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New Approaches in the Assessment of Pre-Service Teachers' Scientific Research Skills: Multidimensional-Many Facet Rasch Model Application*

Yazar(lar) / Author(s)

Doçent Dr., Mahmut Sami Koyuncu
Afyon Kocatepe Üniversitesi, Eğitim Fakültesi, Eğitim Bilimleri Bölümü, Afyonkarahisar-Türkiye
e-posta: mskoyuncu@aku.edu.tr
(Sorumlu Yazar/Corresponding author)

Doçent Dr., Mehmet Şata
Van Yüzüncü Yıl Üniversitesi, Eğitim Fakültesi, Eğitim Bilimleri Bölümü, Afyonkarahisar-Türkiye
e-posta: mehmetsata@yyu.edu.tr

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Abstract

This survey study aimed to determine pre-service teachers' skills in conducting and presenting scientific research process and to examine their peer-scoring behaviors. The participants consisted of 36 pre-service teachers and seven peer raters. The analytical rubric developed by the researchers and the performance task were used to collect data. The multidimensional many-facet Rasch measurement model was employed in data analysis. Rasch analysis was carried out with a fully crossed design. The analyses revealed that the least difficult criterion in the dimension of conducting the scientific research process was to perform data analysis while the most challenging criterion was to determine the research model and sample. In addition, the least difficult criterion in the dimension of making an oral presentation was to ensure the interest and participation of the audience, while the most challenging criterion was to make an effective start. The analysis of the rater facet demonstrated that the most severity rater was R3, while the most leniency rater was R4. The study argues that the multidimensional many-facet Rasch model can be used to present reliability and validity evidence in multidimensional performance evaluations.

Keywords: Performance assessment, Multi-dimensional Rasch, Reliability, Scientific Research Skills, Validity.

Öğretmen Adaylarının Bilimsel Araştırma Becerilerinin Değerlendirilmesinde Yeni Yaklaşımlar: Çok Boyutlu-Çok Yüzeyli Rasch Modeli Uygulaması

Öz

Araştırmada öğretmen adaylarının bilimsel araştırma sürecini yürütme ve sunma becerilerini belirlemek, ayrıca öğrencilerin (akran) puanlama davranışlarını incelemek amaçlandığından nicel araştırma yaklaşımlarından betimsel model ile yürütülmüştür. Araştırmanın çalışma grubu 36 öğretmen adayı ve yedi akran puanlayıcıdan oluşmaktadır. Veri toplama araçları olarak araştırmacılar tarafından geliştirilen analitik dereceli puanlama anahtarı perfromans görevi kullanılmıştır. Veri analizinde çok boyutlu çok yüzeyli Rasch ölçme modeli kullanılmıştır. Rasch analizi tamamen çaprazlanmış desen ile gerçekleştirilmiştir. Yapılan analizler sonucunda, öğretmen adaylarının bilimsel araştırma sürecini yürütme boyutunda en az zorladıkları ölçütün veri analizini gerçekleştirme, en fazla zorlandıkları kriterin ise araştırma modelini ve örneklemini belirleme iken sözlü sunum yapma boyutunda ise en az zorlandıkları ölçüt dinleyicilerin ilgi ve katılımını sağlama iken en fazla zorlandıkları ölçüt ise etkili başlangıç yapma olduğu belirlenmiştir. Puanlayıcı yüzeyine ait analizler incelendiğinde ise en katı puanlayıcının R3 numaralı punlayıcı iken en cömert puanlayıcı ise R4 numaralı puanlayıcı olduğu tespit edilmiştir. Araştırmanın bulgularından hareketle çok boyutlu performans değerlendirmelerinde güvenirlik ve geçerlik kanıtlarının sunulmasında çok boyutlu çok yüzeyli Rasch modelinin kullanılabilir niteliğe sahip olduğu söylenebilir.

Anahtar Kelimeler: Performans değerlendirme, Çok boyutlu Rasch, Güvenirlik, Bilimsel araştırma becerisi, Geçerlik.

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1. Introduction

A review of the historical record reveals a consistent pattern of knowledge accumulation. Human beings have a multitude of avenues through which they can access information. However, for this information to be accepted by all, it must be supported by reliable and valid evidence (Büyüköztürk et al., 2018). Scientific knowledge, obtained through scientific research, is considered valid and reliable. Consequently, new knowledge must be obtained through the scientific research process. Given the importance of this process, it has become an essential skill expected from 21st-century people (Yaşar, 2014).

In the contemporary era, research methods courses are a standard component of the curriculum at all levels of higher education, from the associate to the doctoral degree. These courses are designed to equip students with the knowledge and skills necessary to engage in scientific research within their respective fields. The objective of this course is to equip students with the ability to apply scientific research process skills in order to solve problems encountered in real-life situations. Additionally, numerous projects at various levels within the education system encourage students to engage in research, with institutions such as TUBITAK playing a prominent role in this endeavour.

The scientific research process is conducted through the utilization of both quantitative and qualitative methodologies. While quantitative methods are more applicable in quantitative-based fields, qualitative approaches are adopted in verbal-based departments (Bauman, 2004). In the studies, it has been stated that one of the principal reasons students exhibit considerable anxiety about the scientific research process is that it entails the utilization of intricate statistical techniques (Hafdahl, 2004). Furthermore, it has been documented that a considerable number of students exhibit deficiencies in their ability to engage in the scientific research process (Büyüköztürk, 1996; Papanastasiou, 2005). An analysis of the scientific research process within the curriculum of pre-service teachers in the faculty of education indicates that pre-service teachers demonstrate a lack of competence (Nartgün et al., 2008; Öztürk, 2010).

One of the competencies anticipated of individuals in the 21st century is the capacity to deliver effective presentations. In light of the fact that oral presentation skills are as essential as the ability to conduct the scientific research process, it is incumbent upon individuals to develop effective presentation skills. Students pursuing studies at the Faculty of Education are particularly expected to demonstrate effective presentation skills (De Grez et al., 2009). In academic contexts, students are expected to present their final projects orally and to engage in seminar-style discussions with their peers (Aryadoust, 2015). The oral presentation is a spontaneous endeavour that requires the utilization of a multitude of skills, which can render it intimidating and challenging for many students (Behnke & Sawyer, 2000). In order to enhance students' proficiency in oral presentation, it is recommended that such practices be incorporated with greater frequency within communication courses. Furthermore, students should be encouraged to present their final assignments and projects.

One of the approaches that can be beneficial in the presentation and evaluation of final projects prepared by pre-service teachers is self- or peer assessment (Aryadoust, 2015). In this manner, the prospective teacher will be able to discern the deficiencies and strengths of the project and assess the quality of the presentation (Langan et al., 2005). In this context, the evaluation of the pre-service teachers' ability to conduct scientific research and present their

findings will be conducted concurrently. In this context, there is a requirement for a multidimensional approach model that addresses more than one variable.

The unidimensional approaches that have dominated educational research for many years have typically been based on relatively simple and linear assessment methods for measuring students' knowledge and skills. Students' performance was frequently evaluated on the basis of test results or examination scores (Gagne, 1985). However, the rapid development of information technologies and the digitalization process in education have revealed that these traditional approaches are inadequate and that new multidimensional approaches should be adopted in education (Brunetti et al., 2020). The objective of these novel approaches is to enhance the comprehension and advancement of students' competencies through the facilitation of a more comprehensive and profound educational analysis. In this context, the scientific research and presentation skills of pre-service teachers were evaluated through the multidimensional-multi-facet Rasch measurement model, a novel approach derived from the many-facet Rasch measurement model.

Multidimensional-many-facet Rasch analysis offers significant advantages in providing effective feedback to students, raters, and practitioners. It does so by providing individual and group-level statistics in evaluating multidimensional constructs (Koyuncu & Şata, 2023). This analytical approach enables a more nuanced understanding of individual differences and group dynamics through the detailed evaluation of performance across a range of dimensions. In the context of process-oriented education in the 21st century, the significance of individual feedback has led to an enhanced emphasis on student-centered approaches and personalized learning pathways. In this context, multidimensional-many-facet Rasch analysis facilitates more comprehensive and meaningful evaluations within the educational process, thereby providing more appropriate solutions to the needs of teachers and students. This analytical approach enhances the quality and efficacy of educational processes by facilitating more precise and impartial outcomes, particularly in the context of intricate learning and assessment procedures.

The assessment of both the ability of pre-service teachers to conduct scientific research processes and their effective presentation skills requires a multidimensional analysis approach. In this context, an investigation was conducted into the multidimensional, multifaceted Rasch measurement model. The determination of the dimensionality of the data, or the number of dimensions/factors, will contribute to the reliability and validity of the measurements obtained from measurement tools, while providing evidence for the reliability and validity of said measurements. As Messick (1995) asserts, the two most significant threats to validity are the underrepresentation of the construct and the inclusion of variance that is unrelated to the construct. A precise definition of the data set in terms of its dimensionality will directly contribute to the validity of the measurements. This is because the issue of underrepresentation of the construct intended to be measured is thereby negated (Messick, 1995).

This study underscores the significance of multidimensional, multifaceted Rasch analysis in the field of education. The objective is to conduct a simultaneous evaluation of the scientific research and effective presentation skills of prospective teachers. In the context of process-oriented education in the 21st century, the provision of individual feedback and the utilization of comprehensive assessment methods are becoming increasingly important. In this context, multidimensional-many facet Rasch analysis provides detailed statistical data at both the

individual and group levels, facilitating the provision of effective feedback by students, raters, and practitioners. The research makes a contribution to the achievement of more accurate, fair and meaningful educational results by means of a comprehensive evaluation of the scientific research process skills and effective presentation skills of those in training to become teachers. The accelerated evolution of information technologies and the digitalization of education have demonstrated the necessity for the utilization of methods beyond those employed in traditional assessments. Consequently, the research demonstrates that novel multidimensional methodologies must be embraced in the field of education, offering more suitable solutions to the needs of pre-service teachers and enhancing the quality and efficacy of educational processes. Furthermore, providing evidence for the reliability and validity of the data obtained is of great importance in eliminating the factors that threaten the validity of educational research.

