Rating Domain Analysis: Determining Ready Relevant Learning Point of Need

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ABSTRACT

The Ready Relevant Learning pillar of Sailor 2025 is a transformational Navy initiative intended to accelerate the learning of Sailors for faster response to rapidly changing warfighting requirements. One goal of Ready Relevant Learning is to ensure every Sailor receives modernized training closer to the point of need to support assigned tasking.

Currently, accession Sailors' training is front-loaded with a large amount of content delivered after basic training and before their first deployment. Modernization efforts focus on distributing training out of the schoolhouse to the waterfront and operational environment, utilizing modernized delivery systems to simplify Sailors' access to training. The Ready Relevant Learning training paradigm supports a Sailor's career progression by providing training tailored to initial job demands and continuing skills development for subsequent tours and career milestones.

The Ready Relevant Learning content modernization effort includes the following analysis activities: Rating Domain Analysis and Media and Fidelity Analysis. Rating Domain Analysis and Media and Fidelity Analysis use consistent, repeatable processes and feed into the Functional Requirements Document to produce recommendations on content modernization and training timing. While all the activities work together, this paper will focus solely on the Rating Domain Analysis. The Rating Domain Analysis is a novel analysis methodology to answer the question of when exactly training should be provided. It involves identifying the work a Sailor performs in the Fleet and aligning existing learning objectives with those discrete tasks. This Rating Domain Analysis also identifies potential gaps in training, where work is performed on the job but no training content exists in support of that work, as well as areas of overtraining, where training content is being delivered that does not support work Sailors perform on the job. The paper will discuss the Rating Domain Analysis process, development and why the Rating Domain Analysis is a powerful tool to improve Navy training.

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INTRODUCTION

Overview

Ready Relevant Learning is a Navywide initiative with the primary goal of providing the right training, at the right time, in the right way. It involves developing a career-long learning continuum for every Sailor, modernizing training to maximize impact, and accelerating the processes for delivering new training to the Fleet. Ready Relevant Learning is one of three pillars of Sailor 2025, which intends to ensure every Sailor receives modernized training closer to the point of need to support assigned tasking. It utilizes current science of learning and research, human performance support strategies and distributed learning within virtualized, mobile and Navy training systems to ultimately modernize existing training where appropriate and produce the solutions outlined by the multiple analysis efforts. The Ready Relevant Learning content modernization effort includes several categories of analysis activities. The processes utilized during data collection and analysis adhere to MIL-HDBK-29612 and current instructional design best practices, and facilitate innovative acquisition processes.

Rating Domain Analysis and the Just-in-Time Approach

It has long been recognized that skills learned in Navy initial training are often forgotten before Sailors ever have a chance to apply the knowledge to their job. Sometimes, this deficiency is mitigated by more on-the-job training, which is not always the best use of senior personnel's skills in the workplace and does not provide standardized training for all Sailors. The purpose of the Rating Domain Analysis is to identify and sequence the work and job responsibilities a trainee is expected to perform on the job. This sequencing is linked to learning objectives in order to determine when to deliver instructional content to the trainee. The underlying concept for developing the Rating Domain Analysis was to maximize learning transfer from the classroom to the workplace and minimize the amount of skill decay by better aligning the timing of training closer to the point of need.

This approach can be seen as a variation of the Just in Time Teaching method developed by Novak, Patterson, Gavrin, and Christian (1999). The Just in Time Teaching method was first developed as a web-based technique to teach physics (Clingerman, 2010). Over the last two decades, however, this technique has been applied to other disciplines of science like biology and chemistry, and it has been found effective in humanities, mathematics, geography, economics, sociology, theology and writing as well as its application in the business and professional arenas (De, Kavitha, & Kanagasabai, 2014).

As originally used by Novak et al. (1999), the instructor provided students with prompts or questions requiring a response the day prior to teaching a lesson. The instructors read the responses prior to class, and this practice serves a dual purpose. First, the questions prime the students, for the lesson to come resulting in higher engagement preparing for and participating in the lesson that followed the questions. Second, the instructor is able to gauge the students' current understanding of the topic and tailor the lesson as needed to provide focused training "just-in-time" of the students' needs (Benedict & Anderton, 2004; Novak, 2011). This nontraditional approach creates a learning environment that is more collaborative between the students and the instructor, and it allows for the learning to occur more organically by activating prior knowledge within each student from which the instructor builds (Clingerman, 2010).

