

# **Building a framework based on the Data Information Knowledge and Wisdom (DIKW) model to guide the development of a Comprehensive Data Governance Program for Healthcare**

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## **Introduction**

The purpose of this project is to create a straightforward framework that can help students improve their learning. This framework is intended to guide students through four essential steps: 1) searching and gathering relevant articles from various sources, 2) organizing the collected articles into categories, 3) creating new knowledge by synthesizing the organized information, and 4) proposing the Wisdom, a data governance program, based on new knowledge, experience, and insight.

The focus of this framework is to provide guidance specifically for graduate students in the Doctor of Nursing Practice (DNP) program at the School of Nursing who are working on building a data governance program in healthcare (named DGH framework). The framework is designed to be interactive and hosted on a Canvas platform to increase accessibility for students.

## **Background**

NSG 692: Health Care Information Systems and Technology is an online informatics course for students in the DNP programs at the School of Nursing since 2020, and it is offered two semesters per year. All students in DNP programs are required to take this course.

One of the Student Learning Objectives (SLO) for this course is to "design approaches for using technology in the planning, implementation, and evaluation of data management in the scholarly clinical project." The assignment to this SLO is writing a hypothetical "Data Governance in Healthcare," which requires the student to use multiple skills to select, research, independently evaluate, and formulate five aspects 1) Data quality, 2) Data Integrity, 3) Data access, 4) Data security, and 5) Data lifecycle, of a data governance program in healthcare. Many students struggle to accomplish this assignment.

The Data Information Knowledge Wisdom (DIKW) framework is a hierarchical model that explains the relationship between Data, Information, Knowledge, and Wisdom. Data is at the framework's base, followed by Information, Knowledge, and Wisdom at the top.

Data refers to raw facts, while Information is organized and structured data with relevance and meaning. Knowledge is derived from applying Information to real-world situations, representing a deeper understanding of relationships between Information. Finally, Wisdom represents the highest level of the framework, involving the ability to make judgments and decisions based on knowledge, experience, and intuition.

This framework can be a useful guide for writing a paper as it helps to clarify the different levels of understanding and analysis required for the effective use of all aspects of the ideas.

## **Methods**

**Step 1: Mapping DIKW framework with the Framework for Information Literacy for higher education**

This mapping aims to integrate the concepts of the "Framework for Information Literacy for Higher Education" into the existing DIKW framework. This integration enables the creation of a more comprehensive DGH framework.

| DIKW components | Information Literate components         | Learners Information Literate Abilities   |
|-----------------|---|---|
| Data            | Authority is constructed and contextual | <ul style="list-style-type: none"> <li>• Define different types of authority, such as subject expertise (e.g., scholarship)</li> <li>• Use research tools and indicators of authority to determine the credibility of sources, understanding the elements that might temper this credibility</li> </ul>   |
|                 | Research as inquiry                     | <ul style="list-style-type: none"> <li>• Determine an appropriate scope of investigation</li> <li>• Monitor gathered information and assess for gaps or weaknesses</li> </ul>   |
|                 | Searching as strategic exploration      | <ul style="list-style-type: none"> <li>• Determine the initial scope of the task required to meet their information needs</li> <li>• Identify interested parties, such as scholars, organizations, governments, and industries, who might produce information about a topic and then determine how to access that information</li> <li>• Utilize divergent (e.g., brainstorming) and convergent (e.g., selecting the best source) thinking when searching</li> <li>• Use different types of searching language (e.g., controlled vocabulary, keywords) appropriately</li> <li>• Manage searching processes and results effectively</li> </ul> |
| Information     | Information creation as a process       | <ul style="list-style-type: none"> <li>• Articulate the capabilities and constraints of information developed through various creation processes</li> <li>• Assess the fit between an information product's creation process and a particular information need</li> <li>• Recognize the implications of information formats that contain static or dynamic information</li> <li>• Develop, in their own creation processes, an understanding that their choices impact the purposes for which the information product will be used and the message it conveys</li> </ul>  |
|                 | Research as inquiry                     | <ul style="list-style-type: none"> <li>• Organize information in meaningful ways</li> </ul>   |