This study employs multidimensional-many facet Rasch analysis to provide a comprehensive assessment of pre-service teachers' abilities to conduct scientific research and make effective presentations. Moreover, this research strives to provide more suitable solutions to the needs of pre-service teachers and contribute to the enhancement of educational quality and effectiveness by illustrating the necessity for the adoption of novel multidimensional approaches in education.

2. Methods

2.1. Research Design

The study employs a descriptive research approach, with the objective of ascertaining the competencies of pre-service teachers in conducting and presenting the scientific research process within the context of research methods in education courses. Additionally, it seeks to examine their peer-scoring behaviors.

2.2. Participants

The study group comprised 36 pre-service teachers enrolled at the Faculty of Education of a university in the Eastern Anatolia region during. As part of the research methods in education course, 36 students were assigned a performance task as a final grade. This task required them to conduct individual research and present their findings to their peers. Furthermore, seven peer raters were selected on a voluntary basis to evaluate the performance tasks and presentations. The raters did not undertake the performance task themselves, but rather evaluated their peers' work using a pre-established rubric.

2.3. Instruments

The research data were collected with the assistance of the "*Analytical Rubric for Conducting and Presenting the Scientific Research Process*," which was developed by the researchers. The rubric is comprised of ten criteria and two dimensions. The first dimension encompasses the capacity to conduct the scientific research process, which comprises the initial seven criteria, while the second dimension pertains to the presentation skills, which encompass the final three criteria. The rubric employs a 5-point scale, with the following definitions: *"Very Inadequate" (1 point), "Inadequate" (2 points), "Moderate" (3 points), "Adequate" (4 points),* and "*Very Adequate" (5 points)*. The scientific research report prepared by the pre-service teachers during the semester, along with the presentation of this report, were evaluated using

the aforementioned measurement tool. The students responsible for scoring were provided with a training session by the researcher, during which they were instructed on the correct procedure for scoring. Subsequently, it was verified that each rater had scored the performance task and presentation prepared by each student individually.

The reliability and validity of the measurements obtained from the data collection tool were evaluated through the collection of pertinent evidence. Firstly, in order to provide evidence for content validity, the opinions of eight experts in the field of measurement and evaluation with doctoral qualifications were sought. The Lawshe technique was employed to conduct the expert opinion, with the content validity ratio (CVR) subsequently calculated for each criterion (Lawshe, 1975). The experts were requested to evaluate the criteria by utilizing a measurement tool with a triple rating system, comprising the following categories: (1) necessary, (2) necessary but should be corrected, and (3) unnecessary for the relevant criterion in measuring the ability to conduct the scientific research process and make presentations. In evaluating the criteria, it was determined that a minimum CVR value of .693 is necessary for the relevant criterion to have sufficient coverage (Wilson et al., 2012). In this context, three criteria in the draft measurement tool were found to have a CVR value below the minimum required value of 0.693, and thus were removed from the measurement tool. Consequently, an analytical rubric comprising ten criteria and a five-point scale was devised. Subsequently, evidence was provided to substantiate the content validity of the measurements obtained from the measurement tool. Thereafter, exploratory factor analysis was conducted to ascertain evidence of construct validity. Prior to reporting the EFA analyses, the KMO value and Barlett's test of sphericity were examined, and it was determined that the results were acceptable (KMO = .866 for the relevant data; Barlett's test $\chi^2(df)$= 282.29 (45), p <.05). The EFA revealed that the dimension of conducting scientific research accounted for 48.48% of the variance, the dimension of presentation skills accounted for 25.99%, and the total variance explained was 74.47%. The factor loadings for the items are presented below: The factor loadings were as follows: .765; .879; .812; .670; .875; .745; .813; .880; .818; and .620.

Once the veracity of the measurements obtained from the measurement tool had been established, the McDonald ω and Cronbach α coefficients were calculated in order to provide evidence for the reliability of the measurements. The McDonald ω and Cronbach α values for the scientific research process were .938 and .912, respectively, while the values for the presentation skills were .813 and .794, respectively (Salvucci *et al.,* 1997). Consequently, evidence was furnished to demonstrate the reliability of the measurements obtained from the analytical rubric developed and to substantiate the inferences drawn from these results.

2.4. Data Analysis

The data were analyzed using the multidimensional many-facet Rasch measurement model. The analyses were conducted using the ConQuest GUI Demo version (5.12.3). In this instance, the dimensions under consideration were the execution of the scientific research process and presentation skills, while the facets were taken to be criteria and raters. The logit values, fit values, and discrimination index reliability were calculated for each facet and their interactions. Additionally, latent distribution and model prediction maps were created.

3. Findings

This study examined the evaluation of pre-service teachers' skills in conducting the scientific research process and presenting their research to their peers. The rubric criteria were initially examined in order to ascertain their suitability for this purpose. The objective was to ascertain whether the pre-service teachers demonstrated a greater or lesser proficiency in the criteria set out in the rubric. The results of the estimation for the criterion facet are presented in Table 1.

Tablo 1: Estimation values for the criterion facet

				UNWEIGHTED FIT		WEIGHTED FIT	
Dimension	**Criterion**	**Estimate**	**Error**	**MNSQ**	**T**	**MNSQ**	**T**
Conducting the scientific research process	A6: Data Analysis	0.343	0.115	1.45	1.7	1.41	1.6
	A1: Research Question	0.273	0.078	3.02	5.7	2.77	5.1
	A2: Purpose and Questions of the Study	0.201	0.094	0.94	-0.2	0.93	-0.3
	A3: Literature Review	0.109	0.102	0.93	-0.2	0.91	-0.3
	A7: Reporting	-0.186*	0.108	1.41	1.6	1.36	1.4
	A5: Data collection tools	-0.259	0.098	1.27	1.1	1.02	0.2
	A4: Identifying the model and sample of the research	-0.481	0.091	4.31	8.1	4.67	7.7
Presentation skills	S3: Ensuring audience interest and participation	0.267*	0.089	1.09	0.5	1.11	0.5
	S2: Subject mastery	0.099	0.090	1.09	0.5	1.04	0.2
	S1: Making an effective beginning	-0.366	0.100	1.58	2.2	1.69	2.4

An asterisk next to a parameter estimate indicates that it is constrained
Separation Reliability =.905
Chi-square test of parameter equality = 76.43, df = 8, Sig Level = 0.000

Upon examination of Table 1, it becomes evident that the discriminant reliability of the model is 0.905, a notably high value. This high value indicates that the criteria exhibit statistically disparate levels of adequacy. Furthermore, the chi-square value calculated for parameter equality was found to be statistically significant ($\chi^2(df)$*=76.43 (8), p=0.00)*, indicating that the competence levels of the criteria are indeed distinct. Upon examination of the estimated values, it becomes evident that the criterion exhibiting the highest competence or least difficulty among the pre-service teachers in conducting the scientific research process is data analysis (logit=0.343), followed by research problem (logit=0.273). Conversely, the criterion demonstrating the lowest competence or least difficulty is determining the research model and sample (logit=-0.481) and data collection tools (logit=-0.259). In the domain of presentation skills, the criterion with the highest level of competence or the least difficulty is ensuring the interest and participation of the audience (logit=0.267). Conversely, the criterion with the lowest level of competence or the greatest difficulty is making an effective start (logit=-0.366).

Following an examination of the proficiency levels of the rubric criteria, an analysis was conducted of the rater facet measurements. Table 2 illustrates the prediction values obtained for seven raters who performed peer rating.

Tablo 2: Estimation Values for Rater Facet

			UNWEIGHTED FIT			WEIGHTED FIT		
Rater	**Estimate**	**Error**	**MNSQ**	**CI**	**T**	**MNSQ**	**CI**	**T**
R3	0.301	0.082	1.73	(0.54, 1.46)	2.6	1.81	(0.53, 1.47)	2.8
R2	0.159	0.073	2.59	(0.54, 1.46)	4.8	2.47	(0.53, 1.47)	4.5
R5	0.116	0.091	1.72	(0.54, 1.46)	2.6	1.69	(0.53, 1.47)	2.5
R7	-0.049*	0.079	2.80	(0.54, 1.46)	5.3	2.67	(0.53, 1.47)	4.9
R1	-0.079	0.073	3.48	(0.54, 1.46)	6.6	3.17	(0.53, 1.47)	6.0
R6	-0.081	0.090	1.27	(0.54, 1.46)	1.1	1.18	(0.53, 1.47)	0.8
R4	-0.367	0.092	2.28	(0.54, 1.46)	4.1	2.17	(0.54, 1.46)	3.8

An asterisk next to a parameter estimate indicates that it is constrained

Separation Reliability = .872

Chi-square test of parameter equality = 37.64, df = 6, Sig Level = 0.000

Table 2 reveals that the discriminant reliability of the model is 0.872, indicating that the rating stringency/generosity ranking is highly reliable. Furthermore, the chi-square value calculated for parameter equality was found to be statistically significant *($\chi^2(df)$= 37.64(6), p=0.00)*, indicating that there were notable differences in the perceived severity and generosity of the raters. Table 2 illustrates that the logit values obtained for the rater facet range from 0.301 to -0.367. The rater with the most stringent rating is R3 (logit=0.301), followed by R2 (logit=0.159). In contrast, the rater with the most lenient rating is R4 (logit=-0.367), followed by R6 (logit=-0.081).

Furthermore, the estimation results for the *Item*Rater*Step* facet are provided in Appendix 1 for reference. Following an examination of the estimation values for each facet and facet interaction, the maps of latent distribution and model parameter estimates for each dimension were then examined. Figure 1 depicts the item difficulty map for each dimension in isolation, whereas Figure 2 illustrates the item difficulty map resulting from the combination of all dimensions.

