

PEA5718 - Aprendizagem Ativa

Estratégias em sala de aula

Docentes Responsáveis

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Aprendizagem
Ativa

PEA5718 - Aprendizagem Ativa

Estratégias em sala de aula

Encontro 9

Introdução à Pesquisa
em Educação em Engenharia

kahoot

Introduction to Engineering Education Research



Engineering Education Research Resources

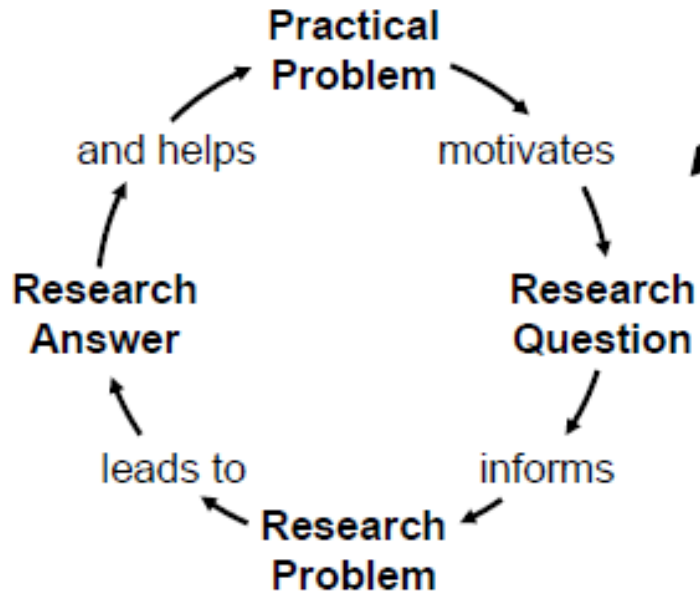


Access a list of references for engineering education research

<http://crlte.engin.umich.edu/ee/ee-resources/>

Empirical Investigations: JEE Review Criteria

- **Focus:** Significantly extends the body of knowledge
- **Problem:** Clearly state and explain the problem or issue
- **Literature:** Identify, synthesize and evaluate the relevant literature
- **Methods and Analysis:** Well-developed, clearly articulated, and appropriate method or set of methods for the expressed problem
- **Quality of Data and Findings:** Sufficient quality to address the hypothesis and/or research questions.
 - Quantitative studies: sample size and demographics
 - Qualitative papers: in-depth understanding of the context?
- **Conclusions:** Are the conclusions specific to the research questions or hypotheses posed?
- **Clarity and Organization**



Research Process

Structural Alignment

Make your story consistent and tight...



Interpretation of results

Methodology / study design

Research Questions

Theoretical / conceptual framework



Guiding Principles for Scientific Research in Education

1. **Question:** pose significant question that can be investigated empirically
2. **Theory:** link research to relevant theory
3. **Methods:** use methods that permit direct investigation of the question
4. **Reasoning:** provide coherent, explicit chain of reasoning
5. **Replicate and generalize** across studies
6. **Disclose** research to encourage professional scrutiny and critique

1. Significant questions that can be investigated empirically

- Who would care about your results?**
- What data will you need to gather to answer your question?**

2. Link research to relevant **theory**

- **Learning theories**
 - Cognition
 - Novice – expert differences
 - Instructional psychology
 - Psychometrics
- **Motivational theories**
- **Moral and ethical development**
- **Social context of education**

3. Methods for direct investigation (examples)

Quantitative methods

- Tests
- Surveys & questionnaires (defined response)
- Faculty or peer ratings

Qualitative methods

- Focus groups
- Interviews
- Observations

4. Reasoning

What makes a convincing argument

- Builds on what others have done before (literature)
- Theoretical foundation – make sense of results within existing frameworks of learning and teaching
- Methodology is explicit and appropriate
 - Instruments are reliable and valid
- Strength of observed relationships
- Elimination of alternative explanations
 - Study design
 - Confounding variables

5. Replicate and generalize – use the results

Setting the results in a larger context

- **MUST** know the literature
- **Strict *replication*** is rare in educational research
 - ***Transferable*** with extension - to new topic, setting, learners, etc.

6. Disclose

- **Scholarly journals**
- **Conference presentations**

- **Peer-review is the core issue**
 - **One of the few quality controls we have**

JEE Editor's Advice

- Do's
 - Support claims with evidence from data
 - Explain how the present study relates to previous studies
 - Offer implications for engineering education practice and/or future research.
- Don't's
 - Make overly broad claims that exceed what your data would warrant
 - Write conclusions that don't tell anything new.
- Replications studies are welcome, but you must still explain the significance of the study.

