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Using a Hybrid Artificial Intelligence-Expert Method to Develop Basic Interest Ratings for the O*NET System Final Report

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Table of Contents

Introduction	1
Current Project.....	1
Step 1: Developing LLM-Based Rating Methods and Generating Provisional Basic Interest Ratings.....	2
Development of LLM-Based Rating Methods	2
Input Data Preparation	3
Platform for Prompt Development.....	3
Large Language Models and Hyperparameters.....	4
Prompt Development	5
Initial Evaluations of LLM Prompts.....	6
Generation of Provisional Basic Interest Ratings.....	11
Step 2: Identifying Occupations for Inclusion in Expert Data Collection	12
Summary of Provisional Basic Interest Ratings across Occupations.....	12
Selection of Sample Occupations for Expert Rating	14
Step 3: Collecting and Evaluating Expert Basic Interest Ratings.....	14
Overview of Rater Recruitment and Training.....	14
Rater Training	14
Overview of Rating Process.....	15
Rating Data Review and Cleaning	16
Evaluation of Expert Basic Interest Ratings.....	16
Basic Descriptives.....	16
Interrater Reliability and Agreement.....	18
Step 4: Evaluating Provisional LLM Ratings Against Expert Ratings	20
Basic Interest Rating Distributions and Descriptives for Provisional LLM and Expert Ratings.....	20
Reliability and Agreement Estimates for Provisional LLM and Expert Basic Interest Ratings.....	25
Consistency and Absolute Agreement Between Provisional LLM and Expert Basic Interest Ratings.....	27
Occupation-Level Agreement Between Provisional LLM and Expert Ratings	29
Evaluation Summary of the Provisional LLM Basic Interest Ratings	30

Table of Contents (Continued)

Step 5: Refining LLM Rating Methods and Evaluating Refined LLM Ratings	31
Development of Refined LLM Rating Method	31
Equating LLM Ratings with Expert Ratings	36
Evaluation of the Refined LLM Ratings Against Expert Ratings	43
Basic Interest Rating Distributions and Descriptives by Source.....	44
Reliability and Agreement Estimates for Refined LLM and Expert Basic Interest Ratings	48
Consistency and Absolute Agreement Between Refined LLM and Expert Ratings	50
Occupation-Level Agreement Between Refined LLM and Expert Ratings.....	52
Step 6: Summary of Basic Interest Ratings Across All Data-Level Occupations	54
Basic Interest Rating Descriptives and Distributions.....	54
Reliability and Agreement of Basic Interest Ratings	58
Convergence Between LLM Basic Interest Ratings and Knowledge and RIASEC Interests Ratings	61
Basic Interest Ratings by Job Zone and Job Family	70
Basic Interest Intercorrelations.....	74
Higher-Order Basic Interests Structure	77
Step 7: Identifying Basic Interest Summary Display Rules	81
Step 8: Finalizing Basic Interest Ratings for the O*NET 30.3 Database	84
Results of Review	86
Summary.....	87
Conclusions and Future Directions	87
References.....	88
Appendix A: Basic Interests Included in the O*NET Content Model and Their Definitions.....	90
Appendix B: O*NET Basic Interests, RIASEC Dimensions, and Knowledges Linkages.....	93
Appendix C: Basic Interest Rating Materials for Experts	95

Table of Contents (Continued)

List of Tables

Table 1.1. List of LLMs Examined and Utilized	4
Table 1.2. Description of LLM-Based Methods	6
Table 1.3. Convergent Correlations Between Basic Interest Ratings Generated by RMs 1-8 and Associated Knowledge Ratings.....	8
Table 1.4. Convergent Correlations Between Basic Interest Ratings Generated by RMs 1-8 and Associated RIASEC Dimension Ratings	10
Table 2.1. Descriptive Statistics for Basic Interests' Provisional Ratings across Occupations	12
Table 3.1. Descriptive Statistics for Basic Interest Expert Ratings across Occupations.....	17
Table 3.2. Interrater Reliability and Agreement of Expert Ratings for Basic Interest Dimensions	18
Table 4.1. Descriptive Statistics for Provisional LLM and Expert Ratings.....	23
Table 4.2. Basic Interest Rating, Reliability, and Agreement Estimates for Provisional LLM and Expert Ratings.....	26
Table 4.3. Consistency and Agreement Between Provisional LLM Ratings and Expert Ratings	28
Table 4.4. Within-Occupation Differences between Provisional LLM and Expert Ratings.....	29
Table 5.1. Description of Refined LLM Rating Methods	31
Table 5.2. Consistency and Agreement Between LLM Ratings from RMs 5, 9-13 and Expert Ratings by Basic Interests	33
Table 5.3. Convergent Correlations Between LLM Ratings from RMs 5, 9-13 and Expert Ratings by Basic Interests.....	35
Table 5.4. Mean of Raw Differences Between Equated LLM and Expert Ratings by Basic Interests	37
Table 5.5. Mean of Absolute Differences Between Equated LLM and Expert Ratings by Basic Interests.....	39
Table 5.6. Mean of Raw Differences Between Equated LLM and Expert Ratings by Expert Rating Levels	40
Table 5.7. Mean of Absolute Differences Between Equated LLM and Expert Ratings by Expert Rating Levels	41
Table 5.8. Correlations Between Equated LLM and Expert Ratings.....	42
Table 5.9. Basic Interest Rating Descriptives by Source	47
Table 5.10. Basic Interest Rating, Reliability, and Agreement Estimates for Refined LLM and Expert Ratings.....	49
Table 5.11. Consistency and Agreement Between Refined LLM and Expert Ratings.....	51
Table 5.12. Within-Occupation Differences Between Refined LLM and Expert Ratings.....	52
Table 6.1. Basic Interest Rating Descriptives across All Active Data-Level Occupations.....	55
Table 6.2. Basic Interest Rating, Reliability, and Agreement Estimates for Refined LLM Ratings Across All Active Data-Level Occupations	59

Table of Contents (Continued)

Table 6.3. Reliability and Agreement Estimates for Within-Occupation Basic Interest Profiles	61
Table 6.4. Convergent Correlations Between LLM Basic Interest Ratings and Associated Knowledge Ratings	62
Table 6.5. Convergent Correlations Between LLM Basic Interest Ratings and Associated RIASEC Ratings.....	64
Table 6.6. Averaged Correlations Between LLM Basic Interest Ratings and RIASEC Ratings	66
Table 6.7. Mean Basic Interest Ratings by Job Zone	71
Table 6.8. Mean Basic Interest Ratings by Job Family	72
Table 6.9. Basic Interest Rating Intercorrelations	75
Table 6.10. Basic Interest Ratings Principal Component Analysis Pattern Matrix	77
Table 6.11. Comparison of PCA-Based Higher-Order Basic Interest Dimensions and the SETPOINT Model.....	79
Table 7.1. Number of Occupations by Count of Basic Interests Meeting or Exceeding Rating Thresholds (Y) on 1-7 Scale	81
Table 7.2. Examples of Displayed Basic Interests for Three Occupations	82
Table 7.3. Count of Occupations that have X Basic Interests Displayed Under the Summary Display Rules	83
Table 8.1. Summary of Differences between Final and Draft Basic Interest Ratings	86
Table A.1. List of Basic Interests Included in the O*NET Content Model and Their Definitions	90
Table B.1. O*NET Basic Interests, RIASEC Dimensions, and Knowledges Linkages	93

List of Figures

Figure 1.1. O*NET Basic Interest Dimension Rating Scale (Standard)	5
Figure 1.2. O*NET Basic Interest Dimension Rating Scale (Expanded).....	5
Figure 4.1. Distributions of Provisional LLM and Expert Ratings	21
Figure 5.1. Basic Interest Rating Distributions by Source.....	45
Figure 6.1. Basic Interest Rating Density Plots across All Active Data-Level Occupations	56
Figure 6.2. Basic Interest-RIASEC Scatter Plots for Linked Pairs (Part 1)	67
Figure 6.2. Basic Interest-RIASEC Scatter Plots for Linked Pairs (Part 2)	68
Figure 6.2. Basic Interest-RIASEC Scatter Plots for Linked Pairs (Part 3)	69

Using a Hybrid Artificial Intelligence-Expert Method to Develop Basic Interest Ratings for the O*NET System

Introduction

The Occupational Information Network (O*NET) is a comprehensive system developed by the U.S. Department of Labor that provides information for over 900 occupations within the U.S. economy. This information is maintained in a comprehensive database ([National Center for O*NET Development, 2026](#)). To keep the database current, the National Center for O*NET Development (hereinafter referred to as “the Center”) conducts a continuous data collection process to identify and maintain current information on the characteristics of workers and occupations. This report summarizes efforts to develop, evaluate, and implement a hybrid artificial intelligence (AI)-expert approach for generating basic interest ratings for all active, data-level occupations included within the O*NET Standard Occupational Classification (O*NET-SOC) 2019 taxonomy ([Gregory et al., 2019](#)), and to offer a streamlined process for the future maintenance of basic interest ratings in O*NET.

Vocational interest information is an important part of the O*NET Program’s support of educational planning, career exploration, career guidance, job search, and organizational placement ([Rounds et al., 2021](#)). While Realistic, Investigative, Artistic, Social, Enterprising, and Conventional (RIASEC) general interests have been included in the [O*NET Content Model](#) since its inception, “basic interests” were first incorporated as an expansion of the model in 2023 ([Rounds et al., 2023](#)). The O*NET Content Model includes basic interests reflected in the Comprehensive Assessment of Basic Interests (CABIN; Su et al., 2019), which measures 41 basic interests characterized as specific, homogeneous facets that group work activities sharing similar properties and representing the same abstract object. Appendix A of this report provides the complete list of basic interests included in the O*NET Content Model and their definitions. These interests use everyday language and definitions, making them easily communicable to a range of audiences. Basic interests function as the “building blocks of general interests” and are systematically linked to the RIASEC model, with each RIASEC general interest comprising multiple basic interests. Including basic interests in the Content Model can provide counselors, end users, and researchers with a more nuanced understanding of each RIASEC theme, enabling more precise person-job matching and enhanced career guidance services.

Current Project

The current effort aimed to develop basic interest ratings for all active, data-level occupations in the O*NET-SOC taxonomy. The project was grounded in three lines of recent developments: (1) an update to the basic interests taxonomy within the O*NET Content Model ([Rounds et al., 2023](#)), (2) research that the Human Resources Research Organization (HumRRO) has conducted with the Center using machine learning and natural language processing for populating occupational interest profiles (OIPs) and high-point codes ([Putka et al., 2023](#)), and (3) successful applications of LLMs to predict expert-rated RIASEC occupational interests and Work Styles ([Putka et al., 2025a](#); Putka et al., 2025b). Building on this foundation, the project employed LLMs to populate basic interest ratings for all active, data-level occupations. This approach offers two key advantages: it can be easily implemented as new occupations emerge or as occupations change (e.g., changes to occupation descriptions, tasks, or linked job titles) and it can reduce or eliminate the need for labor-intensive incumbent or analyst data collection.

To accomplish this objective, we engaged in the following eight steps, which we document in the current report:

- Step 1: Developing LLM-Based Rating Methods and Generating Provisional Basic Interest Ratings
- Step 2: Identifying Occupations for Inclusion in Expert Data Collection
- Step 3: Collecting and Evaluating Expert Basic Interest Ratings
- Step 4: Evaluating Provisional LLM Ratings Against Expert Ratings
- Step 5: Refining LLM Rating Methods and Evaluating Refined LLM Ratings
- Step 6: Summarizing Basic Interest Ratings Across All Data-Level Occupations
- Step 7: Identifying Basic Interest Summary Display Rules
- Step 8: Finalizing Basic Interest Ratings for the O*NET 30.3 database

We provide details on each step in the sections that follow.

Step 1: Developing LLM-Based Rating Methods and Generating Provisional Basic Interest Ratings

As noted earlier, the current O*NET database does not include quantitative indicators reflecting the extent to which each basic interest is characteristic of a given O*NET-SOC occupation. As such, the primary objective of this step was to develop an efficient and accurate LLM-based rating method to generate provisional basic interest ratings for the existing O*NET database. These provisional ratings would serve as an initial foundation for identifying a subset of occupations for each basic interest, which would then be included in the expert data collection activity described in later steps. It is important to note that the ratings produced by this step were provisional and intended as preliminary estimates. They were subject to further validation and refinement through expert review and prompt refinement to ensure accuracy and reliability.

This step comprised two primary tasks. The first task involved developing LLM prompts to generate basic interest ratings and evaluating their performance on a representative subset of O*NET occupations. In the second task, the best-bet prompt identified through this process was applied to generate provisional basic interest ratings for all active, data-level occupations in the O*NET database.

Development of LLM-Based Rating Methods

Building on two recent research studies conducted by HumRRO with the Center that involved prompting LLMs to predict expert-rated Work Styles ratings ([Putka et al., 2025a](#)) and RIASEC occupational interest ratings (Putka et al., 2025b) for O*NET occupations, we explored various prompting strategies to generate basic interest ratings. Given the narrow and specific nature of basic interests and the detailed markers provided in the O*NET Content Model, we developed prompts that integrated basic interest information (e.g., dimension name, description, illustrative activities, exemplar occupations, associated RIASEC dimensions) along with occupation-specific information (e.g., occupation name, description, tasks, example job titles, RIASEC occupational interest scores and high-point codes, and potentially associated knowledge

statements, which have a clear conceptual nexus to basic interests; Ajayi et al., 2024; Chu et al., 2023; Su et al., 2019). We evaluated two primary LLM approaches: (1) a zero-shot prompting strategy that presented information without reference points or rating examples, and (2) a few-shot prompting strategy that incorporated examples and anchors for different rating levels, such as O*NET occupations reflecting high, moderate, or low standing on each basic interest. Each prompt was evaluated against multiple criteria, and the highest-performing prompt was selected and subsequently used to generate provisional basic interest ratings for all active, data-level occupations.

Input Data Preparation

To prepare input data for LLM prompts, we developed a dataset containing occupational information for all active, data-level occupations in the [O*NET 29.3](#) database (i.e., the latest available O*NET data at the time of prompt development). The set of information for each occupation included: occupation title, description, tasks, RIASEC occupational interest scores, high-point codes, example job titles, and knowledge elements.

For tasks, we retained core tasks for all occupations. When core tasks could not be identified due to insufficient task ratings in O*NET 29.3, we included all associated tasks for those occupations. We also incorporated emerging tasks labeled as "New" with an "AI/SME" domain source. For knowledge, we retained only those statements with importance ratings of 3 (Moderately Important) or higher. For occupations that lacked knowledge ratings in O*NET 29.3, no knowledge statements were included. Tasks and knowledge elements were ordered by descending importance ratings. In terms of example job titles, we included a subset of reported titles with the column "Show in My Next Move" marked as "Y" in the Sample of Reported Titles table from O*NET 29.3.

We also created a separate dataset organizing basic interest information. Drawing from the O*NET Content Model and O*NET 29.3 database, we included for each basic interest dimension: name, description, illustrative activities, illustrative occupations, and associated RIASEC dimension(s). Because basic interest definitions often directly align with specific O*NET knowledge statements, we also mapped 30 basic interest dimensions to 28 O*NET knowledge statements based on existing literature (Chu et al., 2023; Liu et al., 2025; Su et al., 2019) and direct conceptual overlap. This mapping is presented in Appendix B.

Platform for Prompt Development

To facilitate the prompt development process and automation LLM-based rating generation at scale, we employed HumRRO's secure generative AI platform (RRObot), which is built upon Amazon Web Services (AWS) Bedrock service (<https://aws.amazon.com/bedrock/>). AWS Bedrock is a service hosted by AWS that provides organizations with access to a variety of foundation models (i.e., LLMs from third-party providers such as Meta, OpenAI, and Amazon) to drive the functionality of generative AI applications, including HumRRO's RRObot platform (Human Resources Research Organization, 2025). The RRObot platform provides HumRRO staff with a suite of AI tools designed to facilitate HumRRO's provision of high-stakes assessment and talent management solutions. RRObot operates in a completely secure environment (based on current National Institute of Standards and Technology [NIST]/International Organization for Standardization [ISO]/Cybersecurity Maturity Model Certification [CMMC] compliance and boundaries) where client information remains protected. RRObot allows HumRRO staff to interact with LLMs. It provides HumRRO staff with highly

accessible, practical means to significantly streamline, enhance, and reimagine how we do our work, leveraging generative AI.

For this effort, we leveraged RRObot’s batch processing capabilities to upload a file of (a) prompt templates designed to produce ratings for a given basic interest-occupation combination that took on information on the specific basic interest and occupation to be rated as variable inputs, (b) information on the occupations to be rated (e.g., job descriptions, task statements, knowledge elements), (c) information on the basic interest to be rated (e.g., names and descriptions of the basic interest dimension), and (d) configuration information that identifies LLMs and hyperparameters to be used when generating ratings. The application automatically populates the templates with information for each basic interest-occupation combination, creating populated prompts for every combination. These prompts are then batch-processed through LLMs to generate ratings for each combination.

Large Language Models and Hyperparameters

The earlier research conducted by HumRRO and the Center using a hybrid AI-Expert method to develop Work Styles for the O*NET database ([Putka et al., 2025a](#)) informed our starting point for selecting LLMs and developing prompt templates. In this project, we focused on three LLMs representing the most advanced options available within the RRObot environment at the time of study. Claude 3.5 Sonnet v1, the most performant model within our system at the time of research, was used for prompt development and experimentation. For provisional and final rating generation, we employed Claude 3.5 Sonnet v1, Claude 3.5 Sonnet v2, and Llama 3.3 70B Instruct to mitigate model-specific bias and reduce variance in ratings attributable to LLM selection. Table 1.1 provides a summary of the LLMs examined and used throughout the project.

Table 1.1. List of LLMs Examined and Utilized

LLM	Full LLM Name-Version	Release Date	# of Parameters	Usage	Citation
Claude 3.5 Sonnet v1	claude-3-5-sonnet-20240620-v1:0	2024-06-20	Not disclosed	Used for experimentation and provisional/final rating generation	Anthropic, 2024
Claude 3.5 Sonnet v2	claude-3-5-sonnet-20241022-v2:0	2024-10-22	Not disclosed	Used for provisional/final rating generation	Anthropic, 2024
Llama 3.3 70B Instruct	llama-3.3-70b-instruct-maas	2024-12-06	70B	Used for provisional/final rating generation	Dubey et al. 2024

To prepare for prompt development, we first developed and refined several prompt templates within RRObot’s chat environment, which enabled real-time interaction with the LLMs listed in Table 1.1. This iterative process ensured that prompts functioned as intended by producing ratings within the valid range and in the specified format. We also experimented with two rating scales: (1) a standard 7-point scale (1 = "not at all characteristic," 7 = "extremely characteristic"; see Figure 1.1) and (2) an expanded 3-21-point scale (linearly mapping the original scale, where 3 = “not at all characteristic” and 21 = “extremely characteristic”; see Figure 1.2). The expanded scale was designed to address the coarseness inherent in requesting LLM ratings on traditional 7-point scales.

Figure 1.1. O*NET Basic Interest Dimension Rating Scale (Standard)

1	2	3	4	5	6	7
Not at all characteristic			Moderately characteristic			Extremely characteristic

Figure 1.2. O*NET Basic Interest Dimension Rating Scale (Expanded)

3	6	9	12	15	18	21
Not at all characteristic			Moderately characteristic			Extremely characteristic

Following preliminary testing, we settled on a prompt template that mirrored the structure used in Putka et al. (2025a). This template instructed the LLM to rate how characteristic a basic interest is of a given occupation's work environment using the expanded 3-21-point scale. To improve consistency across all models and prompts, we standardized hyperparameters by setting temperature = 0.2 and top p = 0.2, settings we found have worked well in our past applications of using LLM to make job analysis-related ratings (e.g., Putka et al., 2025a, 2025b).

Prompt Development

At this stage, we conducted prompt development using a representative subset of O*NET occupations. We employed the same sample of 125 occupations identified in Putka et al. (2025a), stratified by job zone and job family. However, we replaced 32 occupations with suspended data collection status at the time with 32 new occupations sampled from the same job zone and job family strata. Building on the prompt template, we created and refined eight distinct prompt variations across zero-shot and few-shot prompting methods. Table 1.2 presents a detailed description and comparison of all eight LLM prompts.

Rating Method (RM) 1 served as our baseline and included only core basic interest descriptors (i.e., name and description) and occupation information (i.e., occupation title, example job titles, description, and tasks). In light of Putka et al. (2025a)'s prompt exploration and refinement work and Center suggestion, we added example job titles to the core occupation information to provide a more comprehensive occupational description covering a wider range of job titles. Building on RM1, we then developed four additional zero-shot prompts (RMs 2-5) that varied in their basic interest and job input elements. For basic interest input, we tested different combinations of illustrative activities, illustrative occupations, and associated RIASEC dimensions. For job input, we varied the inclusion of important knowledge elements and corresponding occupational interest high-point codes.

Second, we developed three few-shot prompt variations (RMs 6-8) that differed primarily in the inclusion of exemplar occupations representing high or low ratings on the basic interest scale. For exemplar occupations reflecting high standing (high set) on each basic interest, we used the illustrative occupations identified in the original O*NET basic interest development (Rounds et al., 2023). For exemplar occupations reflecting low standing (low set), we employed a multi-step selection process. First, as described in an earlier step, we identified O*NET knowledge domains with near one-to-one conceptual correspondence to each basic interest (see Appendix B). Using published knowledge importance ratings, we then selected occupations across different job zones and job families for which the corresponding basic

interest would likely be uncharacteristic. For basic interest dimensions lacking direct mapping to O*NET knowledge variables, we supplemented this approach by leveraging published RIASEC occupational interest scores associated with those basic interests to identify additional low-standing exemplar occupations. Because the published O*NET knowledge and RIASEC ratings served only as proxies for estimating occupational standing on a given basic interest, we did not include exemplar occupations representing mid-range standing (the middling set) at this stage.

Table 1.2. Description of LLM-Based Methods

Rating Method	Prompt Type	Basic Interest Input	Job Input	Few-shot Example
RM1	Zero-shot	Name, description	Title, example job titles, description, tasks	None
RM2	Zero-shot	Name, description, illustrative activities	Title, example job titles, description, tasks, knowledges	None
RM3	Zero-shot	Name, description, illustrative activities, illustrative occupations	Title, example job titles, description, tasks, knowledges	None
RM4	Zero-shot	Name, description, illustrative activities, RIASEC	Title, example job titles, description, tasks, knowledges, RIASEC	None
RM5	Zero-shot	Name, description, illustrative activities, illustrative occupations, RIASEC	Title, example job titles, description, tasks, knowledges, RIASEC	None
RM6	Few-shot	Name, description	Title, example job titles, description, tasks	Occupation examples at low and high levels
RM7	Few-shot	Name, description, illustrative activities	Title, example job titles, description, tasks, knowledges	Occupation examples at low and high levels
RM8	Few-shot	Name, description, illustrative activities, RIASEC	Title, example job titles, description, tasks, knowledges, RIASEC	Occupation examples at low and high levels

With the prompt template, basic interest input, job input, and configuration file constructed, we used RRObot batch to automatically populate and run prompts for 41 basic interest x 125 occupation combinations through Claude Sonnet 3.5 v1. These runs yielded a set of eight ratings for each basic interest dimension for each occupation (i.e., one rating each for RM 1 through RM 8).

Initial Evaluations of LLM Prompts

Given the absence of expert ratings for basic interests at this stage, we evaluated LLM prompts based on the extent to which the basic interest ratings they produced converged with ratings of O*NET elements most conceptually related to each basic interest. Specifically, we examined correlations between each method's ratings and published importance ratings of associated O*NET knowledges and RIASEC dimensions, treating occupations as the unit of analysis. Results are summarized in Tables 1.3 and 1.4.

Overall, zero-shot prompt methods (RMs 1-5) yielded results comparable to those of few-shot prompt methods (RMs 6-8). Average convergent correlations between basic interest ratings and associated knowledge ratings ranged from .70 to .73, whereas average correlations between basic interest ratings and associated RIASEC dimension ratings were relatively lower, ranging from .50 to .53. Among the eight rating methods, RM 5 and RM 8 emerged as the best-performing approaches, with average correlations of .72 and .53 for knowledge and RIASEC dimension ratings, respectively. Conceptually, we did not find this pattern of results surprising. Specifically, we expected the correlation between basic interests and knowledges to be stronger than the correlation between basic and general interests, as the former are defined at a similar level of specificity (i.e., there is more of a one-to-one correspondence between basic interests and knowledges).

Both RM 5 and RM 8 included illustrative activities, illustrative occupations, and associated RIASEC dimensions for basic interest input and knowledge, and RIASEC high-point codes for job input. The key difference was that RM 8 provided exemplar occupations at the low standing level, complementing the illustrative occupations as few-shot examples. Given that RM 8 produced convergent correlations very similar to RM 5 with associated knowledges and RIASEC dimensions, the additional low-standing occupation examples in RM 8 did not provide meaningful improvements over the approach using available existing information with solely illustrative occupations (RM 5). Therefore, we selected RM 5 as the provisional best-performing prompt for this stage of analysis.

Table 1.3. Convergent Correlations Between Basic Interest Ratings Generated by RMs 1-8 and Associated Knowledge Ratings

Basic Interest	Knowledge	RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8
Accounting	Economics and Accounting	.62	.72	.67	.63	.67	.69	.72	.68
Agriculture	Food Production	.55	.51	.54	.52	.53	.53	.52	.50
Animal Service									
Applied Arts and Design	Design	.41	.49	.48	.45	.44	.46	.50	.44
Athletics									
Business Initiatives									
Construction/Woodwork	Building and Construction	.83	.79	.77	.81	.78	.83	.78	.79
Creative Writing	Communications and Media	.63	.65	.63	.63	.64	.63	.67	.64
Creative Writing	English Language	.50	.54	.54	.52	.53	.50	.55	.52
Culinary Art									
Engineering	Engineering and Technology	.82	.85	.86	.85	.85	.83	.86	.86
Finance	Economics and Accounting	.69	.70	.71	.71	.70	.70	.72	.73
Health Care Service									
Human Resources	Personnel and Human Resources	.68	.72	.71	.72	.72	.68	.71	.71
Humanities	History and Archeology	.79	.80	.77	.78	.78	.79	.78	.78
Humanities	Philosophy and Theology	.62	.67	.65	.63	.63	.63	.67	.65
Information Technology	Computers and Electronics	.77	.81	.81	.80	.81	.77	.82	.82
Law	Law and Government	.78	.81	.79	.79	.78	.79	.81	.80
Life Science	Biology	.92	.92	.92	.93	.93	.93	.92	.92
Management/Administration	Administration and Management	.60	.64	.65	.67	.68	.62	.64	.66
Marketing/Advertising	Sales and Marketing	.65	.71	.68	.70	.72	.64	.70	.69
Mathematics/Statistics	Mathematics	.78	.81	.79	.80	.81	.77	.80	.80
Mechanics/Electronics	Mechanical	.77	.76	.78	.78	.79	.77	.77	.78
Media	Communications and Media	.68	.73	.72	.72	.71	.70	.72	.70
Medical Science	Medicine and Dentistry	.85	.79	.77	.80	.79	.84	.81	.82

Table 1.3. (Continued)

Basic Interest	Knowledge	RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8
Music	Fine Arts	.74	.74	.71	.75	.76	.76	.75	.72
Nature/Outdoors									
Office Work	Administrative	.67	.70	.71	.69	.69	.67	.70	.70
Performing Arts	Fine Arts	.85	.85	.85	.88	.88	.84	.83	.88
Personal Service	Customer and Personal Service	.63	.73	.72	.74	.72	.68	.73	.73
Physical Science	Chemistry	.65	.68	.68	.67	.67	.67	.68	.67
Physical Science	Physics	.80	.78	.79	.80	.81	.81	.80	.80
Physical/Manual Labor									
Politics	Law and Government	.60	.62	.62	.62	.61	.62	.64	.62
Professional Advising									
Protective Service									
Public Speaking									
Religious Activities									
Sales	Sales and Marketing	.73	.76	.75	.72	.70	.72	.74	.74
Social Science	Psychology	.65	.65	.67	.65	.70	.63	.67	.70
Social Science	Sociology and Anthropology	.74	.76	.76	.76	.78	.74	.77	.77
Social Service	Therapy and Counseling	.85	.88	.87	.88	.87	.85	.88	.87
Teaching/Education	Education and Training	.74	.77	.77	.77	.79	.73	.78	.76
Transportation/Machine Operation	Transportation	.55	.56	.59	.56	.55	.48	.56	.55
Visual Arts	Fine Arts	.66	.62	.68	.73	.76	.71	.70	.76
Average		.70	.72	.72	.72	.72	.71	.73	.72

Note: N = 125 (unit of analysis is occupation). Some basic interests are associated with multiple RIASEC dimensions, whereas some basic interests lack direct alignment with O*NET knowledge domains. For basic interests lacking associated O*NET knowledges, correlations are left as empty in this table.

Table 1.4. Convergent Correlations Between Basic Interest Ratings Generated by RMs 1-8 and Associated RIASEC Dimension Ratings

RIASEC	Basic Interest	RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8
Realistic	Physical/Manual Labor	.81	.81	.81	.83	.82	.81	.81	.83
Realistic	Mechanics/Electronics	.65	.61	.62	.65	.62	.64	.61	.65
Realistic	Transportation/Machine Operation	.55	.52	.53	.56	.55	.57	.53	.54
Realistic	Engineering	.50	.46	.45	.46	.47	.50	.47	.47
Realistic	Construction/Woodwork	.36	.37	.36	.40	.43	.35	.35	.43
Realistic	Agriculture	.19	.19	.21	.24	.25	.23	.21	.20
Realistic	Nature/Outdoors	.20	.14	.18	.15	.17	.21	.19	.17
Realistic	Animal Service	.05	.08	.08	.05	.08	.06	.07	.08
Realistic	Protective Service	-.09	-.07	-.07	-.08	-.08	-.06	-.06	-.05
Realistic	Athletics	-.20	-.19	-.21	-.19	-.20	-.16	-.22	-.20
Investigative	Mathematics/Statistics	.71	.73	.74	.75	.74	.72	.74	.74
Investigative	Medical Science	.62	.67	.69	.68	.69	.65	.67	.67
Investigative	Life Science	.61	.62	.63	.65	.66	.60	.63	.66
Investigative	Physical Science	.53	.55	.57	.62	.64	.59	.60	.66
Investigative	Social Science	.42	.44	.43	.46	.47	.42	.42	.48
Investigative	Health Care Service	.33	.36	.36	.37	.36	.36	.36	.38
Investigative	Humanities	.09	.13	.11	.09	.14	.10	.15	.14
Artistic	Applied Arts and Design	.76	.79	.76	.84	.84	.78	.80	.84
Artistic	Performing Arts	.79	.80	.81	.82	.81	.79	.79	.83
Artistic	Visual Arts	.73	.70	.72	.79	.78	.76	.76	.81
Artistic	Humanities	.75	.76	.73	.76	.77	.74	.73	.75
Artistic	Creative Writing	.70	.70	.66	.73	.74	.71	.72	.75
Artistic	Media	.70	.72	.72	.74	.74	.72	.74	.75
Artistic	Music	.70	.70	.68	.72	.73	.73	.71	.67
Artistic	Marketing/Advertising	.48	.40	.45	.43	.34	.45	.37	.41
Artistic	Culinary Art	.15	.20	.21	.27	.27	.16	.16	.31
Social	Social Service	.90	.90	.90	.93	.94	.92	.91	.94
Social	Teaching/Education	.78	.79	.80	.82	.83	.78	.77	.83
Social	Professional Advising	.75	.78	.76	.83	.83	.74	.79	.83
Social	Social Science	.67	.65	.65	.68	.70	.67	.67	.71
Social	Health Care Service	.65	.67	.66	.67	.67	.66	.66	.68
Social	Personal Service	.69	.61	.58	.66	.63	.70	.69	.67
Social	Religious Activities	.44	.50	.56	.58	.61	.39	.44	.53
Social	Human Resources	.41	.45	.44	.46	.44	.42	.43	.44
Social	Animal Service	.10	.12	.12	.15	.13	.08	.11	.14
Social	Culinary Art	.07	.08	.08	.17	.12	.08	.07	.12

Table 1.4. (Continued)

RIASEC	Basic Interest	RM1	RM2	RM3	RM4	RM5	RM6	RM7	RM8
Enterprising	Business Initiatives	.73	.71	.74	.80	.79	.72	.72	.81
Enterprising	Management/Administration	.76	.75	.76	.78	.78	.77	.76	.78
Enterprising	Sales	.66	.67	.66	.69	.72	.68	.68	.75
Enterprising	Marketing/Advertising	.62	.66	.65	.69	.72	.63	.67	.69
Enterprising	Politics	.55	.55	.57	.62	.59	.52	.56	.59
Enterprising	Public Speaking	.55	.53	.56	.60	.59	.56	.56	.59
Enterprising	Finance	.56	.55	.55	.59	.56	.58	.58	.59
Enterprising	Law	.41	.43	.41	.41	.43	.41	.43	.43
Enterprising	Professional Advising	.43	.40	.41	.44	.42	.41	.43	.49
Enterprising	Religious Activities	.31	.26	.24	.30	.30	.30	.27	.26
Enterprising	Athletics	.23	.20	.22	.23	.21	.20	.23	.23
Conventional	Office Work	.64	.62	.64	.69	.69	.64	.63	.67
Conventional	Accounting	.64	.62	.64	.68	.69	.63	.60	.68
Conventional	Information Technology	.59	.59	.60	.59	.58	.58	.56	.55
Conventional	Finance	.53	.51	.51	.51	.53	.52	.50	.52
Conventional	Mathematics/Statistics	.33	.31	.32	.30	.32	.35	.32	.32
Conventional	Human Resources	.22	.17	.20	.18	.22	.20	.18	.21
Average		.50	.50	.50	.52	.53	.50	.50	.53

Note: $N = 125$ (unit of analysis is occupation). Some basic interests are associated with multiple RIASEC dimensions. The table is first sorted by RIASEC dimension (in the order R, I, A, S, E, C) and, within each dimension, basic interests are ordered by descending RM5 correlation.