Dimension 1: Conducting the scientific research process	Dimension 2: Presentation skills

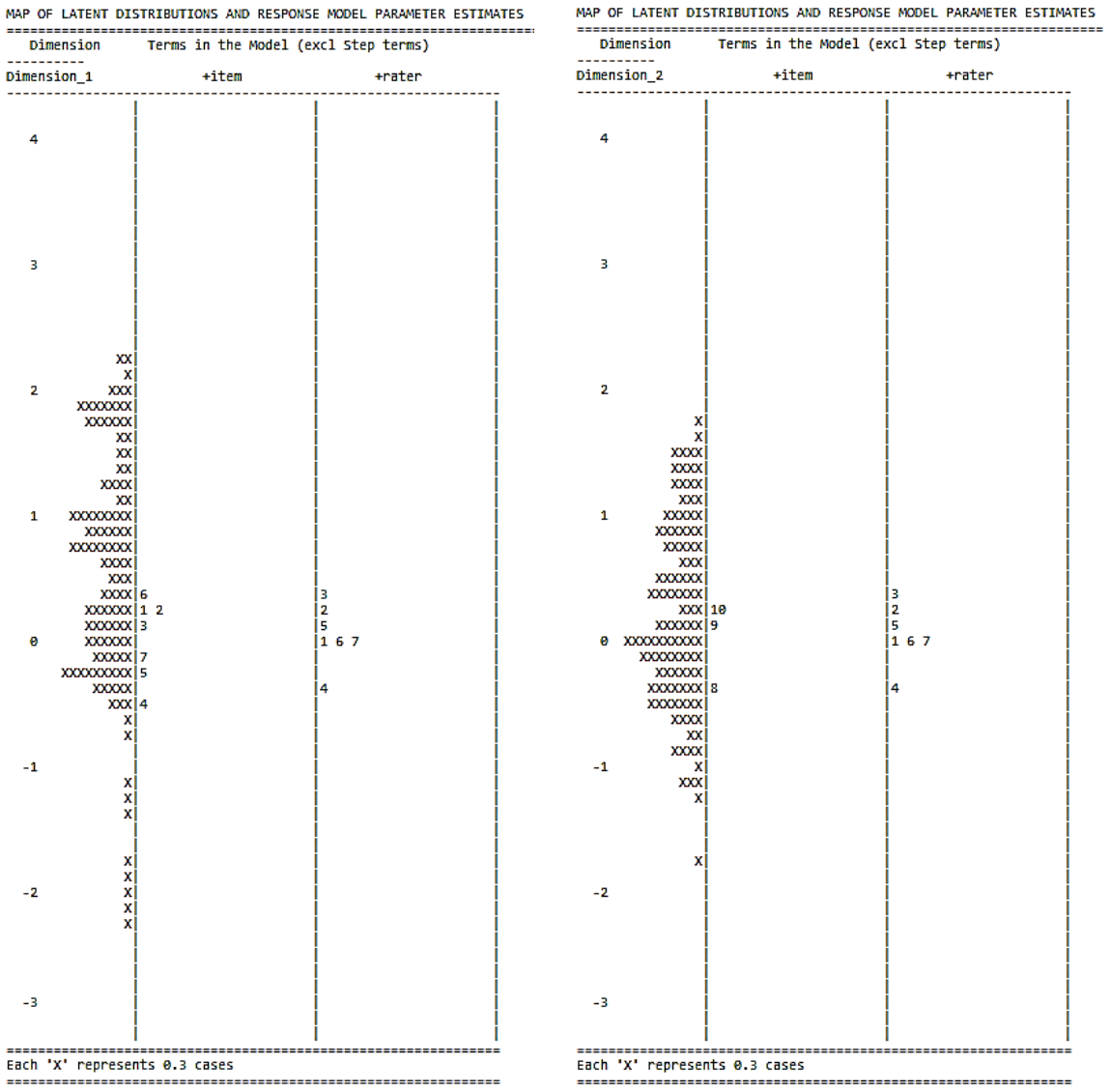

Figure 1: Many-facet Multidimensional Model Item difficulty map separately by dimension

Upon analysis of the dimensions of the scientific research process depicted in Figure 1, it becomes evident that the criterion exhibiting the lowest level of competence is the *identification of the research model and sample (4)*. Conversely, the criterion demonstrating the highest level of competence is *data analysis (6)*. Upon examination of the dimension of presentation skills, it becomes evident that the criterion exhibiting the lowest competence is making *an effective beginning (8)*. Conversely, the criterion demonstrating the highest competence is ensuring the interest and *participation of the audience (10).* Upon examination of the rater behaviours depicted in Figure 1, it became evident that the peer-scoring behaviours exhibited by the raters were largely consistent across both dimensions. Rater R3 exhibited the greatest degree of severity in both dimensions, whereas Rater R4 demonstrated the greatest degree of generosity.

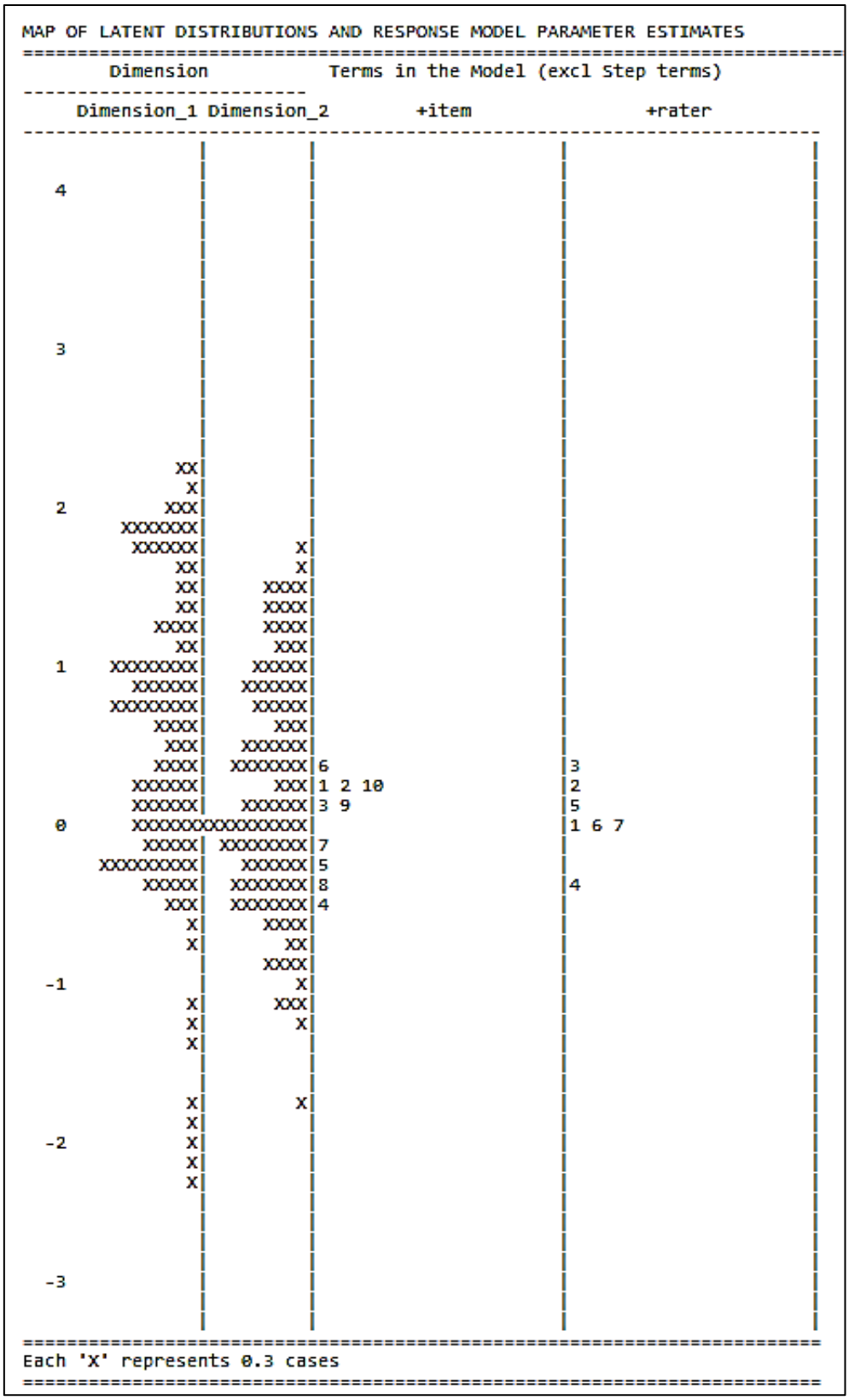

Figure 2: Item difficulty map formed by combining the dimensions of the Many-facet Multidimensional Model

Upon detailed examination of Figure 2, it becomes evident that the criterion exhibiting the lowest competence or greatest difficulty among the pre-service teachers is the ability *to identify the model and sample of the research (4)* and to conduct the scientific research process. This

is followed by the criterion of *making an effective beginning (8*) in presentation skills. Conversely, the criterion exhibiting the highest competence or least difficulty among the pre-service teachers is *data analysis (6)*. Upon analysis of the raters' severity/leniency, it was determined that R3 exhibited the most severity rating style, while R4 demonstrated the most leniency approach. The attitudes of raters R1, R5, and R6 towards peer scoring were found to be similar.

5. Conclusion/Discussion/Suggestons

This study examined the evaluation of pre-service teachers' skills in conducting scientific research and making presentations, which were scored by their peers using a multidimensional approach. In this context, the criteria of the measurement tool, the raters, and the interaction between the criteria and the raters were subjected to examination. The results demonstrated that the criteria employed in the rubric were highly effective in assessing the proficiency of pre-service teachers in conducting scientific research and presenting findings. It was determined that the most challenging aspect of the scientific research process was identifying the research method and sampling, while the least challenging aspect was identifying the research question. In the process of making a presentation, it was determined that the stage at which the participants experienced the greatest difficulty was the beginning, and the stage at which they experienced the least difficulty was ensuring the interest and participation of the audience. A review of the literature reveals that pre-service teachers experience a range of anxieties and fears when conducting scientific research and making presentations (Behnke & Sawyer, 2000; Hafdahl, 2004; Papanastasiou, 2005).