Modern technology has allowed Just in Time Teaching to move outside of the classroom and has found a presence among web application to promote professional development and training. Many businesses have adapted similar

methods to make training work processes more responsive and flexible to the needs of employees (De, Kavitha, & Kanagasabai, 2014). Professional organizations are able to receive feedback from the workforce to determine the type and frequency of training needs among personnel. Greenhalgh & Koehler (2017) completed a case study employing digital methods to assess effectiveness of professional development for French teachers preparing to discuss recent terrorist attacks with students. Modern-day applications of Just in Time Teaching as shown in this case study can be used to support large audiences in a distributed environment at the point of need, where web-based technologies were used to support teachers around the world, providing guidance and training on how to relate sensitive information to students.

The intent of the Rating Domain Analysis process is closely aligned with these last examples of Just in Time Teaching, where modern technology can be used to support training. However, the Rating Domain Analysis approach expands upon the Just in Time Teaching method. Traditional techniques in teaching and training generally include direct instructional activities, but often neglect to consider all aspects of human performance. The goal of Rating Domain Analysis is to create training that is responsive to the community being trained, focused on specific needs, and provided "in time" for when it is needed. The Rating Domain Analysis process identifies the work a trainee is expected to perform by prompting experienced professionals, or Subject Matter Experts, within specific jobs about the performance expectations of trainees in the Fleet. The Subject Matter Experts are then prompted to establish when a trainee performs the outlined jobs and tasks. This questioning serves as the primer to align instructional content with specific and focused tasks, just as the Just in Time Teaching allows instructors to tailor lessons with content students appear to need based on student responses. The Subject Matter Experts also provide a detailed timeline of when specific tasks are required to be performed in Fleet, which ensures training can be delivered "just-in-time" for application on the job. The recommended support is inclusive of formalized training solutions as well as performance support solutions, targeting the specific activity and provided at the time needed in a Sailor's career.

Rating Domain Analysis to Mitigate Skill Decay

Current research in skill decay seeks to determine the likelihood a skill can be maintained after a period of nonperformance. Empirical findings have shown that skill decay is predictable in its nature, where decreases in performance can be shown by graphically relating the level of performance with the time interval between skill training and skill performance (Bryant & Angel, 2000). Figure 1 shows that performance declines very rapidly following skill training, then slowly decreases over time to a point of leveling out (asymptote). This representation is considered the most accurate description of retention for a broad array of tasks and has consistently been supported by multiple studies examining skill decay of military tasks (Bryant & Angel, 2000).

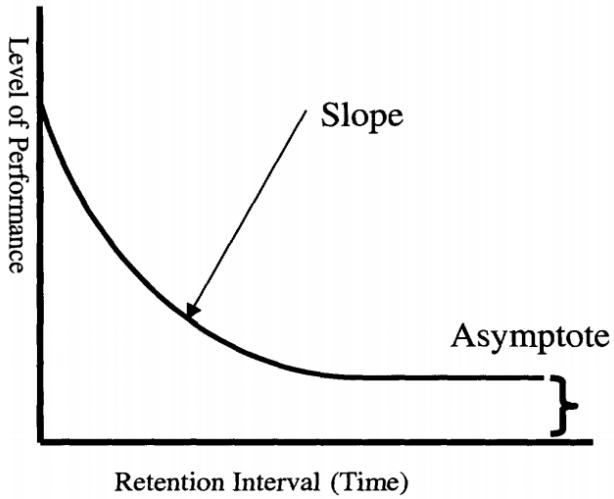

Figure 1: Function Relating Level of Performance to Time

A major problem with measuring skill loss is that different types of skills will be impacted by the factors influencing skill decay in various ways, changing how quickly a skill is lost. Additionally, the asymptote levels of performance for different skills will also vary (Bryant & Angel, 2000). Military tasks can involve any number of skill components,

including psychomotor skills, perceptual skills and cognitive skills. For example, research involving U.S. Army Soldiers indicates that skill decay for weapon qualification skills mostly decay after 10 months of nonuse and digital communication skills can decay as quickly as an 8-week period of nonuse (Goldberg, n.d.).