Generation of Provisional Basic Interest Ratings

Based on the prompt in RM 5, we updated job input to include all active, data-level occupations in the O*NET 29.3 database. To make basic interest ratings produced by RM 5 more robust and less prone to model-specific error (i.e., variation in ratings based on LLM selection) and stochastic variation (i.e., variation in ratings stemming from the non-deterministic nature of LLMs, which can generate slightly different ratings even with identical prompts and inputs), we processed the prompt using three LLMs (Claude Sonnet 3.5 v1, Claude Sonnet 3.5 v2, and Llama 3.3 70B Instruct) across three separate runs. The decision to consider these three models was driven by their being the latest models available in our generative AI platform at the time this work was conducted, and by the observation in Putka et al. (2025a) that these three models tend to perform better than older or lighter models. These runs yielded nine ratings across 41 basic interest \times 891 occupation combinations. For all runs, hyperparameter settings were held constant at temperature = 0.2 and top p = 0.2.

The nine ratings from each basic interest-occupation combination were rescaled to the 1-7 rating scale by dividing the 3-21 ratings by 3. Next, the three rescaled ratings for each model were averaged to form a composite rating for each LLM, and these composites were subsequently averaged to form a provisional basic interest rating for the occupation.

Step 2: Identifying Occupations for Inclusion in Expert Data Collection

As part of the current effort, we gathered basic interest ratings from vocational interest experts for a subset of the 891 data-level O*NET-SOC occupations that were active as of O*NET 29.3. These expert ratings served two purposes: to provide a "gold standard" against which to evaluate ratings generated by LLM prompts and to inform refinement of the LLM-based rating methods.

Our intent here was not to gather expert ratings for all 891 data-level occupations, but rather to obtain ratings for a strategically selected subset of occupations for each basic interest, representing different levels on the rating scale based on the provisional ratings for the given basic interest from Step 1. The intent here was to ensure that the occupations sampled for each basic interest spanned a broad range on the rating scale to facilitate evaluating how aligned expert and provisional LLM-based ratings were for a given basic interest. This section first provides a summary of the provisional basic interest ratings for all data-level occupations, then describes the approach we used to select occupations for expert data collection.

Summary of Provisional Basic Interest Ratings across Occupations

We first calculated descriptive statistics for the provisional basic interest ratings generated in Step 1. Table 2.1 presents descriptive summaries for each basic interest dimension, sorted in descending order of mean ratings across occupations and color-coded for interpretability. Based on the provisional ratings, Physical/Manual Labor and Management/Administration received the highest mean ratings, while Animal Service and Religious Activities received the lowest. All basic interests exhibited positive skew, indicating that the LLMs generally assigned lower ratings across most occupations. In general, these findings align with expectations, as the narrow definition of basic interests suggests that few are characteristic of any single occupation.

Table 2.1. Descriptive Statistics for Basic Interests' Provisional Ratings across Occupations

Basic Interest	M	SD	Min	Max	Percentiles				
					5	25	50	75	95
Physical/Manual Labor	2.95	1.86	1.00	6.89	1.00	1.37	2.34	4.61	6.33
Management/Administration	2.81	1.48	1.11	7.00	1.22	1.63	2.37	3.48	6.22
Engineering	2.76	1.72	1.00	6.96	1.11	1.26	2.15	4.04	6.15
Mechanics/Electronics	2.65	1.69	1.00	6.89	1.04	1.26	1.96	3.67	6.22
Office Work	2.63	1.32	1.00	7.00	1.22	1.63	2.37	2.96	5.80
Teaching/Education	2.59	1.58	1.00	7.00	1.22	1.45	2.04	3.04	6.73
Public Speaking	2.54	1.44	1.00	6.78	1.04	1.33	2.18	3.18	5.81
Professional Advising	2.52	1.50	1.00	7.00	1.00	1.32	2.07	3.20	5.87
Mathematics/Statistics	2.48	1.32	1.00	7.00	1.18	1.41	2.11	2.91	5.30
Social Service	2.35	1.62	1.00	7.00	1.00	1.22	1.56	2.85	6.22
Information Technology	2.30	1.31	1.00	6.96	1.04	1.28	2.04	2.67	5.28
Personal Service	2.24	1.24	1.00	6.89	1.00	1.33	1.81	2.63	5.11

Table 2.1. (Continued)

Basic Interest	M	SD	Min	Max	Percentiles				
					5	25	50	75	95
Physical Science	2.17	1.36	1.00	6.96	1.00	1.22	1.63	2.59	5.57
Health Care Service	2.10	1.83	1.00	7.00	1.00	1.04	1.22	2.07	6.65
Business Initiatives	2.04	1.19	1.00	6.74	1.11	1.22	1.67	2.30	5.00
Social Science	2.02	1.32	1.00	7.00	1.00	1.11	1.45	2.44	5.22
Life Science	1.95	1.52	1.00	7.00	1.00	1.00	1.22	2.13	5.81
Accounting	1.93	1.00	1.00	7.00	1.18	1.33	1.52	2.13	4.15
Sales	1.90	1.15	1.00	7.00	1.11	1.22	1.45	2.04	4.61
Medical Science	1.90	1.44	1.00	6.85	1.00	1.00	1.22	2.00	5.69
Transportation/Machine Operation	1.89	1.29	1.00	7.00	1.00	1.04	1.33	2.19	5.11
Human Resources	1.84	0.90	1.00	6.93	1.11	1.22	1.63	2.07	3.83
Applied Arts and Design	1.78	1.18	1.00	6.85	1.04	1.18	1.33	1.81	4.82
Media	1.70	1.07	1.00	7.00	1.00	1.15	1.33	1.70	4.09
Visual Arts	1.69	1.02	1.00	7.00	1.00	1.18	1.33	1.74	4.00
Marketing/Advertising	1.68	0.99	1.00	6.93	1.00	1.15	1.33	1.78	3.80
Finance	1.66	1.07	1.00	7.00	1.00	1.11	1.22	1.78	3.93
Law	1.62	0.99	1.00	7.00	1.00	1.04	1.22	1.69	3.96
Humanities	1.61	1.02	1.00	6.82	1.00	1.11	1.22	1.56	3.93
Construction/Woodwork	1.58	0.92	1.00	7.00	1.00	1.00	1.22	1.69	3.37
Nature/Outdoors	1.56	1.14	1.00	6.85	1.00	1.00	1.18	1.37	4.32
Protective Service	1.55	0.98	1.00	7.00	1.00	1.11	1.22	1.48	3.33
Creative Writing	1.51	0.70	1.00	7.00	1.00	1.15	1.30	1.59	2.74
Agriculture	1.45	0.97	1.00	7.00	1.00	1.00	1.15	1.33	3.19
Politics	1.43	0.69	1.00	7.00	1.00	1.00	1.22	1.45	2.65
Performing Arts	1.38	0.84	1.00	7.00	1.00	1.00	1.11	1.30	2.72
Athletics	1.34	0.73	1.00	7.00	1.00	1.04	1.15	1.26	2.33
Culinary Art	1.26	0.56	1.00	6.71	1.00	1.00	1.11	1.26	2.15
Music	1.21	0.69	1.00	7.00	1.00	1.00	1.00	1.11	2.07
Animal Service	1.16	0.62	1.00	7.00	1.00	1.00	1.00	1.11	1.55
Religious Activities	1.15	0.45	1.00	7.00	1.00	1.00	1.00	1.15	1.78

Note. N = 891 (unit of analysis is occupation). Ratings were made on a 7-point scale ranging from 1 (not at all characteristic) to 7 (extremely characteristic). Basic interests are sorted in descending order of their mean importance across the 891 occupations.

Selection of Sample Occupations for Expert Rating

Using provisional basic interest ratings for all active, data-level occupations, we then identified a subset of occupations for each basic interest to be included in the expert data collection activity. The logic of the sample selection here was that very few basic interests are characteristic of any given occupation, given how narrowly basic interests are defined. Consequently, asking experts to rate 41 basic interests across a common, limited set of occupations may not provide adequate representation of the rating scale for each basic interest. Therefore, we sampled occupations for each basic interest separately, aiming to target occupations that spanned different ranges of the rating scale, using the provisional ratings generated in Step 1.

To identify a representative subset of occupations for expert evaluation, we first transformed the provisional basic interest ratings from a 7-point (1-7) scale to a 6-point (0-5) scale. Ratings of 1-2 were recoded to 0 (“not characteristic”), and ratings of 3-7 were linearly mapped to 1-5 (“low” to “extremely characteristic”). We collapsed the 1-2 points to reduce the positive skew observed in most basic interests and more clearly distinguished occupations in which an interest was not characteristic from those in which it showed at least some relevance. For each basic interest, ratings of 1 or higher were then partitioned into quintiles, with ratings below 1 forming an additional category, yielding six data ranges. As noted previously, because occupations were heavily clustered in the lower ranges, these quintiles did not correspond directly to scale points 1-5.

After defining these six data ranges for each basic interest, we used stratified sampling to select four to five occupations from each range, yielding 25 occupations per basic interest. This approach ensured representation across the full rating distribution on the scale and included occupations from diverse job zones and families. Because occupations that were representative of different rating ranges varied by basic interest, each basic interest received its own occupation sample ($n = 25$). In total, 1,025 basic interest-occupation combinations were selected for expert data collection.

Step 3: Collecting and Evaluating Expert Basic Interest Ratings

HumRRO recruited three academic researchers with expertise in the study of vocational interests to provide basic interest ratings for selected O*NET occupations identified in Step 2. Those expert ratings were later used to evaluate the provisional basic interest ratings and to refine LLM-based rating methods.

Overview of Rater Recruitment and Training

We recruited three academic researchers who study and publish on vocational interests and occupational analysis to serve as our expert raters. Those individuals were Dr. James Rounds of the University of Illinois Urbana-Champaign’s Department of Psychology (our primary consultant on this project), Dr. Rong Su of the University of Iowa’s Tippie College of Business, and Dr. Kevin Hoff of Michigan State University’s Department of Psychology.

Rater Training

Rater training involved the following activities: (a) providing an overview of the rating task, (b) describing the basic interest taxonomy and how basic interests are defined within O*NET, (c) walking through the rating process, materials, and guidance for provisioning ratings, and (d) participating in a calibration exercise to establish a common frame of reference for making

ratings independently. Because experts were already well-versed in basic interests, we devoted most of the training time to the final two activities.

Raters were instructed to make their ratings on the same 7-point scale as the LLM prompts, responding to the question “How characteristic is the given basic interest work environment of the given occupation?” where a rating of 1 is “not at all characteristic,” and a rating of 7 is “extremely characteristic.”

Following the scale introduction, we conducted a calibration exercise in which raters discussed the relationship between basic interests and occupational work environments, then rated and discussed an initial subset of occupations. For the initial exercise and subsequent calibration assignment, we selected six occupations from the pool of 25 sampled occupations for each basic interest. These occupations were deliberately chosen to represent each of the six data ranges on the transformed 0-5 rating scale, thereby ensuring variation in the degree to which each occupation reflects a given basic interest.

Raters were reminded that basic interest ratings across the full O*NET population of occupations would likely exhibit a highly skewed distribution (with relatively few occupations in the 6-7 range and many in the 1-2 range on the 1-7 scale, because any given basic interests reflect a narrow range of work that may be characteristic of relatively few occupations, and not characteristic of the vast majority of occupations). However, within this rating exercise, the subset selected for expert rating was intentionally stratified across all data ranges for each basic interest. Consequently, we expected a relatively uniform distribution within the sample, in deliberate contrast to the skewed distribution anticipated in the full occupational population.

Overview of Rating Process

Before rater training, HumRRO distributed rating materials to experts, including training slides and an Excel-based rating booklet. Appendix C presents the workbook rating instructions and example rating sheet. The rating booklet contained three tabs with basic interest and occupational information drawn from the O*NET 29.3 database, organized as follows:

- Tab 1: Workbook instructions (see *Basic Interests Rating Workbook Instructions* in Appendix C).
- Tab 2: O*NET Content Model ID, basic interest name, definition, illustrative activities, illustrative occupations, and associated RIASEC dimension(s).
- Tab 3: Master rating sheet with occupational information organized by basic interest, then by calibration status (calibration occupations listed first), and finally by O*NET-SOC Code. Each row represented a unique basic interest-occupation combination. For each basic interest-occupation combination, occupational information included O*NET-SOC 2019 code, O*NET-SOC 2019 title, example job titles, description, job tasks, important knowledge, and occupational interest high-point codes, which were the same set of information used in the LLM-based rating methods.

The rating process consisted of three phrases:

- **Initial calibration and group discussion:** Raters first independently rate one occupation per basic interest (i.e., a total of 41). As noted above, this rating was done as part of the initial expert training session. After raters made their initial ratings for these

occupations, we discussed the ratings as a group and discussed areas of disagreement to develop a clearer shared understanding of the basic interest dimensions. Raters were permitted to independently update their initial ratings for the first occupations within each basic interest dimension following the group discussion.

- **Follow-up calibration and group discussion:** Following the initial calibration above, raters were assigned and independently rated an additional five occupations per basic interest (bringing the total number of occupations used for calibration to six per basic interest). Raters were instructed to complete and submit their ratings before a scheduled recalibration session.

In preparation for a follow-up calibration discussion, HumRRO reviewed expert ratings for the selected six occupations per basic interest dimension and flagged basic interest-occupation combinations with high levels of disagreement, prioritizing discussion of those combinations during the follow-up calibration meeting. After a general discussion of how the independent rating exercise went, we reviewed the basic interest-occupations flagged for disagreement and worked with expert raters to further refine a shared rating policy.

- **Independent rating of remaining occupations:** Upon completion of the calibration effort above, expert raters were assigned and independently rated the remaining 19 occupations per basic interest.

Rating Data Review and Cleaning

Once all final ratings were obtained from experts, we conducted several checks to ensure that the information captured in the individual rating workbooks was both accurate and complete. This involved ensuring that each basic interest-occupation combination had a rating and following up with individuals when ratings were incomplete. These checks also ensured that ratings were within the expected scale range (i.e., 1 to 7) for each basic interest-occupation combination.

Because we used three expert raters and expected some disagreement based on calibration discussions, we retained all individual ratings for analysis rather than excluding outliers. We calculated final expert ratings as the means of the three raters' ratings.

Evaluation of Expert Basic Interest Ratings

Given our intent to use expert ratings as the gold standard for evaluating and refining LLM-based rating methods, this step focused on assessing their psychometric quality. Specifically, we aimed to evaluate whether expert ratings for each basic interest exhibited (a) variance across occupations and (b) sufficient levels of interrater reliability and agreement. All of the analyses that follow were conducted on the mean expert ratings resulting from the above step.

Basic Descriptives

We first computed descriptive statistics for the mean expert ratings of basic interests. Table 3.1 presents the descriptive summaries for each basic interest dimension. Within this sample, Health Care Service and Protective Service received the highest mean expert ratings, whereas Agriculture and Religious Activities received the lowest. Compared with the distribution of provisional ratings across the full pool of occupations, expert mean ratings for most basic interests were less skewed and more uniformly distributed, except for Religious Activities. This

exception was expected, as Religious Activities represents a relatively narrow domain, and most data points were concentrated at the lower end of the scale, with few occupations strongly characterized by this interest. Indeed, Religious Activities also exhibited the lowest mean provisional ratings across all occupations.

Table 3.1. Descriptive Statistics for Basic Interest Expert Ratings across Occupations

Basic Interest	M	SD	Min	Max	Percentiles				
					5	25	50	75	95
Health Care Service	4.32	2.04	1.00	7.00	1.07	2.33	4.33	6.00	6.93
Protective Service	3.81	1.97	1.00	7.00	1.33	2.00	4.00	5.00	7.00
Transportation/Machine Operation	3.59	1.81	1.33	6.67	1.33	2.00	3.33	4.33	6.67
Mechanics/Electronics	3.57	1.49	1.00	7.00	1.73	2.33	3.33	4.33	6.47
Physical/Manual Labor	3.48	1.74	1.00	7.00	1.07	2.33	3.33	4.00	6.33
Law	3.43	1.65	1.33	7.00	1.67	2.33	3.00	4.00	7.00
Human Resources	3.41	1.44	1.00	7.00	1.67	2.67	3.33	4.00	6.00
Management/Administration	3.37	1.76	1.00	7.00	1.67	2.00	3.00	4.00	6.67
Teaching/Education	3.36	1.75	1.00	6.67	1.07	2.33	2.33	4.33	6.33
Humanities	3.35	1.91	1.00	7.00	1.00	2.00	2.67	4.67	7.00
Medical Science	3.35	1.71	1.33	7.00	1.33	2.00	3.00	4.67	6.13
Culinary Art	3.33	1.96	1.00	7.00	1.00	2.00	3.00	3.67	6.93
Accounting	3.29	1.70	1.00	7.00	1.07	2.00	3.33	4.33	6.47
Mathematics/Statistics	3.29	1.48	1.33	7.00	1.67	2.00	3.33	4.00	5.87
Social Science	3.28	1.58	1.00	7.00	1.20	2.00	2.67	4.67	5.87
Athletics	3.25	2.07	1.00	7.00	1.00	1.67	2.33	5.33	6.60
Life Science	3.25	1.61	1.00	6.67	1.33	2.00	3.00	3.67	6.20
Engineering	3.20	1.62	1.00	7.00	1.40	2.00	3.00	4.00	6.47
Public Speaking	3.19	1.65	1.00	6.67	1.40	1.67	2.67	4.67	6.13
Personal Service	3.13	1.39	1.00	6.33	1.07	2.33	3.33	3.67	5.53
Animal Service	3.12	2.04	1.00	7.00	1.00	1.00	2.67	5.00	6.53
Information Technology	3.12	1.65	1.00	6.67	1.07	2.33	2.67	3.67	6.20
Office Work	3.12	1.70	1.00	6.33	1.33	2.00	2.67	4.33	6.33
Finance	3.09	1.53	1.00	6.67	1.07	2.00	3.00	3.33	6.60
Media	3.09	1.49	1.00	7.00	1.40	2.00	2.67	3.33	6.13
Social Service	3.04	1.49	1.00	7.00	1.33	2.00	2.67	3.67	5.80
Nature/Outdoors	2.99	1.46	1.00	6.33	1.40	2.00	2.67	3.67	5.87
Marketing/Advertising	2.96	1.53	1.00	7.00	1.33	2.00	2.67	3.33	6.40
Visual Arts	2.93	1.44	1.00	6.33	1.33	2.00	2.67	4.00	5.93
Construction/Woodwork	2.91	1.51	1.00	7.00	1.00	1.67	2.67	4.00	5.27
Professional Advising	2.89	1.41	1.00	6.67	1.33	2.00	2.33	3.67	5.73
Business Initiatives	2.88	1.62	1.00	7.00	1.00	2.00	2.33	3.33	5.93
Music	2.88	1.57	1.00	7.00	1.07	1.67	2.33	3.67	5.60

Table 3.1. (Continued)

Basic Interest	M	SD	Min	Max	Percentiles				
					5	25	50	75	95
Applied Arts and Design	2.87	1.62	1.00	7.00	1.33	1.67	2.00	4.00	5.53
Performing Arts	2.87	1.95	1.00	7.00	1.00	1.67	2.33	3.00	7.00
Politics	2.87	1.42	1.00	7.00	1.33	1.67	2.67	3.67	5.20
Physical Science	2.83	1.58	1.00	6.67	1.07	1.67	2.33	4.33	5.53
Sales	2.83	1.78	1.00	7.00	1.00	1.67	2.67	3.33	6.87
Creative Writing	2.73	1.45	1.00	7.00	1.00	1.67	2.33	3.33	5.40
Agriculture	2.69	1.43	1.00	7.00	1.00	1.67	2.67	3.33	5.13
Religious Activities	1.92	1.70	1.00	7.00	1.00	1.00	1.33	1.67	6.53

Note. $N = 25$ (unit of analysis is occupation). Ratings were made on a 7-point scale ranging from 1 (not at all characteristic) to 7 (extremely characteristic). Basic interests are sorted in descending order of their mean importance across the selected 25 occupations per basic interest.

Interrater Reliability and Agreement

Next, we examined interrater reliability (i.e., consistency) and absolute agreement (i.e., interchangeability) of the expert basic interest ratings. Table 3.2 shows the interrater reliability and agreement estimates for each basic interest dimension. Two pairs of Intraclass Correlation Coefficient-based (ICC-based) reliability and agreement coefficients are provided (McGraw & Wong, 1996). ICC(C,1) estimates the reliability of a single rater's rating and represents the expected correlation between two randomly selected experts. ICC(C, k) estimates the reliability of the mean rating across k raters and represents the expected correlation between mean ratings from two randomly selected groups of k raters. In the case of experts, the number of raters (k) equals three. Similarly, ICC(A,1) reflects absolute agreement for a single rater's rating for the given basic interest dimension, while ICC(A, k) reflects absolute agreement for mean ratings across the k (i.e., three) raters.

Table 3.2. Interrater Reliability and Agreement of Expert Ratings for Basic Interest Dimensions

Basic Interest	ICC(C,1)	ICC(C,3)	ICC(A,1)	ICC(A,3)
Religious Activities	.94	.98	.91	.97
Humanities	.89	.96	.89	.96
Teaching/Education	.89	.96	.89	.96
Culinary Art	.89	.96	.84	.94
Sales	.89	.96	.87	.95
Animal Service	.87	.95	.85	.94
Athletics	.86	.95	.86	.95
Mathematics/Statistics	.85	.94	.81	.93
Office Work	.85	.94	.80	.92
Marketing/Advertising	.84	.94	.81	.93
Public Speaking	.84	.94	.78	.92
Law	.83	.94	.76	.91

Table 3.2. (Continued)

Basic Interest	ICC(C,1)	ICC(C,3)	ICC(A,1)	ICC(A,3)
Protective Service	.83	.94	.82	.93
Health Care Service	.82	.93	.79	.92
Performing Arts	.82	.93	.80	.92
Social Science	.81	.93	.79	.92
Management/Administration	.81	.93	.79	.92
Engineering	.80	.92	.77	.91
Visual Arts	.80	.92	.75	.90
Physical/Manual Labor	.79	.92	.79	.92
Finance	.78	.92	.77	.91
Information Technology	.78	.92	.76	.91
Music	.77	.91	.71	.88
Life Science	.76	.91	.73	.89
Agriculture	.76	.90	.76	.90
Social Service	.74	.90	.71	.88
Physical Science	.74	.90	.74	.89
Applied Arts and Design	.74	.89	.74	.89
Human Resources	.74	.89	.74	.89
Transportation/Machine Operation	.74	.89	.74	.89
Creative Writing	.73	.89	.71	.88
Business Initiatives	.72	.89	.70	.87
Accounting	.71	.88	.71	.88
Mechanics/Electronics	.71	.88	.68	.87
Nature/Outdoors	.69	.87	.64	.84
Medical Science	.68	.87	.67	.86
Media	.68	.86	.67	.86
Professional Advising	.65	.85	.65	.85
Politics	.61	.83	.61	.83
Construction/Woodwork	.55	.78	.51	.76
Personal Service	.53	.77	.53	.77
Average	.77	.91	.75	.90

Note. $N = 25$ (unit of analysis is occupation). Occupations are treated as targets of measurement. Basic Interests are sorted in descending order of ICC(C,3) reliability estimates.

Of prime interest in Table 3.2 are the ICC(C,3) values, as these reflect the reliability of the *mean expert ratings* that serve as the actual gold standard ratings for each basic interest dimension. Focusing on these values, we see that ICC(C,3) values range from .77 (Personal Service) to .98 (Religious Activities), with an average of .91 across all basic interests. These values indicate moderate to high levels of interrater reliability for the mean expert ratings.

Step 4: Evaluating Provisional LLM Ratings Against Expert Ratings

Our next step involved evaluating the best-bet LLM rating method emerging from Step 1 against expert ratings, which served as the gold standard. Because experts rated the 1,025 sampled basic interest-occupation combinations (rather than all basic interest-occupation combinations in the current database), we assessed alignment exclusively within this subset, specifically, the 25 occupations evaluated for each of the 41 basic interests.

To evaluate how closely aligned the provisional best-bet LLM ratings were with experts, we conducted several evaluation-focused analyses and summarized the results in the following sections:

- **Distributions and descriptives of LLM and expert basic interest ratings:** We evaluated basic interest ratings means, standard deviations, skews, ranges, and distributions of expert and LLM-based ratings for similarity/differences.
- **Reliability and absolute agreement estimates for LLM vs. expert basic interest ratings.** We estimated and compared the reliability/agreement of LLM basic interest ratings to the reliability/agreement of expert basic interest ratings reported earlier in Table 3.2.
- **Consistency and absolute agreement between LLM and expert basic interest ratings:** We evaluated the level of consistency and absolute agreement between LLM and expert ratings for each basic interest (treating occupations as the unit of analysis).
- **Occupation-level agreement between LLM and expert basic interest ratings:** We compared the proportion of occupations for each basic interest for which the expert rating fell within a specified range of LLM-based rating to provide a finer-grained evaluation of LLM-expert agreement.

Basic Interest Rating Distributions and Descriptives for Provisional LLM and Expert Ratings

We first examined smoothed frequency distributions of LLM and expert ratings for each basic interest (see Figure 4.1), as well as the means, standard deviations, skews, and ranges of ratings from the two data sources (see Table 4.1).

As shown in Figure 4.1 and Table 4.1, LLM ratings were consistently higher than expert ratings across basic interests. Across all dimensions, the average mean rating was 4.10 for the LLM and 3.14 for the experts (on the 1-7 scale). Experts also showed slightly greater variability (average $SD = 1.65$) than the LLM (average $SD = 1.49$). Within the sampled occupations, expert ratings displayed stronger positive skew, reflecting a tendency to assign lower ratings, whereas LLM ratings were more symmetric and concentrated in the mid-to-high range. These patterns were consistent across individual basic interests: LLMs systematically produced distributions that were higher and less skewed than those of experts. The largest mean differences between LLM and expert ratings were observed for Agriculture and Applied Arts and Design, whereas the smallest differences were found for Culinary Arts and Protective Services.

Figure 4.1. Distributions of Provisional LLM and Expert Ratings

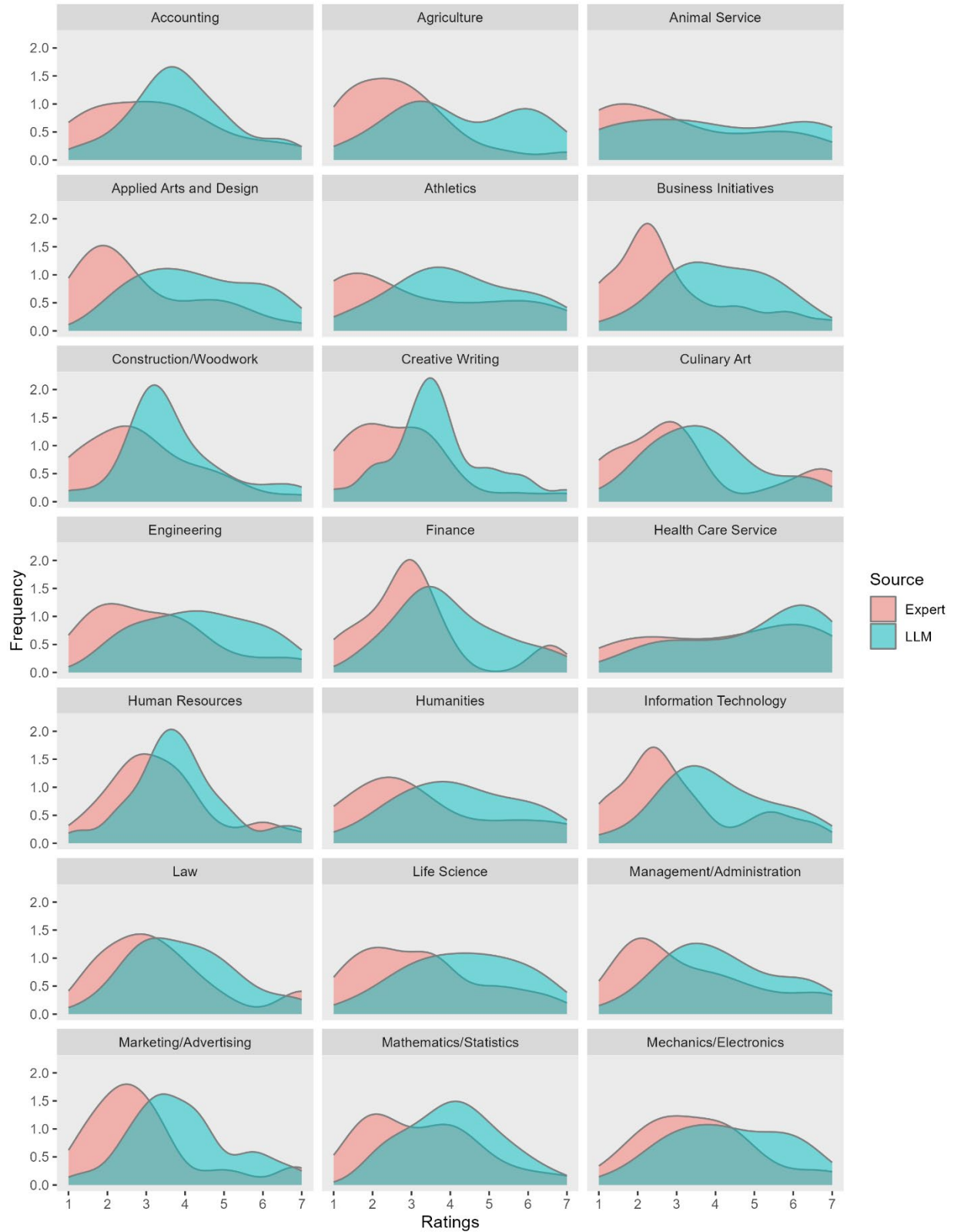


Figure 4.1. (Continued)