The study has revealed that the majority of ratings assigned by peers during the evaluation of pre-service teachers exhibit a notable degree of bias and lack sufficient objectivity. The findings of the research indicate that there are both those who are unduly harsh and those who are unduly lenient in their evaluation of the performance of pre-service teachers. It is frequently reported in the literature that peer evaluations are less reliable and valid than teacher evaluations (Aslanoğlu et al., 2020; Aslanoğlu, 2022; Topping, 2009). Despite the assertion that rubrics enhance the reliability and validity of scoring in peer assessments (Kutlu et al., 2014; Şata & Karakaya, 2021), research indicates that peer raters exhibit disparate scoring behaviours. The implementation of rater training designs can facilitate the attainment of more valid assessments (Şata & Karakaya, 2022). The implementation of such training programmes to reduce bias and subjectivity in peer assessments would represent a crucial step in enhancing the reliability and validity of the assessment process. In this context, the development of standardization and training programmes for peer assessment processes in faculties of education and other educational institutions is imperative. This will facilitate the objective and reliable evaluation of pre-service teachers, thereby contributing to the improvement of the overall quality of education.

Following the statistical analysis of the peer raters' ratings and their relationship with the criteria, an examination of rater behaviours was conducted, taking into account both the pre-service teachers' abilities in conducting scientific research and making presentations. The results of the analysis indicated that the raters and the evaluation criteria yielded comparable outcomes in both dimensions. The results demonstrate that peer raters consistently evaluated their fellow pre-service teachers at the scientific research and presentation levels. In particular, it was determined that a severity rater was consistent in their evaluation, applying the same

level of severity in both dimensions. Conversely, a leniency rater demonstrated a similar level of generosity in both dimensions. This demonstrates that raters display a general tendency in peer evaluations, which is reflected in all dimensions of evaluation. It is therefore evident that the utilization of rater training and standardized assessment tools within peer assessment processes is of paramount importance in order to enhance the objectivity and reliability of the ratings. Furthermore, the implementation of such training programmes will serve to reinforce the validity of the evaluation results, thereby facilitating a greater degree of consciousness and fairness on the part of the raters in the evaluation process. It is of the utmost importance for educational institutions to implement the requisite safeguards and to enhance the efficacy of peer assessment procedures, thereby enabling pre-service teachers to hone their assessment competencies and obtain feedback that is both objective and reliable.

References

Aryadoust, V. (2015). Self-and-peer assessments of oral presentations by first-year university students. *Educational Assessment, 20*(3), 199-225. https://doi.org/10.1080/10627197.2015.1061989

Aslanoğlu, A. E. (2022). Akran ve öz değerlendirme uygulamalarının yazma becerilerine etkisinin incelenmesi. *International Journal of Assessment Tools in Education*, *9* (özel sayı*),* 179-196. https://doi.org/10.21449/ijate.1127815

Aslanoğlu, A. E., Karakaya, İ., & Şata, M. (2020). Evaluation of university students' rating behaviors in self and peer rating process via many facet Rasch model. *Eurasian Journal of Educational Research*, *89*, 25-46.

Bauman, S. (2004). School counselor and research revisited. *Professional School Counseling*, *7*, 141–151.

Behnke, R. R., & Sawyer, C. R. (2004). Public speaking anxiety as a function of sensitization and habituation processes. *Communication Education*, *53*(2), 164–173. https://doi.org/10.1080/0363452041000168242 9

Brunetti, F., Matt, D. T., Bonfanti, A., De Longhi, A., Pedrini, G., & Orzes, G. (2020). Digital transformation challenges: strategies emerging from a multi-stakeholder approach. *The TQM Journal*, *32*(4), 697-724.

Büyüköztürk, Ş. (1996). *Türk yüksek öğretiminde araştırma eğitimi* [Yayımlanmamış Doktora Tezi]. Ankara Üniversitesi.

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2018). *Eğitimde bilimsel araştırma yöntemleri*. Pegem Akademi. https://doi.org/10.14527/9789944919289

De Grez, L., Valcke, M., & Roozen, I. (2009). The impact of aninnovative instructional intervention on the acquisition of oral presentation skills in higher education. *Computers & Education*, *53*, 112–120. https://doi.org/10.1016/j.compedu.2009.01.005

Gagne, R. M. (1985). *The conditions of learning and theory of instruction*. Holt, Rinehart & Winston.

Hafdahl, A. R. (2004, June, 14-17). *Refinements for random-effects meta-analysis of correlation matrices* [Oral presentation]. The meeting of the Psychometric Society, Monterey, California.

Koyuncu, M. S., & Şata, M. (2023). Using ACER ConQuest program to examine multidimensional and many-facet models. *International journal of assessment tools in education*, *10*(2), 279-302. https://doi.org/10.21449/ijate.1238248

Kutlu, Ö., Doğan, C.D., & Karakaya, İ. (2014). *Öğrenci başarısının belirlenmesi: Performansa ve portfolyoya dayalı durum belirleme*. Pegem Akademi Yayıncılık.

Langan, A., Wheater, C., Shaw, E., Haines, B., Cullen, W., Boyle, J., ... Preziosi, R. F. (2005). Peer assessment of oral presentations: Effects of student gender, university affiliation and participation in the development of assessment criteria. *Assessment and Evaluation in Higher Education*, *30*, 21–34. https://doi.org/10.1080/0260293042003243878

Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel psychology*, *28*(4), 563–575. https://doi.org/10.1111/j.1744-6570.1975.tb01393.x

Messick, S. (1995). Validity of psychological assessment. *American Psychologist*, *50*(9), 741–749. https://doi.org/10.1037/0003-066X.50.9.741

Nartgün, Z., Uluman, M., Akın, Ç., Çelik, T. & Çevik, C. (2008, Eylül, 1-3). *Öğretmen adaylarının bilimsel araştırma öz-yeterliklerinin incelenmesi* [Sözlü sunum]. XVII. Ulusal Eğitim Bilimleri Kongresi, Sakarya, Türkiye.

Öztürk, M. A. (2010). An exploratory study on measuring educators' attitudes toward educational research. *Educational Research and Reviews*, *5*(12), 758-769.

Papanastasiou, E. C. (2005). Factor structure of the attitudes toward research scale. *Statistic Education Research Journal*, *4*(1), 16-26. https://doi.org/10.52041/serj.v4i1.523

Salvucci, S., Walter, E., Conley, V., Fink, S., & Saba, M. (1997). *Measurement Error Studies at the National Center for Education Statistics.*

Şata, M., & Karakaya, İ. (2021). Investigating the Effect of Rater Training on Differential Rater Function in Assessing Academic Writing Skills of Higher Education Students. *Journal of Measurement and Evaluation in Education and Psychology, 12*(2), 163-181. https://doi.org/10.21031/epod.842094

Şata, M., & Karakaya, İ. (2022). Investigating the impact of rater training on rater errors in the process of assessing writing skill. *International journal of assessment tools in education*, *9(*2), 492-514. https://doi.org/10.21449/ijate.877035

Topping, K. J. (2009). Peer Assessment. *Theory Into Practice, 48*(1), 20–27. https://doi.org/10.1080/00405840802577569

Wilson, F. R., Pan, W., & Schumsky, D. A. (2012). Recalculation of the critical values for Lawshe's content validity ratio. *Measurement and Evaluation in Counseling and Development, 45*(3), 197–210. https://doi.org/10.1177/0748175612440286

Yaşar, M. (2014). Bilimsel araştırma yöntemleri dersine yönelik tutum ölçeği geliştirme çalışması: Geçerlik ve güvenirlik. *Eğitim Bilimleri Araştırmaları Dergisi*, *4*(2), 109-129. http://dx.doi.org/10.12973/jesr.2014.42.7