Correspondence, Michael Loui, Editor



4th Edition

RESEARCH DESIGN

Qualitative,
Quantitative,
and
Mixed Methods
Approaches

JOHN W. CRESWELL



Journals on Teaching & Learning



Advances in Engineering Education has a mission to disseminate significant, proven innovations in engineering education practice, especially those that are best presented through the creative use of multimedia.

<http://advances.asee.org/>



Chemical Engineering Education is a quarterly journal serving the needs of the international community of educators in chemical engineering.

<http://www.che.ufl.edu/cee/>



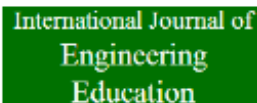
European Journal of Engineering Education examines the economic, cultural, and social factors which influence the education of engineers in different societies and provides a forum in which teachers in engineering schools, institutions and industry can share accounts of good practice and discuss methodology.

<http://www.tandf.co.uk/journals/titles/03043797.asp>



IEEE Transactions on Education is the research journal of the Education Society of the Institute for Electrical and Electronics Engineers.

<http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=13>



International Journal of Engineering Education serves as an international interdisciplinary forum of reference for engineering education. It provides a balance between papers on developments in educational methods technology, case studies, laboratory applications, new theoretical approaches, educational policy and survey papers. It also gives comprehensive coverage of new education schemes and techniques makes the journal a unique source of ideas for engineering educators who are keen to keep abreast of latest developments in educational applications in all fields of engineering.

<http://www.ijee.ie/>

Journals on Teaching & Learning

International Journal of
Engineering
Education

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The **Journal of Engineering Education** is a peer-reviewed international journal published quarterly by the American Society for Engineering Education. It serves as an archival record of the leading scholarly research in engineering education.

<http://www.asee.org/papers-and-publications/publications>

Journal of STEM Education,
Innovations and Research

Journal of STEM Education Innovations and Research is a half yearly, peer-reviewed publication for educators in Science, Technology, Engineering, and Mathematics (STEM) education. The journal emphasizes real-world case studies that focus on issues that are relevant and important to STEM practitioners. These studies may showcase field research as well as secondary-sourced cases. The journal encourages case studies that cut across the different STEM areas and that cover non-technical issues such as finance, cost, management, risk, safety, etc. Case studies are typically framed around problems and issues facing a decision maker in an organization.

<http://www.auburn.edu/research/litee/jstem/>

Principais eventos na área



COBENGE 2017

XLV CONGRESSO BRASILEIRO DE EDUCAÇÃO EM ENGENHARIA

Joinville/sc - 26 A 29 DE SETEMBRO DE 2017

“INOVAÇÃO NO ENSINO APRENDIZAGEM EM ENGENHARIA”



AMERICAN SOCIETY FOR
ENGINEERING EDUCATION



European Society for
Engineering Education



Qual suas áreas de interesse?

- 1. Métodos e Meios de Ensino/Aprendizagem de Engenharia e de Tecnologia.
 - a) Inovação no Ensino/Aprendizagem;
 - b) Estratégias Pedagógicas; c) Avaliação da Qualidade de Ensino/Aprendizagem;
 - c) Multidisciplinaridade e Interdisciplinaridade; dentre outros;
- 2. Projeto, Gestão e Avaliação de Cursos de Engenharia e de Tecnologia.
 - a) Projeto Pedagógico de Curso;
 - b) Gestão de Cursos;
 - c) ENADE e Avaliação de Cursos;
 - d) Resoluções CONFEA/CREA;
- 3. Retenção e Evasão nos Cursos de Engenharia e de Tecnologia.
 - a) Políticas para Redução da Evasão e Retenção;
 - b) Políticas afirmativas;
 - c) Acolhimento e Nivelamento;
 - d) Prática Tutorial; dentre outros;
- 4. Formação Pedagógica dos Professores de Engenharia e de Tecnologia.
 - a) Iniciativas de Formação;
 - b) Educação Continuada;
 - c) Capacitação Docente;
 - d) Avaliação Docente; dentre outros;

Qual suas áreas de interesse?

