

Data Management in Special Education Research Scientific Review

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ABSTRACT

Data management is defined as: The process of understanding, collecting, storing, organizing, and maintaining data that has been created, collected, stored, organized, and maintained. Data management is an important aspect of scientific research in special education. Effective data management is an important process in providing analytical information to help drive decision-making by those responsible for special education. In this paper, data management in special education will be highlighted in the following areas: The importance of collecting accurate and reliable data, using appropriate analysis methods, avoiding bias against people with disabilities, the need for appropriate data management strategies, and the challenges associated with data management in special education research. In the end, the paper concludes with a number of recommendations, including adopting specific and clear strategies in data management in special education research, establishing local and Arab centers for special education data management, training researchers in the field of data management, and introducing it into postgraduate courses.

Keywords: Special Education, Data Management, Scientific Research, Scientific Review, Qualitative Research.

INTRODUCTION

Special education is the educational programs and services provided to students with disabilities to meet their unique needs (IDEA, 2020). The Individuals with Disabilities Education Act (IDEA) defines a student with a disability as a person who has one or more of the following;

Cognitive Impairments ‘Physical Impairment ‘Emotional Disorders ‘Hearing Impairments ‘Visual Impairments ‘Speech Language Impairments ‘Autism ‘Traumatic Brain Injury ‘Learning Disabilities ‘Other Health Impairments, Special education is designed to provide students with disabilities with access to the general education curriculum. It ensures that students with disabilities receive the same educational opportunities as their non-disabled peers and opportunities to learn the skills needed to fully participate in their communities, is provided at no additional cost to families, and is designed to meet the individual needs of the student through the development of an Individualized Education Program (IEP) (Haimour, & Al Shabatat, 2024).

Good special education practices are evidence-based practices derived from scientific research, and evidence-based practices are practices that have been proven effective through high-quality research to meaningfully improve student outcomes (Cook et al., 2012)

Scientific research is based on collecting and analyzing data in order to solve problems, develop practices, or build scientific theories. Therefore, in order to optimize the benefits of scientific research, we need effective management of research in general and its data in particular.

Definition of Research Data Management

Research Data Management (RDM) refers to the organization, documentation, preservation, and dissemination of data during the research process (Tenopir et al., 2011). This includes planning its collection, storage, and sharing with others, as well as implementing policies and procedures to ensure data quality, integrity, and accessibility (Tenopir et al., 2011). Data management is an important aspect of research because it ensures the reliability and reproducibility of research results (Tenopir et al., 2011). It also facilitates data sharing and collaboration with organizations and individuals involved in scientific research, which can lead to new discoveries and developments in a field (Tenopir et al., 2011). In addition, proper data management can minimize the risk of data loss and confidentiality breaches (Tenopir et al., 2011)

Research Data Management Cycle

The research data management cycle is the cycle that data goes through from planning its collection to reuse, a process that helps researchers plan, organize, and maintain data throughout the research process. The results indicated that the study's sub-variables, namely (data management, analytics, business performance management, and information delivery), had a positive impact on enhancing E-HRM practices (Awad, & Mahmoud, 2024).

1-Planning: Researchers plan their data collection, management, and preservation strategies before the research begins. This includes defining the research question, identifying the data needed, and determining the methods for collecting, analyzing, and storing the data.

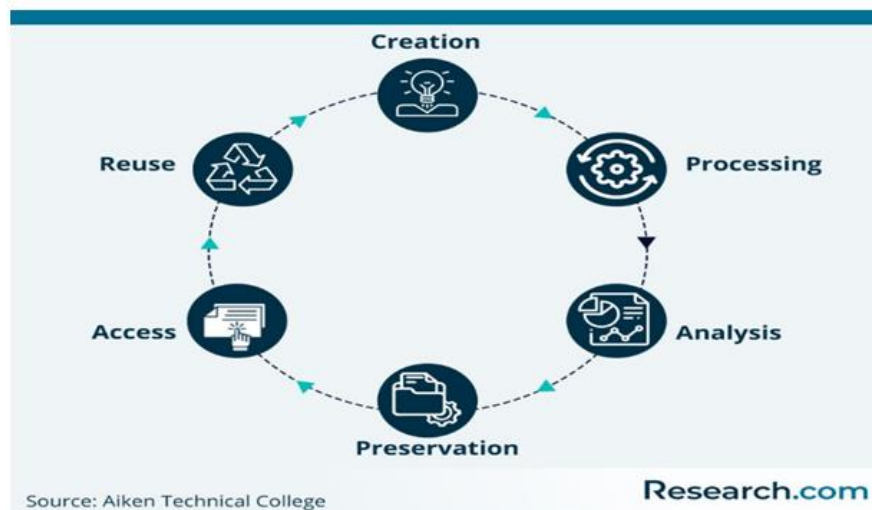
2-Collection: Researchers collect the data needed for the research, either by conducting experiments, surveys, or using existing data sources.