There have been many models developed for predicting skill retention and skill decay, which have applications in the military domain. The U.S. Army Research Institute established the Users' Decision Aid model, which is considered the most developed quantitative model of skill retention (Bryant & Angel, 2000; Sayala, Carey, & Stoloff, 2010). However, the Users' Decision Aid is supported by only one empirical study that shows the comparison between the model's predictions and actual skill retention data (Bryant & Angel, 2000). Research to support these prediction tools is said to be rarely performed due to cost, difficulty of data collection and the reported inadequacy of models, despite the demand for research in this area (Goldberg, n.d.).

Using measures to determine skill retention can better identify skills that would benefit from refresher or recurring training, to mitigate the retention time interval by providing consistent opportunities for skill practice. The analysis conducted in 2010 by Sayala, Carey, and Stoloff categorized deficient skills into three types:

- Skills showing decay, but were not predicted to (skills not transfer/ never learned).
- Skills showing minimal decay as predicted.
- Skills that decay and are predicted to have a high likelihood of decay.

For skills predicted to have a high likelihood of decay, the authors recommend training closer to when a Sailor enters the Fleet or refresher training once in the Fleet (Sayala, Carey, & Stoloff, 2010).

The Rating Domain Analysis effort is an innovative methodology to quickly and effectively align the work Sailors perform with the time when they are expected to perform it. This alignment pinpoints the retention interval by identifying how much time passes from initial training to task performance. The Rating Domain Analysis provides options in response to the identified retention interval:

- Move training closer to the point of need, thereby targeting when training could be most effectively offered, if skill development not initially required.
- Identify multiple instances of a task being required throughout a Sailors career (a training task being mapped to multiple work elements on the Career Progression Timeline to provide refresher training when required as evidenced by periods of nonuse (between instances of the task on the Career Progression Timeline).

METHOD

Career Progression Timeline

The current scope of Ready, Relevant Learning includes analysis of all apprentice-level training courses for over 70 Navy jobs or ratings. When analysis for a rating begins, the training paths within that rating are identified to determine the scope of the effort. A training path includes a specific set of courses a Sailor must complete to achieve a specialization within the rating. Career Progression Timelines are generated for each training path because work variations may exist across different platforms and in different operational environments. For example, within the Aviation Electrician's Mate rating, there are a number of specializations that focus on maintaining aircraft wiring on different platforms, so an FA-18 Aviation Electrician's Mate is provided a different training path than an H-60 Aviation Electrician's Mate. There will be overlap in some of the training provided, but unique training requirements and differences in the career milestones across the two specialties mandate separate consideration. A Career Progression Timeline is generated for each training path upon completion of the Rating Domain Analysis. The Career Progression Timeline specifies all work expected of Sailors within the rating and training path, mapping the Sailor's work responsibilities across a career timeline. While this level of analysis is detailed and tailored to each of a large number of communities, this unprecedented analysis of the work variations within a given rating is mandatory if the Navy is to realize the vision of the right training, at the right time, for the right person.

The first step in the Rating Domain Analysis process is to generate a draft Career Progression Timeline for each training path within the rating. The draft Career Progression Timeline is initially generated using the broad work areas listed in the rating's Occupational Standards. This document includes statements describing the Navy's minimum

requirements or skills of Navy enlisted ratings and occupationally defines the work performed by enlisted personnel. The broad areas of work identified become the "work categories" on the draft Career Progression Timeline. Many of the task statements listed within each area of work become the "work elements" on the draft Career Progression Timeline (Figure 2).