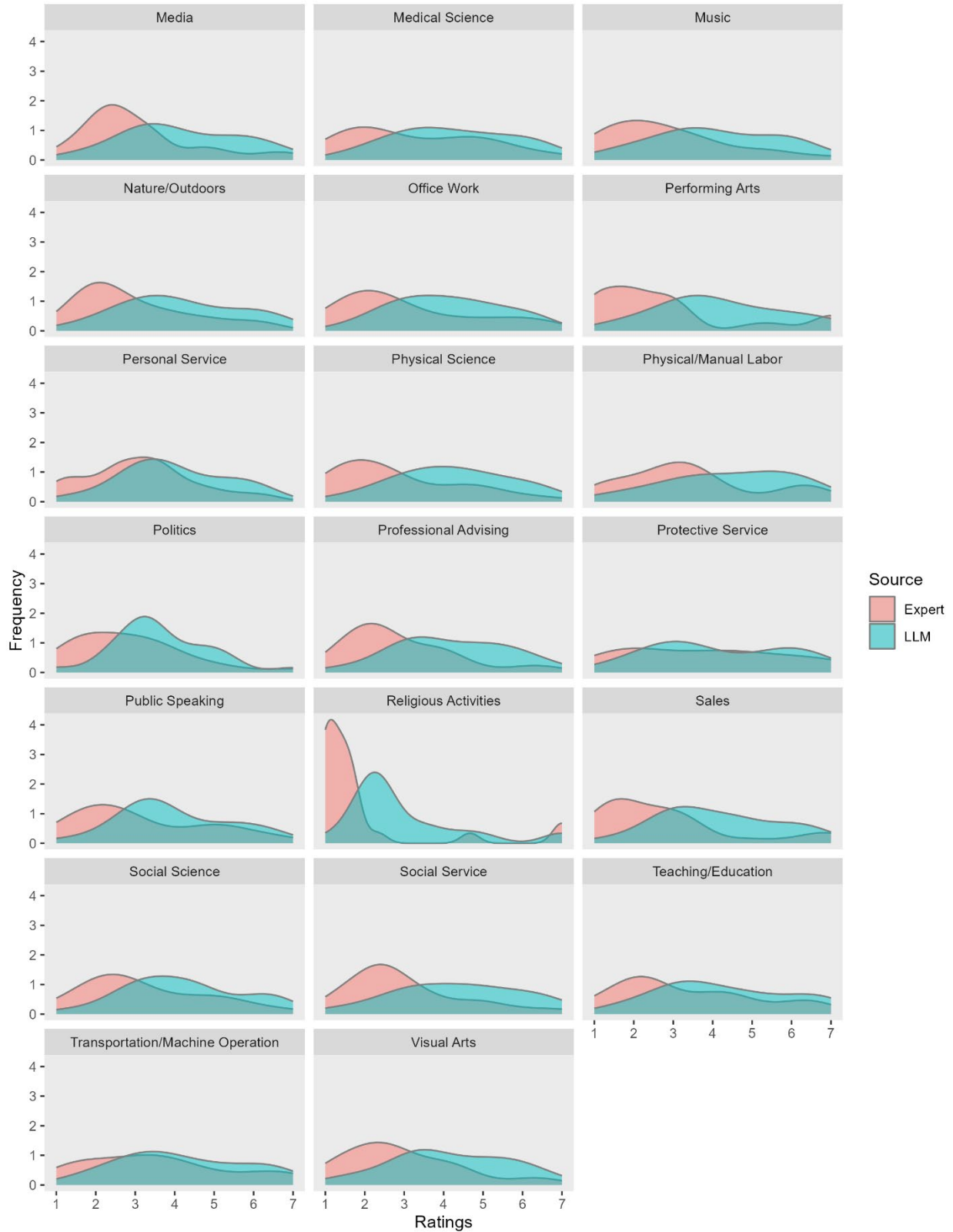


Table 4.1. Descriptive Statistics for Provisional LLM and Expert Ratings

Basic Interest	Provisional LLM				Expert				LLM - Expert
	Mean	SD	Skew	Range	Mean	SD	Skew	Range	
Agriculture	4.25	1.69	-0.04	6.00	2.69	1.43	1.14	6.00	1.55
Applied Arts and Design	4.27	1.46	0.12	4.82	2.87	1.62	0.94	6.00	1.40
Physical Science	4.21	1.45	-0.04	5.49	2.83	1.58	0.81	5.67	1.39
Performing Arts	4.18	1.57	0.19	5.70	2.87	1.95	1.09	6.00	1.31
Sales	4.14	1.50	0.19	5.63	2.83	1.78	1.18	6.00	1.31
Professional Advising	4.20	1.44	0.02	5.78	2.89	1.41	1.03	5.67	1.31
Social Service	4.35	1.59	-0.13	5.96	3.04	1.49	0.98	6.00	1.31
Business Initiatives	4.12	1.38	-0.03	5.52	2.88	1.62	0.99	6.00	1.24
Visual Arts	4.16	1.48	-0.06	5.60	2.93	1.44	0.84	5.33	1.23
Music	4.10	1.58	-0.01	5.93	2.88	1.57	0.89	6.00	1.22
Nature/Outdoors	4.15	1.51	0.11	5.49	2.99	1.46	0.82	5.33	1.16
Engineering	4.34	1.44	0.02	4.82	3.20	1.62	0.78	6.00	1.14
Media	4.18	1.50	0.10	5.67	3.09	1.49	1.07	6.00	1.09
Religious Activities	3.00	1.53	1.40	6.00	1.92	1.70	2.23	6.00	1.08
Life Science	4.34	1.47	-0.15	5.37	3.25	1.61	0.54	5.67	1.08
Marketing/Advertising	3.95	1.34	0.41	5.59	2.96	1.53	1.24	6.00	0.99
Office Work	4.10	1.39	0.07	5.00	3.12	1.70	0.75	5.33	0.98
Creative Writing	3.71	1.34	0.45	6.00	2.73	1.45	1.09	6.00	0.97
Physical/Manual Labor	4.43	1.61	-0.33	5.89	3.48	1.74	0.52	6.00	0.95
Information Technology	4.07	1.41	0.22	5.56	3.12	1.65	0.73	5.67	0.95
Social Science	4.22	1.48	0.14	5.63	3.28	1.58	0.63	6.00	0.94
Teaching/Education	4.29	1.64	0.17	5.52	3.36	1.75	0.53	5.67	0.93

Table 4.1. (Continued)

Basic Interest	Provisional LLM				Expert				LLM - Expert
	Mean	SD	Skew	Range	Mean	SD	Skew	Range	
Medical Science	4.25	1.51	0.01	5.45	3.35	1.71	0.44	5.67	0.90
Athletics	4.15	1.59	0.06	5.82	3.25	2.07	0.48	6.00	0.90
Finance	3.99	1.37	0.47	5.33	3.09	1.53	1.07	5.67	0.90
Humanities	4.21	1.56	-0.02	5.82	3.35	1.91	0.70	6.00	0.86
Animal Service	3.98	2.14	0.03	6.00	3.12	2.04	0.52	6.00	0.86
Personal Service	3.98	1.34	0.09	5.08	3.13	1.39	0.38	5.33	0.84
Politics	3.66	1.25	0.50	6.00	2.87	1.42	0.99	6.00	0.79
Management/Administration	4.17	1.49	0.25	5.67	3.37	1.76	0.72	6.00	0.79
Public Speaking	3.99	1.42	0.28	5.63	3.20	1.66	0.61	5.67	0.79
Mathematics/Statistics	4.08	1.22	0.17	4.63	3.29	1.48	0.68	5.67	0.79
Construction/Woodwork	3.69	1.34	0.68	6.00	2.91	1.51	0.81	6.00	0.78
Mechanics/Electronics	4.32	1.48	-0.06	5.41	3.57	1.49	0.55	6.00	0.75
Health Care Service	4.95	1.77	-0.58	5.82	4.32	2.04	-0.23	6.00	0.63
Accounting	3.90	1.32	0.24	5.52	3.29	1.70	0.54	6.00	0.60
Transportation/Machine Operation	4.19	1.58	0.14	5.37	3.59	1.81	0.43	5.33	0.60
Law	3.98	1.34	0.44	5.33	3.43	1.65	0.98	5.67	0.55
Human Resources	3.84	1.25	0.45	5.71	3.41	1.44	0.73	6.00	0.42
Culinary Art	3.75	1.44	0.43	5.63	3.33	1.96	0.74	6.00	0.41
Protective Service	4.13	1.71	0.06	5.71	3.81	1.97	0.20	6.00	0.32
Average	4.10	1.49	0.16	6.00	3.14	1.65	0.78	6.00	0.95

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. Means and mean difference (LLM ratings - mean Expert ratings) are color coded on a green-red gradient such that relatively higher values are shaded green and relatively lower values are shaded red. Basic interests are sorted based on the descending order of mean difference between LLM and expert ratings.

Reliability and Agreement Estimates for Provisional LLM and Expert Basic Interest Ratings

Next, we examined the “operational” interrater reliability and agreement estimates for ratings for each basic interest. By “operational” estimates, we mean the reliability and agreement estimates for the final composite ratings from a given source (i.e., not the reliability of ratings from a single expert rater or single LLM that contributes to the final rating from that source).

For expert ratings, ICC-based reliability and agreement coefficients are provided. ICC(C,*k*) reflects the estimated reliability of the mean rating for a given basic interest dimension (across three experts). Effectively, ICC(C,*k*) is comparable to the expected correlation between the mean ratings of two randomly selected groups of *k* raters. ICC(A,*k*) reflects the estimated absolute agreement of the mean rating for a given basic interest dimension (across three experts). The expert reliability and agreement estimates presented in Table 3.2 are reproduced in Table 4.2 for direct comparison with LLM estimates.

For LLM ratings, given that the provisional rating for a basic interest was based on a composite of ratings from three LLMs, where each LLM generated three ratings each (stemming from three independent runs of the final prompt through each LLM), we employed a generalizability (G) theory approach to estimate reliability and agreement. Adopting a G-theory approach allowed us to simultaneously account for two types of measurement error in LLM ratings: (a) error stemming from inconsistency in ratings across the three different LLMs (i.e., model-specific error), and (b) error stemming from inconsistency in ratings across occasions on which a given model was run (i.e., run-specific error) (Cronbach et al., 1972).

The measurement design underlying the LLM ratings for each basic interest can be described as occupations (o) crossed with runs (r) nested within models (i.e., o x [r:m]). Occupations represent the target of measurement, and as such, variation in ratings attributable to the occupation main effect may be viewed as “true score variance” in the Classical Test Theory (CTT) reliability sense (“universe score variance” in G-theory terms). Models (i.e., LLMs) and runs (i.e., prompts processed through a given model) can be considered measurement facets that may contribute to error in the observed basic interest ratings for occupations. Based on G-theory, we can (a) provide reliability and agreement estimates for LLM ratings that account for model-based, run-based, and residual sources of measurement error, and (b) partition the relative contribution of the aforementioned sources of error to overall measurement error in ratings.

To estimate reliability and agreement coefficients for the LLM ratings, we first estimated the Restricted Maximum Likelihood (REML) variance components for each effect that could be estimated in the measurement design above, namely: (1) occupation main effect (i.e., σ^2_o = variation in ratings across the targets of measurement), (2) model main effect (i.e., σ^2_m = variation in ratings across LLMs), (3) run nested within model effect (i.e., $\sigma^2_{r:m}$ = variation in ratings across runs within model), (4) the occupation-by-model interaction effect (i.e., σ^2_{om} = variation attributable to the occupation x LLM interaction), and (5) the residual effects (i.e., $\sigma^2_{o:r:m, res}$ = variation attributable to the occupation x LLM x run interaction and unexplained variation in ratings). We then used the resulting raw variance components to estimate the reliability of LLM ratings using the following formula based on rules from G-theory for a o x (r:m) measurement design.

$$\text{Reliability Estimate for LLM Basic Interest Ratings} = \frac{\sigma_0^2}{\sigma_0^2 + \left[\frac{\sigma_{0m}^2}{3} + \frac{\sigma_{r:m}^2}{9} + \frac{\sigma_{or:m,res}^2}{9} \right]}$$

$$\text{Agreement Estimate for LLM Basic Interest Ratings} = \frac{\sigma_0^2}{\sigma_0^2 + \left[\frac{\sigma_m^2}{3} + \frac{\sigma_{0m}^2}{3} + \frac{\sigma_{r:m}^2}{9} + \frac{\sigma_{or:m,res}^2}{9} \right]}$$

On average across basic interests, the reliability of the LLM ratings was very high (.98), indicating that, on average, 98% of the observed variance in basic interest ratings (across occupations) was attributable to true (universe) score variance, while only 2% was attributable to measurement error variance. The average agreement estimate was only slightly lower, at .96. Stated differently, if we were to randomly sample another three LLMs and run our prompt through them three times each and take the average of the resulting ratings, we would expect the correlation between our final ratings and the new composite ratings to be approximately .98 on average, across basic interests. Also, note in Table 4.2 that LLM ratings appeared to be more reliable than expert ratings (though expert ratings were still very reliable).

Table 4.2. Basic Interest Rating, Reliability, and Agreement Estimates for Provisional LLM and Expert Ratings

Basic Interest	Provisional LLM		Expert	
	G (Rel)	G (Abs)	ICC(C,3)	ICC(A,3)
Accounting	.97	.95	.88	.88
Agriculture	.98	.97	.90	.90
Animal Service	.99	.99	.95	.94
Applied Arts and Design	.98	.97	.89	.89
Athletics	.97	.95	.95	.95
Business Initiatives	.98	.95	.89	.87
Construction/Woodwork	.95	.90	.78	.76
Creative Writing	.96	.95	.89	.88
Culinary Art	.97	.95	.96	.94
Engineering	.98	.97	.92	.91
Finance	.98	.96	.92	.91
Health Care Service	.99	.98	.93	.92
Human Resources	.98	.98	.89	.89
Humanities	.98	.97	.96	.96
Information Technology	.99	.98	.92	.91
Law	.97	.96	.94	.91
Life Science	.98	.98	.91	.89
Management/Administration	.98	.96	.93	.92
Marketing/Advertising	.98	.97	.94	.93
Mathematics/Statistics	.98	.98	.94	.93

Table 4.2. (Continued)

Basic Interest	Provisional LLM		Expert	
	G (Rel)	G (Abs)	ICC(C,3)	ICC(A,3)
Mechanics/Electronics	.98	.96	.88	.87
Media	.97	.94	.86	.86
Medical Science	.98	.97	.87	.86
Music	.97	.96	.91	.88
Nature/Outdoors	.98	.96	.87	.84
Office Work	.98	.91	.94	.92
Performing Arts	.98	.98	.93	.92
Personal Service	.97	.95	.77	.77
Physical Science	.98	.98	.90	.89
Physical/Manual Labor	.98	.94	.92	.92
Politics	.97	.91	.83	.83
Professional Advising	.98	.96	.85	.85
Protective Service	.98	.95	.94	.93
Public Speaking	.98	.89	.94	.92
Religious Activities	.98	.98	.98	.97
Sales	.98	.94	.96	.95
Social Science	.98	.97	.93	.92
Social Service	.98	.95	.90	.88
Teaching/Education	.99	.94	.96	.96
Transportation/Machine Operation	.98	.98	.89	.89
Visual Arts	.97	.96	.92	.90
Average	.98	.96	.91	.90

Note. $N = 25$ (unit of analysis is occupation). Occupations are treated as targets of measurement.

Consistency and Absolute Agreement Between Provisional LLM and Expert Basic Interest Ratings

Next, we examined the consistency and absolute agreement between provisional LLM and expert ratings (i.e., consistency and absolute agreement of the mean ratings from each source). ICC(C,1) indexes the consistency between the provisional LLM and expert ratings for a given basic interest (across occupation). Conceptually, ICC(C,1) is similar to the expected correlation between the provisional LLM and expert ratings. Similarly, ICC(A,1) indexes the absolute agreement between provisional LLM and expert ratings for a given basic interest (across occupation). Effectively, ICC(A,1) captures elevation (mean) differences in ratings for a given basic interest between sources (LLM vs. expert) and differences in the rank ordering of occupations for a given basic interest between sources, whereas ICC(C,1) only captures the latter (i.e., differences in the rank ordering of occupations between sources).

The ICC(A,1) values in Table 4.2 are the main focus, as they represent the absolute agreement between the LLM and expert ratings. ICC(A,1) values range from .49 (Professional Advising) to .88 (Protective Services), with an average of .71 across all basic interests. These results indicate moderate agreement between LLM-generated ratings and expert ratings for the selected occupations. Meanwhile, ICC(C,1) values range from .69 (Professional Advising) to .95 (Teaching/Education), with an average of .84 across all basic interests.

Table 4.3. Consistency and Agreement Between Provisional LLM Ratings and Expert Ratings

Basic Interest	ICC(C,1)	ICC(A,1)
Protective Service	.89	.88
Health Care Service	.91	.86
Law	.90	.85
Animal Service	.91	.84
Culinary Art	.86	.84
Transportation/Machine Operation	.88	.83
Teaching/Education	.95	.82
Management/Administration	.91	.82
Human Resources	.85	.81
Accounting	.86	.80
Athletics	.87	.78
Public Speaking	.87	.77
Mechanics/Electronics	.85	.75
Physical/Manual Labor	.86	.74
Mathematics/Statistics	.86	.74
Finance	.87	.73
Humanities	.81	.73
Religious Activities	.89	.73
Marketing/Advertising	.88	.72
Politics	.83	.71
Personal Service	.84	.71
Social Science	.82	.70
Medical Science	.80	.69
Information Technology	.82	.69
Music	.89	.68
Creative Writing	.85	.68
Construction/Woodwork	.76	.66
Engineering	.82	.64
Visual Arts	.86	.64
Office Work	.76	.64
Performing Arts	.80	.63
Sales	.82	.62
Nature/Outdoors	.81	.62
Business Initiatives	.81	.61
Life Science	.74	.60
Applied Arts and Design	.85	.60
Physical Science	.82	.58
Media	.73	.58
Social Service	.77	.57
Agriculture	.82	.55
Professional Advising	.69	.49
Average	.84	.71

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. ICC(A,1) estimates are color-coded on a green-red gradient, with relatively higher values in green and relatively lower values in red. Basic interests are sorted based on the descending order of ICC(A,1).

Occupation-Level Agreement Between Provisional LLM and Expert Ratings

To provide a finer-grained evaluation of LLM-expert alignment/misalignment in absolute terms, we further compared the percentage of occupations where the difference between the LLM and experts fell within a certain range. Table 4.4 provides a summary of within-occupation differences between the provisional LLM and expert ratings. On average across basic interests, more than half (67%) of the LLM ratings overestimated experts by half a scale point or more, and 30% of the LLM ratings fell within half a rating scale point of the expert ratings. In contrast, relatively few LLM ratings underestimated the experts by half a scale point or more (3% of occupations on average, across basic interest).

Table 4.4. Within-Occupation Differences between Provisional LLM and Expert Ratings

Basic Interest	M	SD	Min	Max	% of Occupations where LLM - Expert Difference				
					≥ +1.0	≥ 0.5 and < 1.0	> -0.5 and < 0.5	≤ -0.5 and > -1.0	≤ -1.0
Accounting	0.60	0.80	-1.04	3.00	32	24	40	0	4
Agriculture	1.55	0.94	0.00	3.48	72	8	20	0	0
Animal Service	0.86	0.88	-1.00	3.15	32	32	32	0	4
Applied Arts and Design	1.40	0.85	-0.41	3.30	76	12	12	0	0
Athletics	0.90	0.93	-0.67	2.63	48	20	24	8	0
Business Initiatives	1.24	0.91	-0.33	3.59	60	24	16	0	0
Construction/Woodwork	0.78	1.00	-0.93	2.67	36	20	36	8	0
Creative Writing	0.97	0.78	-0.37	2.33	60	8	32	0	0
Culinary Art	0.41	0.92	-1.56	1.92	36	8	40	12	4
Engineering	1.14	0.92	-0.29	3.15	56	12	32	0	0
Finance	0.90	0.74	-0.48	2.33	48	16	36	0	0
Health Care Service	0.63	0.83	-0.48	2.89	20	24	56	0	0
Human Resources	0.42	0.74	-1.48	1.63	24	16	52	4	4
Humanities	0.86	1.07	-1.74	2.85	44	24	28	0	4
Information Technology	0.95	0.92	-0.63	2.56	52	8	32	8	0
Law	0.55	0.66	-1.22	1.67	28	32	36	0	4
Life Science	1.08	1.11	-0.82	3.04	44	20	32	4	0
Management/Administration	0.79	0.69	-0.67	2.11	44	16	36	4	0
Marketing/Advertising	0.99	0.71	-0.30	2.74	64	12	24	0	0
Mathematics/Statistics	0.79	0.72	-0.30	2.56	32	32	36	0	0
Mechanics/Electronics	0.75	0.83	-0.81	2.41	36	20	40	4	0
Media	1.09	1.10	-0.22	3.70	48	12	40	0	0
Medical Science	0.90	1.03	-1.26	3.30	44	20	32	0	4
Music	1.22	0.74	0.00	2.52	56	32	12	0	0
Nature/Outdoors	1.16	0.93	-1.33	3.15	68	12	16	0	4
Office Work	0.98	1.08	-1.89	2.96	56	12	24	0	8

Table 4.4. (Continued)

Basic Interest	M	SD	Min	Max	% of Occupations where LLM - Expert Difference				
					≥ +1.0	≥ 0.5 and < 1.0	> -0.5 and < 0.5	≤ -0.5 and > -1.0	≤ -1.0
Performing Arts	1.31	1.11	-0.37	3.44	64	12	24	0	0
Personal Service	0.84	0.76	-0.44	2.33	36	20	44	0	0
Physical Science	1.39	0.89	-0.52	3.45	60	28	8	4	0
Physical/Manual Labor	0.95	0.89	-0.44	3.04	48	24	28	0	0
Politics	0.79	0.77	-0.37	1.93	44	20	36	0	0
Professional Advising	1.31	1.12	-0.89	3.07	64	8	20	8	0
Protective Service	0.32	0.87	-1.33	2.11	24	16	44	12	4
Public Speaking	0.79	0.78	-0.78	2.78	32	28	36	4	0
Religious Activities	1.08	0.76	-0.04	3.00	48	28	24	0	0
Sales	1.31	0.99	-0.41	3.11	68	4	28	0	0
Social Science	0.94	0.91	-1.37	2.37	48	24	20	4	4
Social Service	1.31	1.05	-0.85	3.11	60	12	24	4	0
Teaching/Education	0.93	0.55	0.11	2.22	48	28	24	0	0
Transportation/Machine Operation	0.60	0.85	-0.63	2.37	36	16	40	8	0
Visual Arts	1.23	0.78	0.00	3.30	60	16	24	0	0
Average	0.95	0.88	-0.70	2.76	48	19	30	2	1

Note. *N* = 25 (unit of analysis is occupations) for each basic interest. For purposes of calculation, expert ratings were subtracted from LLM ratings. Thus, positive differences indicate the LLM ratings overestimated the expert ratings and negative differences indicate the LLM ratings underestimated the expert ratings.

Evaluation Summary of the Provisional LLM Basic Interest Ratings

The results above illustrate the degree of alignment between the provisional best-bet LLM ratings and expert judgments. Overall, the provisional LLM ratings demonstrated moderate to high absolute agreement with experts. However, the LLMs also showed a consistent positive bias, tending to produce higher ratings than experts. This pattern indicates that while the current best-bet prompt resulted in reliable ratings that rank-ordered occupations similarly to experts, there was some miscalibration in the level of the ratings relative to experts, with LLMs appearing to offer more lenient ratings. Accordingly, in the following section, we used the expert ratings for the 25 occupations within each basic interest to refine and update the provisional best-bet prompt.

Step 5: Refining LLM Rating Methods and Evaluating Refined LLM Ratings

The goal of this step was to leverage the expert ratings to help improve the working best-bet prompt identified in Step 1. In this step, we refined and evaluated multiple prompt variations. The highest-performing prompt was then selected as the refined best-bet prompt for generating basic interest ratings across all active occupations in the O*NET database. We used the basic interest-occupation combinations (identified in Step 2) that had both LLM-generated and expert ratings to inform the development and evaluation of the refined prompts.

Development of Refined LLM Rating Method

The working best-bet LLM prompt (RM 5) used to generate provisional ratings was a zero-shot prompt that incorporated the following inputs: for basic interest, the dimension name, description, illustrative activities, illustrative occupations, and associated RIASEC dimension; for occupation, the occupation name, description, example job titles, important tasks, knowledges, and occupational interest high-point codes. To refine RM 5, we conducted additional experiments by examining five additional prompt variations (see Table 5.1).

Table 5.1. Description of Refined LLM Rating Methods

Rating Method	Description
RM5	Baseline
RM9	Same prompt as RM 5, with the addition of low-level occupation examples selected based on mean expert ratings for each basic interest.
RM10	Same prompt as RM 5, with an instruction for the LLM to adopt more conservative ratings.
RM11	A combination of RMs 9 and 10, incorporating (a) low-level occupation examples selected based on mean expert ratings for each basic interest and (b) an instruction for the LLM to adopt more conservative ratings.
RM12	Variation of RM 11, using "illustrative occupations" as high-level examples and providing middle- and low-level occupation examples selected based on mean expert ratings for each basic interest.
RM13	Variation of RM 12, adding occupational interest profile scores for each occupation.

The first revision focused on updating the few-shot examples to better anchor the rating scale using expert data. For high-level examples, we retained illustrative occupations from [Rounds et al., \(2023\)](#), as all were rated highly by experts for their respective basic interests. We began by testing the addition of low-level occupation examples to the baseline prompt. In RMs 9 and 11, we selected three to four occupations per basic interest with mean expert ratings between 1 and 2 (on the 1-7 scale) to represent the low end of the rating scale. We then refined prompts by incorporating both middle- and low-level examples. For the middle-level set, we selected three to four occupations per basic interest with mean expert ratings around 4 (*moderately characteristic* on the 1-7 scale). RMs 12 and 13, therefore, included middle- and low-level occupation examples based on expert ratings, with the illustrative occupations continuing to serve as high-level examples.

The second major revision involved modifying the RM 5 prompt by incorporating an explicit instruction directing LLMs to adopt a more conservative and stringent approach when assigning ratings. This instruction was added at the end of the prompt in RMs 10, 11, 12, and 13. The last revision we made to the LLM rating methods was the inclusion of occupational interest profile scores in RM 13. The rationale was that providing the six RIASEC dimension scores (all rated on the same 7-point scale), along with the occupational interest high-point codes for each occupation and the associated RIASEC dimension for each basic interest, would enable the LLMs to better calibrate their ratings by using the RIASEC dimension scores as reference anchors.

To minimize rating idiosyncrasies inherent in the stochastic nature of LLMs and compare against the provisional ratings produced by RM 5, we ran the five variations (RMs 9-13) using Claude Sonnet 3.5 v1, Claude Sonnet 3.5 v2, and Llama 3.3 70B Instruct, with three separate runs for each model. Final ratings for each prompt represented average scores across runs and models. Given that expert ratings were available at this stage and our goal was to identify the prompt that produced ratings most closely aligned with expert judgments, we evaluated the five variations using criteria different from those employed in Step 1. Specifically, we assessed each revised prompt by (a) comparing the consistency and absolute agreement between each method's ratings and expert ratings (see Table 5.2, treating occupations as units of analysis) and (b) estimating correlations between each method's ratings and expert ratings (See Table 5.3, treating occupations as units of analysis).

As shown in Table 5.2, ICC(C,1) represents the expected correlation between one randomly selected LLM rater and one randomly selected expert rater. All five variations outperformed RM 5, with average ICC(C,1) values ranging from .86 to .90; notably, RMs 12 and 13 achieved the highest values across all dimensions. Similarly, ICC(A,1) represents the expected level of absolute agreement between two randomly selected raters. All five variations showed improvement over RM 5, with average ICC(A,1) values ranging from .75 to .86. Among all rating methods, RM 13 achieved the highest ICC(A,1) values across dimensions.

Table 5.3 reveals a consistent pattern: correlations between LLM and expert ratings improved across all five variations. Among these, RM 13 achieved the highest convergent correlations with expert ratings, averaging .91, surpassing RM 5 and the other prompt variations.

Table 5.2. Consistency and Agreement Between LLM Ratings from RMs 5, 9-13 and Expert Ratings by Basic Interests

Basic Interest	RM5		RM9		RM10		RM11		RM12		RM13	
	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)
Accounting	.86	.80	.93	.90	.86	.86	.92	.92	.93	.93	.93	.93
Agriculture	.82	.55	.81	.60	.82	.67	.81	.68	.81	.72	.82	.73
Animal Service	.91	.84	.91	.85	.93	.90	.93	.91	.94	.91	.95	.93
Applied Arts and Design	.85	.60	.85	.66	.89	.77	.90	.79	.89	.80	.94	.91
Athletics	.87	.78	.88	.79	.89	.87	.94	.91	.94	.91	.94	.93
Business Initiatives	.81	.61	.86	.65	.82	.74	.92	.80	.90	.79	.89	.79
Construction/Woodwork	.76	.66	.81	.78	.73	.73	.80	.80	.84	.84	.86	.85
Creative Writing	.85	.68	.84	.70	.84	.82	.86	.81	.93	.87	.92	.87
Culinary Art	.86	.84	.91	.90	.87	.87	.90	.90	.93	.93	.90	.90
Engineering	.82	.64	.89	.80	.83	.77	.88	.85	.91	.88	.90	.88
Finance	.87	.73	.89	.75	.88	.85	.92	.86	.94	.87	.93	.89
Health Care Service	.91	.86	.93	.89	.94	.93	.94	.94	.96	.95	.96	.96
Human Resources	.85	.81	.89	.86	.86	.86	.90	.90	.92	.91	.93	.93
Humanities	.81	.73	.84	.73	.87	.87	.87	.84	.89	.87	.88	.88
Information Technology	.82	.69	.86	.78	.86	.82	.87	.84	.90	.86	.93	.90
Law	.90	.85	.92	.89	.94	.94	.94	.94	.94	.94	.94	.94
Life Science	.74	.60	.88	.78	.81	.77	.87	.83	.92	.88	.92	.90
Management/Administration	.91	.82	.94	.87	.94	.92	.96	.93	.94	.91	.96	.94
Marketing/Advertising	.88	.72	.88	.75	.90	.86	.87	.81	.92	.86	.93	.90
Mathematics/Statistics	.86	.74	.86	.70	.88	.85	.87	.81	.88	.85	.86	.82
Mechanics/Electronics	.85	.75	.90	.83	.85	.84	.91	.89	.93	.92	.93	.92
Media	.73	.58	.70	.59	.72	.68	.76	.71	.71	.65	.74	.71
Medical Science	.80	.69	.83	.77	.81	.80	.83	.82	.89	.87	.90	.89
Music	.89	.68	.89	.72	.93	.85	.92	.82	.94	.88	.94	.89
Nature/Outdoors	.81	.62	.80	.64	.83	.77	.81	.76	.89	.82	.89	.85

Table 5.2. (Continued)

Basic Interest	RM5		RM9		RM10		RM11		RM12		RM13	
	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)	ICC(C,1)	ICC(A,1)
Office Work	.76	.64	.71	.60	.76	.72	.75	.67	.76	.69	.77	.64
Performing Arts	.80	.63	.80	.65	.83	.77	.85	.77	.84	.75	.87	.81
Personal Service	.84	.71	.82	.65	.82	.82	.85	.80	.85	.79	.86	.83
Physical Science	.82	.58	.86	.68	.86	.75	.89	.79	.91	.82	.91	.83
Physical/Manual Labor	.86	.74	.88	.79	.87	.82	.89	.83	.91	.87	.88	.83
Politics	.83	.71	.87	.75	.85	.85	.88	.88	.89	.86	.91	.89
Professional Advising	.69	.49	.69	.50	.78	.71	.76	.66	.84	.68	.81	.66
Protective Service	.89	.88	.92	.91	.90	.90	.89	.89	.95	.95	.95	.95
Public Speaking	.87	.77	.90	.77	.88	.87	.90	.85	.88	.84	.92	.89
Religious Activities	.89	.73	.91	.81	.93	.86	.94	.89	.95	.91	.96	.93
Sales	.82	.62	.83	.69	.87	.78	.86	.76	.88	.80	.91	.83
Social Science	.82	.70	.85	.70	.88	.87	.86	.81	.89	.84	.91	.88
Social Service	.77	.57	.81	.64	.81	.72	.83	.72	.88	.79	.85	.76
Teaching/Education	.95	.82	.93	.82	.95	.91	.94	.89	.95	.90	.96	.94
Transportation/Machine Operation	.88	.83	.90	.89	.91	.91	.92	.91	.94	.94	.92	.92
Visual Arts	.86	.64	.86	.66	.87	.79	.88	.79	.88	.79	.91	.84
Average	.84	.71	.86	.75	.86	.82	.88	.83	.90	.85	.90	.86

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. ICC values are color-coded on a green-red gradient, with relatively higher values in green and relatively lower values in red. Basic interests are sorted based on the alphabetic order of basic interest dimension names.

