Review Article https://doi.org/10.12973/ijem.11.1.81

International Journal of Educational Methodology
Volume 11, Issue 1, 81 - 95.
ISSN: 2469-9632
https://www.ijem.com/

University Faculty Research Competence: A Systematic Literature Review of Core Components, Distinctions, and Measures

Muhammad Salahuddin*
University of North Dakota, USA

Robert H. Stupnisky
University of North Dakota, USA

Received: November 26, 2024 ▪ Revised: December 23, 2024 ▪ Accepted: February 10, 2025

Abstract: Recent studies identified that faculty research productivity increased when they felt competent in conducting research. Faculty level of research competency varies due to academic training, context, country, discipline, and experiences; however, what is faculty research competency? The core competencies of faculty research are unclear; thus, the current study systematically reviewed the literature. Researchers used Boolean searches of four popular databases to identify 553 articles for first-level screening. These yielded 46 peer-reviewed journal articles for full-text analysis, six of which focused on faculty populations (40 on non-faculty). Six core components of faculty research proficiency were identified: finding and reviewing literature, planning a study, collecting and analyzing data, writing research, disseminating research findings, and managing research projects. Compared to non-faculty populations, faculty are uniquely more engaged in research project management. Researchers also identified 18 sub-competencies that will help to measure faculty research competency more reliably in the future. Finally, as the identified studies relied on self-reported measurements that may carry self-representation bias, an aspirational implication is to develop a competency-based diagnostic test for measuring faculty research competence.

Keywords: *Faculty, higher education, measures, research competence, systematic review.*

To cite this article: Salahuddin, M., & Stupnisky, R. H. (2025). University faculty research competence: A systematic literature review of core components, distinctions, and measures. *International Journal of Educational Methodology*, *11*(1), 81-95. https://doi.org/10.12973/ijem.11.1.81

Introduction

Scientific research productivity has been connected to countries' intellectual capacity and economic prosperity (Jaffe et al., 2020). New knowledge generation, quality of higher education, and world university ranking are highly dependent on faculty research activities (Kaycheng, 2015). Faculty research tasks can include collecting and analyzing data; creating presentations for professional events; publishing in scientific journals, academic books, and conference proceedings; securing competitive research funding awards; and acquiring patents and licenses (Creswell, 1985). Faculty research productivity is highly uneven with many faculty members having low publication rates, while a select few being demonstrate exceptional levels of productivity (Abramo et al., 2017; Albarra'n et al., 2011; Carrasco & Ruiz-Castillo, 2014; Ruiz-Castillo & Costas, 2014). This phenomenon occurs in the US and internationally (Abramo et al., 2009; Bond et al., 2021; Kwiek, 2018).

Empirical studies found that research productivity is related to faculty career age, academic rank, percentages of research on faculty contracts, resource allocation, and awards (Armijos Valdivieso et al., 2022; Stupnisky et al., 2019). Recent studies found that faculty produced more publications when they felt competent in research (Stupnisky et al., 2017, 2019; Verburgh et al., 2007). The skills or core components that make a proficient faculty researcher, however, are not clearly established. Thus, the purpose of this study is to identify the key components of faculty research competence that help to become productive researchers.

Faculty Research Competence

Various motivation theories have explored the concept of competence using different terms: 'competence' in self-determination theory (Ryan & Deci, 2020), 'self-efficacy' in social cognitive theory (Bandura, 1994), 'locus of causality' in attribution theory (Weiner, 1985), and 'perceived control' in the control-value theory of emotions (Pekrun, 2006).

* **Corresponding author:**
Muhammad Salahuddin, University of North Dakota, 231 Centennial Drive Stop 7189, Grand Forks, ND, USA. ✉ Muhammad.Salahuddin@und.edu

Scholars defined competence differently, though their assumption about competence relates to achievement, learning or success, and ability or skills. For example, self-determination theory (SDT) described 'competence' as "the feeling of mastery, a sense that one can succeed and grow" (Ryan & Deci, 2020, p.1), and social cognitive theory described self-efficacy as "people's beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives" (Bandura, 1994, p.1). In this study, we considered competence as a person's ability or skills related to task-specific jobs that lead to success.