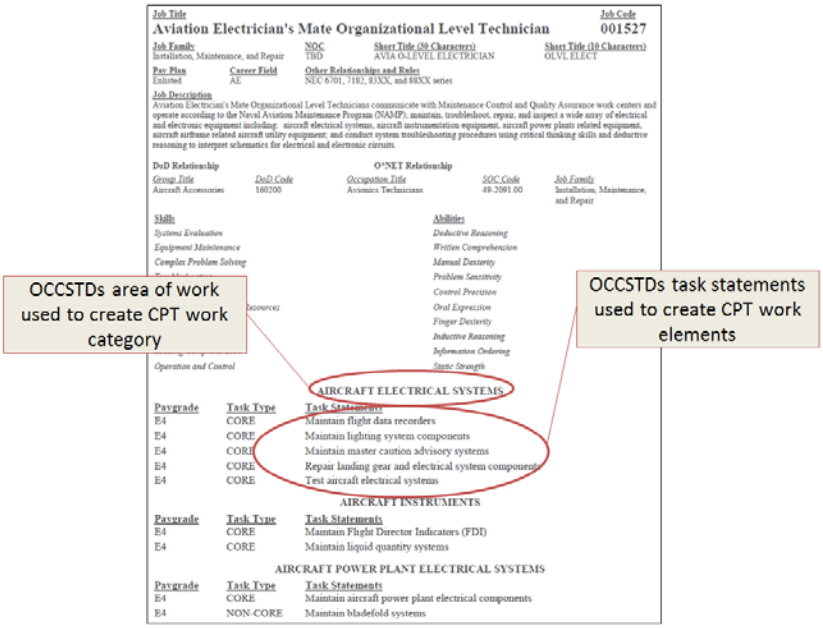

Figure 2: Deriving CPT Work Categories and Work Elements from OCCSTDs

Some Occupational Standards include task statements that may not be pertinent to all training paths within the rating. For example, the Occupational Standards for some maintenance ratings cover tasks that would be performed only on a fixed-wing aircraft and therefore would not be applicable to rotary-wing aircraft. In these instances, the tasks that are not relevant to the specific training path that maintains only rotary-wing aircraft are not included on the draft Career Progression Timeline. The draft Career Progression Timeline is also refined using rating-specific material, including available job task analyses, training material, and career documents such as the Navy Learning and Development Roadmap, which outlines training and education milestones for each rating at each pay grade.

Since the focus of the Rating Domain Analysis is to document the Sailors typical acquisition of tasks as they progress through their career, Sailors directly from the Fleet are the primary participants in Rating Domain Analysis workshops. Six to eight Fleet Subject Matter Experts from the rating and specific training path being analyzed are participants for each workshop. The Subject Matter Experts requested are asked to be within the E-5 to E-7 pay grade with one Subject Matter Expert at the E-4 level. Using groups of this size ensure that workshop findings are vetted and balanced, and the use of Sailors who belong in the above pay grades increases the likelihood that the Subject Matter Experts are accomplished within their career path but are still responsible for performing rating tasks regularly enough to maintain currency. In addition to Fleet Subject Matter Experts, one instructor for each training path analyzed participates in the data collection effort in order to clarify the scope and intent of learning objectives when ambiguity exists.

Creating the draft Career Progression Timeline prior to the workshop accomplishes a couple of things. First, the analyst conducting the data collection and later data analysis gets the opportunity to become familiar with the rating and/or training path and the work expected of Sailors prior to completing the data collection. Additionally, the draft Career Progression Timeline serves as a starting point for Subject Matter Experts during the workshop. The Subject Matter Experts begin the Rating Domain Analysis process with an idea of what is expected from the data collection, and can work to refine the Career Progression Timeline throughout the workshop. All work categories and work elements defined for the rating's or training path's draft Career Progression Timeline are reviewed, updated where necessary

and validated with Subject Matter Experts input to most accurately reflect work being done in Fleet. These experts provide feedback on the categories through guided discussion during data collection workshops, allowing for work categories to be broken into more granular statements or rolled into combined statements. The intent is to include only relevant work related to tasks and skills required on the job on the final Career Progression Timeline.

The Subject Matter Experts next plot work elements on the Career Progression Timeline based on when new Sailors are expected to first perform the task with minimal supervision (Figure 3). Minimal supervision indicates a Sailor is performing work with little to no oversight and/or guidance from more experienced Sailors. The more experienced Sailor may be observing the Sailor's performance, but the more experienced Sailor does not need to interject to guide the Sailor through the specified task because the Sailor has reached a level of competency with the task that he or she can perform it with little to no assistance. This does not negate the need for on-the-job requirements such as inspections during maintenance activities. Minimally supervised merely indicates that the bulk of the knowledge and skills required to perform a task originates from the novice Sailor and the more experienced Sailor is standing by to verify the novice Sailor understands what to do and is performing the work accurately.

