Collection, Graphing, and Analysis for Intervention Plans

Module 24

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Mr. Henry is having difficulties with Martha, a smart young girl whose need for attention has become a major disruption to the class. Mr. Henry spent three weeks observing, collecting data, and coordinating with his colleagues on an appropriate behavior plan for Martha. She was instructed to either raise her hand or a response card whenever she had the urge to call out during class or chat with her peers during seat work. Unfortunately, she had shown no change in behavior for the past month despite his frequent reminders for her to behave according to the plan. Mr. Henry had intended to administer weekly behavior probes and regularly take data on the effectiveness of the plan; but with so much to do each day and too little time to devote to properly monitoring the plan, he reluctantly admitted that observation alone and frequent reminders would have to do.

Data Collection, Graphing, and Analysis

Monitoring Martha's progress is not only important for her academic success; it also is a requirement of IDEA. Every IEP must include statements that describe: 1) how progress toward achieving a student's annual goals will be measured and 2) how the parents will be informed of their student's progress. This requires IEP teams to develop and implement appropriate assessment tools to monitor student progress, the effectiveness of the program of intervention, and the efficacy of implementation of the intervention. The very heart of assessment is data collection. Quantitative data can be measured, graphed, and visually analyzed to confirm if goals are being met or if student progress is unacceptable (Yell, Meadows, Drasgow, & Shriner, 2009). The key elements of an effective progress monitoring system are: (a) simplicity of design and (b) efficiency of administration. Although methods and instruments for progress monitoring will vary according to their purpose and student need, all assessment strategies share certain characteristics:

1. Administration of multiple measures across time to reduce the "practice effect."
2. Measures are inexpensive to obtain, produce, and distribute.
3. Measures are easy to understand and interpret.
4. Measures are highly sensitive to small changes in student performance over time.
5. Measures are consistent every time student data are collected (Yell et al., 2009).

Upon the selection of appropriate progress monitoring measures, educators should develop a plan for implementing progress monitoring. The implementation of academic measures follows a similar routine:

1. Collect baseline data to determine the current functioning level of the student.
2. Determine the weekly growth rate of the student by setting a realistic goal based upon student need and current capability.
3. Set a long-term goal for the student to achieve by the end of the progress-monitoring period. Educators can estimate this goal by:
    - collecting the median baseline score, number of weeks until the end of the progress-monitoring period, and the desired rate of growth. The median is the middle score, the score that separates the score—50% above and 50% below.
    - setting the long-term goal by multiplying desired weekly growth by the number of weeks in the progress-monitoring period and adding the result to the median baseline score.
4. Place the long-term goal line on a graph to mark the target for student performance by the end of the progress-monitoring period.
5. Determine how often the student must be monitored, typically based on the seriousness of the problem.
6. Monitor the student following strict adherence to the progress-monitoring program.
7. Make decisions and implement program of intervention changes based upon the data collected. Any modifications made to the plan of intervention require clearly delineating new phase on the graph. Teachers should use caution not to make frequent or rapid changes to the data collection methods as this will tamper with the accuracy of the results.
8. Continue monitoring student progress and collecting data, revisiting step 7 regularly (Yell et al., 2009).

Through the precise measurement of student skills and behavior, teachers can assess and modify instructional strategies to meet the needs of their students. There is also an accountability aspect to data collection. Data can provide critical insight into the effectiveness of instructional and behavioral interventions, as well as the efficacy of data collection methods and interpretation. The most useful and popular method of data interpretation is through graphing. Data graphing is a three-step process involving: 1) the accuracy of graphing the data, 2) accurately analyzing the data, and 3) accurately using the data to guide instructional and behavioral intervention selection and implementation (Yell et al., 2009).

Many graphing tools are available; however, the accuracy of graphing and interpreting data is essential for desired results. The first step is visual inspection of the collected data. This requires careful graphing of the data and examining the results for trends, levels, and variability (Kennedy, 2005). Trends are the slope of the graphed data. For any pattern or trend to be established, at least three data points must be graphed. The subsequent trend line can either indicate an increase (upward trend) or a decrease (downward trend) in the occurrence of the target behavior (Yell et al., 2009).