3-Processing: Researchers process the data to make it ready for analysis. This includes cleaning, coding, and organizing the data. 4-Analysis: Researchers analyze data using statistical techniques or other methods to answer the research question and reach specific conclusions.

5-Preservation: Researchers preserve data for long-term use and accessibility. This includes creating backups, creating metadata, and depositing data in a repository.

6-Sharing: Researchers share data with other researchers or the public, depending on the terms of the data sharing agreement and ethical considerations.

-Reuse: Other researchers reuse the data for their own research purposes 7



The data cycle enables researchers to go back to previous steps in order to improve the data or address unforeseen challenges. It is important to note that the data management cycle is not a linear process and is designed to the specific needs of the research project and the researcher. (Shen et al., 2018)

The Importance of Research Data Management in Special Education

Data management ensures the quality, integrity, and reliability of research findings in special education (Zhang, 2018). It also facilitates the sharing of data with others in an organized manner and helps to reduce the risk of data loss and confidentiality breaches (Tenopir et al., 2011)

One of the main benefits of good data management in special education is that it allows data to be collected, organized, and analyzed in a systematic and efficient manner (Zhang, 2018). This includes planning, collecting, storing, sharing, and facilitating access to data (Tenopir et al., 2011). It provides a solid foundation for evidence-based decision-making, which can lead to better educational outcomes for students with disabilities (Zhang, 2018)

The benefits of good data management in special education include facilitating data sharing and facilitating the use of technology to improve the quality of data collection and analysis, which can lead to more accurate and reliable research results (Qi et al., 2022)

Research data management also enables the ability to track data and identify patterns by providing a structured approach to organizing and analyzing data by implementing policies and procedures for data collection, storage, and sharing, research data management allows researchers to easily access and analyze data, which can lead to the identification of patterns and trends (Tenopir et al., 2011) Good research management in special education improves communication between individuals and organizations specializing in the field of special education, and provides them with access to up-to-date data and updates. This facilitates collaboration between decision makers in the field. (Tenopir et al., 2011 & Qi et al., 2022)

It can help build platforms for storing, managing, and sharing data. It can help build rules for accountability and transparency. (Hrynaszkiewicz et al., 2016)

Used Tools in Conducting Special Education Research

1-Data collection tools: Surveys, interviews, and other data collection tools can be used to gather information from participants. Examples of programs that can be used for this purpose include Qualtrics and Survey Monkey.

.2-Data storage tools: Database management systems, such as MySQL, Microsoft Access, and SQL Server, can be used to store data in an organized and structured manner.

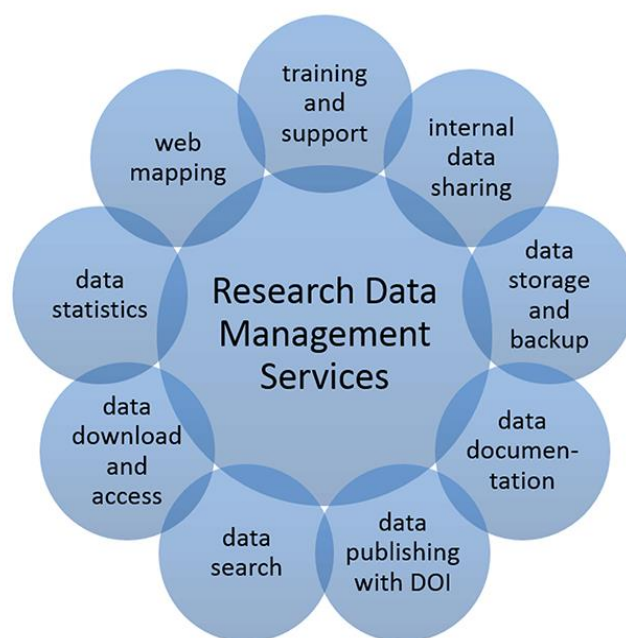
3-Data analysis tools: Software such as SPSS, SAS, and R can be used for data analysis and statistical analysis. These tools allow processing and analyzing data, as well as creating graphs and charts to present the data in a meaningful way.

4-Backup and data archiving tools: Tools such as Backblaze, Acronis True Image, and Carbonite can be used to back up data and ensure that it can be easily retrieved in case of data loss

.55-Data security and privacy tools: Tools such as VPNs, firewalls, and encryption can be used to protect data from unauthorized access and ensure that confidentiality is maintained.

Researchers should know the advantages of these tools and the limitations of their use, and choose the most appropriate tool based on their research needs and the services they provide, including these services.