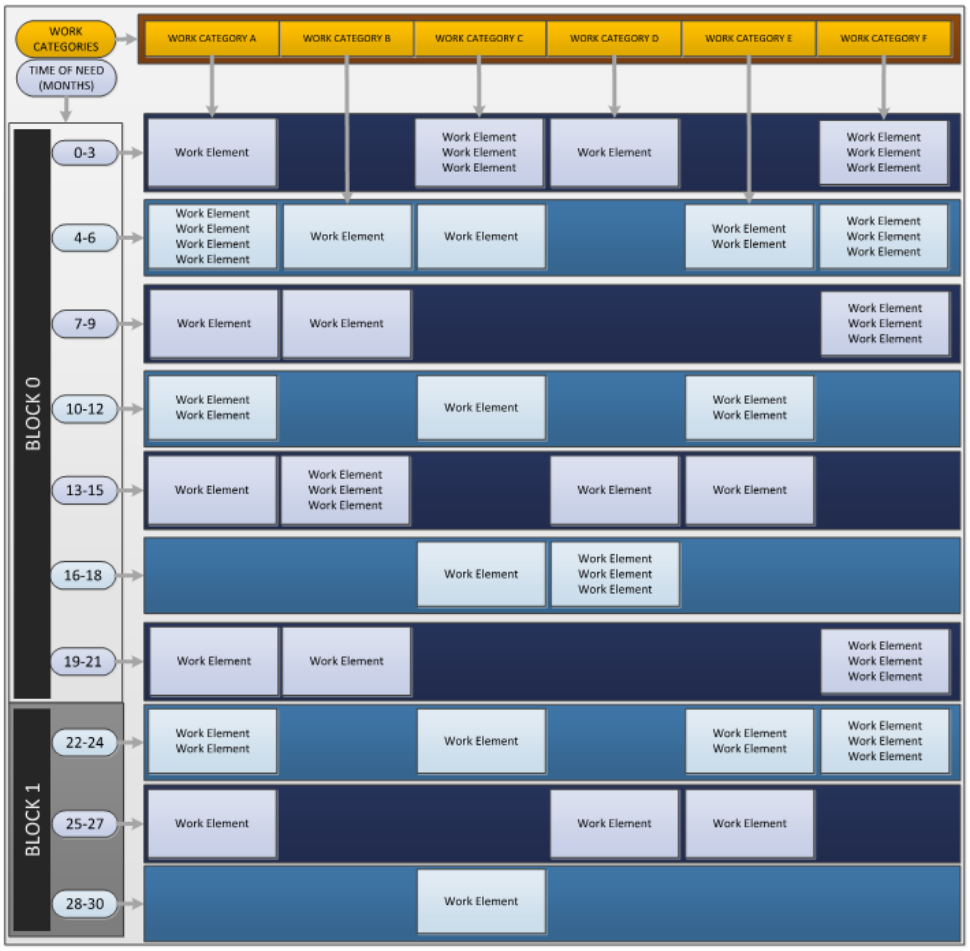

Figure 3: Sample Career Progression Timeline

Once all work elements have been mapped on the Career Progression Timeline, the SMEs revisit each work element to validate their placement on the timeline. In validating the placement of the work elements, Subject Matter Experts are also validating the time just prior to which training should be provided to support each work element. During this part of the process, work element statements often need to be broken into more granular statements so they can be plotted at discrete points on the Career Progression Timeline. For example, if one of the Occupational Standard statements indicates that a Sailor needs to "Maintain the fuel system," the entirety of the maintenance activities, to

include preventative maintenance, corrective maintenance and troubleshooting, generally are not expected of a Sailor at the same point in his/her career. Typically, preventative maintenance tasks are assigned to junior Sailors, and they are assigned corrective maintenance and later troubleshooting work as they gain proficiency and experience on-the-job. This one statement would then be broken into three separate work elements (one for performing preventative maintenance on the fuel system, one for performing corrective maintenance on the fuel system, and one for troubleshooting fuel system malfunctions) so that they can be plotted at different points on the Sailor's career timeline.