APPENDIX

Appendix-1: Estimation results of item*rater*step facet

							UNWEIGHTED FIT			WEIGHTED FIT		
	item		rater	category	Estimate	Error	MNSQ	CI	T	MNSQ	CI	T
1	A1	1	R1	0			2.63	(0.54, 1.46)	4.9	1.89	(0.18, 1.82)	1.8
1	A1	1	R1	1	-1.869	0.461	4.62	(0.54, 1.46)	8.5	1.77	(0.71, 1.29)	4.3
1	A1	1	R1	2	1.419	0.576	2.70	(0.54, 1.46)	5.1	1.08	(0.22, 1.78)	0.3
1	A1	1	R1	3	1.224	0.877	0.86	(0.54, 1.46)	-0.5	1.00	(0.00, 2.22)	0.2
1	A1	1	R1	4	-0.774*		2.92	(0.54, 1.46)	5.5	1.57	(0.51, 1.49)	2.0
2	A2	1	R1	0			0.07	(0.54, 1.46)	-7.5	0.25	(0.00, 2.15)	-1.7
2	A2	1	R1	1	-1.049	0.758	1.47	(0.54, 1.46)	1.8	1.03	(0.12, 1.88)	0.2
2	A2	1	R1	2	-1.315	0.677	1.12	(0.54, 1.46)	0.6	1.03	(0.68, 1.32)	0.2
2	A2	1	R1	3	-0.114	0.428	1.14	(0.54, 1.46)	0.7	1.15	(0.81, 1.19)	1.6
2	A2	1	R1	4	2.478*		1.58	(0.54, 1.46)	2.2	1.24	(0.26, 1.74)	0.7
3	A3	1	R1	1			0.28	(0.54, 1.46)	-4.3	0.52	(0.33, 1.67)	-1.6
3	A3	1	R1	2	-0.749	0.470	1.52	(0.54, 1.46)	2.0	1.07	(0.60, 1.40)	0.4
3	A3	1	R1	3	-0.006	0.485	0.97	(0.54, 1.46)	-0.0	1.01	(0.73, 1.27)	0.1
3	A3	1	R1	4	0.755*		0.86	(0.54, 1.46)	-0.6	0.98	(0.65, 1.35)	-0.0
4	A4	1	R1	1			0.43	(0.54, 1.46)	-3.1	1.06	(0.03, 1.97)	0.3
4	A4	1	R1	2	-0.246	0.594	1.23	(0.54, 1.46)	1.0	1.12	(0.28, 1.72)	0.4
4	A4	1	R1	3	-0.151	0.618	0.75	(0.54, 1.46)	-1.1	0.88	(0.63, 1.37)	-0.6
4	A4	1	R1	4	0.397*		0.60	(0.54, 1.46)	-1.9	0.70	(0.68, 1.32)	-2.0
5	A5	1	R1	1			0.37	(0.54, 1.46)	-3.5	0.77	(0.17, 1.83)	-0.5
5	A5	1	R1	2	-0.340	0.546	1.34	(0.54, 1.46)	1.4	0.96	(0.39, 1.61)	-0.0
5	A5	1	R1	3	-0.170	0.566	1.36	(0.54, 1.46)	1.4	1.06	(0.68, 1.32)	0.4
5	A5	1	R1	4	0.510*		1.12	(0.54, 1.46)	0.6	1.15	(0.68, 1.32)	0.9
6	A6	1	R1	1			0.12	(0.54, 1.46)	-6.3	0.26	(0.21, 1.79)	-2.5
6	A6	1	R1	2	-1.416	0.483	0.77	(0.54, 1.46)	-1.0	0.91	(0.68, 1.32)	-0.6
6	A6	1	R1	3	-0.299	0.433	1.02	(0.54, 1.46)	0.2	1.05	(0.86, 1.14)	0.7
6	A6	1	R1	4	1.715*		1.36	(0.54, 1.46)	1.4	1.38	(0.48, 1.52)	1.4
7	A7	1	R1	1			3.51	(0.54, 1.46)	6.7	0.83	(0.00, 2.08)	-0.1
7	A7	1	R1	2	-1.226	0.534	1.69	(0.54, 1.46)	2.5	1.00	(0.54, 1.46)	0.1
7	A7	1	R1	3	-0.301	0.481	0.92	(0.54, 1.46)	-0.3	0.94	(0.87, 1.13)	-0.9
7	A7	1	R1	4	1.527*		0.71	(0.54, 1.46)	-1.3	0.87	(0.64, 1.36)	-0.7
8	S1	1	R1	1			0.25	(0.54, 1.46)	-4.6	0.57	(0.04, 1.96)	-0.9
8	S1	1	R1	2	-0.681	0.581	0.87	(0.54, 1.46)	-0.5	1.00	(0.36, 1.64)	0.1
8	S1	1	R1	3	-0.908	0.527	0.99	(0.54, 1.46)	0.0	1.00	(0.88, 1.12)	0.0
8	S1	1	R1	4	1.589*		3.01	(0.54, 1.46)	5.7	1.31	(0.63, 1.37)	1.6
9	S2	1	R1	1			2.05	(0.54, 1.46)	3.5	1.96	(0.12, 1.88)	1.8
9	S2	1	R1	2	-2.054	0.442	1.21	(0.54, 1.46)	0.9	1.18	(0.79, 1.21)	1.7
9	S2	1	R1	3	1.087	0.448	1.11	(0.54, 1.46)	0.5	1.05	(0.58, 1.42)	0.3
9	S2	1	R1	4	0.967*		0.36	(0.54, 1.46)	-3.6	0.63	(0.46, 1.54)	-1.5
10	S3	1	R1	1			2.30	(0.54, 1.46)	4.1	1.45	(0.47, 1.53)	1.5
10	S3	1	R1	2	-1.362	0.384	1.12	(0.54, 1.46)	0.6	1.08	(0.84, 1.16)	1.0
10	S3	1	R1	3	1.306	0.527	1.18	(0.54, 1.46)	0.8	1.03	(0.34, 1.66)	0.2
10	S3	1	R1	4	0.056*		0.47	(0.54, 1.46)	-2.7	0.75	(0.54, 1.46)	-1.1
1	A1	2	R2	0			0.95	(0.54, 1.46)	-0.2	1.51	(0.46, 1.54)	1.7
1	A1	2	R2	1	0.122	0.662	0.75	(0.54, 1.46)	-1.1	1.01	(0.07, 1.93)	0.2
1	A1	2	R2	2	-1.590	0.656	1.00	(0.54, 1.46)	0.1	0.98	(0.76, 1.24)	-0.1
1	A1	2	R2	3	0.789	0.492	0.75	(0.54, 1.46)	-1.1	0.94	(0.54, 1.46)	-0.2
1	A1	2	R2	4	0.679*		0.41	(0.54, 1.46)	-3.2	0.73	(0.55, 1.45)	-1.2
2	A2	2	R2	0			0.40	(0.54, 1.46)	-3.3	0.83	(0.33, 1.67)	-0.4
2	A2	2	R2	1	-0.462	0.619	0.70	(0.54, 1.46)	-1.3	0.99	(0.27, 1.73)	0.1
2	A2	2	R2	2	-1.106	0.606	0.94	(0.54, 1.46)	-0.2	1.02	(0.68, 1.32)	0.2
2	A2	2	R2	3	0.182	0.458	1.03	(0.54, 1.46)	0.2	1.05	(0.73, 1.27)	0.4
2	A2	2	R2	4	1.386*		0.62	(0.54, 1.46)	-1.8	0.87	(0.49, 1.51)	-0.5
3	A3	2	R2	1			0.76	(0.54, 1.46)	-1.1	1.12	(0.15, 1.85)	0.4
3	A3	2	R2	2	-1.636	0.485	0.82	(0.54, 1.46)	-0.7	0.90	(0.71, 1.29)	-0.7
3	A3	2	R2	3	-0.194	0.422	0.86	(0.54, 1.46)	-0.5	0.90	(0.85, 1.15)	-1.3
3	A3	2	R2	4	1.830*		0.41	(0.54, 1.46)	-3.2	0.71	(0.44, 1.56)	-1.1
4	A4	2	R2	1			0.31	(0.54, 1.46)	-4.0	0.73	(0.22, 1.78)	-0.6
4	A4	2	R2	2	-0.262	0.541	0.96	(0.54, 1.46)	-0.1	1.03	(0.39, 1.61)	0.2
4	A4	2	R2	3	-0.080	0.574	0.80	(0.54, 1.46)	-0.8	0.91	(0.63, 1.37)	-0.5
4	A4	2	R2	4	0.341*		0.57	(0.54, 1.46)	-2.1	0.68	(0.67, 1.33)	-2.1