- 1.Training the research team
- 2.Provide internal data sharing
- 3.Maintain data backups
- 4.Documentation of data
- 5.Publish the data and provide a digital identifier
- 6.Searching the data
- 7.Accessing and downloading data
- 8.Statistical processing
- 9.Data tabulation



Challenges to Managing Research Data in Special Education

Managing research data in special education can be challenging due to a variety of factors. One of the main challenges is the lack of clear standards for data management in special education research.

This can lead to inconsistent data collection, storage, and sharing practices among researchers, making it difficult to compare and replicate results across studies, making it difficult for researchers to ensure data quality and integrity, which can lead to errors and biases in research results (Liu & Chen, 2018).

In addition, data management in special education research faces ethical challenges such as protecting and maintaining confidentiality of sensitive data, informed consent from participants, and maintaining anonymity of participants (Liu & Chen, 2018).

Addressing the ethical implications of research findings is an additional challenge to managing special education research data and the difficulty of adhering to institutional and national data protection regulations, which can be difficult to navigate.

Another challenge is the apparent lack of qualified and specialized personnel to effectively process, manage, and analyze large and complex data.

Obtaining accurate data in special education research can be difficult for several reasons, including the lack of standardization in assessment and measurement tools.

Another difficulty in obtaining accurate data in special education is the complexity and diversity of research samples in terms of their needs, abilities, ability to respond to study tools, and willingness to express the information required by the research (Henderson & Mapp, 2002). (Yell et al., 2006).

Concerns about privacy and security in special education research data are an important issue. A key aspect is the protection of sensitive and confidential information of participants, such as personal and medical information, for several reasons; The first reason is that most of the participants in these studies have sensitive issues and data that should only be seen by people directly involved. The second reason is that a number of participants in these studies may not realize the importance, seriousness, and privacy of this information, so they may provide more data than required. The third reason is that publishing private data may cause stigma (Henderson & Mapp, 2002).

The cost of managing data in special education research can be significant. This is evident in the cost of software and hardware required to collect, store, and analyze data.

In addition, the cost of training and professional development for researchers and staff to ensure proper handling and management of data can also be significant (Wang et al., 2016).

Applications of Special Education Research Management

1-Program Evaluation: Data management can be used to track the progress of students in special education programs, evaluate the effectiveness of interventions, and identify areas for improvement. This can be done through the use of standardized assessment tools and data analysis software.

2- Policy Development: Data management can be used to inform policy decisions related to special education, such as allocating resources and developing best practices. This can be done through analyzing data on student needs and the effectiveness of current policies.

3- Intervention Design: Data management can be used to design and implement interventions and supports for students with special needs. This can be done through the use of data on student needs and the effectiveness of current interventions.

4- Identify and Address Disparities: Research data management can be used to identify and address disparities in special education services, such as disparities in access to services, disparities in service delivery, and disparities in student outcomes.

5- Identify and Address Learning Gaps: Data management can be used to identify learning gaps among students with special needs, and design interventions and supports to address these gaps (Liu & Chen, 2020).

Data Management Technology

Structured databases: This is one of the most common technologies used for data management. Examples of database management systems (Structured Query Language) include MySQL, Oracle, Microsoft SQL Server, and PostgreSQL. These systems allow users to create, read, update, and delete data.

Cloud-based storage: Cloud-based storage solutions such as Amazon S3, Microsoft Azure, and Google Cloud Storage allow you to store, manage, and analyze large amounts of data without having to invest in expensive hardware or infrastructure.

Data warehouses: Data warehouses are specialized databases designed to store large amounts of data from multiple sources. They are optimized for data analysis and can be used to support business intelligence and decision-making processes. Examples of data warehouse technologies include Amazon Redshift, Google BigQuery, and Microsoft Azure Synapse Analytics

NoSQL databases: Unlike structured databases, NoSQL databases such as MongoDB, Cassandra, and Couchbase are designed to handle with unstructured or semi-structured data. They can be used to manage large amounts of data, as well as for real-time applications such as social media analytics and Internet of Things (IoT) devices, and are flexible and scalable.

- Data integration tools: Data integration tools such as Informatica, Talend, and Microsoft Power Query allow businesses to extract, transform, and load data from multiple sources into a single repository. These tools are useful for managing data from different sources and ensuring data consistency and accuracy.

- Master data management (MDM) systems: MDM systems such as SAP Master Data Governance and Informatica MDM are used to create a single, consistent view of critical business data across different systems and applications. They can help maintain data quality and integrity, and ensure that accurate data is used in decision-making processes.

Although technology has facilitated data management, it faces some challenges, including dealing with data generated using artificial intelligence, the inability to deal with encrypted data, high cost, cloud failures, and data loss (Abadi, 2009, Agrawal, et al., 2010)

CONCLUSION

This scientific review aims to highlight the need for proper data management in special education research. The field of special education research is witnessing remarkable growth, which requires effective data management to preserve this information and ensure easy access to it when needed. This scientific review emphasizes the importance of this aspect in the humanities in general and in the field of special education in particular

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