Following completion and validation of the Career Progression Timeline, the Subject Matter Experts are then provided the learning objectives from the apprentice-level training course(s). They are asked to align each learning objective to the work elements within the Career Progression Timeline that the learning objective supports (Figure 4). This alignment of learning objectives to work elements is used to drive the recommended timing of all apprentice-level training within the rating/training path. For instance, if a mechanic is expected to independently replace an oil filter after 6 months on-the-job, the training required to replace the oil filter should be delivered to the mechanic just prior to the 6-month mark.

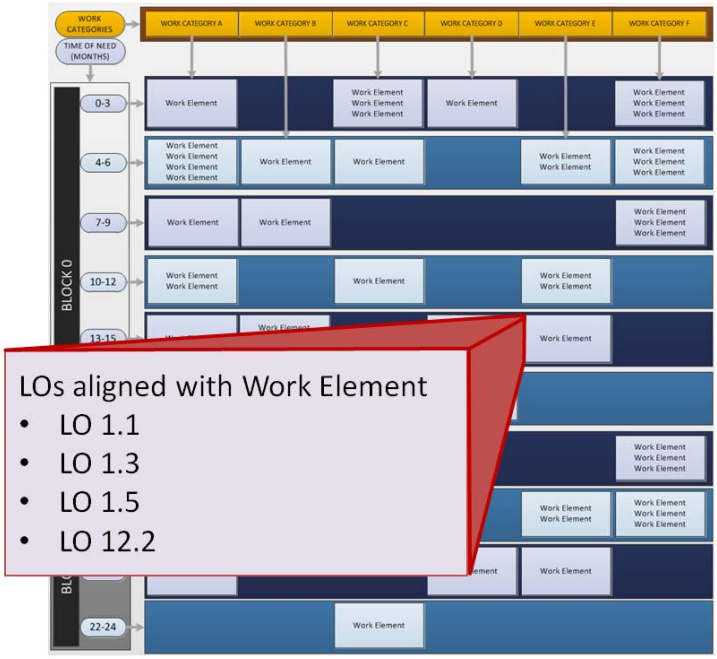

Figure 4: Work Element and Learning Objective Alignment

When correlating learning objectives to work elements, there are instances where one learning objective supports the execution of two or more work elements. In these cases, the learning objective is mapped to the earliest work element it most supports. This is to best determine the first instance of need to ensure training is provided closest to the point of need. Any additional work elements identified as supported by the learning objective are documented for review purposes to ensure the objective was accurately mapped to the work element it most supports. There are also instances in which a learning objective is determined to cover foundational knowledge or skills that enabled performance of all work elements on the Career Progression Timeline. This designation indicates the learning objective must be trained prior to a Sailor's first assignment. In these instances, the learning objective is flagged as "foundational" to indicate the prerequisite nature of the objective.

IMPLICATIONS

The driving concern that prompted the development of the Rating Domain Analysis approach was skill decay and the need to increase the effectiveness of training. As pointed out by Sayala, Carey, and Stoloff (2010), the Navy does not currently measure the decay of initial skills or the transfer of learning from the schoolhouse to the Fleet. The Navy is

currently developing a formalized, enterprise-wide evaluation tool that can measure the extent to which skill decay is occurring. In its absence, instructional designers have relied on less formal indicators of skill decay, such as consistent reports from Sailors of an increased need to provide on-the-job training to junior Sailors, and reports from junior Sailors that they do not recall knowledge and skills taught to them during accession training. While informal and reported to various levels of intensity, these trends are consistent across ratings as is the front-loaded nature of Navy training that has known and obvious impediments toward effective behavior change.

The Career Progression Timeline provides concrete and functional data on the point in a Sailor's career by which he/she needs to have received training on a given task. While data is not yet available on the effects of the training timing changes, there is a wealth of literature in training and neuroscience that substantiates that closely coupling training and performance of associated tasks decreases the chance of skill decay.