5	A5	2	R2	0			5.66	(0.54, 1.46)	10.0	2.37	(0.00, 2.26)	1.8
5	A5	2	R2	1	-1.838	0.610	0.73	(0.54, 1.46)	-1.2	0.87	(0.56, 1.44)	-0.5
5	A5	2	R2	2	0.465	0.605	1.02	(0.54, 1.46)	0.2	1.02	(0.35, 1.65)	0.2
5	A5	2	R2	3	-0.494	0.539	0.98	(0.54, 1.46)	-0.0	1.00	(0.83, 1.17)	0.1
5	A5	2	R2	4	1.867*		0.57	(0.54, 1.46)	-2.1	0.77	(0.55, 1.45)	-1.0
6	A6	2	R2	1			0.33	(0.54, 1.46)	-3.9	0.60	(0.36, 1.64)	-1.3
6	A6	2	R2	2	-1.634	0.425	0.95	(0.54, 1.46)	-0.1	0.97	(0.80, 1.20)	-0.2
6	A6	2	R2	3	0.475	0.437	0.95	(0.54, 1.46)	-0.1	1.02	(0.69, 1.31)	0.2
6	A6	2	R2	4	1.160*		0.46	(0.54, 1.46)	-2.8	0.84	(0.47, 1.53)	-0.6
7	A7	2	R2	0			0.31	(0.54, 1.46)	-4.0	3.44	(0.00, 4.68)	1.4
7	A7	2	R2	1	-4.011	0.908	0.92	(0.54, 1.46)	-0.3	1.14	(0.60, 1.40)	0.7
7	A7	2	R2	2	-0.252	0.470	0.96	(0.54, 1.46)	-0.1	0.99	(0.83, 1.17)	-0.1
7	A7	2	R2	3	1.042	0.449	0.79	(0.54, 1.46)	-0.9	0.89	(0.69, 1.31)	-0.7
7	A7	2	R2	4	3.221*		0.18	(0.54, 1.46)	-5.5	0.55	(0.00, 2.28)	-0.6
8	S1	2	R2	0			1.46	(0.54, 1.46)	1.8	1.14	(0.00, 2.62)	0.4
8	S1	2	R2	1	-1.926	0.755	2.65	(0.54, 1.46)	5.0	1.09	(0.38, 1.62)	0.4
8	S1	2	R2	2	-0.846	0.561	0.85	(0.54, 1.46)	-0.6	0.91	(0.75, 1.25)	-0.7
8	S1	2	R2	3	0.247	0.425	0.98	(0.54, 1.46)	-0.0	0.98	(0.80, 1.20)	-0.2
8	S1	2	R2	4	2.525*		0.74	(0.54, 1.46)	-1.1	1.01	(0.11, 1.89)	0.2
9	S2	2	R2	1			0.47	(0.54, 1.46)	-2.8	0.72	(0.44, 1.56)	-1.0
9	S2	2	R2	2	-1.489	0.397	0.79	(0.54, 1.46)	-0.9	0.82	(0.84, 1.16)	-2.4
9	S2	2	R2	3	0.911	0.471	0.76	(0.54, 1.46)	-1.1	0.91	(0.52, 1.48)	-0.3
9	S2	2	R2	4	0.578*		0.62	(0.54, 1.46)	-1.8	0.94	(0.48, 1.52)	-0.2
10	S3	2	R2	1			0.51	(0.54, 1.46)	-2.5	0.78	(0.43, 1.57)	-0.8
10	S3	2	R2	2	-1.285	0.461	0.87	(0.54, 1.46)	-0.5	0.94	(0.72, 1.28)	-0.4
10	S3	2	R2	3	-0.570	0.419	1.08	(0.54, 1.46)	0.4	1.08	(0.81, 1.19)	0.8
10	S3	2	R2	4	1.855*		1.05	(0.54, 1.46)	0.3	1.60	(0.15, 1.85)	1.3
1	A1	3	R3	0			1.71	(0.54, 1.46)	2.6	1.20	(0.29, 1.71)	0.6
1	A1	3	R3	1	-1.011	0.608	0.57	(0.54, 1.46)	-2.1	0.91	(0.39, 1.61)	-0.2
1	A1	3	R3	2	-0.865	0.588	1.01	(0.54, 1.46)	0.1	1.03	(0.58, 1.42)	0.2
1	A1	3	R3	3	-0.592	0.458	1.08	(0.54, 1.46)	0.4	1.13	(0.75, 1.25)	1.0
1	A1	3	R3	4	2.467*		6.98	(0.54, 1.46)	11.7	1.37	(0.02, 1.98)	0.8
2	A2	3	R3	1			0.28	(0.54, 1.46)	-4.4	0.56	(0.08, 1.92)	-1.0
2	A2	3	R3	2	-2.121	0.519	0.97	(0.54, 1.46)	-0.0	1.00	(0.76, 1.24)	0.1
2	A2	3	R3	3	-0.255	0.404	0.90	(0.54, 1.46)	-0.4	0.93	(0.81, 1.19)	-0.7
2	A2	3	R3	4	2.376*		5.24	(0.54, 1.46)	9.5	1.63	(0.10, 1.90)	1.3
3	A3	3	R3	1			0.62	(0.54, 1.46)	-1.8	1.10	(0.00, 2.04)	0.4
3	A3	3	R3	2	-1.961	0.583	0.87	(0.54, 1.46)	-0.5	0.96	(0.63, 1.37)	-0.2
3	A3	3	R3	3	-0.875	0.432	0.92	(0.54, 1.46)	-0.3	0.94	(0.75, 1.25)	-0.4
3	A3	3	R3	4	2.836*		0.34	(0.54, 1.46)	-3.7	0.75	(0.00, 2.02)	-0.4
4	A4	3	R3	1			0.30	(0.54, 1.46)	-4.2	0.66	(0.31, 1.69)	-1.0
4	A4	3	R3	2	-0.175	0.537	0.90	(0.54, 1.46)	-0.4	1.01	(0.38, 1.62)	0.1
4	A4	3	R3	3	-0.279	0.564	0.83	(0.54, 1.46)	-0.7	0.91	(0.68, 1.32)	-0.5
4	A4	3	R3	4	0.453*		0.58	(0.54, 1.46)	-2.0	0.68	(0.67, 1.33)	-2.1
5	A5	3	R3	2			3.79	(0.54, 1.46)	7.2	1.71	(0.24, 1.76)	1.6
5	A5	3	R3	3	-1.707	0.361	1.02	(0.54, 1.46)	0.2	1.02	(0.76, 1.24)	0.2
5	A5	3	R3	4	1.707*		0.79	(0.54, 1.46)	-0.9	0.89	(0.60, 1.40)	-0.5
6	A6	3	R3	1			0.12	(0.54, 1.46)	-6.4	0.65	(0.00, 2.69)	-0.2
6	A6	3	R3	2	-3.642	0.763	0.79	(0.54, 1.46)	-0.9	0.81	(0.76, 1.24)	-1.7
6	A6	3	R3	3	0.191	0.399	0.78	(0.54, 1.46)	-1.0	0.82	(0.75, 1.25)	-1.5
6	A6	3	R3	4	3.450*		0.50	(0.54, 1.46)	-2.6	1.17	(0.00, 2.96)	0.5
7	A7	3	R3	0			0.08	(0.54, 1.46)	-7.1	0.25	(0.00, 2.01)	-2.0
7	A7	3	R3	1	-0.281	0.834	0.39	(0.54, 1.46)	-3.4	0.89	(0.00, 2.19)	0.0
7	A7	3	R3	2	-2.000	0.770	0.86	(0.54, 1.46)	-0.6	0.92	(0.78, 1.22)	-0.6
7	A7	3	R3	3	0.695	0.432	1.05	(0.54, 1.46)	0.3	1.08	(0.73, 1.27)	0.6
7	A7	3	R3	4	1.587*		0.65	(0.54, 1.46)	-1.6	1.04	(0.49, 1.51)	0.2
8	S1	3	R3	1			0.44	(0.54, 1.46)	-2.9	0.89	(0.00, 2.57)	0.1
8	S1	3	R3	2	-2.256	0.703	0.95	(0.54, 1.46)	-0.1	1.05	(0.57, 1.43)	0.3
8	S1	3	R3	3	-0.994	0.446	0.99	(0.54, 1.46)	0.0	1.02	(0.68, 1.32)	0.2
8	S1	3	R3	4	3.250*		3.65	(0.54, 1.46)	6.9	1.21	(0.00, 2.25)	0.5
9	S2	3	R3	1			0.42	(0.54, 1.46)	-3.2	0.76	(0.34, 1.66)	-0.7
9	S2	3	R3	2	-1.860	0.443	1.11	(0.54, 1.46)	0.5	1.07	(0.85, 1.15)	0.9
9	S2	3	R3	3	0.325	0.417	0.84	(0.54, 1.46)	-0.7	0.94	(0.72, 1.28)	-0.4
9	S2	3	R3	4	1.536*		2.14	(0.54, 1.46)	3.8	1.30	(0.18, 1.82)	0.8
10	S3	3	R3	2			1.66	(0.54, 1.46)	2.4	1.39	(0.71, 1.29)	2.4
10	S3	3	R3	3	0.142	0.390	1.00	(0.54, 1.46)	0.1	1.01	(0.63, 1.37)	0.1
10	S3	3	R3	4	-0.142*		0.82	(0.54, 1.46)	-0.7	0.97	(0.62, 1.38)	-0.1
1	A1	4	R4	1			0.41	(0.54, 1.46)	-3.2	0.85	(0.25, 1.75)	-0.3
1	A1	4	R4	2	-1.044	0.447	1.11	(0.54, 1.46)	0.5	1.09	(0.68, 1.32)	0.6
1	A1	4	R4	3	0.643	0.495	0.92	(0.54, 1.46)	-0.3	0.98	(0.58, 1.42)	-0.0
1	A1	4	R4	4	0.402*		0.89	(0.54, 1.46)	-0.4	0.96	(0.64, 1.36)	-0.2
2	A2	4	R4	1			3.35	(0.54, 1.46)	6.4	1.30	(0.00, 2.14)	0.7
2	A2	4	R4	2	-1.718	0.506	0.69	(0.54, 1.46)	-1.4	0.84	(0.67, 1.33)	-0.9
2	A2	4	R4	3	0.093	0.440	0.93	(0.54, 1.46)	-0.2	0.96	(0.86, 1.14)	-0.6
2	A2	4	R4	4	1.625*		1.06	(0.54, 1.46)	0.3	1.06	(0.60, 1.40)	0.4
3	A3	4	R4	1			0.34	(0.54, 1.46)	-3.8	0.91	(0.00, 2.26)	0.1
3	A3	4	R4	2	-1.531	0.562	0.87	(0.54, 1.46)	-0.5	0.91	(0.54, 1.46)	-0.3
3	A3	4	R4	3	-0.467	0.474	0.89	(0.54, 1.46)	-0.4	0.90	(0.87, 1.13)	-1.6