The level is the difference between the end of one phase and the beginning of another. Variability is the day-to-day fluctuations in the target behavior. Too much variability can lead to flawed interpretation and may be the result of imprecise data collection methods, the introduction of new material, complications at home, or other influences on the target behavior. Once a set of data is collected, the teacher is now faced with several possibilities: 1) adjustment of the time necessary to achieve goals and 2) objectives, the necessity for teaching prerequisite skills needed

to achieve goals and objectives, or 3) the need for changes in the intervention (Wolery, Bailey, & Sugai, 1988).

Research that Supports Graphing and Analyzing Data

The use of data as an instructional decision-making tool to aid the improvement of student performance, intervention effectiveness, and implementation efficacy has been consistently validated and reinforced by numerous studies (Yell et al., 2009). Data collection is the foundation upon which accurate and effective intervention selection and implementation can be made. This process begins with identifying and defining the target behavior, devising appropriate and effective observation and data recording methods, and accurately graphing the collected data. With this information, teachers are better equipped to make better decisions (Yell et al., 2009).

Measuring student academic progress and the effectiveness of instruction is often accomplished by employing curriculum-based measurement (CBM). CBM is essentially synonymous with progress monitoring and allows instructors to monitor student progress with both day-to-day and long-term objectives (Boyle & Scanlon, 2010). Using curriculum-based assessment (CBA) as a guide to intervention planning, CBM techniques aid teachers with instructional decision-making. Collected data can be applied to monitor the program of intervention for effectiveness and progress, while CBA can be used to implement program adaptations by identifying incompatibilities or conflicts between the intervention and student skill (Burns, 2002). In other words, CBA can be employed as a tool for mastery measurement while CBM measures general outcomes (Yell et al., 2009).

Curriculum-based measurement is a five-step process involving:

1. Planning assessment procedures. Considerations should be made by asking the following questions:
   - What content skill or behavior is most important for mastery?
   - What content skill or behavior is most difficult to understand?
   - What content skill or behavior must be mastered before progressing to more challenging objectives?
   - What short- and long-term goals are included in the IEP?

   Based upon the answers to these questions, educators can then develop assessment materials, determine the duration of the assessment tools, and decide how frequently to administer the assessments.
2. Identifying performance goals based upon student ability, IEP requirements, and the levels of acceptable expectations within the classroom.
3. Measuring student performance according to time-limited format (Miller, 2009). A typical method for measuring student progress is for teachers to deliver quick, one-minute probes every three to five days to assess skill performance (Boyle & Scanlon, 2010).
4. Graphing the data. After several probes have been administered (no less than three) this data can be plotted on a graph to provide a visual representation of the student's progress.

This information can then be used as the basis for continuance, changes, or stoppage of the program of intervention (Boyle & Scanlon, 2010).

5. Analyzing the data to make decisions. If the data shows an increasing (upward) trend, it indicates desired behavioral outcomes. The intervention method(s) employed should be continued. A decreasing (downward) trend indicates inadequate progress. The intervention(s) should be revised, replaced, or discontinued (Yell et al., 2009).

Reliable data are dependent upon the fidelity of implementation (FOI). According to Dane and Schneider (1998), five common dimensions define fidelity of implementation: adherence, exposure, participant responsiveness, program differentiation, and quality of delivery. Despite identifying these factors, there are no universally accepted guidelines for adherence to FOI. However, based upon existing commonalities, six considerations for adherence to fidelity of implementation emerge:

1. Keeping to the plan or adherence to the intervention -- as originally intended.
2. Allotment of time spent and frequency of sessions or student exposure to the 'dosage' of the intervention.
3. Quality of delivery (setting, resources, supports, enthusiasm, and integrity of implementation, etc.).
4. The level of student engagement or responsiveness of the participant.
5. The level of differentiation or the extent to which critical components that define an intervention are present (or absent).
6. An understanding of what to do and what to know in order to successfully implement the plan of intervention (Century, Rudnick, & Freeman, 2010).