Table 5.3. Convergent Correlations Between LLM Ratings from RMs 5, 9-13 and Expert Ratings by Basic Interests

Basic Interest	RM5	RM9	RM10	RM11	RM12	RM13
Accounting	.89	.93	.88	.92	.94	.94
Agriculture	.83	.84	.85	.84	.83	.84
Animal Service	.91	.92	.94	.94	.95	.95
Applied Arts and Design	.85	.85	.89	.90	.89	.94
Athletics	.90	.90	.92	.95	.95	.95
Business Initiatives	.83	.87	.84	.92	.91	.90
Construction/Woodwork	.76	.81	.73	.80	.84	.86
Creative Writing	.85	.84	.84	.86	.93	.92
Culinary Art	.90	.91	.89	.90	.93	.91
Engineering	.82	.89	.83	.89	.91	.90
Finance	.88	.88	.89	.92	.94	.94
Health Care Service	.92	.93	.94	.94	.96	.96
Human Resources	.86	.89	.85	.90	.92	.93
Humanities	.83	.85	.88	.87	.89	.89
Information Technology	.83	.86	.86	.87	.91	.93
Law	.92	.93	.95	.94	.95	.95
Life Science	.75	.88	.81	.87	.92	.92
Management/Administration	.92	.94	.95	.96	.94	.96
Marketing/Advertising	.89	.88	.90	.88	.93	.94
Mathematics/Statistics	.88	.86	.90	.87	.89	.86
Mechanics/Electronics	.85	.90	.85	.92	.93	.93
Media	.73	.71	.72	.76	.71	.75
Medical Science	.80	.84	.81	.83	.89	.90
Music	.89	.89	.93	.93	.94	.94
Nature/Outdoors	.81	.80	.83	.82	.89	.90
Office Work	.77	.72	.78	.76	.78	.77
Performing Arts	.82	.80	.84	.85	.84	.87
Personal Service	.84	.82	.82	.86	.85	.86
Physical Science	.83	.86	.86	.89	.91	.91
Physical/Manual Labor	.86	.88	.88	.89	.91	.88
Politics	.84	.87	.86	.89	.90	.92

Table 5.3. (Continued)

Basic Interest	RM5	RM9	RM10	RM11	RM12	RM13
Professional Advising	.69	.70	.78	.77	.84	.81
Protective Service	.90	.92	.90	.89	.95	.95
Public Speaking	.88	.90	.88	.90	.89	.92
Religious Activities	.89	.91	.94	.94	.95	.96
Sales	.83	.83	.87	.86	.89	.91
Social Science	.83	.85	.88	.86	.89	.91
Social Service	.77	.82	.81	.84	.89	.86
Teaching/Education	.95	.93	.95	.94	.95	.96
Transportation/Machine Operation	.88	.90	.91	.92	.94	.92
Visual Arts	.86	.86	.87	.89	.89	.91
Average	.85	.86	.87	.88	.90	.91

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. Correlation estimates are color-coded on a green-red gradient, with relatively higher values in green and relatively lower values in red. Basic interests are sorted based on the alphabetical order of basic interest dimension names.

Based on the evaluation above, RM 13 emerged as the best-performing rating method among all test approaches.

Equating LLM Ratings with Expert Ratings

After identifying RM 13 as the best-bet refined method, but before conducting a more detailed analysis, we did a quick check of the alignment between the ratings it produced and expert ratings to see whether it addressed the LLM leniency issue we identified in Step 4. Despite some clear improvement with RM 13, we still observed a systematic discrepancy between LLM-based and expert ratings. Specifically, ratings generated by the best-bet refined LLM prompt (RM 13) still tended to be higher compared to expert ratings, regardless of basic interest. To address this issue, we explored equating methods to calibrate the refined LLM ratings (derived from RM 13) against expert ratings, thereby improving alignment between the two rating sources.

The equating process involved three steps. First, to evaluate equating methods, we implemented a leave-one-out cross-validation approach. For each basic interest, we trained an equating model on 24 occupations and applied it to the remaining occupation, repeating this process 25 times. This allowed us to generate equated basic interest ratings for all 1,025 combinations without overfitting. We tested five different equating methods: (1) linear equating, (2) equipercentile equating, (3) circle-arc equating (standard or non-symmetric), (4) symmetric circle-arc equating, and (5) odds-transform equating¹. We then compared these methods based

¹ Two different approaches to circle-arc equating were examined in this study: standard (or non-symmetric) and symmetric (see Livingston & Kim, 2008). The “Circle-Arc” column in the tables that follow reflects results based on the standard, non-symmetric method. Odds-transform equating includes two variants: (a) fixing parameter k at 1, and (b) estimating k from the data (see Benton & Carroll, 2025). We evaluated both variants and found their results highly

on the mean raw difference (equated LLM ratings – expert ratings), mean absolute difference, and the correlation between equated LLM ratings and expert ratings. The results for each equating method and the raw LLM ratings are presented in Tables 5.4 – 5.8. Across all metrics, the standard, non-symmetric circle-arc equating method and odds-transform equating method consistently outperformed the others across most metrics examined, particularly in preserving the fidelity of ratings at the lower and upper ends of the expert rating distributions. Given the strong performance of the circle-arc method and its well-established use in assessment and measurement research, we selected the standard, non-symmetric circle-arc equating method as the final equating approach.

Table 5.4. Mean of Raw Differences Between Equated LLM and Expert Ratings by Basic Interests

Basic Interest	Baseline	Linear	Equi-percentile	Symmetric Circle-Arc	Circle-Arc	Odds-Transform
Accounting	0.06	0.02	-0.06	0.03	0.02	0.01
Agriculture	0.80	0.01	0.05	0.23	0.27	0.26
Animal Service	0.50	0.08	0.07	0.29	0.27	0.26
Applied Arts and Design	0.43	-0.01	0.02	0.12	0.14	0.15
Athletics	0.33	0.04	0.00	0.11	0.10	0.11
Business Initiatives	0.84	0.04	0.01	0.19	0.19	0.21
Construction/Woodwork	0.30	0.02	0.02	0.02	0.07	0.08
Creative Writing	0.51	0.04	0.03	0.12	0.14	0.13
Culinary Art	-0.08	0.01	0.06	0.02	-0.02	-0.03
Engineering	0.37	0.00	-0.02	0.06	0.11	0.10
Finance	0.45	0.03	0.01	0.09	0.10	0.10
Health Care Service	0.19	0.02	0.05	0.16	0.09	0.08
Human Resources	0.07	0.01	-0.01	0.00	0.02	0.02
Humanities	0.22	0.03	0.08	0.09	0.07	0.07
Information Technology	0.41	0.01	0.02	0.12	0.11	0.11
Law	0.05	-0.02	-0.03	0.05	0.01	0.01
Life Science	0.41	0.01	0.01	0.13	0.13	0.12
Management/Administration	0.32	0.01	-0.01	0.10	0.10	0.10
Marketing/Advertising	0.44	0.04	0.01	0.12	0.11	0.10
Mathematics/Statistics	0.47	0.00	0.00	0.16	0.09	0.09
Mechanics/Electronics	0.31	0.00	0.02	0.13	0.09	0.09
Media	0.52	0.00	0.02	0.19	0.17	0.17
Medical Science	0.28	0.02	0.01	0.13	0.09	0.08

similar to each other and to the circle-arc methods. Consequently, we report only the results from the $k = 1$ odds-transform variant in the study.

Table 5.4. (Continued)

Basic Interest	Baseline	Linear	Equi-percentile	Symmetric Circle-Arc	Circle-Arc	Odds-Transform
Music	0.56	0.04	0.01	0.15	0.17	0.16
Nature/Outdoors	0.54	0.01	0.05	0.14	0.17	0.17
Office Work	1.01	0.09	0.03	0.23	0.23	0.23
Performing Arts	0.72	0.11	0.03	0.24	0.26	0.25
Personal Service	0.40	0.03	0.06	0.11	0.09	0.08
Physical Science	0.71	0.03	0.06	0.20	0.21	0.21
Physical/Manual Labor	0.66	0.03	0.01	0.23	0.22	0.22
Politics	0.29	0.01	-0.02	0.04	0.04	0.05
Professional Advising	1.00	0.06	0.05	0.23	0.27	0.25
Protective Service	-0.12	0.00	0.01	0.00	-0.04	-0.04
Public Speaking	0.41	0.04	-0.01	0.11	0.11	0.10
Religious Activities	0.42	0.03	0.01	0.19	0.19	0.20
Sales	0.72	0.09	0.03	0.26	0.20	0.19
Social Science	0.46	0.01	0.08	0.15	0.12	0.13
Social Service	0.82	0.02	0.04	0.24	0.26	0.26
Teaching/Education	0.39	0.01	0.00	0.11	0.13	0.14
Transportation/Machine Operation	0.20	0.00	-0.02	0.10	0.06	0.07
Visual Arts	0.64	0.02	0.00	0.12	0.17	0.18
Average	0.44	0.02	0.02	0.13	0.13	0.13

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. The raw differences were calculated by subtracting expert ratings from the LLM ratings. The baseline represents the raw LLM ratings that emerged from RM 13 and pre-equating.

Table 5.5. Mean of Absolute Differences Between Equated LLM and Expert Ratings by Basic Interests

Basic Interest	Baseline	Linear	Equi-percentile	Symmetric Circle-Arc	Circle-Arc	Odds-Transform
Accounting	0.46	0.46	0.42	0.48	0.48	0.48
Agriculture	0.89	0.66	0.63	0.73	0.69	0.67
Animal Service	0.62	0.43	0.46	0.50	0.49	0.48
Applied Arts and Design	0.57	0.48	0.39	0.52	0.46	0.46
Athletics	0.58	0.49	0.46	0.57	0.56	0.56
Business Initiatives	0.89	0.50	0.52	0.52	0.50	0.50
Construction/Woodwork	0.60	0.65	0.65	0.67	0.61	0.61
Creative Writing	0.58	0.45	0.47	0.41	0.41	0.40
Culinary Art	0.55	0.58	0.59	0.56	0.58	0.58
Engineering	0.49	0.54	0.57	0.54	0.49	0.49
Finance	0.53	0.44	0.54	0.42	0.41	0.41
Health Care Service	0.47	0.49	0.53	0.45	0.45	0.45
Human Resources	0.42	0.46	0.52	0.49	0.44	0.44
Humanities	0.65	0.58	0.64	0.59	0.60	0.60
Information Technology	0.56	0.48	0.56	0.45	0.45	0.45
Law	0.39	0.42	0.49	0.40	0.40	0.40
Life Science	0.63	0.47	0.55	0.52	0.47	0.47
Management/Administration	0.46	0.44	0.30	0.42	0.40	0.40
Marketing/Advertising	0.55	0.43	0.41	0.41	0.41	0.41
Mathematics/Statistics	0.64	0.66	0.66	0.60	0.59	0.59
Mechanics/Electronics	0.50	0.45	0.42	0.47	0.43	0.42
Media	0.76	0.84	0.79	0.78	0.78	0.78
Medical Science	0.62	0.65	0.70	0.66	0.60	0.60
Music	0.59	0.42	0.43	0.38	0.37	0.37
Nature/Outdoors	0.69	0.54	0.53	0.54	0.56	0.55
Office Work	1.22	0.86	0.94	0.84	0.83	0.83
Performing Arts	0.88	0.65	0.72	0.63	0.63	0.64
Personal Service	0.63	0.62	0.71	0.61	0.59	0.59
Physical Science	0.77	0.53	0.50	0.53	0.50	0.49
Physical/Manual Labor	0.75	0.64	0.71	0.61	0.59	0.58
Politics	0.50	0.42	0.47	0.45	0.45	0.45
Professional Advising	1.02	0.75	0.64	0.66	0.73	0.68
Protective Service	0.43	0.44	0.50	0.44	0.44	0.44
Public Speaking	0.54	0.50	0.51	0.51	0.50	0.50
Religious Activities	0.45	0.32	0.27	0.31	0.31	0.31
Sales	0.82	0.56	0.42	0.50	0.53	0.54

Table 5.5. (Continued)

Basic Interest	Baseline	Linear	Equi-percentile	Symmetric Circle-Arc	Circle-Arc	Odds-Transform
Social Science	0.61	0.54	0.57	0.58	0.53	0.52
Social Service	0.87	0.66	0.61	0.65	0.65	0.62
Teaching/Education	0.49	0.37	0.38	0.42	0.40	0.41
Transportation/Machine Operation	0.58	0.58	0.65	0.57	0.55	0.55
Visual Arts	0.68	0.47	0.53	0.44	0.45	0.44
Average	0.63	0.53	0.54	0.53	0.52	0.52

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. The absolute differences were calculated as the absolute values of the mean difference between LLM and expert ratings. The baseline represents the raw LLM ratings that emerged from RM 13 and pre-equating.

Table 5.6. Mean of Raw Differences Between Equated LLM and Expert Ratings by Expert Rating Levels

Level	n	Baseline	Linear	Equi-percentile	Symmetric Circle-Arc	Circle-Arc	Odds-Transform
1	82	0.28	0.07	0.15	0.21	0.20	0.21
1.33	75	0.37	-0.04	0.08	0.18	0.16	0.19
1.67	87	0.75	0.29	0.34	0.42	0.43	0.45
2	106	0.79	0.30	0.21	0.40	0.40	0.42
2.33	103	0.62	0.13	0.02	0.21	0.20	0.22
2.67	89	0.71	0.26	0.18	0.31	0.31	0.31
3	70	0.74	0.31	0.25	0.35	0.36	0.34
3.33	67	0.48	0.08	-0.02	0.13	0.13	0.12
3.67	53	0.33	-0.12	-0.26	-0.13	-0.12	-0.13
4	46	0.04	-0.35	-0.37	-0.35	-0.36	-0.37
4.33	35	0.07	-0.31	-0.28	-0.30	-0.29	-0.31
4.67	32	0.55	0.08	-0.09	0.17	0.17	0.14
5	29	0.24	-0.15	-0.18	-0.01	-0.06	-0.09
5.33	22	0.25	-0.12	0.08	0.05	0.00	-0.03
5.67	25	0.17	-0.16	-0.24	0.05	-0.04	-0.07
6	15	0.06	-0.34	-0.37	-0.07	-0.12	-0.15
6.33	23	-0.05	-0.63	-0.48	-0.30	-0.29	-0.33
6.67	25	-0.12	-0.38	-0.27	-0.15	-0.21	-0.22
7	41	-0.28	-0.65	-0.24	-0.41	-0.33	-0.34
Average		0.31	-0.09	-0.08	0.04	0.03	0.02

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. The raw differences were calculated by subtracting expert ratings from the LLM ratings. The baseline represents the raw LLM ratings that emerged from RM 13 and pre-equating.

Table 5.7. Mean of Absolute Differences Between Equated LLM and Expert Ratings by Expert Rating Levels

Level	n	Baseline	Linear	Equi-percentile	Symmetric Circle-Arc	Circle-Arc	Odds-Transform
1	82	0.28	0.07	0.15	0.21	0.20	0.21
1.33	75	0.42	0.28	0.25	0.30	0.27	0.27
1.67	87	0.81	0.57	0.49	0.58	0.56	0.57
2	106	0.83	0.58	0.45	0.55	0.55	0.54
2.33	103	0.69	0.44	0.43	0.40	0.41	0.40
2.67	89	0.83	0.66	0.68	0.63	0.64	0.62
3	70	0.90	0.74	0.82	0.72	0.73	0.71
3.33	67	0.86	0.78	0.87	0.77	0.77	0.75
3.67	53	0.45	0.35	0.53	0.35	0.35	0.35
4	46	0.17	0.43	0.46	0.44	0.43	0.44
4.33	35	0.60	0.68	0.70	0.71	0.71	0.70
4.67	32	0.90	0.83	0.90	0.93	0.92	0.90
5	29	0.74	0.66	0.73	0.81	0.75	0.76
5.33	22	0.76	0.63	0.70	0.81	0.75	0.74
5.67	25	0.62	0.61	0.91	0.65	0.60	0.60
6	15	0.64	0.79	0.87	0.68	0.63	0.64
6.33	23	0.36	0.64	0.81	0.53	0.49	0.51
6.67	25	0.21	0.50	0.52	0.30	0.27	0.28
7	41	0.28	0.65	0.24	0.41	0.33	0.34
Average		0.60	0.57	0.61	0.57	0.55	0.55

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. The absolute differences were calculated as the absolute values of the mean difference between LLM and expert ratings. The baseline represents the raw LLM ratings that emerged from RM 13 and pre-equating.

Table 5.8. Correlations Between Equated LLM and Expert Ratings

Basic Interest	Baseline	Linear	Equi-percentile	Symmetric Circle-Arc	Circle-Arc	Odds-Transform
Accounting	.94	.94	.95	.93	.93	.93
Agriculture	.84	.79	.81	.78	.83	.83
Animal Service	.95	.95	.95	.96	.96	.96
Applied Arts and Design	.94	.93	.95	.92	.94	.94
Athletics	.95	.94	.95	.94	.94	.94
Business Initiatives	.90	.89	.88	.90	.90	.90
Construction/Woodwork	.86	.84	.84	.82	.85	.85
Creative Writing	.92	.91	.91	.93	.93	.93
Culinary Art	.91	.90	.87	.90	.90	.90
Engineering	.90	.88	.86	.89	.89	.89
Finance	.94	.93	.90	.94	.94	.94
Health Care Service	.96	.95	.95	.96	.96	.96
Human Resources	.93	.92	.88	.91	.93	.93
Humanities	.89	.88	.87	.88	.88	.88
Information Technology	.93	.92	.89	.93	.93	.93
Law	.95	.94	.93	.94	.94	.94
Life Science	.92	.91	.90	.92	.93	.93
Management/Administration	.96	.95	.97	.96	.96	.96
Marketing/Advertising	.94	.94	.94	.95	.95	.95
Mathematics/Statistics	.86	.85	.82	.87	.87	.87
Mechanics/Electronics	.93	.92	.92	.93	.94	.94
Media	.75	.70	.72	.73	.73	.73
Medical Science	.90	.88	.85	.87	.89	.89
Music	.94	.93	.94	.95	.95	.95
Nature/Outdoors	.90	.88	.88	.90	.90	.90
Office Work	.77	.75	.68	.76	.77	.76
Performing Arts	.87	.86	.80	.88	.88	.88
Personal Service	.86	.83	.81	.83	.84	.84
Physical Science	.91	.90	.91	.90	.92	.91
Physical/Manual Labor	.88	.86	.83	.88	.88	.88
Politics	.92	.92	.87	.91	.92	.91
Professional Advising	.81	.79	.83	.84	.83	.84

Table 5.8. (Continued)

Basic Interest	Baseline	Linear	Equi-percentile	Symmetric Circle-Arc	Circle-Arc	Odds-Transform
Protective Service	.95	.94	.92	.94	.94	.94
Public Speaking	.92	.91	.90	.92	.92	.92
Religious Activities	.96	.94	.96	.97	.97	.97
Sales	.91	.91	.94	.94	.93	.94
Social Science	.91	.90	.87	.89	.91	.91
Social Service	.86	.83	.85	.85	.86	.87
Teaching/Education	.96	.96	.95	.96	.96	.96
Transportation/Machine Operation	.92	.91	.88	.92	.92	.92
Visual Arts	.91	.90	.88	.92	.92	.92
Average	.91	.89	.88	.90	.91	.91

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. The baseline represents the raw LLM ratings that emerged from RM 13 and pre-equating.

Evaluation of the Refined LLM Ratings Against Expert Ratings

To further evaluate how closely aligned the refined best-bet LLM ratings (based on RM 13) were with experts, we conducted several evaluation-focused analyses that mirrored the analyses we conducted for the provisional ratings in Step 4 and summarized the results in the following sections:

- **Distributions and descriptives of refined LLM and expert basic interest ratings:** We evaluated means, standard deviations, skews, ranges, and distributions of expert and LLM-based basic interest ratings for similarities and differences.
- **Reliability and absolute agreement estimate for refined LLM vs. expert basic interest ratings:** We estimated and compared the reliability/agreement of LLM basic interest ratings to the reliability/agreement of expert basic interest ratings reported earlier in Table 3.2.
- **Consistency and absolute agreement between refined LLM and expert basic interest ratings:** We evaluated the level of consistency and absolute agreement between LLM and expert ratings for each basic interest (treating occupations as the unit of analysis).
- **Occupation-level agreement between refined LLM and expert basic interest ratings:** For each basic interest, we compared the proportion of occupations for which the expert rating fell within a specified range of LLM-based rating to provide a finer-grained evaluation of LLM-expert agreement.

As we further describe below, some of these analyses focus on pre-equated (raw) LLM ratings and post-equated LLM ratings, whereas others focus only on the latter.

Basic Interest Rating Distributions and Descriptives by Source

We first reexamined smoothed frequency distributions of the refined LLM ratings (both raw and equated) alongside expert ratings for each basic interest (see Figure 5.1), as well as the descriptive statistics including means, standard deviations, skewness, and ranges for each rating source (see Table 5.9). Specifically, Figure 5.1 and Table 5.9 show distribution information for three sets of basic interest ratings:

- **Raw LLM Ratings (LLM-R):** These are the refined LLM ratings that emerged from the best-bet LLM rating method (RM 13) before any equating with expert ratings was performed.
- **Equated LLM Ratings (LLM-E):** These are the refined LLM ratings that emerged from the best-bet LLM rating method (RM 13) following equating against expert ratings.
- **Expert Ratings:** These are the mean expert ratings resulting from Step 3.

As shown in Figure 5.1 and even more so in Table 5.9, equating the raw refined LLM ratings (LLM-R) had the intended effect of reducing differences between the resulting equated LLM ratings (LLM-E) and expert ratings. As noted in Figure 5.1, Table 4.1, and Table 5.9, the equated refined LLM ratings demonstrated improved alignment with expert judgments relative to the raw refined LLM ratings (see Table 5.9) and provisional ratings (see Table 4.1). Specifically, the average mean rating for LLM-E was 3.27, which was much closer to the average mean rating for experts of 3.14 when compared to the average mean rating for LLM-R (3.58) or the average mean provisional rating (4.10). Note that we also observed higher variability on average with LLM-E (average $SD = 1.62$) compared with the provisional ratings (average $SD = 1.49$), which was also more in line with the average variability for expert ratings (average $SD = 1.65$), indicating better differentiation among occupations.

Figure 5.1. Basic Interest Rating Distributions by Source

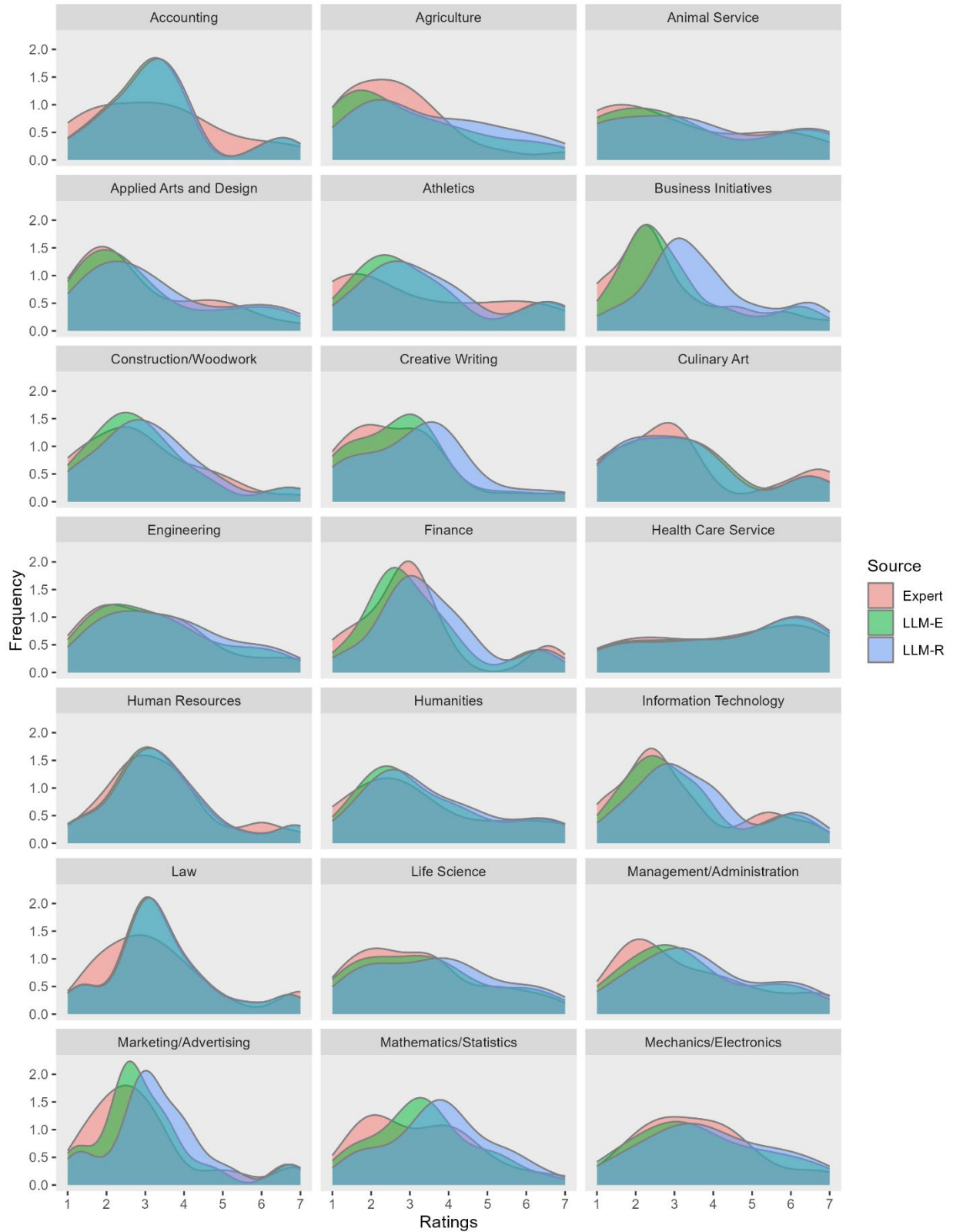


Figure 5.1. (Continued)

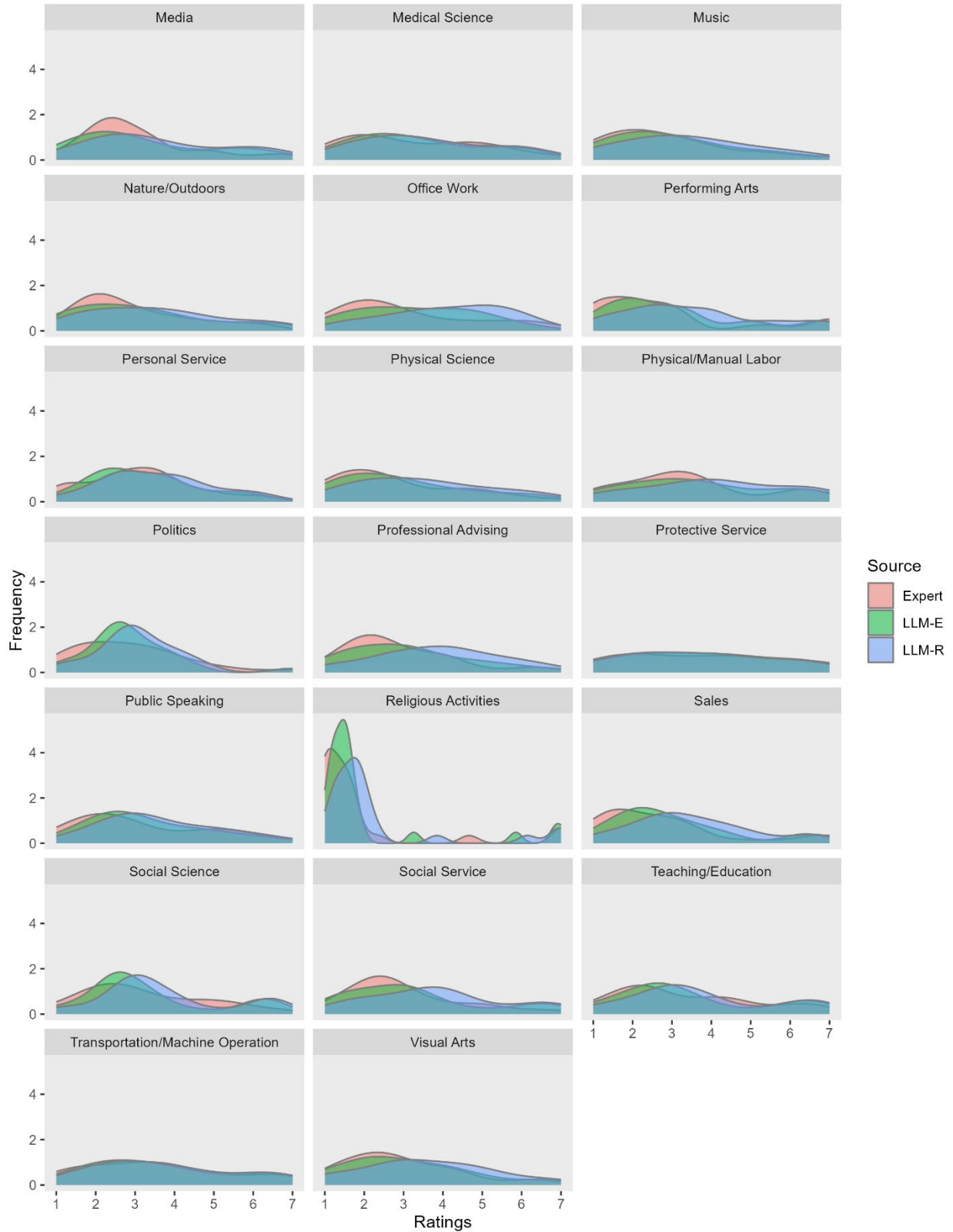


Table 5.9. Basic Interest Rating Descriptives by Source

Basic Interest	LLM-R		LLM-E		Expert	
	Mean	SD	Mean	SD	Mean	SD
Health Care Service	4.51	1.99	4.41	1.99	4.32	2.04
Protective Service	3.69	1.81	3.78	1.81	3.81	1.97
Transportation/Machine Operation	3.78	1.74	3.65	1.75	3.59	1.81
Mechanics/Electronics	3.88	1.62	3.67	1.63	3.57	1.49
Physical/Manual Labor	4.14	1.78	3.70	1.81	3.48	1.74
Law	3.47	1.39	3.44	1.39	3.43	1.65
Human Resources	3.48	1.44	3.43	1.44	3.41	1.44
Management/Administration	3.70	1.64	3.47	1.64	3.37	1.76
Teaching/Education	3.75	1.80	3.48	1.83	3.36	1.75
Medical Science	3.63	1.67	3.43	1.66	3.35	1.71
Humanities	3.56	1.68	3.42	1.69	3.35	1.91
Culinary Art	3.25	1.71	3.31	1.72	3.33	1.96
Mathematics/Statistics	3.76	1.37	3.38	1.34	3.29	1.48
Accounting	3.36	1.44	3.31	1.44	3.29	1.70
Social Science	3.74	1.61	3.40	1.65	3.28	1.58
Life Science	3.67	1.65	3.38	1.64	3.25	1.61
Athletics	3.58	1.77	3.35	1.79	3.25	2.07
Public Speaking	3.61	1.49	3.31	1.48	3.20	1.66
Engineering	3.57	1.59	3.30	1.58	3.20	1.62
Personal Service	3.54	1.37	3.22	1.34	3.13	1.39
Animal Service	3.62	2.17	3.38	2.16	3.12	2.04
Office Work	4.13	1.51	3.35	1.49	3.12	1.70
Information Technology	3.53	1.57	3.23	1.57	3.12	1.65
Media	3.62	1.73	3.27	1.73	3.09	1.49
Finance	3.54	1.38	3.19	1.40	3.09	1.53
Social Service	3.86	1.71	3.30	1.78	3.04	1.49
Nature/Outdoors	3.53	1.69	3.16	1.67	2.99	1.46
Marketing/Advertising	3.40	1.41	3.06	1.41	2.96	1.53
Visual Arts	3.58	1.62	3.10	1.58	2.93	1.44
Construction/Woodwork	3.21	1.50	2.98	1.48	2.91	1.51
Professional Advising	3.90	1.57	3.16	1.57	2.89	1.41
Business Initiatives	3.72	1.52	3.07	1.57	2.88	1.62
Music	3.44	1.64	3.05	1.60	2.88	1.57
Performing Arts	3.58	1.78	3.12	1.81	2.87	1.95
Applied Arts and Design	3.30	1.74	3.01	1.74	2.87	1.62
Politics	3.16	1.20	2.91	1.19	2.87	1.42

Table 5.9. (Continued)

Basic Interest	LLM-R		LLM-E		Expert	
	Mean	SD	Mean	SD	Mean	SD
Physical Science	3.54	1.66	3.04	1.64	2.83	1.58
Sales	3.55	1.56	3.02	1.57	2.83	1.78
Creative Writing	3.25	1.48	2.87	1.43	2.73	1.45
Agriculture	3.49	1.76	2.96	1.74	2.69	1.43
Religious Activities	2.34	1.73	2.11	1.74	1.92	1.70
Average	3.58	1.62	3.27	1.62	3.14	1.65

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. Ratings were made on a 7-point scale from 1 (not at all characteristic) to 7 (extremely characteristic). Basic interests are sorted based on the descending order of their mean characteristic rating of expert ratings across the 25 occupations selected per basic interest.

Reliability and Agreement Estimates for Refined LLM and Expert Basic Interest Ratings

Next, we revisited the “operational” interrater reliability and agreement estimates that were examined in Step 4, only this time examining reliability and agreement estimates for refined LLM ratings rather than provisional LLM ratings.