3	A3	4	R4	4	1.997*		0.59	(0.54, 1.46)	-2.0	0.79	(0.58, 1.42)	-1.0
4	A4	4	R4	1			0.78	(0.54, 1.46)	-0.9	1.71	(0.00, 2.29)	1.1
4	A4	4	R4	2	-0.643	0.616	1.28	(0.54, 1.46)	1.2	1.06	(0.29, 1.71)	0.3
4	A4	4	R4	3	0.061	0.624	0.74	(0.54, 1.46)	-1.1	0.87	(0.63, 1.37)	-0.7
4	A4	4	R4	4	0.581*		0.65	(0.54, 1.46)	-1.7	0.76	(0.68, 1.32)	-1.6
5	A5	4	R4	2			2.25	(0.54, 1.46)	4.0	0.97	(0.06, 1.94)	0.1
5	A5	4	R4	3	-1.179	0.363	0.98	(0.54, 1.46)	0.0	0.99	(0.81, 1.19)	-0.1
5	A5	4	R4	4	1.179*		0.97	(0.54, 1.46)	-0.0	1.03	(0.73, 1.27)	0.3
6	A6	4	R4	1			1.98	(0.54, 1.46)	3.3	3.75	(0.00, 2.80)	2.1
6	A6	4	R4	2	-3.146	0.558	1.21	(0.54, 1.46)	0.9	1.12	(0.71, 1.29)	0.8
6	A6	4	R4	3	1.261	0.433	0.87	(0.54, 1.46)	-0.5	0.92	(0.68, 1.32)	-0.4
6	A6	4	R4	4	1.886*		0.28	(0.54, 1.46)	-4.3	0.55	(0.39, 1.61)	-1.6
7	A7	4	R4	1			0.28	(0.54, 1.46)	-4.4	2.49	(0.00, 4.15)	1.2
7	A7	4	R4	2	-3.445	0.614	1.30	(0.54, 1.46)	1.2	1.06	(0.71, 1.29)	0.5
7	A7	4	R4	3	0.808	0.418	0.90	(0.54, 1.46)	-0.4	0.92	(0.86, 1.14)	-1.1
7	A7	4	R4	4	2.637*		1.42	(0.54, 1.46)	1.7	1.07	(0.44, 1.56)	0.3
8	S1	4	R4	1			0.18	(0.54, 1.46)	-5.5	1.10	(0.00, 3.08)	0.4
8	S1	4	R4	2	-1.880	0.647	0.65	(0.54, 1.46)	-1.6	0.90	(0.45, 1.55)	-0.3
8	S1	4	R4	3	-0.627	0.496	0.95	(0.54, 1.46)	-0.1	0.95	(0.79, 1.21)	-0.4
8	S1	4	R4	4	2.507*		0.75	(0.54, 1.46)	-1.1	0.92	(0.48, 1.52)	-0.2
9	S2	4	R4	1			0.38	(0.54, 1.46)	-3.4	0.54	(0.57, 1.43)	-2.5
9	S2	4	R4	2	0.113	0.391	0.92	(0.54, 1.46)	-0.3	0.96	(0.62, 1.38)	-0.1
9	S2	4	R4	3	-0.113*		0.88	(0.54, 1.46)	-0.5	0.91	(0.71, 1.29)	-0.6
10	S3	4	R4	1			0.30	(0.54, 1.46)	-4.2	0.65	(0.00, 2.29)	-0.4
10	S3	4	R4	2	-2.218	0.567	1.09	(0.54, 1.46)	0.4	1.03	(0.72, 1.28)	0.2
10	S3	4	R4	3	-0.226	0.406	1.04	(0.54, 1.46)	0.2	1.05	(0.83, 1.17)	0.6
10	S3	4	R4	4	2.445*		0.51	(0.54, 1.46)	-2.5	0.98	(0.17, 1.83)	0.1
1	A1	5	R5	0			3.32	(0.54, 1.46)	6.3	1.29	(0.00, 2.01)	0.7
1	A1	5	R5	1	-1.496	0.668	0.52	(0.54, 1.46)	-2.4	0.89	(0.40, 1.60)	-0.3
1	A1	5	R5	2	-0.874	0.579	1.01	(0.54, 1.46)	0.1	1.02	(0.63, 1.37)	0.1
1	A1	5	R5	3	-0.398	0.442	0.87	(0.54, 1.46)	-0.5	0.92	(0.76, 1.24)	-0.6
1	A1	5	R5	4	2.767*		6.14	(0.54, 1.46)	10.7	1.45	(0.00, 2.04)	0.9
2	A2	5	R5	1			0.41	(0.54, 1.46)	-3.2	0.88	(0.00, 2.23)	0.0
2	A2	5	R5	2	-2.593	0.555	0.92	(0.54, 1.46)	-0.3	0.95	(0.77, 1.23)	-0.4
2	A2	5	R5	3	0.129	0.400	0.93	(0.54, 1.46)	-0.2	0.96	(0.81, 1.19)	-0.4
2	A2	5	R5	4	2.464*		0.73	(0.54, 1.46)	-1.2	1.09	(0.13, 1.87)	0.3
3	A3	5	R5	1			0.51	(0.54, 1.46)	-2.5	0.93	(0.07, 1.93)	-0.0
3	A3	5	R5	2	-1.572	0.523	0.88	(0.54, 1.46)	-0.4	0.98	(0.64, 1.36)	-0.1
3	A3	5	R5	3	-0.564	0.437	0.99	(0.54, 1.46)	0.0	1.01	(0.84, 1.16)	0.2
3	A3	5	R5	4	2.136*		0.54	(0.54, 1.46)	-2.3	0.90	(0.39, 1.61)	-0.2
4	A4	5	R5	1			0.33	(0.54, 1.46)	-3.9	0.77	(0.18, 1.82)	-0.5
4	A4	5	R5	2	-0.310	0.547	0.94	(0.54, 1.46)	-0.2	1.02	(0.39, 1.61)	0.2
4	A4	5	R5	3	-0.049	0.576	0.79	(0.54, 1.46)	-0.9	0.90	(0.63, 1.37)	-0.5
4	A4	5	R5	4	0.359*		0.56	(0.54, 1.46)	-2.2	0.66	(0.67, 1.33)	-2.3
5	A5	5	R5	2			2.17	(0.54, 1.46)	3.8	1.81	(0.06, 1.94)	1.5
5	A5	5	R5	3	-1.910	0.373	1.01	(0.54, 1.46)	0.1	1.03	(0.72, 1.28)	0.2
5	A5	5	R5	4	1.910*		0.59	(0.54, 1.46)	-2.0	0.78	(0.61, 1.39)	-1.1
6	A6	5	R5	1			0.14	(0.54, 1.46)	-6.0	0.90	(0.00, 2.96)	0.2
6	A6	5	R5	2	-3.732	0.771	0.82	(0.54, 1.46)	-0.7	0.83	(0.75, 1.25)	-1.4
6	A6	5	R5	3	0.362	0.401	0.81	(0.54, 1.46)	-0.8	0.84	(0.76, 1.24)	-1.4
6	A6	5	R5	4	3.370*		0.39	(0.54, 1.46)	-3.3	0.92	(0.00, 2.69)	0.2
7	A7	5	R5	0			0.06	(0.54, 1.46)	-7.6	0.25	(0.00, 2.20)	-1.6
7	A7	5	R5	1	-0.534	0.855	0.52	(0.54, 1.46)	-2.4	0.98	(0.00, 2.17)	0.2
7	A7	5	R5	2	-1.811	0.776	0.92	(0.54, 1.46)	-0.3	0.99	(0.75, 1.25)	-0.1
7	A7	5	R5	3	0.658	0.433	1.04	(0.54, 1.46)	0.2	1.06	(0.77, 1.23)	0.5
7	A7	5	R5	4	1.688*		0.59	(0.54, 1.46)	-2.0	0.92	(0.52, 1.48)	-0.2
8	S1	5	R5	1			0.89	(0.54, 1.46)	-0.4	1.77	(0.00, 3.42)	0.9
8	S1	5	R5	2	-2.846	0.830	0.92	(0.54, 1.46)	-0.3	1.03	(0.57, 1.43)	0.2
8	S1	5	R5	3	-0.861	0.449	0.96	(0.54, 1.46)	-0.1	1.01	(0.64, 1.36)	0.1
8	S1	5	R5	4	3.707*		0.92	(0.54, 1.46)	-0.3	0.75	(0.00, 2.45)	-0.1
9	S2	5	R5	1			0.71	(0.54, 1.46)	-1.3	1.49	(0.00, 2.25)	0.9
9	S2	5	R5	2	-2.866	0.568	1.09	(0.54, 1.46)	0.4	1.06	(0.78, 1.22)	0.6
9	S2	5	R5	3	0.717	0.411	0.88	(0.54, 1.46)	-0.5	0.95	(0.71, 1.29)	-0.3
9	S2	5	R5	4	2.148*		0.21	(0.54, 1.46)	-5.1	0.49	(0.00, 2.09)	-1.0
10	S3	5	R5	1			0.29	(0.54, 1.46)	-4.2	0.52	(0.00, 2.14)	-0.8
10	S3	5	R5	2	-2.992	0.555	0.75	(0.54, 1.46)	-1.1	0.78	(0.69, 1.31)	-1.5
10	S3	5	R5	3	1.248	0.462	0.70	(0.54, 1.46)	-1.4	0.86	(0.52, 1.48)	-0.5
10	S3	5	R5	4	1.744*		0.69	(0.54, 1.46)	-1.4	1.48	(0.00, 2.19)	0.9
1	A1	6	R6	0			0.25	(0.54, 1.46)	-4.6	0.68	(0.17, 1.83)	-0.7
1	A1	6	R6	1	-1.118	0.573	0.80	(0.54, 1.46)	-0.8	0.99	(0.50, 1.50)	0.0
1	A1	6	R6	2	-0.082	0.593	1.23	(0.54, 1.46)	1.0	1.08	(0.44, 1.56)	0.4
1	A1	6	R6	3	-0.469	0.508	0.94	(0.54, 1.46)	-0.2	1.01	(0.81, 1.19)	0.1
1	A1	6	R6	4	1.670*		3.96	(0.54, 1.46)	7.5	1.66	(0.51, 1.49)	2.3
2	A2	6	R6	1			0.09	(0.54, 1.46)	-6.9	0.38	(0.00, 2.32)	-1.0
2	A2	6	R6	2	-2.492	0.542	0.97	(0.54, 1.46)	-0.0	1.01	(0.75, 1.25)	0.1
2	A2	6	R6	3	0.209	0.405	1.02	(0.54, 1.46)	0.2	1.04	(0.84, 1.16)	0.5
2	A2	6	R6	4	2.282*		1.00	(0.54, 1.46)	0.1	1.23	(0.32, 1.68)	0.7
3	A3	6	R6	1			0.43	(0.54, 1.46)	-3.1	0.74	(0.00, 2.08)	-0.3