When to Introduce Data Collection, Graphing, and Analysis

Establishing and maintaining a systematic approach to data collection, graphing, and analysis for intervention plans requires teachers to take an active role in the evaluation of their own interventions. Teachers can employ these basic guidelines to devise a sound program of intervention:

1. Identify and define the problem behavior in terms that are measurable, observable, and objective. This process involves determining what isn't working and what can be done to remedy the situation. It is not in the teacher's best interest to tackle every complication, only the one or few manageable problem issues that are the most significant. Significant problems may be behavioral excesses (verbal threats) or deficits (limited social initiations).
2. Collect direct observation data that serves as baseline performance such as student products, student questionnaires, or family interviews. Selection of the measurement tools will depend on the behavior of concern; it may be useful to count "how many" (frequency), "how long" (duration), or magnitude (impact on environment – usually measured with a likert scare). The purpose is to uncover possible patterns of behavior that may stem from more than one factor (e.g., a difficult academic task, argument with a classmate, family crisis).
3. Analyze the data by plotting the results on a graph. Creating a visual representation of the data will reveal either a discernible pattern or inconclusive outcomes.

4. Develop a program of intervention that promotes a behavior that serves the same function or accomplishes the same outcome but is socially more acceptable. Using the baseline data as a guide, generate a hypothesis regarding the origin of the problem. That is, identify the function or reason the behavior is occurring, and introduce an intervention that includes acceptable replacement behavior.
5. Implement the program of intervention and continually monitor the program for effectiveness and efficacy. Ensure the accuracy of intervention monitoring by using the same data collection instruments and methods as those used to collect the baseline data.
6. Analyze the data and evaluate the results. By looking at the graphed data – its trend and slope (e.g., the direction of the data and the amount of behavior change), you can see if there has been any changes in behavior, determine if this change is a result of the intervention, and decide to continue, replace, or discontinue the intervention. Teachers should collect at least three data points or, if a discernible pattern is not established, keep collecting data until a pattern emerges. Highly variable data may necessitate making immediate changes in classroom management or adjustments in instruction – or both.
7. Maintain, revise, or replace the intervention. Based upon the results of the collected data, teachers can now choose to maintain the program of intervention or opt to revise or replace portions or the entire intervention plan. Teachers should keep in mind that any change in intervention represents a separate intervention and will require a new set of data from which to evaluate its effectiveness (Babkie & Provost, 2004).

Guidelines for Implementation

Assessment is a critical element to any program of intervention and helps to ensure the efficacy and effectiveness of both the intervention itself and the implementation of the intervention. Prior to initiating any intervention analysis, the educator must ask themselves some important questions:

- What is the program of intervention?
- What does the intervention look like?
- Has the intervention been altered in any way from its original intent? (Century, Rudnick, & Freeman, 2010).

The very foundation of any assessment system is a clear picture of student performance and progress. The first step involves developing a task description that includes:

1. The indicators that will be assessed by the performance measures.
2. The specific skill or content to be assessed.
3. A description of the student's behaviors, activities, and products that will be produced.
4. The resources and materials needed to complete the task.
5. A clear description of examples of acceptable products based upon grade-level general education criteria.
6. A time estimate to complete the task.
7. A clear description of the level of supports provided to complete the task (Nolet, 2006).

Another aspect to data collection and assessment is the fidelity of implementation (FOI). Fidelity of implementation is generally considered the extent to which an intervention is implemented as it was originally designed. Drawing from the available literature provides educators with general guidelines to intervention design and assessment:

1. Decide how fidelity will be conceptualized and measured.
2. Make certain that all critical components and features of the intervention are clearly defined, along with the roles and responsibilities of all those who are responsible for the intervention.
3. Follow a clearly defined set of guidelines to adhere to fidelity of implementation, namely: (a) daily checklists, (b) collegial observation, (c) anecdotal record, (d) scripted plan, or (e) a combination of these options.

Cautions Regarding Data Collection, Graphing, and Analysis

An important factor in regard to evaluating the results of collected data and intervention analysis is the fidelity of implementation (FOI). Essentially, fidelity of implementation is the extent to which the critical components of a program of intervention are present at the beginning and throughout the program. However, without first establishing a specific description and precise measurement of the intervention, it is impossible to determine the origin of undesired results.

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