- 5. Indissociabilidade entre a Tríade Ensino, Pesquisa e Extensão.
 - a) Experiência dos grupos PET e afins;
 - b) Formatos de gestão;
 - c) Projetos que Foquem em Inovação no Ensino/Aprendizagem;
 - d) A Engenharia e a Prática da Extensão; dentre outros;
- 6. Formação Cidadã na Engenharia e Tecnologia.
 - a) Responsabilidade Social;
 - b) Sustentabilidade e Ecossistemas;
 - c) Pluralidade e Diversidade; dentre outros;
- 7. Educação Presencial e à Distância em Engenharia e Tecnologia.
 - a) Formação Mediada por Tecnologia;
 - b) Prática Laboratorial Presencial, Remota e Simulada;
 - c) Avaliação; dentre outros;
- 8. Interação entre Cursos de Engenharia e Tecnologia e o Ensino Fundamental e Médio.
 - a) Relato de Experiências;
 - b) Formas de Despertar Vocações; dentre outros;
- 9. Formação Sem Fronteiras: intercâmbio, mobilidade acadêmica e dupla diplomação
 - a) Mobilidade Interna e Externa;
 - b) Dupla Diplomação e Reconhecimento de Títulos;
 - c) Intercâmbio, dentre outros; e
- 10. Temas Transversais na Educação em Engenharia e Tecnologia.

Exemplos de questões para investigação

- Qual a relação entre estudantes que vêm do ensino médio e a escolha de suas profissões?
- Como projetos envolvendo a comunidade preparam estudantes para uma melhor vida profissional?
- Como o uso da técnica XXXX afeta a aprendizagem?

Atividade individual

Selecione duas área de interesse.

A seguir compartilhe com os colegas em sua volta.



Métodos Qualitativos x Quantitativos



Atividade em grupo (4 alunos)

- Pense em ideias de problemas/comportamentos que podem ser pesquisados
- Que evidências poderiam ser obtidas?



Sua ideia é:

- Significativa para a comunidade?
- Pode ser mensurada empiricamente?
- Tem foco?
- Tem algum embasamento teórico?
- Pode trazer implicações para a aprendizagem?
- Pode ser replicada?
- Quais as vantagens e desvantagens?

Likert Scale



Dr. Rensis Likert

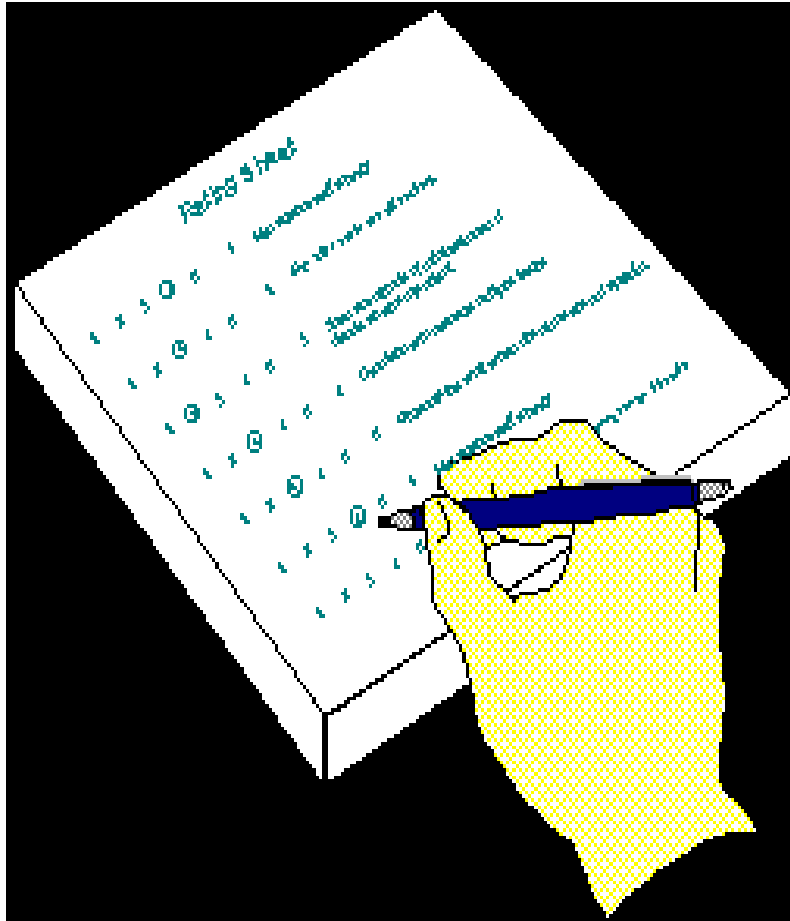
(1903 - 1981)

The original idea for the likert scale is found in Rensis Likert's 1932 article in *Archive of psychology* titled "A technique for the measurement of Attitudes". This idea was expanded by Likert's 1934 *Journal of social psychology* article titled "A simple and Reliable method of scoring the Thurstone Attitude Scales".