As we did for the LLM ratings in Step 4, we adopted a generalizability (G) theory approach to estimate reliability and agreement for the LLM ratings for the subset of 1,025 basic interest-occupation combinations here. As noted in Step 5, adopting a G-theory approach allowed us to simultaneously account for two types of measurement error in LLM ratings: (a) error stemming from inconsistency in ratings across the three different LLMs (i.e., model-specific error), and (b) error stemming from inconsistency in ratings across occasions on which a given model was run (i.e., run-specific error) (Cronbach et al., 1972). Table 5.10 provides reliability and agreement estimates for refined LLM ratings. Once again, the expert reliability and agreement estimates previously presented in Table 4.2 are repeated in Table 5.10 for the purpose of direct comparison with LLM estimates.

On average across basic interests, the reliability of the refined LLM ratings was very high (.99). This indicates that, on average, 99% of the observed variance in basic interest ratings (across occupations) was attributable to true (universe) score variance, while only 1% was attributable to measurement error variance. The average agreement estimate was only slightly lower, at .98. Stated differently, if we were to randomly sample another three LLMs, run our prompt through them three times each, and take the average of the resulting ratings, we would expect the correlation between our final ratings and the new composite ratings to be approximately .99 on average, across basic interests. Also, note in Table 5.10 that the revised LLM ratings appeared more reliable than expert ratings (though expert ratings remained very high in reliability).

Table 5.10. Basic Interest Rating, Reliability, and Agreement Estimates for Refined LLM and Expert Ratings

Basic Interest	Refined LLM		Expert	
	G (Rel)	G (Abs)	ICC(C,3)	ICC(A,3)
Accounting	.99	.99	.88	.88
Agriculture	.99	.98	.90	.90
Animal Service	.99	.99	.95	.94
Applied Arts and Design	.99	.98	.89	.89
Athletics	.98	.98	.95	.95
Business Initiatives	.99	.99	.89	.87
Construction/Woodwork	.97	.97	.78	.76
Creative Writing	.98	.98	.89	.88
Culinary Art	.99	.99	.96	.94
Engineering	.99	.98	.92	.91
Finance	.97	.97	.92	.91
Health Care Service	.99	.98	.93	.92
Human Resources	.99	.99	.89	.89
Humanities	.99	.99	.96	.96
Information Technology	.99	.99	.92	.91
Law	.99	.99	.94	.91
Life Science	.98	.96	.91	.89
Management/Administration	.99	.99	.93	.92
Marketing/Advertising	.99	.99	.94	.93
Mathematics/Statistics	.99	.99	.94	.93
Mechanics/Electronics	.99	.98	.88	.87
Media	.98	.98	.86	.86
Medical Science	.98	.95	.87	.86
Music	.98	.98	.91	.88
Nature/Outdoors	.99	.98	.87	.84
Office Work	.97	.97	.94	.92
Performing Arts	.98	.98	.93	.92
Personal Service	.98	.98	.77	.77
Physical Science	.99	.98	.90	.89
Physical/Manual Labor	.99	.98	.92	.92
Politics	.98	.97	.83	.83
Professional Advising	.99	.98	.85	.85
Protective Service	.99	.99	.94	.93
Public Speaking	.99	.99	.94	.92
Religious Activities	1.00	1.00	.98	.97
Sales	.99	.98	.96	.95

Table 5.10. (Continued)

Basic Interest	Refined LLM		Expert	
	G (Rel)	G (Abs)	ICC(C,3)	ICC(A,3)
Social Science	.99	.99	.93	.92
Social Service	.99	.99	.90	.88
Teaching/Education	1.00	.99	.96	.96
Transportation/Machine Operation	.99	.99	.89	.89
Visual Arts	.99	.98	.92	.90
Average	.99	.98	.91	.90

Note. $N = 25$ (unit of analysis is occupation). Occupations are treated as targets of measurement.

Consistency and Absolute Agreement Between Refined LLM and Expert Ratings

Beyond the reliability and agreement for refined LLM ratings for each basic interest, we also reexamined the consistency and absolute agreement between the refined LLM ratings and expert ratings². Following the approach used for the provisional LLM ratings in Step 4, we calculated the intraclass correlation coefficients ICC(C,1) and ICC(A,1) to quantify agreement between the two sources. As presented in Table 5.11, both ICC(C,1) and ICC(A,1) showed improvement following prompt refinement and equating. Specifically, ICC(A,1) values, which are the primary focus as they reflect absolute agreement, ranged from .74 for Media to .96 for Religious Activities, Health Care Service, Management/Administration, Teaching/Education, and Animal Service, with an average of .91 across all basic interests. Correspondingly, ICC(C,1) values, reflecting consistency, ranged from .74 for Media to .97 for Religious Activities, averaging .91 across all basic interests.

² For these analyses and all subsequent analyses, our focus is only the equated LLM ratings as those represent the draft final set of basic interest ratings being evaluated for use.

Table 5.11. Consistency and Agreement Between Refined LLM and Expert Ratings

Basic Interest	ICC(C,1)	ICC(A,1)
Religious Activities	.97	.96
Health Care Service	.96	.96
Management/Administration	.96	.96
Teaching/Education	.96	.96
Animal Service	.96	.96
Music	.95	.95
Marketing/Advertising	.95	.95
Protective Service	.95	.95
Finance	.94	.94
Applied Arts and Design	.94	.94
Athletics	.94	.94
Law	.94	.94
Mechanics/Electronics	.94	.94
Creative Writing	.94	.94
Human Resources	.93	.93
Information Technology	.93	.93
Accounting	.93	.93
Life Science	.93	.93
Sales	.93	.93
Transportation/Machine Operation	.93	.93
Public Speaking	.92	.92
Visual Arts	.92	.92
Physical Science	.92	.92
Social Science	.91	.91
Politics	.91	.91
Business Initiatives	.91	.90
Culinary Art	.90	.90
Engineering	.90	.90
Nature/Outdoors	.90	.90
Medical Science	.90	.90
Humanities	.89	.89
Physical/Manual Labor	.89	.88
Performing Arts	.89	.88
Mathematics/Statistics	.88	.88
Construction/Woodwork	.86	.86
Personal Service	.86	.86
Social Service	.86	.85
Professional Advising	.84	.83
Agriculture	.82	.81
Office Work	.78	.78
Media	.74	.74
Average	.91	.91

Note. $N = 25$ (unit of analysis is occupations) for each basic interest. Basic interests are sorted based on the descending order of ICC(A,1).

Occupation-Level Agreement Between Refined LLM and Expert Ratings

Next, we revisited the within-occupation differences between the refined LLM (post-equating) and expert ratings to provide insight into alignment/misalignment at the occupation level. Consistent with the analysis conducted in Step 4, Table 5.12 summarizes the proportion of occupations for which the difference between refined LLM ratings and expert ratings fell within specified ranges. The results help reinforce the relatively close correspondence between refined LLM and expert ratings. Specifically, for any given basic interest, most of the LLM ratings fell within half a rating scale point of expert ratings (62% of occupations on average, across basic interests). In contrast, for any given basic interest, a smaller proportion of LLM ratings overestimated experts by half a scale point or more (25% of occupations on average, across basic interests), and relatively few LLM ratings underestimated experts by half a scale point or more (14% of occupations on average, across basic interests). Furthermore, for any given basic interest, relatively few LLM ratings overestimated experts by 1 scale point or more (10% of occupations, across basic interests) and even fewer underestimated experts by 1 scale point or more (4% of occupations, across basic interests).

Table 5.12. Within-Occupation Differences Between Refined LLM and Expert Ratings

Basic Interest	M	SD	Min	Max	% of Occupations where LLM - Expert Difference				
					>= +1.0	>= 0.5 and < 1.0	> -0.5 and < 0.5	<= -0.5 and > -1.0	<= -1.0
Accounting	0.02	0.60	-1.73	0.93	0	24	64	8	4
Agriculture	0.26	0.96	-1.04	2.93	16	12	52	16	4
Animal Service	0.26	0.59	-1.50	1.12	8	32	52	4	4
Applied Arts and Design	0.14	0.57	-0.77	1.43	8	16	64	12	0
Athletics	0.10	0.70	-1.35	1.58	4	24	56	8	8
Business Initiatives	0.19	0.69	-1.42	2.18	8	20	60	8	4
Construction/Woodwork	0.07	0.80	-1.22	1.81	12	12	56	12	8
Creative Writing	0.13	0.51	-1.07	1.16	8	12	76	0	4
Culinary Art	-0.02	0.83	-2.80	1.47	8	8	64	12	8
Engineering	0.10	0.72	-0.65	2.29	12	4	72	12	0
Finance	0.10	0.50	-0.83	1.06	4	24	60	12	0
Health Care Service	0.09	0.56	-0.89	1.13	4	24	60	12	0
Human Resources	0.02	0.54	-1.01	1.20	4	12	68	12	4
Humanities	0.07	0.87	-3.07	1.57	8	12	64	12	4
Information Technology	0.11	0.60	-1.16	1.46	8	16	64	8	4
Law	0.01	0.56	-1.44	1.07	8	8	72	8	4
Life Science	0.12	0.61	-1.46	1.55	4	24	56	12	4
Management/Administration	0.09	0.48	-0.97	1.01	4	24	64	8	0
Marketing/Advertising	0.10	0.47	-0.80	1.23	4	8	80	8	0
Mathematics/Statistics	0.09	0.71	-1.25	1.45	16	12	60	8	4
Mechanics/Electronics	0.09	0.56	-1.01	1.54	4	16	68	8	4
Media	0.17	1.17	-1.24	3.08	16	8	56	12	8
Medical Science	0.09	0.77	-1.20	1.60	12	16	48	16	8

Table 5.12. (Continued)

Basic Interest	M	SD	Min	Max	% of Occupations where LLM - Expert Difference				
					>= +1.0	>= 0.5 and < 1.0	> -0.5 and < 0.5	<= -0.5 and > -1.0	<= -1.0
Music	0.17	0.49	-0.59	1.37	8	12	72	8	0
Nature/Outdoors	0.17	0.70	-1.15	1.49	16	16	56	4	8
Office Work	0.23	1.07	-2.42	2.13	24	12	48	8	8
Performing Arts	0.25	0.89	-2.00	2.30	16	8	64	8	4
Personal Service	0.09	0.74	-0.99	1.84	12	12	52	24	0
Physical Science	0.21	0.64	-1.13	1.61	12	12	68	4	4
Physical/Manual Labor	0.22	0.85	-1.03	2.83	8	20	60	8	4
Politics	0.04	0.56	-1.09	1.06	4	20	52	20	4
Professional Advising	0.26	0.85	-1.14	1.86	20	16	44	12	8
Protective Service	-0.04	0.63	-1.93	1.26	8	4	72	12	4
Public Speaking	0.11	0.63	-1.07	1.89	8	20	60	8	4
Religious Activities	0.19	0.43	-0.61	1.59	8	4	84	4	0
Sales	0.20	0.62	-0.92	1.68	8	24	52	16	0
Social Science	0.12	0.68	-1.85	1.16	12	20	60	4	4
Social Service	0.26	0.88	-1.07	2.28	20	8	56	12	4
Teaching/Education	0.12	0.51	-0.97	1.61	4	12	72	12	0
Transportation/Machine Operation	0.06	0.70	-1.44	1.36	12	8	60	12	8
Visual Arts	0.17	0.59	-0.71	1.52	12	12	64	12	0
Average	0.13	0.68	-1.27	1.63	10	15	62	10	4

Note. N = 25 (unit of analysis is occupations) for each basic interest.

Step 6: Summary of Basic Interest Ratings Across All Data-Level Occupations

To produce and update basic interest ratings for all data-level occupations, we applied the best-bet LLM rating method from the previous step to all 891 active data-level occupations in [O*NET 30.0](#). In contrast to prior steps and analyses, where ratings were based on O*NET 29.3, we shifted to O*NET 30.0 here, as it was the latest available data at the time work on this step of the project was conducted. The LLM ratings presented here reflect ratings that were produced and equated using the process described in Step 5. In the sections that follow, we summarize the updated set of basic interest ratings for the 891 active, data-level occupations in O*NET 30.0 by presenting descriptive statistics, distributions, reliability and agreement estimates, convergence with RIASEC and O*NET knowledge ratings, and intercorrelations. In addition to summarizing the statistics above, we also conducted additional analyses to examine the factor structure of basic interests.

Basic Interest Rating Descriptives and Distributions

As shown in Table 6.1 and Figure 6.1, all basic interests clearly differentiate among occupations, as evidenced by the level of standard deviation in the ratings and the distributional spread. Religious Activities appear not to be characteristic of the vast majority of occupations in O*NET, which is intuitive and similar to the finding with expert ratings among the subset of 25 occupations sampled for this dimension in earlier steps. Although basic interests appeared to help differentiate occupations, it is worth noting that, for the most part, ratings fell on the lower end (*not at all to low characteristic*) rather than the higher end (*characteristic*) of the rating scale. This finding is not surprising, given how narrow the definitions of basic interests are; there should be only a few characteristics that are characteristic of any single occupation.

Table 6.1. Basic Interest Rating Descriptives across All Active Data-Level Occupations

Basic Interest	M	SD	Min	Max	Percentiles				
					5	25	50	75	95
Physical/Manual Labor	2.61	1.76	1.00	6.84	1.00	1.13	1.93	3.65	6.22
Mechanics/Electronics	2.36	1.59	1.00	6.86	1.00	1.17	1.65	3.04	6.15
Management/Administration	2.34	1.41	1.00	6.86	1.08	1.35	1.90	2.69	6.11
Engineering	2.27	1.51	1.00	6.87	1.00	1.12	1.60	2.88	5.82
Teaching/Education	2.12	1.50	1.00	7.00	1.03	1.16	1.48	2.38	6.63
Mathematics/Statistics	2.10	1.19	1.00	7.00	1.05	1.26	1.65	2.51	4.80
Office Work	2.08	1.30	1.00	6.81	1.05	1.19	1.66	2.23	5.46
Public Speaking	2.08	1.24	1.00	6.72	1.00	1.16	1.66	2.55	5.08
Health Care Service	1.94	1.72	1.00	6.96	1.00	1.00	1.10	1.69	6.42
Information Technology	1.92	1.16	1.00	6.86	1.00	1.16	1.59	2.16	4.37
Personal Service	1.90	1.10	1.00	6.87	1.00	1.15	1.49	2.17	4.44
Social Service	1.89	1.47	1.00	6.94	1.00	1.05	1.17	1.93	5.83
Professional Advising	1.80	1.21	1.00	7.00	1.00	1.04	1.22	1.89	4.69
Transportation/Machine Operation	1.75	1.20	1.00	7.00	1.00	1.00	1.26	2.00	4.35
Accounting	1.74	0.91	1.00	7.00	1.07	1.20	1.41	1.88	3.65
Social Science	1.73	1.16	1.00	6.81	1.00	1.00	1.24	1.87	4.20
Human Resources	1.68	0.82	1.00	6.89	1.00	1.18	1.43	1.86	3.31
Medical Science	1.68	1.27	1.00	6.86	1.00	1.00	1.05	1.58	4.95
Life Science	1.67	1.26	1.00	7.00	1.00	1.00	1.08	1.64	4.92
Physical Science	1.66	1.10	1.00	7.00	1.00	1.05	1.22	1.76	4.35
Business Initiatives	1.55	0.97	1.00	6.82	1.00	1.03	1.18	1.49	3.98
Sales	1.50	0.95	1.00	6.84	1.00	1.08	1.16	1.45	3.24
Law	1.48	0.86	1.00	6.89	1.00	1.00	1.14	1.51	3.24
Finance	1.46	0.90	1.00	6.85	1.00	1.00	1.13	1.47	3.12
Protective Service	1.43	0.91	1.00	6.90	1.00	1.00	1.12	1.36	3.13
Applied Arts and Design	1.42	0.94	1.00	7.00	1.00	1.00	1.10	1.32	3.28
Construction/Woodwork	1.42	0.80	1.00	6.96	1.00	1.00	1.06	1.42	2.79
Media	1.41	0.91	1.00	6.85	1.00	1.00	1.12	1.33	2.82
Humanities	1.40	0.85	1.00	6.87	1.00	1.00	1.09	1.35	2.95
Marketing/Advertising	1.40	0.78	1.00	6.86	1.00	1.00	1.13	1.36	2.73
Nature/Outdoors	1.34	0.92	1.00	6.84	1.00	1.00	1.02	1.17	3.14
Visual Arts	1.34	0.81	1.00	7.00	1.00	1.00	1.09	1.25	2.65
Politics	1.29	0.52	1.00	7.00	1.00	1.00	1.08	1.35	2.19
Creative Writing	1.24	0.54	1.00	7.00	1.00	1.00	1.09	1.23	1.99
Agriculture	1.21	0.74	1.00	7.00	1.00	1.00	1.00	1.08	1.87
Performing Arts	1.18	0.64	1.00	7.00	1.00	1.00	1.00	1.09	1.83
Athletics	1.17	0.60	1.00	6.87	1.00	1.00	1.00	1.11	1.67
Culinary Art	1.15	0.51	1.00	6.76	1.00	1.00	1.00	1.12	1.71
Music	1.12	0.51	1.00	7.00	1.00	1.00	1.00	1.02	1.50
Animal Service	1.10	0.53	1.00	6.85	1.00	1.00	1.00	1.02	1.25
Religious Activities	1.05	0.34	1.00	7.00	1.00	1.00	1.00	1.00	1.23

Note. *N* = 891 (unit of analysis is occupation). Ratings were made on a 7-point scale ranging from 1 (not at all characteristic) to 7 (extremely characteristic). Basic interests are sorted in descending order of their mean importance across the 891 occupations.

Figure 6.1. Basic Interest Rating Density Plots across All Active Data-Level Occupations

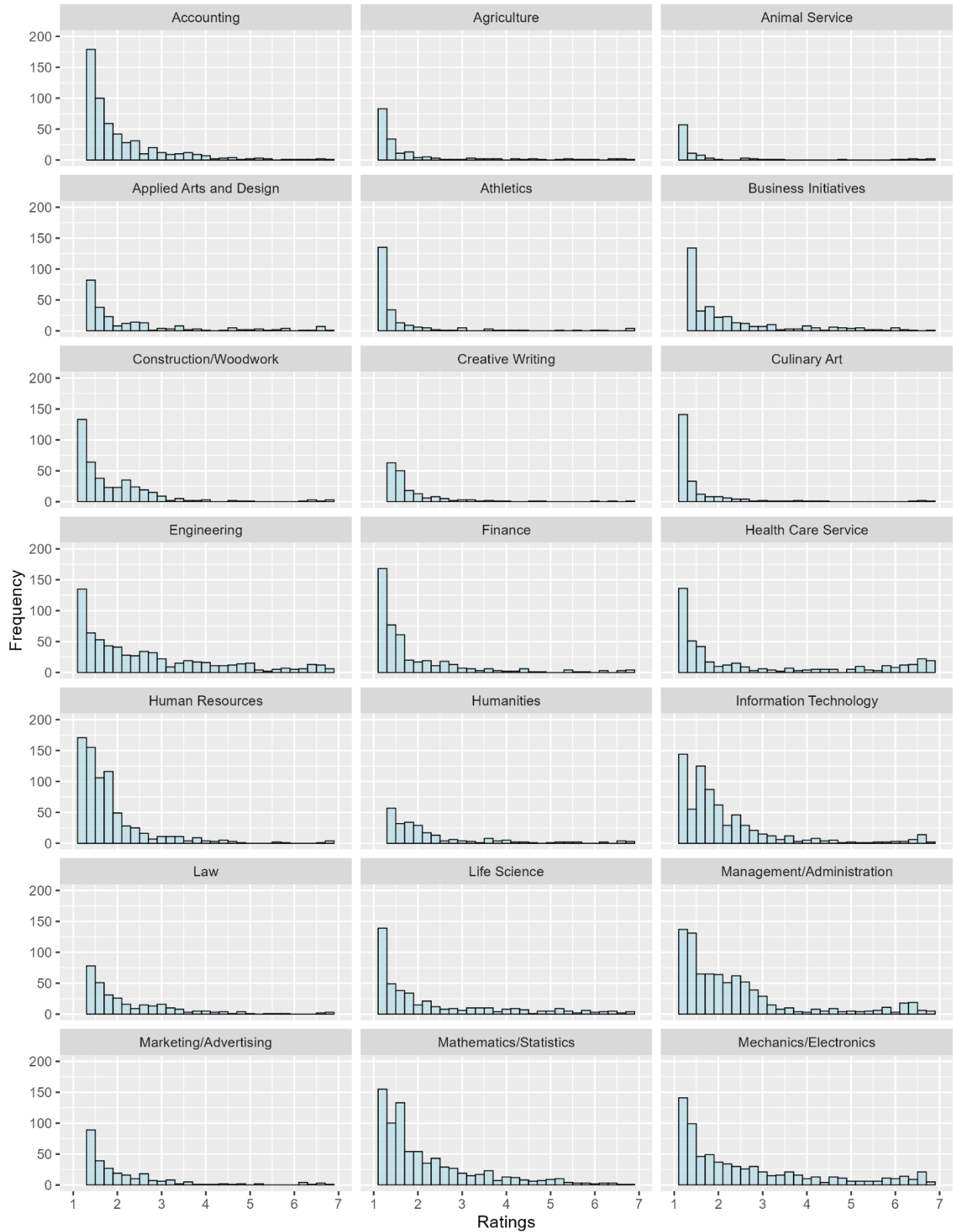
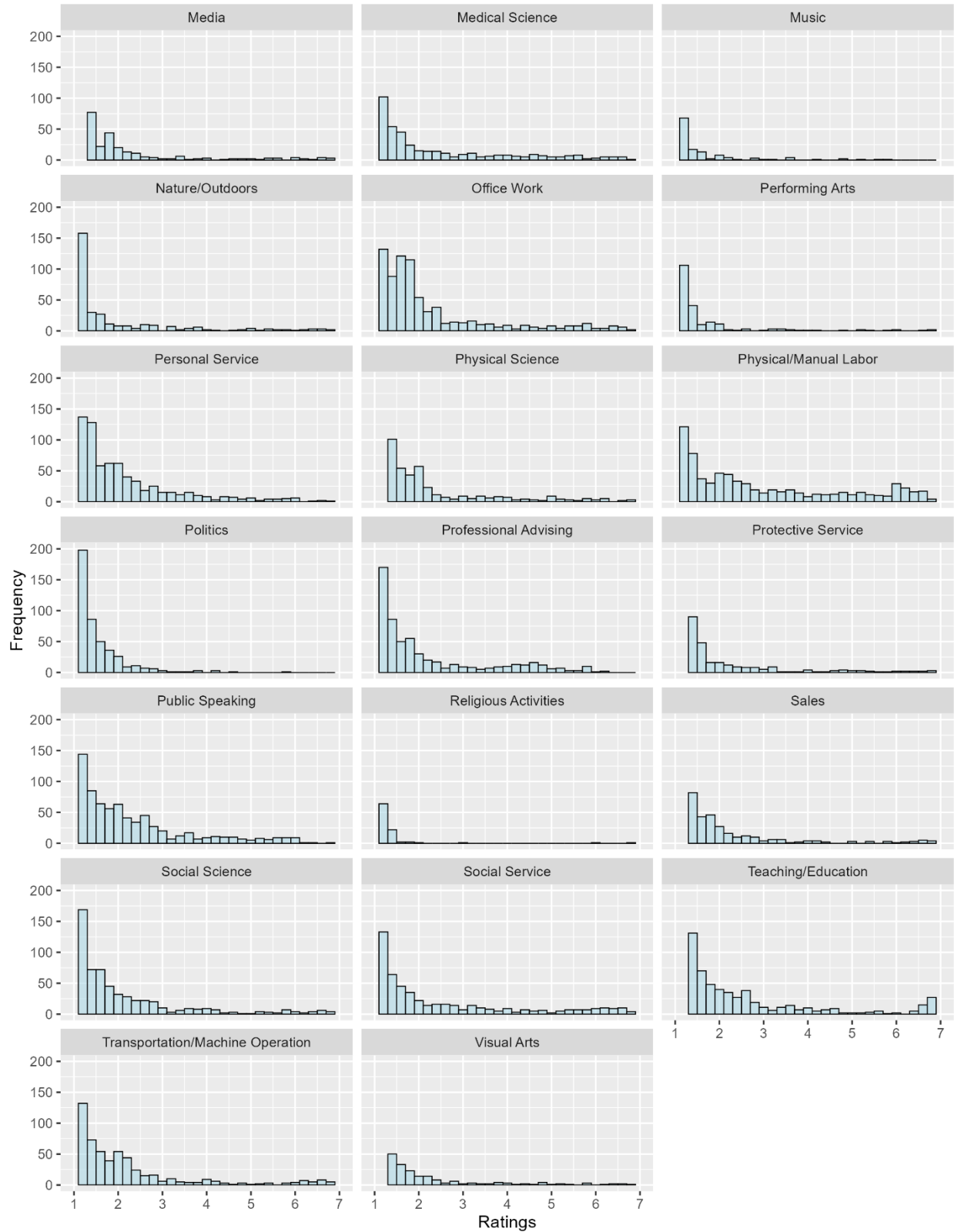


Figure 6.1. (Continued)



Reliability and Agreement of Basic Interest Ratings

As we did for the LLM ratings in Steps 4 and 5, we adopted a generalizability (G) theory approach to estimate reliability and agreement for the LLM ratings for the full set of 891 data-level occupations evaluated here. As noted in Steps 4 and 5, adopting a G-theory approach allowed us to simultaneously account for two types of measurement error in LLM ratings: (a) error stemming from inconsistency in ratings across the three different LLMs (i.e., model-specific error), and (b) error stemming from inconsistency in ratings across occasions on which a given model was run (i.e., run-specific error) (Cronbach et al., 1972).

Unlike Steps 4 and 5, which provide “operational” estimates, that is, reliability and agreement estimates for the final composite LLM ratings, we also offer “single-model, single-run” estimates. These estimates index the expected reliability and agreement of ratings produced by a single LLM, where our final prompt was only run once. We provide these estimates to illustrate the value of basing LLM ratings on multiple models and multiple runs, thereby reducing the contribution of model- and run-specific variance to final ratings.

Table 6.2 presents both operational (composite rating) and single-model-single-run reliability and agreement estimates. The operational reliability of the LLM ratings was very high (.99), indicating that on average, 99% of the observed variance in basic interest ratings (across occupations) was attributable to true (universe) score variance, while only 1% was attributable to measurement error. The average agreement estimate was also very high (.99). Stated differently, if we were to randomly sample another three LLMs, run our prompt through them three times each, and take the average of the resulting ratings, we would expect the correlation between our final ratings and the new composite ratings to be approximately .99 on average, across basic interests.

Table 6.2. Basic Interest Rating, Reliability, and Agreement Estimates for Refined LLM Ratings Across All Active Data-Level Occupations

Basic Interest	Composite Rating		Single Model-Single Run	
	G (Rel)	G (Abs)	G (Rel)	G (Abs)
Accounting	.99	.98	.89	.87
Agriculture	.99	.99	.93	.93
Animal Service	.99	.99	.95	.95
Applied Arts and Design	.99	.99	.92	.92
Athletics	.99	.99	.92	.91
Business Initiatives	.99	.99	.94	.94
Construction/Woodwork	.98	.98	.87	.85
Creative Writing	.99	.98	.89	.88
Culinary Art	.99	.99	.90	.90
Engineering	.99	.99	.93	.93
Finance	.99	.99	.92	.91
Health Care Service	1.00	1.00	.96	.96
Human Resources	.99	.98	.88	.87
Humanities	.99	.99	.94	.94
Information Technology	.99	.99	.92	.92
Law	.99	.99	.93	.92
Life Science	.99	.99	.92	.92
Management/Administration	.99	.99	.94	.94
Marketing/Advertising	.99	.99	.93	.93
Mathematics/Statistics	.99	.99	.93	.93
Mechanics/Electronics	.99	.99	.93	.93
Media	.99	.99	.93	.92
Medical Science	.99	.98	.91	.90
Music	.99	.99	.92	.92
Nature/Outdoors	.99	.99	.92	.92
Office Work	.99	.97	.88	.86
Performing Arts	.99	.99	.92	.92
Personal Service	.98	.98	.88	.87
Physical Science	.99	.99	.93	.93
Physical/Manual Labor	.99	.98	.94	.91
Politics	.98	.98	.87	.86
Professional Advising	.99	.99	.93	.93
Protective Service	.99	.98	.91	.90
Public Speaking	.99	.99	.93	.92
Religious Activities	.99	.99	.93	.93
Sales	.99	.98	.93	.90
Social Science	.99	.99	.93	.93
Social Service	.99	.99	.95	.94
Teaching/Education	1.00	.99	.96	.95
Transportation/Machine Operation	.99	.98	.91	.90
Visual Arts	.99	.99	.92	.92
Average	.99	.99	.92	.91

Note. $N = 891$ (unit of analysis is occupation). Occupations are treated as targets of measurement.

With respect to the composite vs. single model-single run estimates, differences were notable. Specifically, on average, for any given basic interest, the reliability of the LLM composite rating was .99 whereas on average, for any given basic interest, the expected reliability of ratings produced by a single model with a single run was .92 (a difference of .07). Additionally, on average, for any given basic interest, the agreement estimate for the LLM composite rating was .99 whereas on average, for any given basic interest, the agreement estimate for ratings produced by a single model with a single run was .91 (a difference of .08). This indicates that basing a final LLM rating on an average of multiple models and multiple runs can reduce the contribution of idiosyncratic model-specific and run-specific error to observed variance in ratings.

Beyond the reliability and absolute agreement for the individual basic interest dimension ratings, we also examined the reliability (i.e., consistency) and absolute agreement (i.e., interchangeability) of the within-occupation basic interest profiles for LLM ratings. In contrast to the reliability and agreement statistics for each dimension where occupations serve as the target of measurement, here our focus is on reliability and agreement for each of the 891 occupations where basic interest dimensions serve as the target of measurement, that is, we address how consistent LLM/run combinations are in terms of their ordering of basic interest dimensions for any given occupation.

As we did when estimating the reliability and agreement coefficients for individual basic interests based on LLM ratings, we adopted a G-theory approach that allowed us to simultaneously account for two types of measurement error to basic interest profiles: (a) error stemming from inconsistency in ratings across the three different LLMs (i.e., model-specific error), (b) error stemming from inconsistency in ratings across occasions on which a given model was run (i.e., run-specific error) (Cronbach et al., 1972).

The measurement design underlying the profile of LLM ratings for each occupation can be described as basic interests (i) crossed with runs l nested within models (i.e., $l \times [r:m]$). Basic interests represent the target of measurement, and as such, variation in ratings attributable to the basic interest main effect may be viewed as “true score variance” in the CTT reliability sense (“universe score variance” in G-theory terms). Models (i.e., LLMs) and runs (i.e., prompts run through a given model) can be considered measurement facets that may contribute to error in the observed basic interest profiles for an occupation. Based on G-theory, we can (a) provide reliability and agreement estimates for LLM basic interest profiles that account for model-based, run-based, and residual sources of measurement error, and (b) partition the relative contribution of the aforementioned sources of error to overall measurement error in ratings.

To estimate reliability and agreement coefficients for the profile of LLM ratings for each occupation, we first estimated the REML variance components for each effect that could be estimated in the measurement design above (for each occupation separately), namely: (a) basic interest main effect (i.e., σ^2_i = variation in ratings across the targets of measurement), (b) model main effect (i.e., σ^2_m = variation in ratings across LLMs), (c) run nested within model effect (i.e., $\sigma^2_{r:m}$ = variation in ratings across runs within model), (d) the basic interest-by-model interaction effect (i.e., σ^2_{im} = variation attributable to the basic interest x LLM interaction), and (e) the residual effects (i.e., $\sigma^2_{ir,m,res}$ = variation attributable to the basic interest x LLM x run interaction and unexplained variation in ratings). We then used the resulting raw variance component to estimate the reliability of LLM ratings using the following formula based on rules from G-theory for a $l \times (r:m)$ measurement design.

$$\text{Reliability Estimate for LLM Basic Interest Profiles} = \frac{\sigma_i^2}{\sigma_i^2 + \left[\frac{\sigma_{im}^2}{3} + \frac{\sigma_{r:m}^2}{9} + \frac{\sigma_{ir:m,res}^2}{9} \right]}$$

$$\text{Agreement Estimate for LLM Basic Interest Profiles} = \frac{\sigma_i^2}{\sigma_i^2 + \left[\frac{\sigma_m^2}{3} + \frac{\sigma_{im}^2}{3} + \frac{\sigma_{r:m}^2}{9} + \frac{\sigma_{ir:m,res}^2}{9} \right]}$$

Table 6.3 shows the results of our analysis. Recall, reliability, and agreement were estimated for each occupation, so the statistics in Table 6.3 reflect summaries of estimates across 891 occupations. On average, the operational reliability of the LLM-based basic interest profiles was very high (.99). This indicates that, on average, 99% of the observed variance across basic interest ratings within an occupation was attributable to true (universe) score variance, while only 1% was attributable to measurement error. The average operational agreement estimate was the same, at .99. Once again, comparing reliability and agreement estimates for composites, relative to reliability and agreement estimates for LLM ratings based on a single model-run, reveals a clear advantage for basing basic interest ratings on a composite of ratings rather than ratings from any single model or run of that model.