Preliminary findings of the Sailor 2025 pilot phase indicate that this innovative approach is identifying opportunities to distribute front-loading training across Sailors' careers, with some notable instances of recommended timing changes of several years to support work first performed after 72 months on the job. Data is being collected on the extent to which the Rating Domain Analysis approach is facilitating the distribution of training out of the accession schoolhouse and will be reported as it becomes available and more Rating Domain Analysis reports are generated; however, it should be noted that distributing training across a Sailor's career is not the intent of the Rating Domain Analysis process, nor are there arbitrary thresholds to indicate how much training should be retained in accession training and how much should be delivered during job performance. The goal of the Rating Domain Analysis process is to closely couple the timing of training delivery with job execution. In instances where content timing is not changing, this process can be used to validate the accuracy the content's current timing.

In addition to modifying training delivery to increase skills transfer, Rating Domain Analysis has other contributions to training system analysis, design and evaluation to include closer alignment of training system analysis with job competencies, better training cost management, identification of flaws within existing training and occupational standards, and natural training designs that mirror work requirements.

Holistic Alignment Between Training and Work

Regardless of the analysis method employed, a training system should have learning objectives that are traceable back to job performance requirements. This documentation generally takes the form of a training task and learning objective matrix. This learning objective to task relationship is represented on the Career Progression Timeline, but the Career Progression Timeline also provides a more holistic crosswalk between training and workforce management. This crosswalk marries Sailors' typical progression through their career, the responsibilities and authorities added along the way, with the training they will need in order to enable their progression. It provides a common construct that bridges the gap between human resources and training entities, and allows for changes in either training or job requirements to flag needed updates in the other.

Better Training Cost Management

In addition to increasing the timeliness and transfer of training, delivering training closer to the point of need also has cost saving implications. For any given year, the Navy introduces about 40,000 recruits, with approximately 30,000 personnel in training, carrying a Total Force of about 326,000 people. These figures are based on recent analysis at Navy Personnel Command and indicate training requirements keep Fleet operational efficiency at only about 90%. The majority of new personnel, about 75%, are attending training away from their assigned units and are thereby unable to contribute to their units' mission readiness. Additionally, the Navy Personnel Command analysis reports the Navy endures approximately 4,000 man-years of loss annually, mainly caused by bottlenecks in training. The financial impact equates to projected losses well over $400 million yearly (Command, U.S. Fleet Forces Command, 2017). Finally, a substantial amount of training dollars is spent providing advanced training to Sailors who leave the Navy due to attrition before they have the opportunity to apply the skills on-the-job. Ensuring that training is delivered at the point of need decreases the up-front training load on new Sailors and reserves training only for those Sailors who will be performing companion work tasks. In instances when there are multiple training requirements with limited training dollars, the Rating Domain Analysis can assist analysts in prioritizing training that should be developed and can be the source of data for a business case analysis to secure additional funding.

Identification of Improvement Opportunities

Easy identification of potential gaps within the training system is an emergent and beneficial outcome of the Rating Domain Analysis process. Once all work elements are mapped and verified on a Career Progression Timeline and learning objectives are plotted, it is easy to identify work elements that have no corresponding learning objectives. The lack of supporting learning objectives often indicates a training gap but requires further investigation. There have been instances where the learning objectives associated with work elements are not gapped, but rather have been wrongly incorporated into journeyman or master level training that is provided much later in the Sailor's career. In these instances, the delivery point of that training needs to be moved to the left and aligned with the point of need. In another scenario, work elements that appear to be unsupported by training could have been omitted deliberately during the training task analysis in which analysts systematically choose only the task that need to be formally trained. Careful consideration by appropriate stakeholders can determine if the gaps are valid or purposeful.

Similar to the process of identifying potential training gaps, the Rating Domain Analysis also enables the analyst to identify training provided to Sailors that is irrelevant to their job. This is indicated when there are learning objectives that cannot be associated with any of the work elements on the Career Progression Timeline. In these instances, it is important to first verify that the lack of a corresponding work element is not due to a missing work element that should have been plotted on the Career Progression Timeline. There have been instances of missing work elements due to Occupational Standards that are not aligned with current work expectations, as occurs regularly with the roll-out of new operational systems. In order to ensure alignment of Occupational Standards and training, it is recommended that review of the Career Progression Timeline take place during system requirements reviews and formal course reviews.