3	A3	6	R6	2	-1.464	0.564	1.10	(0.54, 1.46)	0.5	1.06	(0.53, 1.47)	0.3
3	A3	6	R6	3	-0.790	0.468	1.03	(0.54, 1.46)	0.2	1.04	(0.81, 1.19)	0.4
3	A3	6	R6	4	2.254*		0.66	(0.54, 1.46)	-1.6	0.96	(0.44, 1.56)	-0.1
4	A4	6	R6	1			0.49	(0.54, 1.46)	-2.6	1.13	(0.00, 2.06)	0.4
4	A4	6	R6	2	-0.816	0.534	1.01	(0.54, 1.46)	0.1	1.08	(0.49, 1.51)	0.4
4	A4	6	R6	3	0.293	0.549	0.78	(0.54, 1.46)	-0.9	0.89	(0.63, 1.37)	-0.5
4	A4	6	R6	4	0.523*		0.57	(0.54, 1.46)	-2.1	0.67	(0.68, 1.32)	-2.2
5	A5	6	R6	2			2.30	(0.54, 1.46)	4.2	1.35	(0.19, 1.81)	0.9
5	A5	6	R6	3	-1.259	0.355	1.03	(0.54, 1.46)	0.2	1.02	(0.83, 1.17)	0.3
5	A5	6	R6	4	1.259*		0.95	(0.54, 1.46)	-0.1	1.02	(0.71, 1.29)	0.2
6	A6	6	R6	1			0.78	(0.54, 1.46)	-0.9	1.45	(0.00, 2.60)	0.8
6	A6	6	R6	2	-3.177	0.602	1.03	(0.54, 1.46)	0.2	0.97	(0.75, 1.25)	-0.2
6	A6	6	R6	3	0.687	0.408	1.11	(0.54, 1.46)	0.5	0.97	(0.76, 1.24)	-0.2
6	A6	6	R6	4	2.490*		0.30	(0.54, 1.46)	-4.1	0.71	(0.06, 1.94)	-0.5
7	A7	6	R6	0			0.06	(0.54, 1.46)	-7.7	0.40	(0.00, 2.47)	-0.8
7	A7	6	R6	1	-1.326	0.785	0.58	(0.54, 1.46)	-2.0	1.06	(0.13, 1.87)	0.3
7	A7	6	R6	2	-0.816	0.701	1.76	(0.54, 1.46)	2.7	1.09	(0.59, 1.41)	0.5
7	A7	6	R6	3	-0.061	0.462	0.97	(0.54, 1.46)	-0.0	1.01	(0.87, 1.13)	0.1
7	A7	6	R6	4	2.203*		0.70	(0.54, 1.46)	-1.4	1.04	(0.51, 1.49)	0.3
8	S1	6	R6	2			2.65	(0.54, 1.46)	5.0	3.55	(0.00, 2.26)	2.7
8	S1	6	R6	3	-2.382	0.419	1.27	(0.54, 1.46)	1.1	1.16	(0.56, 1.44)	0.7
8	S1	6	R6	4	2.382*		0.28	(0.54, 1.46)	-4.3	0.39	(0.46, 1.54)	-2.8
9	S2	6	R6	1			0.57	(0.54, 1.46)	-2.1	1.37	(0.00, 3.19)	0.7
9	S2	6	R6	2	-3.590	0.772	1.18	(0.54, 1.46)	0.8	1.14	(0.78, 1.22)	1.2
9	S2	6	R6	3	0.455	0.391	1.10	(0.54, 1.46)	0.5	1.09	(0.79, 1.21)	0.8
9	S2	6	R6	4	3.135*		0.30	(0.54, 1.46)	-4.1	0.73	(0.00, 2.52)	-0.1
10	S3	6	R6	1			0.41	(0.54, 1.46)	-3.2	0.57	(0.00, 2.04)	-0.8
10	S3	6	R6	2	-2.343	0.531	0.96	(0.54, 1.46)	-0.1	0.96	(0.81, 1.19)	-0.4
10	S3	6	R6	3	0.099	0.396	1.02	(0.54, 1.46)	0.2	1.02	(0.81, 1.19)	0.2
10	S3	6	R6	4	2.243*		3.52	(0.54, 1.46)	6.7	1.47	(0.03, 1.97)	1.0
1	A1	7	R7	0			1.91	(0.54, 1.46)	3.2	1.30	(0.22, 1.78)	0.8
1	A1	7	R7	1	-0.800	0.587	2.32	(0.54, 1.46)	4.2	1.10	(0.39, 1.61)	0.4
1	A1	7	R7	2	-0.933	0.547	1.16	(0.54, 1.46)	0.7	0.97	(0.75, 1.25)	-0.2
1	A1	7	R7	3	0.951	0.495	1.07	(0.54, 1.46)	0.4	1.02	(0.53, 1.47)	0.2
1	A1	7	R7	4	0.781*		0.61	(0.54, 1.46)	-1.8	0.96	(0.56, 1.44)	-0.1
2	A2	7	R7	0			8.38	(0.54, 1.46)	13.2	2.48	(0.00, 2.02)	2.2
2	A2	7	R7	1	-0.335	0.835	0.73	(0.54, 1.46)	-1.2	1.01	(0.00, 2.18)	0.2
2	A2	7	R7	2	-1.972	0.774	0.93	(0.54, 1.46)	-0.2	0.92	(0.76, 1.24)	-0.6
2	A2	7	R7	3	0.414	0.421	0.79	(0.54, 1.46)	-0.9	0.86	(0.79, 1.21)	-1.3
2	A2	7	R7	4	1.893*		0.31	(0.54, 1.46)	-4.0	0.59	(0.42, 1.58)	-1.5
3	A3	7	R7	0			2.23	(0.54, 1.46)	4.0	2.38	(0.00, 3.58)	1.2
3	A3	7	R7	1	-3.196	0.897	1.00	(0.54, 1.46)	0.1	1.11	(0.46, 1.54)	0.5
3	A3	7	R7	2	-0.776	0.531	0.97	(0.54, 1.46)	-0.1	0.97	(0.78, 1.22)	-0.2
3	A3	7	R7	3	0.463	0.423	0.83	(0.54, 1.46)	-0.7	0.89	(0.74, 1.26)	-0.9
3	A3	7	R7	4	3.510*		0.20	(0.54, 1.46)	-5.2	0.62	(0.00, 2.42)	-0.4
4	A4	7	R7	1			0.39	(0.54, 1.46)	-3.4	0.93	(0.06, 1.94)	-0.0
4	A4	7	R7	2	-0.209	0.594	1.15	(0.54, 1.46)	0.7	1.04	(0.28, 1.72)	0.2
4	A4	7	R7	3	-0.172	0.618	0.75	(0.54, 1.46)	-1.1	0.88	(0.63, 1.37)	-0.6
4	A4	7	R7	4	0.381*		0.62	(0.54, 1.46)	-1.8	0.73	(0.68, 1.32)	-1.8
5	A5	7	R7	1			1.62	(0.54, 1.46)	2.3	1.00	(0.33, 1.67)	0.1
5	A5	7	R7	2	0.508	0.643	0.74	(0.54, 1.46)	-1.1	1.00	(0.09, 1.91)	0.2
5	A5	7	R7	3	-0.382	0.703	0.74	(0.54, 1.46)	-1.2	0.90	(0.51, 1.49)	-0.3
5	A5	7	R7	4	-0.126*		4.16	(0.54, 1.46)	7.8	1.17	(0.65, 1.35)	0.9
6	A6	7	R7	1			0.20	(0.54, 1.46)	-5.2	0.69	(0.00, 2.20)	-0.4
6	A6	7	R7	2	-2.646	0.520	0.86	(0.54, 1.46)	-0.5	0.88	(0.76, 1.24)	-1.0
6	A6	7	R7	3	0.669	0.413	0.93	(0.54, 1.46)	-0.2	0.96	(0.75, 1.25)	-0.3
6	A6	7	R7	4	1.977*		0.34	(0.54, 1.46)	-3.8	0.74	(0.29, 1.71)	-0.7
7	A7	7	R7	1			4.06	(0.54, 1.46)	7.7	3.48	(0.00, 2.68)	2.1
7	A7	7	R7	2	-2.605	0.536	1.65	(0.54, 1.46)	2.4	1.31	(0.73, 1.27)	2.1
7	A7	7	R7	3	0.635	0.419	0.99	(0.54, 1.46)	0.0	1.01	(0.83, 1.17)	0.1
7	A7	7	R7	4	1.969*		0.44	(0.54, 1.46)	-3.0	0.67	(0.52, 1.48)	-1.4
8	S1	7	R7	1			0.24	(0.54, 1.46)	-4.7	0.54	(0.23, 1.77)	-1.3
8	S1	7	R7	2	-0.329	0.555	1.21	(0.54, 1.46)	0.9	1.04	(0.36, 1.64)	0.2
8	S1	7	R7	3	-0.704	0.538	1.04	(0.54, 1.46)	0.3	1.04	(0.85, 1.15)	0.5
8	S1	7	R7	4	1.033*		2.46	(0.54, 1.46)	4.5	1.28	(0.70, 1.30)	1.7
9	S2	7	R7	1			0.74	(0.54, 1.46)	-1.1	1.02	(0.41, 1.59)	0.1
9	S2	7	R7	2	-1.526	0.353	0.90	(0.54, 1.46)	-0.3	0.91	(0.79, 1.21)	-0.9
9	S2	7	R7	3	1.526*		0.45	(0.54, 1.46)	-2.9	0.64	(0.54, 1.46)	-1.7
10	S3	7	R7	1			0.65	(0.54, 1.46)	-1.6	0.83	(0.40, 1.60)	-0.5
10	S3	7	R7	2	-1.770	0.367	0.96	(0.54, 1.46)	-0.1	0.98	(0.72, 1.28)	-0.1
10	S3	7	R7	3	1.770*		0.65	(0.54, 1.46)	-1.6	0.98	(0.41, 1.59)	0.0

Appendix-2: Ethics Committee Permission Certificate

Evrak Tarih ve Sayısı: 21.08.2024-292624

T.C.
AFYON KOCATEPE ÜNİVERSİTESİ
SOSYAL VE BEŞERİ BİLİMLERİ BİLİMSEL ARAŞTIRMA VE YAYIN ETİĞİ KURULU KARARLARI

TOPLANTI SAYISI:15 KARAR TARİHİ: 21.08.2024

KARAR 2024/277

Üniversitemiz Eğitim Fakültesi öğretim elemanı Doç. Dr. Mahmut Sami KOYUNCU tarafından yürütülen (Diğer Araştırmacılar: Doç. Dr. Mehmet ŞATA), "Öğretmen Adaylarının Bilimsel Araştırma Becerilerinin Değerlendirilmesinde Yeni Yaklaşımlar: Çok Boyutlu-Çok Yüzeyli Rasch Modeli Uygulaması" başlıklı öğretim elemanı araştırması kapsamında yapılan başvuruda yer alan veri toplama araçlarının, etik açıdan sakıncalı olmadığına, katılanların oy birliği ile karar verildi.

ASLI GİBİDİR

Prof. Dr. Mustafa GÜLER
Sosyal ve Beşeri Bilimleri Bilimsel Araştırma ve Yayın Etiği Kurul Başkanı