Table 6.3. Reliability and Agreement Estimates for Within-Occupation Basic Interest Profiles

Statistic	Composite Rating		Single Model-Run	
	G(Rel)	G(Abs)	ICC(C,8)	ICC(A,8)
Mean	.99	.99	.92	.92
SD	.01	.01	.04	.04
Min	.96	.95	.71	.70
Max	1.00	1.00	.99	.99
Percentiles				
5	.98	.98	.85	.84
25	.99	.99	.90	.90
50	.99	.99	.93	.93
75	.99	.99	.95	.95
95	1.00	1.00	.97	.97

Note. Separate G-coefficients were estimated for each occupation, where the *n* for each estimate was 41 (i.e., the number of basic interests for an occupation). The reported statistics are summaries of estimated G-coefficients across 891 occupations.

Convergence Between LLM Basic Interest Ratings and Knowledge and RIASEC Interests Ratings

Next, we evaluated the convergence between LLM basic interest ratings and knowledge and general interest (RIASEC) ratings from the O*NET 30.0 database. As noted earlier, the O*NET General Interest and Knowledge domains have direct conceptual linkages with basic interests and can inform the validity of basic interest ratings. For each basic interest, we calculated

convergent correlations between the basic interest rating and its theoretically associated O*NET knowledge and general interest (RIASEC) dimensions, as specified by the linkage map referenced in Step 1. To provide a comparative baseline, we also computed divergent correlations by averaging the correlations between each basic interest rating and all non-associated knowledge or general interest (RIASEC) dimensions.

As shown in Table 6.4, the average convergent correlation between basic interests and their associated knowledge ratings was .69 across all basic interests. For each basic interest, convergent correlations with associated knowledge ratings consistently exceeded divergent correlations with non-associated knowledges. This pattern suggests strong evidence of construct convergence and specificity between the basic interests and their corresponding knowledge ratings.

Table 6.4. Convergent Correlations Between LLM Basic Interest Ratings and Associated Knowledge Ratings

Basic Interest	Associated Knowledge	Convergent Correlation	Average Divergent Correlation
Accounting	Economics and Accounting	.71	.01
Animal Service			.04
Applied Arts and Design	Design	.37	.01
Athletics			.04
Business Initiatives			.10
Creative Writing	English Language	.39	.04
Creative Writing	Communications and Media	.57	.04
Culinary Art			.01
Engineering	Engineering and Technology	.86	.01
Finance	Economics and Accounting	.72	.00
Health Care Service			.11
Human Resources	Personnel and Human Resources	.71	.13
Humanities	History and Archeology	.81	.05
Humanities	Philosophy and Theology	.68	.05
Information Technology	Computers and Electronics	.74	.04
Law	Law and Government	.77	.08
Life Science	Biology	.89	.10
Management/Administration	Administration and Management	.66	.17
Marketing/Advertising	Sales and Marketing	.63	.04
Mathematics/Statistics	Mathematics	.70	.07
Media	Communications and Media	.68	.05
Medical Science	Medicine and Dentistry	.82	.09
Music	Fine Arts	.67	.00
Office Work	Administrative	.62	.00
Performing Arts	Fine Arts	.75	.00
Personal Service	Customer and Personal Service	.58	.06
Physical Science	Physics	.71	.05

Table 6.4. (Continued)

Basic Interest	Associated Knowledge	Convergent Correlation	Average Divergent Correlation
Physical Science	Chemistry	.67	.05
Politics	Law and Government	.55	.12
Professional Advising			.16
Public Speaking			.18
Religious Activities			.04
Sales	Sales and Marketing	.71	.01
Social Science	Psychology	.66	.11
Social Science	Sociology and Anthropology	.82	.11
Social Service	Therapy and Counseling	.84	.12
Teaching/Education	Education and Training	.74	.15
Visual Arts	Fine Arts	.68	.00
Average		.69	.06

Note: $N = 891$ (unit of analysis is occupation). Convergent correlation is the correlation between a basic interest rating and its associated knowledge rating across occupations. Divergent correlation is the mean correlation between the same basic interest and the ratings of non-associated knowledges. For basic interests spanning multiple knowledge domains, convergent correlations are reported separately for each domain.

In contrast, convergent correlations between basic interests and their associated RIASEC dimensions were generally smaller in magnitude than those observed for basic interest-knowledges linkages, with an average convergent correlation of .48 across all basic interests (see Table 6.5). Despite the convergent correlations being smaller, they were still notably larger on average than divergent correlations (i.e., .48 vs. -.06). As noted in Step 1, the lower correlations for RIASEC dimensions (relative to knowledges) likely reflects the broader and more abstract nature of RIASEC dimensions, which encompass multiple basic interests and therefore capture variance beyond any single basic interest.

While Table 6.5 summarizes the average convergent and divergent correlations between basic interests and both associated and non-associated RIASEC dimensions, Table 6.6 provides a more granular breakdown by reporting correlations between each basic interest and all six RIASEC dimensions. Again, most basic interests demonstrated stronger correlations with their conceptually associated RIASEC dimensions than with non-associated dimensions, with a few exceptions: Protective Service, Animal Service, Athletics, and Culinary Art. These interests showed relatively weak correlations with all RIASEC dimensions, suggesting limited conceptual overlap with the RIASEC framework or that they may not neatly map onto any single RIASEC domain.

Because RIASEC dimensions are broader and more abstract than basic interests, linear correlations may underestimate meaningful convergence between the two constructs. To examine convergence from a directional perspective, we generated scatter plots for each basic interest-associated RIASEC pairing (see Figure 6.2). In each plot, occupation-level basic interest ratings were plotted on the x-axis and ratings on the associated RIASEC dimension were plotted on the y-axis. For basic interests associated with multiple RIASEC dimensions, separate scatter plots were produced for each linkage. Locally Estimated Smoothing (LOESS) curves were overlaid to visualize directional trends without imposing linearity. Reference lines were added to indicate high ratings (≥ 5) on both dimensions.

For many basic interests (e.g., Mathematics/Statistics, Applied Arts and Design), occupations with high basic interest ratings tended to also show elevated ratings on the associated RIASEC dimension, resulting in a concentration of observations in the upper-right region of the plots. At the same time, substantial variability in RIASEC ratings was observed among occupations with lower or moderate basic interest ratings, reflecting the potential influence of other basic interests contributing to the same RIASEC dimension. This asymmetric pattern indicates that high standing on a specific basic interest is sufficient, but not necessary, for high standing on a broader RIASEC dimension, and low standing on a specific basic interest does not necessarily correspond to high standing on a broader RIASEC dimension (as other basic interests linked to that RIASEC dimension may lead that dimension to be high for an occupation).

Table 6.5. Convergent Correlations Between LLM Basic Interest Ratings and Associated RIASEC Ratings

Associated RIASEC	Basic Interest	Convergent Correlation	Divergent Correlation
Realistic	Physical/Manual Labor	.77	-.42
Realistic	Mechanics/Electronics	.63	-.25
Realistic	Engineering	.52	-.14
Realistic	Transportation/Machine Operation	.48	-.25
Realistic	Construction/Woodwork	.44	-.21
Realistic	Nature/Outdoors	.20	-.03
Realistic	Agriculture	.16	-.03
Realistic	Animal Service	.09	-.03
Realistic	Protective Service	-.04	.05
Realistic	Athletics	-.05	.03
Investigative	Mathematics/Statistics	.76	-.05
Investigative	Life Science	.66	-.01
Investigative	Medical Science	.64	-.01
Investigative	Physical Science	.62	-.04
Investigative	Social Science	.46	-.07
Investigative	Health Care Service	.45	-.13
Investigative	Humanities	.24	-.02
Artistic	Applied Arts and Design	.81	-.09
Artistic	Visual Arts	.77	-.08
Artistic	Media	.71	-.02
Artistic	Performing Arts	.67	-.07
Artistic	Creative Writing	.66	.00
Artistic	Humanities	.59	-.02
Artistic	Music	.51	-.06
Artistic	Marketing/Advertising	.46	-.12
Artistic	Culinary Art	.13	-.03
Social	Social Service	.86	-.05
Social	Teaching/Education	.85	.02

Table 6.5. (Continued)

Associated RIASEC	Basic Interest	Convergent Correlation	Divergent Correlation
Social	Professional Advising	.83	-.05
Social	Social Science	.70	-.07
Social	Personal Service	.63	-.04
Social	Health Care Service	.55	-.13
Social	Human Resources	.48	.03
Social	Religious Activities	.24	-.04
Social	Culinary Art	.09	-.03
Social	Animal Service	.03	-.03
Enterprising	Management/Administration	.85	.00
Enterprising	Business Initiatives	.78	-.04
Enterprising	Sales	.64	-.07
Enterprising	Finance	.60	-.16
Enterprising	Marketing/Advertising	.57	-.12
Enterprising	Public Speaking	.51	.12
Enterprising	Law	.46	.01
Enterprising	Politics	.45	.05
Enterprising	Professional Advising	.25	-.05
Enterprising	Athletics	.13	.03
Enterprising	Religious Activities	.11	-.04
Conventional	Office Work	.72	-.05
Conventional	Accounting	.63	-.04
Conventional	Finance	.46	-.16
Conventional	Information Technology	.37	.05
Conventional	Mathematics/Statistics	.19	-.05
Conventional	Human Resources	.16	.03
Average		.48	-.06

Note: $N = 891$ (unit of analysis is occupation). Convergent correlation is the correlation between a basic interest rating and its associated RIASEC dimension across occupations. Divergent correlation is the mean correlation between the same basic interest and the non-associated RIASEC dimensions. For basic interests linked to multiple RIASEC dimensions, convergent correlations are reported separately for each associated RIASEC dimension.

Table 6.6. Averaged Correlations Between LLM Basic Interest Ratings and RIASEC Ratings

Basic Interest ID	Basic Interest	R	I	A	S	E	C
1.B.3.a	Mechanics/Electronics	.63	.04	-.29	-.53	-.45	-.03
1.B.3.b	Construction/Woodwork	.44	-.19	-.02	-.36	-.26	-.22
1.B.3.c	Transportation/Machine Operation	.48	-.26	-.34	-.34	-.21	-.11
1.B.3.d	Physical/Manual Labor	.77	-.43	-.31	-.49	-.52	-.34
1.B.3.e	Protective Service	-.04	.04	-.18	.08	.20	.12
1.B.3.f	Agriculture	.16	.11	-.08	-.09	-.01	-.10
1.B.3.g	Nature/Outdoors	.20	.15	-.04	-.08	-.02	-.15
1.B.3.h	Animal Service	.09	.09	-.05	.03	-.04	-.12
1.B.3.i	Athletics	-.05	-.03	.11	.28	.13	-.24
1.B.3.j	Engineering	.52	.31	-.15	-.49	-.38	.00
1.B.3.k	Physical Science	.19	.62	-.02	-.11	-.23	-.02
1.B.3.l	Life Science	.00	.66	-.03	.28	-.16	-.16
1.B.3.m	Medical Science	-.07	.64	-.04	.37	-.18	-.15
1.B.3.n	Social Science	-.53	.46	.36	.70	.15	-.26
1.B.3.o	Humanities	-.42	.24	.59	.50	.11	-.28
1.B.3.p	Mathematics/Statistics	-.16	.76	.04	-.05	-.03	.19
1.B.3.q	Information Technology	-.20	.52	.07	-.14	.03	.37
1.B.3.r	Visual Arts	-.07	-.07	.77	.00	.03	-.31
1.B.3.s	Applied Arts and Design	-.07	-.11	.81	.00	.05	-.34
1.B.3.t	Performing Arts	-.20	-.11	.67	.16	.14	-.33
1.B.3.u	Music	-.16	-.09	.51	.15	.09	-.27
1.B.3.v	Creative Writing	-.41	.14	.66	.31	.20	-.23
1.B.3.w	Media	-.36	.02	.71	.17	.26	-.22
1.B.3.x	Culinary Art	.00	-.17	.13	.09	.13	-.10
1.B.3.y	Teaching/Education	-.42	.37	.40	.85	.09	-.36
1.B.3.z	Social Service	-.43	.22	.25	.86	.07	-.34
1.B.3.aa	Health Care Service	-.13	.45	-.07	.55	-.15	-.18
1.B.3.ab	Religious Activities	-.17	.01	.17	.24	.11	-.14
1.B.3.ac	Personal Service	-.40	-.19	.15	.63	.35	-.11
1.B.3.ad	Professional Advising	-.55	.29	.34	.83	.25	-.29
1.B.3.ae	Business Initiatives	-.53	-.05	.06	.10	.78	.23
1.B.3.af	Sales	-.40	-.27	.06	.11	.64	.16
1.B.3.ag	Marketing/Advertising	-.45	-.12	.46	.16	.57	-.08
1.B.3.ah	Finance	-.54	-.02	-.09	.03	.60	.46
1.B.3.ai	Accounting	-.54	-.06	-.19	.00	.57	.63
1.B.3.aj	Human Resources	-.58	-.01	.04	.48	.68	.16
1.B.3.ak	Office Work	-.66	-.06	-.14	.12	.49	.72
1.B.3.al	Management/Administration	-.57	.03	.06	.26	.85	.24
1.B.3.am	Public Speaking	-.62	.30	.45	.66	.51	-.21
1.B.3.an	Politics	-.49	.26	.25	.28	.45	-.03
1.B.3.ao	Law	-.45	.13	-.04	.15	.46	.26
Average		-.18	.11	.15	.16	.15	-.05

Note: N = 891 (unit of analysis is occupation).

Figure 6.2. Basic Interest-RIASEC Scatter Plots for Linked Pairs (Part 1)

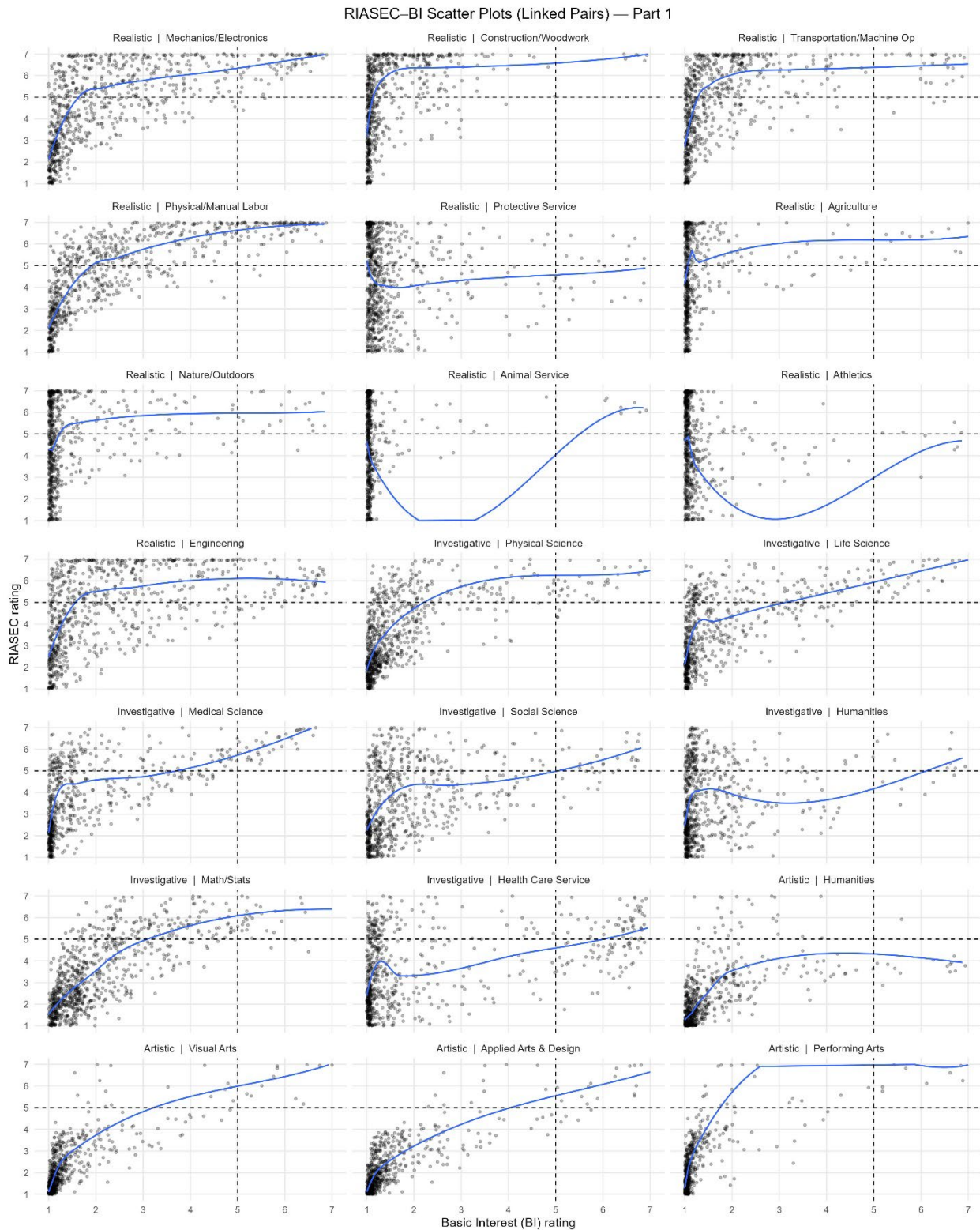


Figure 6.2. Basic Interest-RIASEC Scatter Plots for Linked Pairs (Part 2)

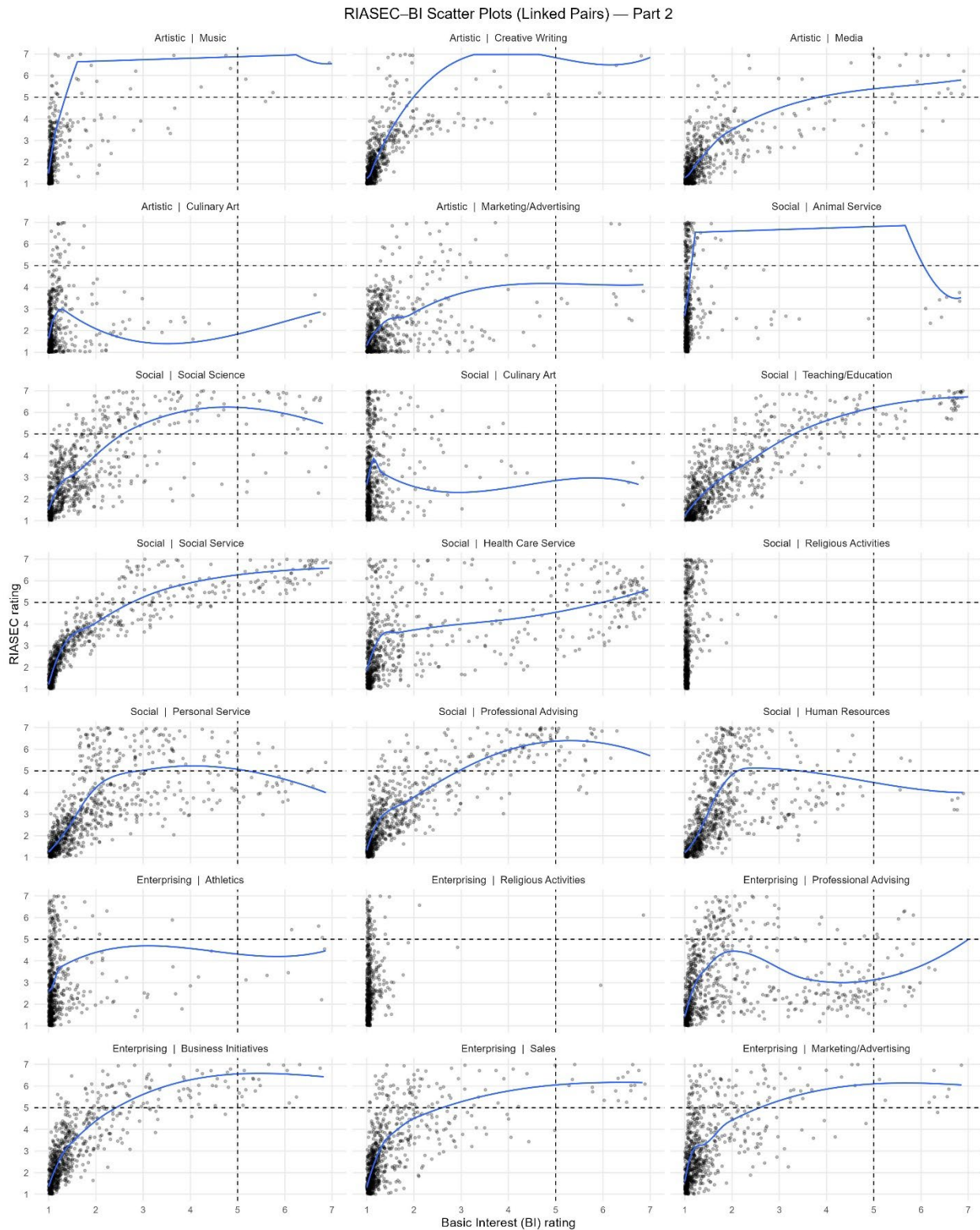
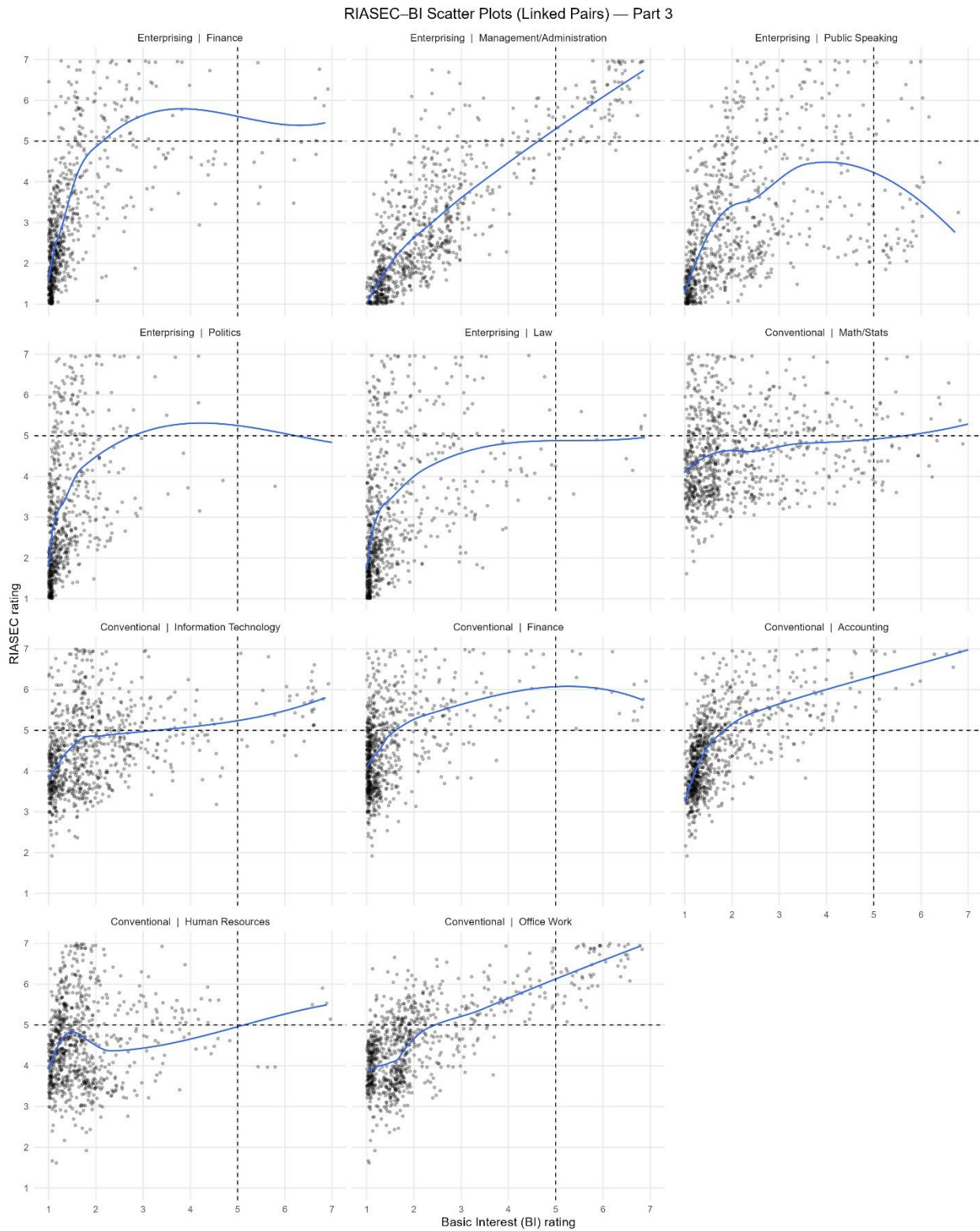


Figure 6.2. Basic Interest-RIASEC Scatter Plots for Linked Pairs (Part 3)



Basic Interest Ratings by Job Zone and Job Family

Next, we examined differences in basic interest ratings by job zone and job family (see Tables 6.7 and 6.8), respectively. For each basic interest, we also decomposed variability in ratings across occupations to evaluate what percentage of observed variance was attributable to job zone and job family, respectively. This decomposition was accomplished by fitting a nested random effects model for each basic interest, where occupations were treated as nested within job zone, and occupations were treated as nested within job family (separate models for job zone and job family), and estimating REML variance components for job zone, job family, and residual sources of variance. The basic interests in Tables 6.7 and 6.8 are presented in descending order of the percentage of variance in their ratings attributable to job zone and job family, respectively, to highlight the basic interests where ratings tend to vary most across job zones and job families.

Starting with Table 6.7, on average, for any given basic interest, 19.0% of the variance in ratings across occupations was attributable to job zone. Basic interests varied greatly in terms of the percentage of variance in their ratings that could be attributed to job zone, with Physical/Manual Labor (59.5%), Social Science (53.7%), Professional Advising (48.0%), and Public Speaking (47.3%) falling at the top of the distribution. In three of these four cases, the basic interests were rated as more characteristic of occupations in higher job zones than in lower job zones, except for Physical/Manual Labor, which was rated as far more characteristic of occupations in lower job zones. In contrast, Personal Service (0.9%), Culinary Art (0.7%), Athletics (0.3%), and Animal Service (0.0%) ranked at the bottom of the distribution, indicating that these basic interests tended to vary little across job zones and generally received lower-to-middling ratings. From a career exploration perspective, this set of findings suggests that some basic interests may matter more than others (i.e., those that are more differentiated across job zones) when considering person-occupation fit across different job zones.

With respect to job family, on average, for any given basic interest, 52.8% of the variance in ratings across occupations was attributable to job family. Basic interests varied greatly in terms of the percentage of variance in their ratings that could be attributed to job family, with Health Care Service (81.7%), Law (77.9%), Teaching/Education (74.6%), and Physical/Manual Labor (74.4%) falling at the top of the distribution. In the case of all four of these basic interests, there was a clear split between job families where the given basic interest had very high ratings (e.g., Healthcare Practitioners and Technical for Health Care Service; Legal for Law; Educational Instruction and Library for Teaching/Education; Construction and Extraction for Physical/Manual Labor) and job families where the given basic interest had very low ratings (e.g., Production for Health Care Service and Law; Construction and Extraction for Teaching/Education; Legal for Physical/Manual Labor). In contrast, Athletics (10.8%) ranked last in the percentage of variance due to job-family distribution, receiving low ratings across all job families. Again, from a career exploration perspective, this set of findings suggests that some basic interests may matter more than others when considering person fit with occupations across different job families.

Table 6.7. Mean Basic Interest Ratings by Job Zone

Work Style	% Variance Due to Job Zone	Job Zone				
		1	2	3	4	5
Physical/Manual Labor	59.5	5.06	3.84	2.69	1.34	1.34
Social Science	53.7	1.01	1.11	1.41	1.89	3.32
Public Speaking	48.0	1.17	1.34	1.70	2.69	3.36
Teaching/Education	47.3	1.12	1.33	1.92	2.23	3.99
Professional Advising	46.2	1.03	1.15	1.53	2.04	3.25
Mathematics/Statistics	41.2	1.12	1.37	1.94	2.81	2.95
Medical Science	39.0	1.01	1.10	1.60	1.62	3.15
Life Science	34.6	1.11	1.11	1.53	1.72	3.03
Humanities	30.8	1.01	1.06	1.22	1.52	2.24
Information Technology	30.0	1.03	1.29	2.02	2.74	2.04
Health Care Service	29.4	1.04	1.30	2.11	1.67	3.57
Management/Administration	28.7	1.32	1.68	2.20	3.38	2.58
Politics	28.4	1.01	1.05	1.13	1.56	1.63
Social Service	27.9	1.10	1.32	1.76	1.97	3.23
Business Initiatives	24.1	1.07	1.20	1.36	2.32	1.53
Transportation/Machine Operation	20.5	2.32	2.33	1.74	1.33	1.08
Creative Writing	17.8	1.02	1.04	1.12	1.49	1.50
Human Resources	17.0	1.15	1.38	1.67	2.02	1.92
Finance	15.7	1.03	1.20	1.35	2.01	1.44
Physical Science	15.2	1.09	1.23	1.70	1.99	2.14
Mechanics/Electronics	14.4	1.93	2.60	3.09	2.00	1.51
Accounting	14.2	1.20	1.52	1.78	2.20	1.57
Office Work	13.7	1.13	1.83	2.19	2.59	1.89
Law	13.5	1.02	1.19	1.48	1.83	1.69
Media	12.8	1.03	1.10	1.34	1.85	1.59
Marketing/Advertising	12.7	1.15	1.18	1.28	1.86	1.37
Construction/Woodwork	9.5	1.74	1.64	1.46	1.25	1.09
Engineering	9.3	1.55	2.07	2.78	2.49	1.80
Sales	5.5	1.46	1.43	1.41	1.87	1.27
Nature/Outdoors	3.5	1.84	1.22	1.33	1.47	1.31
Protective Service	3.1	1.07	1.39	1.62	1.48	1.27
Religious Activities	2.6	1.00	1.01	1.03	1.07	1.16
Visual Arts	2.3	1.22	1.18	1.42	1.50	1.33
Applied Arts and Design	2.1	1.29	1.26	1.53	1.60	1.38
Music	1.8	1.01	1.05	1.14	1.22	1.09
Performing Arts	1.7	1.04	1.09	1.21	1.31	1.19
Agriculture	1.6	1.61	1.16	1.18	1.24	1.20
Personal Service	0.9	1.67	1.81	2.02	1.82	2.07
Culinary Art	0.7	1.34	1.19	1.14	1.10	1.10
Athletics	0.3	1.09	1.12	1.16	1.20	1.25
Animal Service	0.0	1.04	1.12	1.07	1.08	1.12
Average	19.0	1.3	1.4	1.6	1.8	1.9
<i>n</i>		33	292	205	212	149

Note. *N* = 891 (unit of analysis is occupation). Ratings were made on a 7-point scale ranging from 1 (not at all characteristic) to 7 (extremely characteristic). Basic interests are sorted in descending order of the percentage of their variance across occupations that is due to the job zone.