O que é a Escala Likert?

- É uma escala psicométrica comumente envolvida em pesquisas que empregam questionários.
- É a abordagem mais utilizada para respostas de escala em pesquisas.
- As escalas de Likert são uma técnica de escala não comparativa e são de natureza unidimensional.
- Ao responder a um questionário do Likert, os entrevistados especificam seu nível de concordância ou desacordo em uma escala de concordância e discordância simétrica para uma série de declarações.
- Assim, o intervalo capta a intensidade de seus sentimentos por um determinado item, enquanto os resultados da análise de itens múltiplos revelam um padrão.

O formato de um item típico Likert de cinco níveis

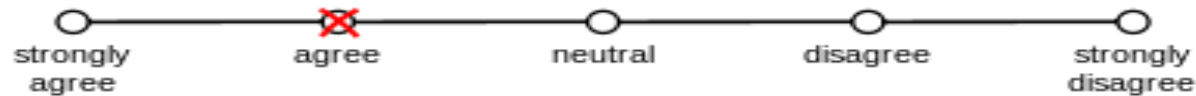


1. Totalmente em desacordo
2. Discordo
3. Nem concordo nem discordo
4. Concordo
5. Concordo plenamente

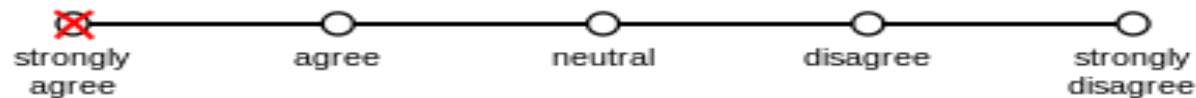
Ver arquivo: **Likert-Type Scale Response Anchors**

Example Likert Scale

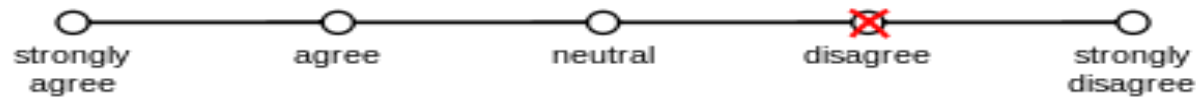
1. Wikipedia has a user friendly interface.



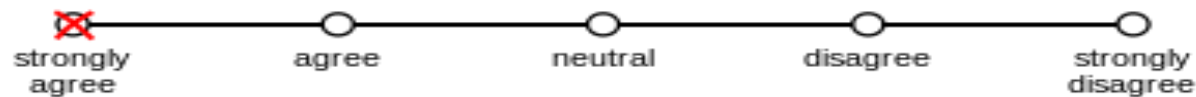
2. Wikipedia is usually my first resource for research.



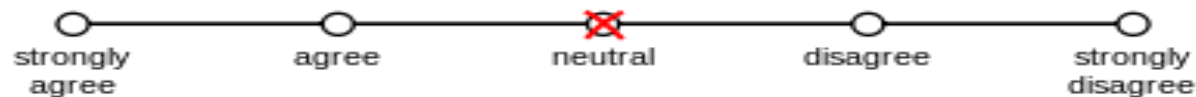
3. Wikipedia pages generally have good images.



4. Wikipedia allows users to upload pictures easily.



5. Wikipedia has a pleasing color scheme.



Métodos de análise

Dependendo de como as questões da escala Likert são tratadas, vários métodos de análise diferentes podem ser aplicados

Métodos de análise utilizados para questões individuais (dados ordinais)

- Gráficos de barras e dispersão

- Não histogramas (os dados não são contínuos)

Tendência central resumida pela mediana e pelo moda

- Não média

Variabilidade resumida por alcance e intervalo interquartil

- Não desvio padrão

Analisado usando testes não-paramétricos

- (Diferença entre as medianas de grupos comparáveis)

- Teste de Mannwitney U

- Wilcoxon

- Teste de Kruskal - Wallis

Atividade em grupo (4 alunos)

- Qual o método mais adequado para investigação? Qualitativo e/ou quantitativo?
- Formule um questionário sobre o problema a ser analisado. Crie este formulário usando o google Drive e post o link no moodle.



Atividade em grupo (4 alunos)

- Quais os próximos passos concretos para que você possa desenvolver esta pesquisa?

