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Research Experiences Instrument Scoring Guide

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REI Scoring Instruction Guide

The following is a scoring guide to assist higher-education administrators, faculty, and researchers who wish to use the Research Experiences Instrument (REI). There are five aspects, or factors, that the REI is intended to measure relative to engineering Ph.D. students' opportunities to practice being a professional in their research experiences, and an overall REI score.

5 Factors: *Teamwork*, *Collaboration*, *Networking*, *Modeling*, and *Experimentation*. Overall REI score: *Opportunity*.

Each factor is comprised of four to six questions. Within the factor, these questions are to be scored and then averaged with the other questions within that factor. The individual factor scores will remain on the original scale: 1) never, 2) very rarely, 3) rarely, 4) occasionally, 5) frequently, 6) very frequently, and should be interpreted as such. The minimum/maximum individual factor scores also remain on the original scale: minimum - 1) never; maximum - 6) very frequently.

The overall REI score, *Opportunity,* is the sum of the five factor scores, and indicates the overall opportunities to practice being a professional (higher scores indicate more opportunities). The overall scale will be on a 30-point scale: 5-7) never, 8-12) very rarely, 13-17) rarely, 18-22) occasionally, 23-27) frequently, 28-30) very frequently. The minimum/maximum overall factor scores will be: minimum 5) never; maximum 30) very frequently.

The REI is not designed as an individual assessment, but rather scores should be compared with relative peer groups across mean scores. When comparing peer groups, the overall REI score should first be compared for which groups have higher and lower scores, then the individual factor scores should be examined for an indication of why the overall REI scores for the peer groups are higher/lower comparatively.

Overall stem: How often in your Ph.D. research experiences did you:

Teamwork: Working as a team member
Q1: take on different roles or responsibilities within a research group?
Q2: coordinate research tasks with other graduate students?
Q3: share decision making responsibility with other graduate students?
Q5: mutually depend on other graduate students to meet the desired outcomes?
Teamwork score = (Q1 + Q2 + Q3 + Q5) / 4

Collaboration: Exposure to collaborator's form of practice

Q6: present your research results to your sponsors or collaborators who are involved in your research?

Q7: interact at your university with your sponsors or collaborators who are involved in your research?

Q8: correspond (e.g., email, phone, etc.) with your sponsors or collaborators who are involved in your research?

Q9: interact with your sponsors or collaborators at their place of work related to your research?

Q10: co-author journal or conference papers with your sponsors or collaborators?

Q11: co-create a presentation with your sponsors or collaborators?

Collaboration score = (Q6 + Q7 + Q8 + Q9 + Q10 + Q11) / 6

Networking: Exposure to relevant professional practice

Q12: develop professional relationships with practicing engineers through research?

Q13: participate in industry or government conferences as part of research?

Q15: present results of your research to practicing engineers?

Q16: interact with practicing engineers during internships or co-ops?

Networking score = (Q11 + Q13 + Q15 + Q16) / 4

Modeling: Modeling and simulation tasks

Q18: develop or utilize a mathematical model to help solve a problem?

Q19: specify constraints or assumptions in development of a mathematical model to help solve a problem?

Q20: utilize sophisticated tools to help solve a modeling or simulation problem?

Q21: simulate a system to obtain results?

Q22: iterate on the development of a model or simulation to optimize results?

Q23: verify a model or simulation based on real-world data or actual results?

Modeling score = (Q18 + Q19 + Q20 + Q21 + Q22 + Q23) / 6

Experimentation: Practical skills

Q24: use testing equipment or instrumentation as an integral part of conducting your research?

Q25: develop plans to use testing equipment or instrumentation?

Q26: ensure testing equipment or instrumentation is appropriately set-up (i.e., calibrated) before use?

Q27: collect data from testing equipment or apparatus using appropriate sensors or instrumentation?

Q28: interpret data gathered from testing equipment or apparatus?

Q29: troubleshoot or modify testing equipment or instrumentation when it does not operate properly?

Experimentation score = (Q24 + Q25 + Q26 + Q27 + Q28 + Q29) / 6

Opportunity score = *Teamwork + Collaboration + Networking + Modeling + Experimentation*

More information can be found at https://doi.org/10.25394/PGS.12437108.v1.