Table 6.8. Mean Basic Interest Ratings by Job Family

Basic Interest	% Variance Due to Job Family	Job Family																					
		Architecture and Engineering	Arts, Design, Entertainment, Sports, and Media	Building and Grounds Cleaning and Maintenance	Business and Financial Operations	Community and Social Service	Computer and Mathematical	Construction and Extraction	Educational Instruction and Library	Farming, Fishing, and Forestry	Food Preparation and Serving Related	Healthcare Practitioners and Technical	Healthcare Support	Installation, Maintenance, and Repair	Legal	Life, Physical, and Social Science	Management	Office and Administrative Support	Personal Care and Service	Production	Protective Service	Sales and Related	Transportation and Material Moving
Health Care Service	81.7	1.23	1.15	1.29	1.23	3.98	1.55	1.02	1.61	1.23	1.22	6.17	5.54	1.08	1.24	1.95	1.58	1.37	1.67	1.08	1.53	1.11	1.18
Law	77.9	1.41	1.35	1.10	2.56	1.93	1.40	1.07	1.49	1.24	1.03	1.27	1.05	1.03	6.24	1.65	2.18	1.56	1.20	1.02	2.91	1.50	1.22
Teaching/Education	74.6	1.46	1.87	1.37	1.67	3.95	1.66	1.13	6.38	1.26	1.44	3.10	2.57	1.25	1.80	2.30	2.20	1.31	2.29	1.15	1.93	1.67	1.31
Physical/Manual Labor	74.4	1.70	1.81	5.20	1.15	1.07	1.08	6.08	1.26	5.20	3.47	1.82	2.77	4.87	1.01	1.81	1.28	1.51	2.43	4.00	2.63	1.33	3.70
Sales	73.7	1.19	1.81	1.40	2.18	1.41	1.26	1.07	1.16	1.14	2.06	1.22	1.22	1.22	1.35	1.19	2.57	1.66	1.90	1.07	1.16	5.62	1.28
Protective Service	72.8	1.27	1.13	1.30	1.50	1.73	1.42	1.16	1.28	1.41	1.10	1.29	1.25	1.19	1.89	1.49	1.53	1.26	1.42	1.06	5.49	1.10	1.68
Information Technology	71.9	3.22	1.97	1.07	2.16	1.28	5.88	1.09	1.78	1.09	1.04	1.77	1.36	1.79	1.44	2.49	2.05	1.77	1.15	1.36	1.64	1.57	1.33
Office Work	69.6	1.81	1.70	1.40	3.99	2.20	2.44	1.09	1.82	1.20	1.30	1.84	2.29	1.25	3.85	1.85	3.17	5.36	1.69	1.17	1.87	2.90	1.37
Professional Advising	68.1	1.21	1.52	1.20	2.08	5.50	1.33	1.03	4.23	1.07	1.18	2.59	1.77	1.07	2.03	1.77	2.31	1.29	1.85	1.03	1.38	1.87	1.14
Social Service	67.6	1.08	1.37	1.16	1.50	6.54	1.14	1.02	3.99	1.07	1.43	3.48	3.83	1.06	1.97	1.68	1.98	1.39	2.42	1.02	1.74	1.35	1.25
Culinary Art	64.0	1.02	1.19	1.05	1.10	1.06	1.01	1.00	1.19	1.18	3.56	1.12	1.16	1.01	1.00	1.10	1.22	1.03	1.23	1.20	1.01	1.11	1.05
Engineering	63.9	6.00	1.71	1.37	1.32	1.01	2.80	2.62	1.48	1.53	1.06	1.78	1.29	4.12	1.03	2.64	1.58	1.14	1.14	2.85	1.43	1.33	2.22
Business Initiatives	63.6	1.40	1.73	1.33	2.87	1.48	1.79	1.05	1.26	1.21	1.42	1.20	1.03	1.07	1.62	1.38	4.17	1.37	1.41	1.05	1.35	3.19	1.20
Agriculture	60.7	1.23	1.03	2.53	1.16	1.00	1.03	1.05	1.17	4.33	1.09	1.05	1.02	1.11	1.00	2.02	1.21	1.02	1.06	1.08	1.11	1.04	1.07
Public Speaking	59.8	1.71	2.74	1.38	2.51	3.44	1.85	1.08	4.56	1.24	1.44	2.04	1.40	1.16	3.28	2.52	3.48	1.42	2.11	1.06	2.27	3.07	1.41
Mechanics/Electronics	58.5	4.28	1.87	1.63	1.28	1.01	2.18	2.95	1.33	2.14	1.16	1.82	1.63	6.03	1.02	2.12	1.45	1.29	1.35	3.23	1.65	1.35	3.01
Mathematics/Statistics	58.0	3.91	1.35	1.26	2.66	1.50	4.04	1.41	2.39	1.40	1.14	2.31	1.26	1.57	1.56	3.88	2.13	1.50	1.13	1.58	1.47	1.55	1.44
Transportation/Machine Operation	57.9	1.71	1.17	2.81	1.22	1.05	1.02	2.87	1.09	3.49	1.10	1.15	1.31	2.19	1.00	1.48	1.27	1.41	1.36	1.78	2.29	1.18	4.70
Media	57.1	1.20	4.35	1.02	1.41	1.57	1.48	1.01	1.88	1.01	1.07	1.15	1.07	1.06	1.26	1.51	1.65	1.21	1.43	1.04	1.20	1.48	1.05
Personal Service	56.7	1.17	1.89	1.63	1.78	3.58	1.30	1.11	2.24	1.14	3.42	2.48	3.16	1.33	1.74	1.38	2.31	2.17	4.45	1.13	1.66	2.70	1.79
Management/Administration	56.7	2.25	2.61	2.44	3.69	2.86	2.66	1.36	2.40	1.83	2.28	2.04	1.43	1.39	3.42	2.18	6.27	2.15	2.44	1.32	2.75	2.75	2.02
Social Science	55.0	1.29	1.50	1.06	1.79	4.54	1.54	1.01	3.71	1.10	1.07	2.34	1.87	1.01	2.44	2.73	1.93	1.22	1.44	1.01	1.77	1.30	1.08
Medical Science	53.5	1.52	1.10	1.14	1.18	1.96	1.64	1.01	1.61	1.26	1.03	4.45	2.42	1.04	1.17	2.82	1.42	1.08	1.19	1.07	1.23	1.08	1.04

Table 6.8. (Continued)

Basic Interest	% Variance Due to Job Family	Job Family																					
		Architecture and Engineering	Arts, Design, Entertainment, Sports, and Recreation	Building and Grounds Cleaning and Maintenance	Business and Financial Operations	Community and Social Service	Computer and Mathematical	Construction and Extraction	Educational Instruction and Library	Farming, Fishing, and Forestry	Food Preparation and Serving Related	Healthcare Practitioners and Technical	Healthcare Support	Installation, Maintenance, and Repair	Legal	Life, Physical, and Social Science	Management	Office and Administrative Support	Personal Care and Service	Production	Protective Service	Sales and Related	Transportation and Material Moving
Accounting	52.0	1.65	1.30	1.40	3.52	1.44	2.03	1.17	1.41	1.42	1.65	1.45	1.50	1.28	2.07	1.53	3.08	2.98	1.58	1.27	1.53	2.32	1.39
Nature/Outdoors	51.3	1.61	1.16	3.18	1.09	1.06	1.04	1.30	1.31	4.18	1.01	1.07	1.03	1.28	1.02	2.58	1.25	1.02	1.26	1.02	1.80	1.03	1.34
Finance	49.5	1.31	1.24	1.15	3.39	1.26	1.79	1.03	1.23	1.12	1.23	1.15	1.05	1.04	1.93	1.25	2.86	2.06	1.24	1.03	1.23	2.30	1.12
Marketing/Advertising	47.1	1.16	2.76	1.12	1.85	1.65	1.34	1.01	1.37	1.05	1.35	1.16	1.07	1.04	1.24	1.26	2.40	1.27	1.55	1.05	1.12	3.06	1.07
Physical Science	46.6	3.64	1.17	1.24	1.14	1.05	1.58	1.23	1.81	1.30	1.06	2.03	1.22	1.42	1.03	3.62	1.31	1.03	1.06	1.46	1.26	1.11	1.21
Life Science	43.8	1.67	1.10	1.44	1.14	1.59	1.52	1.02	1.89	1.96	1.03	3.75	1.97	1.02	1.09	3.56	1.43	1.05	1.20	1.08	1.29	1.07	1.03
Humanities	43.0	1.13	2.17	1.00	1.24	2.34	1.23	1.00	3.19	1.02	1.07	1.32	1.18	1.01	2.03	1.75	1.35	1.14	1.44	1.03	1.20	1.13	1.02
Performing Arts	41.4	1.02	2.98	1.00	1.11	1.20	1.07	1.01	1.41	1.00	1.08	1.08	1.04	1.03	1.08	1.06	1.11	1.01	1.59	1.04	1.02	1.18	1.00
Applied Arts and Design	40.2	1.50	3.97	1.15	1.16	1.22	1.46	1.26	1.66	1.01	1.41	1.17	1.08	1.11	1.05	1.19	1.26	1.10	1.78	1.57	1.02	1.37	1.01
Human Resources	39.1	1.33	1.59	1.73	2.25	2.34	1.50	1.12	2.13	1.34	1.65	1.72	1.56	1.21	2.07	1.50	3.41	1.89	1.90	1.11	1.93	1.83	1.44
Politics	36.7	1.27	1.51	1.04	1.57	1.73	1.21	1.02	1.62	1.11	1.02	1.15	1.01	1.00	2.24	1.68	2.00	1.14	1.06	1.01	1.43	1.25	1.07
Visual Arts	33.7	1.39	3.35	1.06	1.16	1.17	1.42	1.18	1.57	1.01	1.21	1.14	1.06	1.07	1.03	1.24	1.18	1.08	1.52	1.44	1.05	1.29	1.01
Religious Activities	32.3	1.00	1.11	1.00	1.02	2.13	1.00	1.00	1.19	1.00	1.00	1.04	1.03	1.00	1.06	1.03	1.08	1.01	1.15	1.00	1.01	1.00	1.00
Creative Writing	31.7	1.15	2.27	1.02	1.21	1.47	1.35	1.00	1.91	1.01	1.08	1.13	1.07	1.01	1.33	1.34	1.33	1.10	1.17	1.03	1.09	1.20	1.02
Construction/Woodwork	29.6	1.73	1.30	1.46	1.14	1.00	1.02	2.69	1.13	1.65	1.01	1.04	1.06	1.99	1.00	1.19	1.27	1.03	1.05	1.96	1.14	1.12	1.26
Music	27.4	1.01	2.29	1.00	1.06	1.12	1.04	1.00	1.29	1.00	1.02	1.09	1.04	1.10	1.00	1.02	1.06	1.00	1.26	1.00	1.00	1.03	1.00
Animal Service	11.1	1.03	1.02	1.06	1.03	1.02	1.00	1.00	1.10	2.05	1.00	1.15	1.36	1.01	1.02	1.28	1.08	1.01	1.43	1.00	1.33	1.02	1.01
Athletics	10.8	1.02	1.80	1.10	1.05	1.17	1.01	1.04	1.26	1.10	1.03	1.38	1.34	1.04	1.00	1.04	1.28	1.01	1.62	1.01	1.39	1.06	1.06
Average	52.8	1.7	1.8	1.5	1.7	2.0	1.6	1.4	1.9	1.6	1.4	1.8	1.6	1.5	1.7	1.8	2.0	1.4	1.6	1.3	1.6	1.7	1.4
<i>n</i>		53	40	8	45	14	36	57	62	12	16	89	19	49	7	56	45	51	31	104	26	21	50

Note. *N* = 891 (unit of analysis is occupation). Ratings were made on a 7-point scale ranging from 1 (not at all characteristics) to 7 (extremely characteristic). Basic interests are sorted in descending order of the percentage of their variance across occupations that is due to the job family.

Basic Interest Intercorrelations

Next, we examined correlations among basic interests to evaluate whether they were empirically distinct based on LLM ratings (i.e., they did not exhibit perfect or near perfect correlations). As presented in Table 6.9, only two pairs of basic interests showed correlations of .90 or higher: Visual Arts and Applied Arts and Design ($r = .97$) and Medical Science and Life Science ($r = .90$), which would be suggestive of empirical redundancy among the pairs considered. In addition, the correlation matrix reveals another pair of basic interests that exhibited very high correlations of .87 or above in magnitude: Finance and Accounting ($r = .88$). The strong correlation was not surprising, as the pair corresponds to the same associated RIASEC dimension and shares directly linked O*NET knowledge. Among all 1,681 pairs of basic interests, 802 pairs (47.7%) had correlations below .70, with an overall mean correlation of .05 ($SD = .25$), ranging from -.54 (Physical/Manual Labor, Public Speaking) to .97 (Visual Arts, Applied Arts and Design).

In summary, while the findings may suggest some extent of empirical redundancy among the pairs considered, the overall pattern of basic interest intercorrelations aligned with theoretical expectations based on RIASEC linkages and associated O*NET knowledge areas.

Table 6.9. Basic Interest Rating Intercorrelations

Group	Basic Interest	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
1	Realistic	Mechanics/Electronics	1.00																				
2	Realistic	Construction/Woodwork	.24	1.00																			
3	Realistic	Transportation/Machine Operation	.34	.15	1.00																		
4	Realistic	Physical/Manual Labor	.40	.50	.52	1.00																	
5	Realistic	Protective Service	-.09	-.10	.11	-.09	1.00																
6	Realistic	Agriculture	.00	.03	.18	.13	-.01	1.00															
7	Realistic	Nature/Outdoors	.02	.08	.27	.17	.12	.72	1.00														
8	Realistic	Engineering	.81	.26	.17	.17	-.09	.01	.08	1.00													
9	Investigative	Physical Science	.26	-.06	-.08	-.17	-.02	.16	.24	.57	1.00												
10	Investigative	Life Science	-.13	-.18	-.18	-.22	-.03	.30	.25	-.03	.47	1.00											
11	Investigative	Medical Science	-.15	-.21	-.23	-.26	-.04	.03	-.02	-.07	.35	.90	1.00										
12	Artistic	Visual Arts	-.14	.13	-.18	-.10	-.13	-.06	-.01	-.06	-.07	-.11	-.12	1.00									
13	Artistic	Applied Arts and Design	-.15	.15	-.19	-.10	-.16	-.07	-.04	-.07	-.10	-.14	-.15	.97	1.00								
14	Artistic	Performing Arts	-.15	-.07	-.15	-.15	-.09	-.07	-.05	-.16	-.12	-.10	-.09	.50	.59	1.00							
15	Artistic	Music	-.08	-.06	-.12	-.12	-.08	-.06	-.06	-.12	-.11	-.09	-.07	.27	.38	.82	1.00						
16	Artistic	Creative Writing	-.26	-.15	-.23	-.32	-.07	-.06	-.02	-.19	-.05	-.02	-.04	.39	.42	.43	.35	1.00					
17	Artistic	Media	-.18	-.15	-.21	-.29	-.08	-.06	-.01	-.16	-.07	-.06	-.08	.58	.60	.68	.51	.72	1.00				
18	Social	Teaching/Education	-.34	-.24	-.30	-.40	.02	-.03	.01	-.27	.06	.29	.30	.05	.04	.16	.16	.37	.18	1.00			
19	Social	Social Service	-.37	-.25	-.25	-.33	.06	-.10	-.10	-.36	-.12	.23	.35	-.03	-.03	.07	.11	.19	.05	.75	1.00		
20	Social	Personal Service	-.42	-.28	-.22	-.30	.00	-.13	-.11	-.44	-.25	.00	.08	.02	.05	.13	.13	.08	.05	.36	.54	1.00	
21	Enterprising	Business Initiatives	-.27	-.14	-.20	-.38	-.02	.00	-.04	-.19	-.12	-.11	-.12	.03	.04	.05	.03	.15	.23	-.01	-.04	.13	1.00
22	Enterprising	Sales	-.26	-.14	-.16	-.26	-.10	-.03	-.07	-.25	-.19	-.15	-.16	.06	.08	.07	.04	.11	.16	-.05	-.05	.36	.67
23	Enterprising	Management/Administration	-.31	-.19	-.20	-.48	.17	.03	.03	-.19	-.07	-.02	-.04	.00	.01	.06	.04	.17	.21	.17	.11	.21	.79
24	Enterprising	Public Speaking	-.41	-.26	-.31	-.54	.10	-.02	.04	-.29	.04	.15	.11	.09	.11	.26	.22	.52	.43	.73	.45	.29	.44
25	Enterprising	Politics	-.30	-.16	-.20	-.39	.16	.05	.11	-.19	.01	.05	.00	.03	.02	.07	.02	.40	.35	.29	.18	.02	.42
26	Enterprising	Law	-.29	-.16	-.15	-.36	.50	-.02	.02	-.21	-.07	-.04	-.04	-.11	-.13	-.06	-.07	.07	.03	.06	.08	.00	.29
27	Conventional	Information Technology	.16	-.17	-.22	-.42	.02	-.04	-.02	.39	.32	.08	.08	.05	.02	-.06	-.05	.07	.12	-.05	-.17	-.23	.15
28	Conventional	Accounting	-.29	-.19	-.23	-.42	.00	-.03	-.09	-.22	-.12	-.12	-.12	-.14	-.15	-.11	-.10	-.06	-.06	-.11	-.11	.08	.56
29	Conventional	Office Work	-.36	-.27	-.31	-.52	.00	-.10	-.14	-.31	-.15	-.09	-.07	-.12	-.14	-.10	-.08	.01	.00	-.05	.00	.16	.36
30	Compound	Animal Service	-.07	-.04	.03	.06	.06	.42	.30	-.08	.03	.28	.14	-.05	-.05	-.02	-.03	-.02	-.02	.05	.00	.01	-.03
31	Compound	Athletics	-.14	-.10	-.06	-.03	.07	-.04	.05	-.15	-.09	.05	.08	.02	.03	.22	.19	.05	.12	.26	.24	.24	.02
32	Compound	Social Science	-.39	-.25	-.30	-.44	.09	-.06	-.03	-.32	-.03	.23	.30	.01	.00	.07	.05	.38	.20	.71	.68	.23	.09
33	Compound	Humanities	-.30	-.16	-.24	-.34	-.03	-.06	-.01	-.26	-.07	.01	.00	.27	.28	.36	.28	.68	.46	.60	.37	.16	.03
34	Compound	Mathematics/Statistics	.07	-.13	-.22	-.41	-.07	.07	.11	.41	.65	.38	.32	-.08	-.12	-.15	-.13	.01	-.04	.12	-.08	-.28	.13
35	Compound	Culinary Art	-.16	-.09	-.10	.01	-.08	.06	-.03	-.16	-.07	-.02	-.05	-.09	.13	.06	.03	.03	.01	.05	.04	.25	.05
36	Compound	Health Care Service	-.21	-.23	-.23	-.22	-.01	-.09	-.12	-.20	.09	.63	.83	-.13	-.14	-.08	-.04	-.06	-.11	.34	.59	.31	-.13
37	Compound	Religious Activities	-.12	-.07	-.08	-.11	-.02	-.04	-.04	-.12	-.07	-.03	-.02	.02	.05	.11	.11	.21	.12	.23	.26	.20	.05
38	Compound	Professional Advising	-.39	-.25	-.31	-.44	-.01	-.06	-.06	-.33	-.05	.21	.25	.01	.00	.11	.11	.30	.16	.85	.81	.44	.17
39	Compound	Marketing/Advertising	-.29	-.15	-.23	-.32	-.11	-.05	-.05	-.25	-.16	-.11	-.12	.40	.43	.31	.21	.47	.60	.06	.02	.24	.66
40	Compound	Finance	-.29	-.16	-.21	-.38	-.03	-.04	-.08	-.22	-.14	-.13	-.14	-.08	-.09	-.06	.00	.02	.02	-.06	-.08	.06	.66
41	Compound	Human Resources	-.36	-.23	-.23	-.44	.13	-.02	-.06	-.32	-.15	.00	.02	-.08	-.07	.02	.01	.12	.10	.37	.33	.35	.54

Note. N = 891 (unit of analysis is occupation). Correlations that are bolded are statically significant (p < .05, two-tailed). Basic interests are grouped by associated RIASEC dimension, following the order of Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. Basic interests that have connections to multiple dimensions are at the end.

Table 6.9. (Continued)

	Group	Basic Interest	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
1	Realistic	Mechanics/Electronics																				
2	Realistic	Construction/Woodwork																				
3	Realistic	Transportation/Machine Operation																				
4	Realistic	Physical/Manual Labor																				
5	Realistic	Protective Service																				
6	Realistic	Agriculture																				
7	Realistic	Nature/Outdoors																				
8	Realistic	Engineering																				
9	Investigative	Physical Science																				
10	Investigative	Life Science																				
11	Investigative	Medical Science																				
12	Artistic	Visual Arts																				
13	Artistic	Applied Arts and Design																				
14	Artistic	Performing Arts																				
15	Artistic	Music																				
16	Artistic	Creative Writing																				
17	Artistic	Media																				
18	Social	Teaching/Education																				
19	Social	Social Service																				
20	Social	Personal Service																				
21	Enterprising	Business Initiatives																				
22	Enterprising	Sales	1.00																			
23	Enterprising	Management/Administration	.40	1.00																		
24	Enterprising	Public Speaking	.31	.51	1.00																	
25	Enterprising	Politics	.14	.48	.65	1.00																
26	Enterprising	Law	.10	.41	.36	.60	1.00															
27	Conventional	Information Technology	-.06	.15	.04	.07	.04	1.00														
28	Conventional	Accounting	.37	.51	.14	.22	.36	.15	1.00													
29	Conventional	Office Work	.29	.39	.12	.19	.39	.17	.72	1.00												
30	Compound	Animal Service	-.03	-.01	.02	.01	.00	-.07	-.03	-.05	1.00											
31	Compound	Athletics	.03	.08	.19	.01	-.04	-.12	-.09	-.09	.02	1.00										
32	Compound	Social Science	-.04	.20	.65	.54	.29	.00	-.02	.05	.00	.09	1.00									
33	Compound	Humanities	-.02	.12	.62	.46	.17	-.03	-.10	.00	-.03	.03	.68	1.00								
34	Compound	Mathematics/Statistics	-.10	.12	.19	.18	.06	.64	.21	.07	-.01	-.12	.20	.01	1.00							
35	Compound	Culinary Art	.11	.09	.02	-.04	-.10	-.14	.01	-.09	.00	.02	-.03	.01	-.13	1.00						
36	Compound	Health Care Service	-.13	-.05	.07	-.05	-.06	-.06	-.12	-.03	.09	.17	.35	.00	.06	-.03	1.00					
37	Compound	Religious Activities	.04	.13	.29	.17	.05	-.07	-.02	.00	-.02	.01	.23	.37	-.07	-.01	.02	1.00				
38	Compound	Professional Advising	.11	.30	.71	.35	.19	-.08	.03	.08	.00	.22	.75	.51	.06	.02	.36	.28	1.00			
39	Compound	Marketing/Advertising	.69	.44	.46	.34	.08	.03	.20	.16	-.02	.11	.12	.21	-.06	.09	-.11	.12	.17	1.00		
40	Compound	Finance	.46	.51	.24	.30	.38	.14	.88	.57	-.04	-.07	.05	-.04	.24	-.01	-.14	.01	.10	.29	1.00	
41	Compound	Human Resources	.27	.78	.52	.35	.35	-.01	.39	.40	.00	.15	.33	.16	-.02	.07	.09	.13	.51	.28	.34	1.00

Note. N = 891 (unit of analysis is occupation). Correlations that are bolded are statically significant (p < .05, two-tailed). Basic interests are grouped by associated RIASEC dimension, following the order of Realistic, Investigative, Artistic, Social, Enterprising, and Conventional. Basic interests that have connections to multiple dimensions are at the end.

Higher-Order Basic Interests Structure

As noted in the introduction to this report, the basic interests in the O*NET Content Model were developed on the basis of CABIN (Su et al., 2019), with each basic interest linked to one or more RIASEC dimensions. To facilitate the interpretation of basic interests and understand the general pattern, we examined the higher-order structure of the basic interest ratings using the complete set of active, data-level occupations as the basis for analysis.

We conducted a Principal Components Analysis (PCA) on the data with oblique (promax) rotation. To determine the optimal number of components, we used parallel analysis to estimate the critical eigenvalue (Horn, 1965). The parallel analysis indicated an eight-component solution, which aligned with the eight-dimensional SETPOINT model (Su et al., 2019). However, we also compared six-, seven-, and nine-component solutions to evaluate whether they offered a more interpretable solution. This comparison revealed that the nine-component solution provided the clearest and most interpretable structure.

The resulting nine-component solution accounted for 71.7% of the variance in the basic interest ratings, with 13.6% accounted by the first factor, 9.6% by the second, 8.8% by the third, 9.0% by the fourth, 8.0% by the fifth, 8.0% by the sixth, 5.5% by the seventh, 4.8% by the eighth, and 4.5% by the ninth. Table 6.10 provides the pattern matrix from the nine-component PCA solution.

Table 6.10. Basic Interest Ratings Principal Component Analysis Pattern Matrix

Basic Interest	Component								
	1	2	3	4	5	6	7	8	9
Teaching/Education	.94	-.11	.16	-.06	.05	.10	.02	-.11	.08
Social Science	.92	-.03	.04	-.12	-.01	.11	-.05	.11	-.18
Professional Advising	.91	-.18	.10	.12	-.03	.09	-.05	-.10	.00
Humanities	.88	.26	-.01	-.26	-.03	-.26	.05	-.04	-.03
Public Speaking	.76	.08	.09	.35	.13	-.06	.08	.08	.05
Social Service	.75	-.18	.14	-.08	-.20	.27	-.14	-.04	.06
Religious Activities	.61	-.12	.00	-.06	-.03	-.31	.04	-.22	-.01
Politics	.48	.14	.00	.24	.06	-.10	.10	.41	-.21
Applied Arts and Design	-.15	.95	.18	.08	-.11	.10	-.09	-.06	.05
Visual Arts	-.14	.94	.18	.08	-.10	.14	-.09	-.03	-.04
Media	.07	.77	.06	.12	.07	-.06	.02	.07	.32
Creative Writing	.48	.55	.03	-.02	.05	-.15	.04	-.02	.07
Office Work	-.17	-.15	-.92	-.02	-.10	-.10	-.06	.05	.00
Accounting	-.22	-.21	-.85	.24	.01	-.16	.03	-.04	-.05
Finance	-.13	-.14	-.70	.36	.04	-.19	.03	-.04	-.10
Physical/Manual Labor	-.22	-.11	.52	-.11	-.31	-.21	.14	-.06	-.16
Construction/Woodwork	-.08	.14	.47	.10	-.09	-.12	-.05	-.01	-.41
Transportation/Machine Operation	-.14	-.27	.37	-.01	-.12	-.31	.25	.13	.06
Business Initiatives	-.07	.05	-.15	.88	.11	-.07	.02	.01	-.07
Sales	-.14	.09	-.12	.78	-.11	-.04	.01	-.23	-.05

Table 6.10. (Continued)

Basic Interest	Component								
	1	2	3	4	5	6	7	8	9
Marketing/Advertising	-.04	.53	.10	.74	-.04	.04	-.01	-.09	.00
Management/Administration	.07	-.05	-.12	.72	.10	-.04	.04	.22	.06
Human Resources	.29	-.21	-.10	.52	-.07	-.01	-.03	.16	.09
Mathematics/Statistics	.13	-.08	-.22	.04	.83	.21	.06	-.12	-.10
Engineering	-.09	-.13	.39	.08	.80	-.14	-.10	-.12	.01
Physical Science	.04	-.04	.16	.03	.77	.31	.15	-.09	-.01
Information Technology	-.11	.07	-.28	.01	.73	.05	-.12	.00	.08
Mechanics/Electronics	-.13	-.21	.44	.01	.53	-.26	-.11	-.11	.08
Personal Service	.25	-.12	-.08	.21	-.38	.13	-.08	-.22	.23
Medical Science	.01	.05	.09	-.06	.18	.96	-.01	.03	-.07
Life Science	.01	.06	.08	-.03	.24	.87	.31	-.01	-.07
Health Care Service	.08	-.04	.10	-.07	-.08	.86	-.16	.03	.00
Agriculture	-.02	-.09	-.03	.03	.00	.01	.91	-.12	.01
Nature/Outdoors	.02	-.05	.15	.06	.06	-.02	.83	.06	.05
Animal Service	-.10	.00	-.10	-.08	-.14	.20	.62	-.01	.07
Protective Service	-.17	-.06	.15	-.04	-.18	.10	-.05	.90	.16
Law	.05	-.02	-.25	.04	-.14	-.03	-.05	.76	-.11
Culinary Art	.01	.06	-.01	.17	-.21	.04	.10	-.31	-.03
Music	-.03	.40	-.09	-.16	.02	-.20	.06	-.03	.78
Performing Arts	-.07	.63	-.03	-.10	-.04	-.13	.05	.01	.69
Athletics	-.03	-.01	.30	.23	-.08	.16	-.02	.16	.54

Note: N = 891 (unit of analysis is occupation).

As shown in Table 6.10, nine potential components emerged from the analysis that we can interpret as follows:

- Component 1: Social, Education, and Helping
- Component 2: Visual Arts
- Component 3: Office vs. Non-Office Work
- Component 4: Business and Enterprise
- Component 5: Science, Technology, Engineering, and Mathematics (STEM)
- Component 6: Health Science and Services
- Component 7: Nature
- Component 8: Law and Protection
- Component 9: Performative Work – Arts/Athletics

Note that these components differ somewhat from the eight interest dimensions identified in the SETPOINT model (Su et al., 2019) but also exhibit clear overlap. Table 6.11 provides a

side-by-side comparison of the empirical higher-order structure derived from the PCA results and the SETPOINT framework. One potential reason for the observed differences is that CABIN conceptualizes vocational interests as “trait-like preferences,” and the SETPOINT model was therefore developed based on factor analytic work in which *individuals*, rather than *occupations*, were the unit of analysis. In contrast, the present project treats basic interests as characteristics of “work environment types,” with occupations as the analytic units. In addition, prior research indicates that some basic interests may load onto multiple broad-band interest dimensions, reflecting their multifaceted nature. For example, in the PCA pattern matrix, Creative Writing, Mechanics/Electronics, Personal Service, and Athletics show substantial secondary or cross-loadings, suggesting that these interests are compound rather than unidimensional. Therefore, there is little reason to expect that a simple, unidimensional structure would fully capture the complexity inherent in basic interests. The purpose of conducting PCA here was to help understand the general pattern of basic interest ratings produced in this report, rather than to provide a definitive higher-order factor structure for the basic interest domain.

Table 6.11. Comparison of PCA-Based Higher-Order Basic Interest Dimensions and the SETPOINT Model

Basic Interest	Component	SETPOINT	RIASEC
Teaching/Education	1	People	Social
Social Science	1	People	Investigative, Social
Professional Advising	1	Influence	Social, Enterprising
Humanities	1	People	Investigative, Artistic
Public Speaking	1	Influence	Enterprising
Social Service	1	People	Social
Religious Activities	1	People	Social, Enterprising
Politics	1	Influence	Enterprising
Applied Arts and Design	2	Creative Expression	Artistic
Visual Arts	2	Creative Expression	Artistic
Media	2	Creative Expression	Artistic
Creative Writing	2	Creative Expression	Artistic
Office Work	3	Organization	Conventional
Accounting	3	Organization	Conventional
Finance	3	Organization	Enterprising, Conventional
Physical/Manual Labor	3	Things	Realistic
Construction/Woodwork	3	Things	Realistic
Transportation/Machine Operation	3	Things	Realistic
Business Initiatives	4	Influence	Enterprising
Sales	4	Influence	Enterprising
Marketing/Advertising	4	Influence	Artistic, Enterprising
Management/Administration	4	Influence	Enterprising

Table 6.11. (Continued)

Basic Interest	Component	SETPOINT	RIASEC
Human Resources	4	Organization	Social, Conventional
Mathematics/Statistics	5	Technology	Investigative, Conventional
Engineering	5	Technology	Realistic
Physical Science	5	Technology	Investigative
Information Technology	5	Technology	Conventional
Mechanics/Electronics	5	Things	Realistic
Personal Service	5	Organization	Social
Medical Science	6	Health Science	Investigative
Life Science	6	Health Science	Investigative
Health Care Service	6	Health Science	Investigative, Social
Agriculture	7	Nature	Realistic
Nature/Outdoors	7	Nature	Realistic
Animal Service	7	Nature	Realistic, Social
Protective Service	8	Things	Realistic
Law	8	Influence	Enterprising
Culinary Art	8	Creative Expression	Artistic, Social
Music	9	Creative Expression	Artistic
Performing Arts	9	Creative Expression	Artistic
Athletics	9	Things	Realistic, Enterprising

Step 7: Identifying Basic Interest Summary Display Rules

In this step, our focus shifted towards identifying a reduced set of exemplar basic interests to highlight for occupations within the O*NET system. Because there are 41 basic interests and only a few typically reach a characteristic rating of 4 (*Moderately Characteristic*) or higher for any given occupation, our objective here would be to develop rules for highlighting a reduced set of basic interests to identify for each occupation (akin to what is done with “high points” for general interests/RIASEC dimensions within O*NET).

To facilitate the creation of display rules, we first examined the number of occupations with multiple basic interests meeting various thresholds on the 1-7 basic interest rating scale. This analysis helped us understand how the number of basic interests we choose to highlight or display for an occupation varies with the rating threshold that triggers their display. As shown in Table 7.1, only 249 occupations have at least three basic interests rated greater than or equal to 4.5, and only 140 occupations have at least three basic interests rated greater than or equal to 5. Thus, most occupations lack even three basic interests that meet a reasonable characteristic threshold to be highlighted as exemplars of the occupation.