Training Designs that Mirror Work Requirements

While the Rating Domain Analysis's primary role is to determine the point of need for training, it also assists analysts when redesigning the training continuum. Once Learning Objectives are plotted on the Career Progression Timeline, they can be grouped by point of need based on the Rating Domain Analysis output and then also by content type (same work element and work category Learning Objectives together). This yields a quick design framework of modules that are needed at the same point in the Sailor's career and naturally grouped by job task (Figure 5). These groupings are used to organize modules and courses that consolidate potential strategy and media solutions across multiple Learning Objectives.

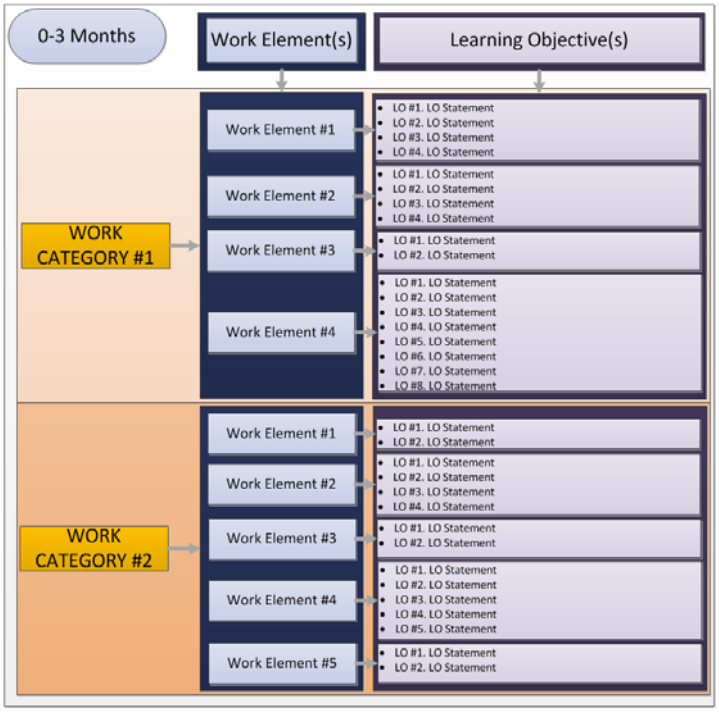

Figure 5: Work Element Timing and Associated LO

FUTURE WORK

The Sailor 2025 (S2025) effort focuses on improving training systems that are already in existence. The Rating Domain Analysis process has been developed for use after learning objectives have already been developed; however, this timing is not ideal for training systems that have not yet been analyzed and designed. In situations where training systems are being developed from scratch, the most ideal use of Rating Domain Analysis would follow Job Task Analysis. Following the documentation of a job's tasks and task attributes, the analyst would then plot the job tasks on a Career Progression Timeline. From there, the analyst would continue with the Training Task analysis to down-select the tasks that require training that then develop learning objectives. This will result in learning objectives that are not only aligned to their corresponding job tasks but also the timing with which the tasks are to be performed by new employees and the ideal timing of the training. A future effort includes the adaptation of the Rating Domain Analysis process for this application.

An additional area of development pertains to training scheduling. Delivering training at the point of need means that lengthy courses with a broad subject base can be broken into a multitude of micro lessons to be interspersed across a worker's career. The increased number of training events increases the complexity of training scheduling and tracking, and requires a substantially more robust scheduling system.

Finally, it is important that current efforts to build an enterprise-wide evaluation capability be fully supported and actualized. This will allow the Navy to more accurately identify and quantify skill decay and/or learning transfer and will help both the military and industry better understand how and when to spend their training dollars to improve performance in workplace.

CONCLUSION

The Rating Domain Analysis process was developed in response to the availability of substantially more robust training technology than was present even 10 years ago. It is now possible to deliver on-demand training within work environments with minimal disruption. This improved flexibility demands modified analysis techniques that determine this "demand point." The Rating Domain Analysis process provides this data point in a fast and straightforward protocol while also providing a multitude of additional cost and performance advantages.

ACKNOWLEDGEMENTS

The authors would like to express their appreciation to all current and former team members who provided their thoughts and feedback, from the conceptualization through the development and refinement of this process. Their energy, support and encouragement are invaluable.

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