|           |                             |   |
|-----------|-----------------------------|---|
| Knowledge | Information has value       | <ul style="list-style-type: none"> <li>• Give credit to the original ideas of others through proper attribution and citation</li> <li>• Understand that intellectual property is a legal and social construct that varies by culture</li> <li>• Articulate the purpose and distinguishing characteristics of copyright, fair use, open access, and the public domain</li> </ul>   |
|           | Research as inquiry         | <ul style="list-style-type: none"> <li>• Synthesize ideas gathered from multiple sources</li> </ul>   |
| Wisdom    | Scholarship as conversation | <ul style="list-style-type: none"> <li>• Cite the contributing work of others in their own information production</li> <li>• Contribute to scholarly conversation at an appropriate level, such as local online community, guided discussion, undergraduate research journal, conference presentation/poster session</li> <li>• Critically evaluate contributions made by others in participatory information environments</li> <li>• Recognize that a given scholarly work may not represent the only or even the majority perspective on the issue</li> </ul> |

**Step 2: Building attributes of each component of the DGH framework**

| DGH components | DIKW components | Information Literate components  | Attributes   |
|----------------|-----------------|--|--|
| Acquisition    | Data            | Authority is constructed and contextual<br>Research as inquiry<br>Searching as strategic exploration | Keywords<br>Peer-reviewed articles, reports, online articles,<br>Health-related databases  |
| Preparation    | Information     | Information creation as a process  | Categorize and organize collected articles based on the following components: <ul style="list-style-type: none"> <li>• Definition of data governance</li> <li>• Significance of data governance</li> <li>• About data quality with examples</li> <li>• About data integrity with examples</li> <li>• About data access with examples</li> <li>• About data security with examples</li> <li>• About data lifecycle with examples</li> </ul> |

|             |           |                             |  |
|-------------|-----------|-----------------------------|--|
| Synthesis   | Knowledge | Information has value       | <p><b>Instruction 1:</b> Make a mockup health institution or use your institution:</p> <ul style="list-style-type: none"> <li>• Bed-size</li> <li>• Specialties (e.g., Med-Surg, ICU, etc.)</li> <li>• Hospital, rehabilitation, or nursing home</li> <li>• Other information</li> </ul> <p><b>Instruction 2:</b> Design a hypothetical data governance program based on the five collected components:</p> <ul style="list-style-type: none"> <li>• Data quality</li> <li>• Data integrity</li> <li>• Data access</li> <li>• Data security</li> <li>• Data lifecycle</li> </ul> |
| Development | Wisdom    | Scholarship as conversation | <p>Writing a data governance program paper:</p> <p><b>Introduction:</b> Use the definition and significance of data governance identified in the 'Preparation' phase.</p> <p><b>Domains of Data Governance in HealthCare:</b> Use definitions and examples of each domain identified in the 'Preparation' phase.</p> <p><b>Hypothetical Data Governance Program:</b> Use all the information synthesized in the 'Synthesis' phase.</p>   |

**Students' Information Literate Abilities**

**Acquisition:** Students develop evaluation and the use of sources of information effectively. They understand different types of authority and their credibility, assess sources, monitor gathered information for gaps or weaknesses, identify interested parties who can provide information, utilize divergent and convergent thinking when searching, use different searching keywords appropriately, and manage searching processes and results effectively.

**Preparation:** Students gain the ability to articulate the capabilities and constraints of information developed through different creation processes, assess the fit between an information product's creation process and a particular information need, recognize the implications of static or dynamic information formats, develop an understanding that the choices made during the creation process can impact the message conveyed and the product's intended use, and organize information in a meaningful way.

**Synthesis:** Students organize information in meaningful ways, give proper attribution and citation to original ideas, understand that intellectual property varies by culture, articulate the purpose and characteristics of different legal constructs such as copyright, fair use, open access, and the public domain, and synthesize ideas from multiple sources.

**Development:** Students participate in scholarly conversations and evaluate the contributions of others. They cite the work of others in one's information production, contribute to scholarly conversations at an appropriate level such as local online communities, guided discussions, undergraduate research journals, or conference presentations, critically evaluate the contributions made by others in participatory information environments, and recognize that a given scholarly work may not represent the only or even the majority perspective on the issue.

**Implementation DGH framework**

A comprehensive and interactive framework to guide the design and development of a 'Data Governance Program in Healthcare' is implemented for students' use on Canvas.

(<https://uncw.instructure.com/courses/69158> )

**Applying to the course:** The DGH framework will be integrated into NSG 692: Health Care Information Systems and Technology, an online informatics course for DNP students on the Canvas, starting in Fall 2023.