Table 7.1. Number of Occupations by Count of Basic Interests Meeting or Exceeding Rating Thresholds (Y) on 1-7 Scale

# of Basic Interests	Not at all Characteristic			Moderately Characteristic			Extremely Characteristic	
	Y >= 1	Y >= 2	Y >= 3	Y >= 4	Y >= 4.5	Y >= 5	Y >= 6	Y >= 7
0	0	0	6	60	92	151	329	868
1	0	9	96	214	291	347	415	23
2	0	34	155	248	259	253	133	0
3	0	68	187	184	147	92	13	0
4	0	113	146	95	64	39	1	0
5	0	110	111	63	33	8	0	0
6	0	71	81	18	3	1	0	0
7	0	67	52	7	1	0	0	0
8	0	66	36	2	1	0	0	0
9	0	64	14	0	0	0	0	0
10	0	68	5	0	0	0	0	0
11	0	68	2	0	0	0	0	0
12	0	46	0	0	0	0	0	0
13	0	42	0	0	0	0	0	0
14	0	30	0	0	0	0	0	0
15	0	9	0	0	0	0	0	0
16	0	9	0	0	0	0	0	0
17	0	7	0	0	0	0	0	0
18	0	7	0	0	0	0	0	0
19	0	2	0	0	0	0	0	0
20	0	1	0	0	0	0	0	0
41	891	0	0	0	0	0	0	0

Note. N = 891 (unit of analysis is occupation). Ratings were made on a 7-point scale ranging from 1 (not at all characteristic) to 7 (extremely characteristic).

Given the observations above, as well as the Center’s aim of highlighting at least a few basic interests for each occupation, we focused subsequent development on more inclusive display rules than simply relying on a fixed rating threshold. These summary display rules are intended for use in [O*NET OnLine](#) (e.g., occupation summary report, occupation details report, and custom report) and ensure that all occupations, including those with lower or more varied basic interest ratings, have indicators of their most characteristic basic interests. This approach minimizes user confusion that may arise from missing or sparsely displayed interests, accommodates potential methodological errors (e.g., erroneously failing to identify characteristic basic interests), and maintains flexibility for application developers and researchers, who may apply their own criteria using the full set of published basic interest ratings.

To address the need above, we developed a four-rule procedure for displaying basic interests for each occupation. The rules are as follows:

- **Rule 1:** Include all basic interests with ratings of 4.0 (*Moderately Characteristic*) or higher on the 1-7 characteristic rating scale.
- **Rule 2:** Display at least two basic interests for each occupation. If fewer than three meet the threshold in Rule 1 (rating ≥ 4.0), backfill with the highest-rated basic interests until three are shown. However, the third basic interest may only be displayed if its rating is 3.0 or higher.
- **Rule 3:** There is no upper limit on the number of basic interests displayed.
- **Rule 4:** When multiple interests share the same rating, order them alphabetically.

These rules were applied to the 891 active, data-level occupations and their basic interest ratings. Table 7.2 provides examples of basic interests that meet these display rules for three occupations. For instance, *Chief Executives* have five basic interests, each with a rating of 4.0 or higher; therefore, all five are displayed according to Rule 1. In contrast, *Civil Engineers* have only two interests rated 4.0 or above, but their third-highest-rated interest exceeds 3.0. Under Rule 2, three interests may be displayed. Finally, for *Phlebotomists*, the highest-rated interest, Health Care Service, exceeds 4.0 (Rule 1), and the second highest, Medical Science, exceeds 3.0 (Rule 2), so both are displayed. However, because the third-highest-rated interest falls below 3.0, no additional interest is shown.

Table 7.2. Examples of Displayed Basic Interests for Three Occupations

O*NET-SOC Code	Title	Basic Interest	Rating	Summary Display Rank
11-1011.00	Chief Executives	Management/Administration	6.86	1
11-1011.00	Chief Executives	Business Initiatives	6.82	2
11-1011.00	Chief Executives	Finance	5.51	3
11-1011.00	Chief Executives	Public Speaking	5.14	4
11-1011.00	Chief Executives	Accounting	4.02	5
17-2051.00	Civil Engineers	Engineering	6.82	1
17-2051.00	Civil Engineers	Mathematics/Statistics	4.45	2
17-2051.00	Civil Engineers	Construction/Woodwork	3.67	3
31-9097.00	Phlebotomists	Health Care Service	5.73	1
31-9097.00	Phlebotomists	Medical Science	3.28	2

After applying these rules to basic interest ratings for all data-level occupations, we further examined the count of occupations by number of displayed basic interests. As shown in Table 7.3, only 28.8% of occupations have fewer than three basic interests meeting the display rules, 50.4% of occupations have three displayed basic interests, and 20.8% of occupations have at least four displayed basic interests by the summary display rules. Importantly, all occupations have at least two basic interests displayed. At the extreme end, two occupations (*Directors, Religious Activities and Education* and *Art, Drama, and Music Teachers, Postsecondary*) have eight basic interests displayed because all these eight basic interests have characteristic ratings greater than or equal to 4.0.

Table 7.3. Count of Occupations that have X Basic Interests Displayed Under the Summary Display Rules

X	n	%
8	2	0.2
7	7	0.8
6	18	2.0
5	63	7.1
4	95	10.7
3	449	50.4
2	257	28.8
1	0	0.0
0	0	0.0

Note. % is out of 891 occupations.

Step 8: Finalizing Basic Interest Ratings for the O*NET 30.3 Database

The basic interest ratings produced as part of Step 6 for all 891 active, data-level occupations in O*NET 30.0 could be considered as draft final ratings for the O*NET 30.3 database. To finalize those ratings for inclusion in O*NET 30.3, we constructed a file comprising occupational data from O*NET 30.0, draft final LLM ratings for basic interest-occupation combinations, and a set of diagnostic flags to highlight draft final LLM ratings for basic interest-occupation combinations that require closer inspection. The purpose of constructing this file was to facilitate a final review of the draft final basic interest ratings by our primary expert consultant on this work, Dr. James Rounds.

In terms of occupational data from O*NET 30.0, the following data were provided in the final review files:

- Occupation O*NET-SOC code
- Occupation title
- Occupation description
- Occupation task statements (core when available, otherwise all)
- Occupation sample of reported job titles
- Occupation knowledge statements (importance ratings of 3 or higher when available, otherwise no example provided)
- OIP scores and high-point codes

In addition to the information above from O*NET 30.0, the following data were included in the final review file:

- Draft final basic interest-occupation ratings (based on using O*NET 30.0 occupation data as input).
- Expert basic interest ratings for a subset of 25 occupations per basic interest from Step 3.
- A set of diagnostic flags indicating basic interest-occupation combinations flagged for closer review (detailed below).
- Within-LLM z-scores for each LLM composite rating (i.e., z-score for the composite of two Claude-based ratings and one Llama-based rating). In this case, z-scores were calculated across the 891 data-level occupations in 30.0.
- Z-scores of O*NET 30.0 basic interest ratings for those basic interests that have directly linked RIASEC dimensions and knowledge statements.

We provided Dr. Rounds with the review file above, which contained draft final ratings for all 41 basic interests across the 891 occupations listed above (36,531 ratings in total). Of these 36,531 ratings, we flagged 315 (0.86%) for closer review based on five sets of flagging rules described below:

- First, among 1,025 basic interest-occupation combinations where we had both draft final LLM and expert ratings, we flagged basic interest-occupation combinations where the draft final LLM differed from the expert ratings by one or more points on the 7-point (1 to 7) rating scale. We flagged 135 of 36,531 basic interest-occupation combinations (0.37%, 13.17% of combinations for which we had both sources of ratings) for this reason.
- Second, we flagged basic interest-occupation combinations that had highly different ratings among the three average LLM ratings that comprised the draft final rating. Specifically, we flagged a basic interest-occupation combination if the z-scores for the LLM composites that comprised the basic interest-occupation combinations had a range of 2.0 or greater (regardless of the sign of those z-scores). We flagged 155 of 36,531 (0.42%) of basic interest-occupation combinations for this reason.
- Lastly, we flagged basic interest-occupation combinations for which the draft final LLM ratings were inconsistent with what would be expected given the occupation's standing on the O*NET knowledge and RIASEC dimension associated with that basic interest. For basic interests linked to specific O*NET knowledge(s), we flagged basic interest-occupation combinations where the draft final LLM rating had a z-score greater than +1.0 (or less than -1.0) while the corresponding knowledge importance rating had a z-score less than -1.0 (or greater than +1.0). A total of 6 out of 36,531 combinations (0.02%) were flagged for this reason. We applied an analogous procedure for RIASEC dimensions. Specifically, we flagged basic interest-occupation combinations where the draft final LLM rating had a z-score greater than +1.0 (or less than -1.0), and the associated RIASEC dimension had a z-score less than -1.0 (or greater than +1.0). This rule resulted in 37 flagged basic interest-occupation combinations (0.10%).

These thresholds were determined by visual inspection of the distribution of the variables involved in each flagging rule (e.g., LLM-expert differences, differences among LLM composite z-scores, differences among draft LLM z-scores, and associated RIASEC/knowledge z-scores).

Dr. Rounds was tasked with reviewing the full set of ratings, with particular attention to the flagged basic interest-occupation ratings, and making updated final ratings when he believed the draft final LLM ratings needed adjustment based on his review. Specifically, we offered the following general suggestions for review:

- Consider one basic interest at a time and first examine the occupations flagged for review for that basic interest and why the given occupation was flagged.
- Next, consider viewing where the flagged occupation for a given basic interest falls relative to all other occupations for that basic interest. Ask yourself, does the draft LLM rating for that flagged occupation seem higher or lower than it should be relative to other occupations adjacent to it in the list? Consult the definition of the basic interest and the occupation description of tasks when doing so (also provided as part of the review materials).
- Ultimately, view your role here as serving as the “final” expert reviewer/gatekeeper for basic interest ratings that will be published to the O*NET database for all data-level occupations. So, consider the suggestion above as a guide, but not necessarily exhaustive of everything you may want to consider as you review the ratings.

Results of Review

Of the 36,531 draft final LLM ratings, 53 of them were adjusted by Dr. Rounds (0.15%), and all of those were from the set of 315 basic interest-occupation combinations flagged for review. Specifically, Dr. Rounds adjusted these 53 basic interest-occupation combinations as follows:

- In 20 out of 53 combinations, he accepted expert ratings.
- In 19 out of 53 combinations, he took the average of drafted LLM and expert ratings as the final ratings.
- In 14 out of 53 combinations, he assigned new basic interest ratings.

The magnitude of adjustments was small on average ($M = -.39$ [final-draft], $SD = 1.17$). Table 8.1 provides a frequency distribution of the differences between final (adjusted) LLM ratings and the draft final ratings produced by Step 6. As shown in Table 8.1, 90% of disagreements fell in the range of -2.01 to 1.42, indicating that when LLM ratings were adjusted based on expert review, they were largely within two scale points of the draft rating.

Table 8.1. Summary of Differences between Final and Draft Basic Interest Ratings

Statistic	Final Rating - Draft Rating
<i>Mean</i>	-.39
<i>SD</i>	1.17
<i>Min</i>	-2.33
<i>Max</i>	2.50
Percentiles	
5	-2.01
25	-1.26
50	-.77
75	.66
95	1.42

Note. $n = 53$ (basic interest-occupation combinations where the difference between final and draft ratings was not zero). Positive values indicate final ratings were higher than draft ratings, and negative values indicate that draft ratings were higher than final ratings.

During the review process, Dr. Rounds observed that the draft final LLM ratings were slightly higher than expert ratings across most occupations (among those where both ratings were available) and suggested that LLMs may have been applying a different evaluative metric (e.g., statistical judgment) than experts (e.g., clinical judgment), which in return, required higher adjustment standard for the LLM ratings. Additionally, in vocational interest research, the pattern or profile shape of interests is often more predictive of person-occupation fit than absolute interest levels; therefore, the relative ordering of basic interests within an occupation is especially critical. Based on the above reasons, Dr. Rounds adopted a conservative approach for changing draft final LLM ratings. Specifically, Dr. Rounds structured his final review strategies into three steps. First, for each basic interest, he reviewed its definition, illustrative activities and occupations, and associated RIASEC dimensions and knowledge statements. He then reviewed combinations in which the draft final LLM ratings differed from expert ratings by one or more points. Next, he reviewed combinations with highly disparate ratings across the three LLM composite ratings. Finally, he examined combinations flagged for inconsistencies with the associated RIASEC codes and knowledge domains.

For most of the flagged basic interest-occupation combinations, Dr. Rounds leaned toward using the LLM ratings after further review of the occupations. The findings here reinforce the notion that actuarial (statistical) judgments can offer more accurate and reliable judgments than clinical judgments made by humans (e.g., Grove & Meehl, 1996; Kuncel et al., 2013).

Summary

Based on the results of Dr. Rounds' review, a few changes were made to the draft final set of LLM ratings to finalize them for inclusion in O*NET 30.3. These changes were implemented, and the summary display process described in Step 7 was rerun using the updated ratings to arrive at a final set of basic interest ratings and displayed basic interests for the 891 active, data-level O*NET SOCs. The final set of characteristic ratings produced here will be published in O*NET 30.3, targeted for release in May 2026.

Conclusions and Future Directions

This report summarizes the successful effort to leverage advances in generative AI, specifically LLMs, combined with expert human judgment, to populate basic interest ratings for 891 data-level O*NET-SOC occupations. The generative AI methods used occupational information from the O*NET database as input to generate basic interest ratings for occupations. As the world of work changes, these models can be applied to future versions of the O*NET database to quickly and efficiently generate and maintain high-quality basic interest information for the O*NET system, thereby minimizing the need for human raters.

For each of the 41 basic interests, we developed an LLM prompt template that allowed us to generate basic interest ratings that best align with ratings made by experts in vocational interest and occupational analysis (i.e., highly experienced academic researchers who publish in this area). The level of correlations we observed between LLM-based ratings and expert ratings approaches the levels of interrater reliability among expert raters. The LLM-based approach we developed eliminates the need to gather basic interest ratings through traditional expert or analyst data collection, helping ensure updated, accurate basic interest information is available on a timely basis for O*NET customers and stakeholders.

Although our LLM-based approach performed well, we still advise the Center to incorporate a layer of expert review into LLM-based basic interest ratings.

In terms of future directions, the success of the LLM-based approach here and a similar effort in an earlier project ([Putka et al., 2025a](#)) bodes well for potentially extending this work to automate the generation of ratings for other domains of O*NET that have historically relied on public burden or labor- and time-intensive forms of data collection with incumbents or occupational analysts (e.g., incumbent-method-based knowledge data collections and occupational analyst-based skills data collections). The methods examined here suggest that an LLM-based approach could be a promising avenue for this purpose.

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Appendix A: Basic Interests Included in the O*NET Content Model and Their Definitions

Table A.1. List of Basic Interests Included in the O*NET Content Model and Their Definitions

O*NET Content Model ID	Basic Interest	Definition
1.B.3.a	Mechanics/Electronics	Work involves maintaining and repairing of machinery, such as automotive engines, electronic equipment, computers, and communication systems.
1.B.3.b	Construction/Woodwork	Work involves constructing, installing, or repairing structures and fixtures made of wood.
1.B.3.c	Transportation/Machine Operation	Work involves driving vehicles, such as vans, trucks, trains, and buses, to transport people or materials. Work can also involve operating heavy equipment, such as cranes, forklifts, bulldozers, and backhoes, to move materials or earth.
1.B.3.d	Physical/Manual Labor	Work involves manually unloading and moving freight, stock, luggage, or other materials, or performing other physical labor.
1.B.3.e	Protective Service	Work involves maintaining order and protecting life and property by conducting investigations and enforcing laws and regulations to prevent or solve crimes.
1.B.3.f	Agriculture	Work involves planting, cultivating, and harvesting crops, plants, or trees, or raising farm animals. Work can also involve preparing plant and animal products for distribution to consumers, or protecting natural resources to maximize their use in farming.
1.B.3.g	Nature/Outdoors	Work involves planning, restoring, and conserving natural areas and wildlife habitats.
1.B.3.h	Animal Service	Work involves feeding, grooming, exercising, or otherwise providing care to promote and maintain the well-being of pets and other animals in settings such as kennels, animal shelters, and zoos.
1.B.3.i	Athletics	Work involves training, practicing, or competing in athletic events, or supporting those participating in athletics through coaching, training, or officiating.
1.B.3.j	Engineering	Work involves applying science and technology to the design, building, testing, and use of electrical and electronic components, mechanical devices and machines, automotive, marine, and aerospace equipment and vehicles, materials, or structures.
1.B.3.k	Physical Science	Work involves studying and researching non-living objects, materials, and phenomena through scientific disciplines such as physics, chemistry, astronomy, meteorology, or geology.

O*NET Content Model ID	Basic Interest	Definition
1.B.3.l	Life Science	Work involves studying and researching living organisms through scientific disciplines such as biology, botany, zoology, microbiology, physiology, and biochemistry.
1.B.3.m	Medical Science	Work involves studying and researching the causes, nature, effects, and treatments of disease or other forms of impairment or illness.
1.B.3.n	Social Science	Work involves studying and researching human behavior, society, politics, and social relationships through scientific disciplines such as psychology, sociology, economics, or political science.
1.B.3.o	Humanities	Work involves studying and researching aspects of human history, culture, and language through disciplines such as history, philosophy, the language arts, or area/ethnic studies.
1.B.3.p	Mathematics/Statistics	Work involves developing and applying mathematics and statistical theory and methods.
1.B.3.q	Information Technology	Work involves designing, developing, testing, and maintaining computer software, hardware, networks, and systems.
1.B.3.r	Visual Arts	Work involves creating original visual artwork for a variety of media and purposes using various techniques and software.
1.B.3.s	Applied Arts and Design	Work involves applying artistic principles to the design and creation of various objects and materials.
1.B.3.t	Performing Arts	Work involves acting as a performer in dance, comedy, or dramatic productions, choreographing of dance performances, or producing of live or recorded entertainment.
1.B.3.u	Music	Work involves conducting, composing, or playing music or singing.
1.B.3.v	Creative Writing	Work involves developing creative written works, such as novels, scripts, song lyrics, poetry, stories, or advertisements.
1.B.3.w	Media	Work involves producing, developing, writing, directing, or presenting information through print, radio, television, or digital media.
1.B.3.x	Culinary Art	Work involves preparing, cooking, and presenting food in a distinctive style usually associated with a specific culture or region.
1.B.3.y	Teaching/Education	Work involves teaching through lectures, discussions, and demonstrations in one or more subjects.
1.B.3.z	Social Service	Work involves providing social services and assistance to improve the well-being and social and psychological functioning of children and adults.

O*NET Content Model ID	Basic Interest	Definition
1.B.3.aa	Health Care Service	Work involves providing health care services to individuals to include the diagnosis, prevention, or treatment of diseases and other forms of illness or impairment.
1.B.3.ab	Religious Activities	Work involves conducting religious worship, leading a church or other religious group, and offering moral guidance associated with beliefs and practices of a religious faith.
1.B.3.ac	Personal Service	Work involves providing personal services to individuals in need of non-medical assistance, such as helping arrange or plan for travel, meals, or events.
1.B.3.ad	Professional Advising	Work involves providing expert advice, coaching, and counseling on topics such as careers, educational opportunities, and educational and professional development.
1.B.3.ae	Business Initiatives	Work involves creating strategic plans or taking actions to expand an organization's business or market share.
1.B.3.af	Sales	Work involves selling goods or services.
1.B.3.ag	Marketing/Advertising	Work involves promoting or creating a public image for products, services, or organizations to attract interest, engagement, or sales.
1.B.3.ah	Finance	Work involves directing and managing financial activities, such as planning and investments for an individual or organization to generate income.
1.B.3.ai	Accounting	Work involves examining, analyzing, and interpreting accounting records for financial statements, or maintaining, auditing, or evaluating records and accounts.
1.B.3.aj	Human Resources	Work involves recruiting, selecting, and training job applicants, maintaining employee personnel records, administering compensation and employee-benefit programs, and conducting employee performance reviews.
1.B.3.ak	Office Work	Work involves clerical and administrative tasks for an organization, such as answering phones, bookkeeping, updating records, scheduling appointments or meetings, and editing documents and files.
1.B.3.al	Management/ Administration	Work involves planning, directing, or coordinating the daily operations of an organization and overseeing personnel, business, or administrative services.
1.B.3.am	Public Speaking	Work involves speaking before an audience to educate, entertain, or influence the listeners.
1.B.3.an	Politics	Work involves engaging in political activities to influence government policy.
1.B.3.ao	Law	Work involves studying and applying legal knowledge.

Appendix B: O*NET Basic Interests, RIASEC Dimensions, and Knowledges Linkages

Table B.1. O*NET Basic Interests, RIASEC Dimensions, and Knowledges Linkages

O*NET Content Model ID	Basic Interest	Associated RIASEC Dimension(s)	Associated O*NET Knowledge(s)
1.B.3.a	Mechanics/Electronics	Realistic	Mechanical
1.B.3.b	Construction/Woodwork	Realistic	Building and Construction
1.B.3.c	Transportation/Machine Operation	Realistic	Transportation
1.B.3.d	Physical/Manual Labor	Realistic	
1.B.3.e	Protective Service	Realistic	
1.B.3.f	Agriculture	Realistic	Food Production
1.B.3.g	Nature/Outdoors	Realistic	
1.B.3.h	Animal Service	Realistic, Social	
1.B.3.i	Athletics	Realistic, Enterprising	
1.B.3.j	Engineering	Realistic	Engineering and Technology
1.B.3.k	Physical Science	Investigative	Physics; Chemistry
1.B.3.l	Life Science	Investigative	Biology
1.B.3.m	Medical Science	Investigative	Medicine and Dentistry
1.B.3.n	Social Science	Investigative, Social	Psychology, Sociology and Anthropology
1.B.3.o	Humanities	Investigative, Artistic	History and Archeology; Philosophy and Theology
1.B.3.p	Mathematics/Statistics	Investigative, Conventional	Mathematics
1.B.3.q	Information Technology	Conventional	Computers and Electronics
1.B.3.r	Visual Arts	Artistic	Fine Arts
1.B.3.s	Applied Arts and Design	Artistic	Design
1.B.3.t	Performing Arts	Artistic	Fine Arts
1.B.3.u	Music	Artistic	Fine Arts

O*NET Content Model ID	Basic Interest	Associated RIASEC Dimension(s)	Associated O*NET Knowledge(s)
1.B.3.v	Creative Writing	Artistic	English Language; Communications and Media
1.B.3.w	Media	Artistic	Communications and Media
1.B.3.x	Culinary Art	Artistic, Social	
1.B.3.y	Teaching/Education	Social	Education and Training
1.B.3.z	Social Service	Social	Therapy and Counseling
1.B.3.aa	Health Care Service	Investigative, Social	
1.B.3.ab	Religious Activities	Social, Enterprising	
1.B.3.ac	Personal Service	Social	Customer and Personal Service
1.B.3.ad	Professional Advising	Social, Enterprising	
1.B.3.ae	Business Initiatives	Enterprising	
1.B.3.af	Sales	Enterprising	Sales and Marketing
1.B.3.ag	Marketing/Advertising	Artistic, Enterprising	Sales and Marketing
1.B.3.ah	Finance	Enterprising, Conventional	Economics and Accounting
1.B.3.ai	Accounting	Conventional	Economics and Accounting
1.B.3.aj	Human Resources	Social, Conventional	Personnel and Human Resources
1.B.3.ak	Office Work	Conventional	Administrative
1.B.3.al	Management/Administration	Enterprising	Administration and Management
1.B.3.am	Public Speaking	Enterprising	
1.B.3.an	Politics	Enterprising	Law and Government
1.B.3.ao	Law	Enterprising	Law and Government

Note. Basic interests are sorted based on the ascending order of the O*NET Content Model ID. The knowledge *Geography* was excluded from the variables linked to *Physical Science*, although it was included in the linkage maps reported in Chu et al. (2023) and Liu et al. (2025). This exclusion is due to the conceptual distinction between geology, which falls within the Physical Science basic interest, and geography. In particular, physical geography, a subfield of geography, is not well captured by the current definition of Physical Science.

Appendix C: Basic Interest Rating Materials for Experts

Basic Interests Rating Workbook Instructions

Instructions: The O*NET 2025 Basic Interest Data Collection Master Rating Booklet contains information necessary to rate 25 occupations for each basic interest.

Contents (tabs) of Workbook:

Instructions. Include instructions for making basic interest ratings.

Basic Interests. This tab lists the 41 basic interest dimensions, along with definitions from the O*NET Content Model, and examples of work activities and occupations that are illustrative of each Basic Interest. Also listed are the RIASEC dimensions linked to each Basic Interest in the O*NET Content Model. Use this tab as a reference to understand each BI before rating.

Master Ratings. This is the main tab where you will enter your ratings. It includes 25 selected O*NET occupations per basic interest. Each row represents a unique basic interest-occupation pair. Occupations are sorted by their O*NET-SOC code. You will enter your rating (on a 1-7 scale) in Column G.

Steps:

1. Go to the Basic Interests tab and review the definition for the basic interest dimension you are currently rating.
2. In the Master Ratings tab, filter the “Basic Interest ID” column to show only the rows for the basic interest you just reviewed.
3. For each occupation listed under this basic interest, review the occupational information associated with an occupation before providing a rating.
4. Rate the occupation on the corresponding basic interest.
 - a. **DO:**
 - i. Review task statements to understand the actions (verbs) and objects necessary to perform the job.
 - ii. Review knowledge statements to understand the set of principles and facts necessary to perform the job.
Review OIP high-point codes to understand the most descriptive/characteristic RIASEC work environment for the job.
 - iii. Rely on the occupational description and how it relates to the work environment that involves a given basic interest category.
 - iv. Focus on the tasks performed and knowledge(s) required.
 - v. Ask yourself, "How characteristic is the given basic interest work environment of the given occupation?"

- b. **Don't:**
 - i. Rely on your personal experience or stereotype of the occupation and tasks performed.
5. Repeat steps 3-4 until all occupations within the basic interest set are rated.
 6. Once all occupations for one BI are rated, return to Step 1 and begin the process for the next Basic Interest dimension.

Rating Scale:

1	2	3	4	5	6	7
Not at all characteristic			Moderately characteristic			Extremely characteristic

Example Basic Interest Rating Sheet

Calibra	Basic Int	Basic Interest	IO with	ONET SOC 20	ONET SOC 2019 Tit	Basic Interest Ra	ONET SOC 2019 Description	Job Tasks	Example Job Titles	Knowledge	OIP High Point Code
Y	1.B.3.a	Mechanics/Electronics	1	17-203100	Biengineers and Biomedical Engineers		Apply knowledge of engineering, biology, chemistry, computer science, and biomechanical principles to the design, development, and evaluation of biological, agricultural, and health systems and products, such as artificial organs, prostheses, instrumentation, medical information systems, and health management and care delivery systems.	Evaluate the safety, efficiency, and effectiveness of biomedical equipment. Prepare technical reports, data summary documents, or research articles for scientific publication, regulatory submissions, or patent applications. Design or develop medical diagnostic or clinical instrumentation, equipment, or procedures, using the principles of engineering and biobehavioral sciences. Conduct research, along with life scientists, chemists, and medical scientists, on the engineering aspects of the biological systems of humans and animals. Adapt or design computer hardware or software for medical science uses. Maintain databases of experiment characteristics or results. Develop statistical models or simulations, using statistical or modeling software. Read current scientific or trade literature to stay abreast of scientific, industrial, or technological advances. Manage teams of engineers by creating schedules, tracking inventory, creating or using budgets, or overseeing contract obligations or deadlines. Develop models or computer simulations of human biobehavioral systems to obtain data for measuring or controlling life processes. Design or conduct follow-up experimentation, based on generated data, to meet established process objectives. Write documents describing protocols, policies, standards for use, maintenance, and repair of medical equipment. Communicate with bioregulatory authorities regarding licensing or compliance responsibilities. Develop methodologies for transferring procedures or biological processes from laboratories to commercial-scale manufacturing production. Collaborate with manufacturing or quality assurance staff to prepare product specification or safety sheets, standard operating procedures, user manuals, or qualification and validation reports. Research new materials to be used for products, such as implanted artificial organs. Prepare project plans for equipment or facility improvements, including time lines, budgetary estimates, or capital spending requests. Consult with chemists or biologists to develop or evaluate novel technologies. Confer with research and biomaterial manufacturing personnel to ensure the compatibility of design and production. Recommend process formulas, instrumentation, or equipment specifications, based on results of bench or pilot experimentation. Communicate with suppliers regarding the design or specifications of bioproduction equipment, instrumentation, or materials. Conduct training or in-services to educate	Biomedical Engineer; Biomedical Technician (Biomedical Tech); Process Engineer; Research Engineer	Administration and Management; Computers and Electronics; Engineering and Technology; Design; Mathematics; Physics; Chemistry; Biology; Medicine and Dentistry; Education and Training; English Language	Investigative, Realistic
Y	1.B.3.a	Mechanics/Electronics	2	19-405100	Nuclear Technicians		Assist nuclear physicists, nuclear engineers, or other scientists in laboratory, power generation, or electricity production activities. May operate, maintain, or provide quality control for nuclear testing and research equipment. May monitor	Follow nuclear equipment operational policies and procedures that ensure environmental safety. Conduct surveillance testing to determine safety of nuclear equipment. Monitor nuclear reactor equipment performance to identify operational inefficiencies, hazards, or needs for maintenance or repair. Test plant equipment to ensure it is operating properly. Apply safety tags to equipment needing maintenance. Follow policies and procedures for radiation workers to ensure personnel safety. Modify, devise, or maintain nuclear equipment used in operations.	Licensed Nuclear Operator; Nuclear Auxiliary Operator; Nuclear Equipment Operator (NEO); Operations Technician	Computers and Electronics; Engineering and Technology; Mechanical; Mathematics; Physics; Chemistry; Education and Training; English Language; Public Safety and Security; Law and Government	Realistic, Conventional, Investigative
Y	1.B.3.a	Mechanics/Electronics	3	19-409303	Remote Sensing Technicians		Apply remote sensing technologies to assist scientists in areas such as natural resources, urban planning, or homeland security. May prepare flight plans or sensor configurations for flight trips.	Collect geospatial data, using technologies such as aerial photography, light and radio wave detection systems, digital satellites, or thermal energy systems. Verify integrity and accuracy of data contained in remote sensing image analysis systems. Integrate remotely sensed data with other geospatial data. Consult with remote sensing scientists, surveyors, cartographers, or engineers to determine project needs. Adjust remotely sensed images for optimum presentation by using software to select image displays, define image set categories, or choose processing routines. Manipulate raw data to enhance interpretation, either on the ground or during remote sensing flights. Merge scanned images or build photo mosaics of large areas, using image processing software. Participate in the planning or development of mapping projects.	Digital Cartographic Technician; Geospatial Extractor; Meteorologist Liaison; Research Associate	Customer and Personal Service; Production and Processing; Computers and Electronics; Engineering and Technology; Mathematics; Geography; English Language	Realistic, Conventional, Investigative
Y	1.B.3.a	Mechanics/Electronics	4	33-302102	Police Identification and Records Officers		Collect evidence at crime scene, classify and identify fingerprints, and photograph evidence for use in criminal and civil cases.	Prepare documentation or presentations, including charts, photos, or graphs. Operate remote sensing equipment on	Crime Scene Investigator; Crime Scene Technician; Criminalist; Forensic Specialist	Administrative; Customer and Personal Service; English Language; Public Safety and Security; Law and Government	Conventional, Realistic, Investigative
Y	1.B.3.a	Mechanics/Electronics	5	39-302100	Motion Picture Projectionists		Set up and operate motion picture projection and related sound reproduction equipment.	Maintain records of evidence and write and review reports. Package, store and retrieve evidence. Submit evidence to supervisors, crime labs, or court officials for legal proceedings. Testify in court and present evidence. Analyze and process evidence at crime scenes, during autopsies, or in the laboratory, wearing protective equipment and using powders and chemicals. Look for trace evidence, such as fingerprints, hairs, fibers, or shoe impressions, using alternative light sources when necessary. Photograph crime or accident scenes for evidence records. Dust selected areas of crime scene and lift latent fingerprints, adhering to proper preservation procedures. Create sketches and diagrams, by hand or computer software, to depict crime scenes. Serve as technical advisor and coordinate with other law enforcement workers or legal personnel to exchange information on crime scene collection activities. Coordinate or conduct instructional classes or in-services, such as citizen police academy classes and crime scene training for other officers. Use drone technology for	Booth Operator; Movie Projectionist; Projectionist; Technical Projection Guide	Customer and Personal Service; Computers and Electronics; Mechanical; English Language	Realistic, Conventional