Research competence among faculty has been examined through Bandura's (1977) self-efficacy construct within Social-Cognitive theory. Self-efficacy refers to "beliefs in one's capabilities to mobilize the motivation, cognitive resources, and courses of action needed to meet given situational demands" (Wood & Bandura, 1989, p. 408). Specifically, self-efficacy for research is defined as "an individual's belief or confidence in his or her ability to successfully perform tasks associated with conducting research" (Forester et al., 2004, p. 4).

Research Process and Components

Scholars assert that research is a systematic process of answering questions and solving problems through data collection and analysis. For instance, Creswell (2014) stated that "research is a process of steps used to collect and analyze information to increase our understanding of a topic or issue" (p.3). Leedy and Ormrod (2010) described research as a systematic process that follows steps one by one.

Creswell (2014) identified six steps in the process of research: identifying a research problem, reviewing the literature, specifying a purpose for research, collecting data, analyzing and interpreting the data, and reporting and evaluating research. Similarly, Hardré et al. (2007, 2011) cataloged six indicators influenced by Bandura as self-efficacy of research: identifying a topic, designing research, gathering data, analyzing data, presenting at conferences, and publishing research. Robson and McCartan (2016) identified nine main steps that have to be followed to complete a research project, including: deciding on a focus for the project, developing a set of research questions, choosing a research design, selecting the method(s), arranging practicalities for data collection, collecting data, preparing the data for analysis, interpreting the data, and reporting, and disseminating findings.

Leedy and Ormrod (2010) asserted that when a researcher can execute all the steps effectively, they are proficient researchers. Fischer et al. (2014) stated that research competence helps people "to understand how scientific knowledge is generated in different scientific disciplines, to evaluate the validity of science-related claims, to assess the relevance of new scientific concepts, methods, and findings, and to generate new knowledge using these concepts and methods" (p.29). The indicators in these frameworks (see Figure 1) may represent faculty research competence, but a literature review is needed to confirm their validity.

Figure 1. Conceptual Framework for this Study.

Measuring Research Competence

Faculty research competence has typically been measured using self-report scales. However, Krumpal (2013, p. 2025) stated that "due to self-presentation concerns, survey respondents underreport socially undesirable activities and overreport socially desirable ones". This tendency to distort responses in a socially desirable direction is known as social desirability bias (Grimm, 2010). To mitigate this limitation and more objectively measure faculty research competence, a diagnostic test could be developed.

Randazzo et al. (2021) studied 144 US communication sciences and disorders (CSD) faculty to explore their research self-efficacy and productivity. They measured CSD faculty research competence (i.e., how confident are you that you can

identify a research problem that can be researched scientifically?) following self-reported scales where faculty asked 30 questions to rate their degree of confidence recording a number from 0 (no confidence at all) to 100 (completely confident). They also asked another six questions for self-reported productivity. They found that self-efficacy for research among the CSD faculty was high, and self-efficacy for research significantly predicted faculty research productivity.

Ndiango et al. (2023) studied 247 faculty from in Tanzania to examine the influence of research self-efficacy on faculty research productivity. They asked faculty through nine statements (i.e., effective electronic database searching of the scholarly literature) measuring self-reported research competencies, where faculty gave responses in a five-point Likert scale. Moreover, another nine statements (i.e., the number of published manuscripts authored in referred journals) also asked faculty to examine research productivity. They found faculty self-reported competence positively and significantly influenced faculty research productivity.

Stupnisky et al. (2023) studied 651 STEM faculty in the US to explore how self-determined motivation predicted research success through Likert-type scales. They asked faculty to determine their research competence: "Regarding your RESEARCH, to what extent do you agree with the following: I am confident in my ability to do things well". Faculty were also asked to "Please rate your success over the last three academic years" in three areas: conducting research activities, publishing research, and securing external grant funding for research as measuring faculty research success. They found that faculty research competence positively and significantly predicted faculty research success, whereas autonomous motivation was the strongest predictor of faculty publications and citations.

Previous tests to assess research skills were designed for students. For instance, a group of researchers in Belgium (Maddens et al., 2020, 2021) measured the research skills of undergraduate and upper-secondary level students. In 2019, those researchers evaluated the research skills of 11th and 12th-grade students, as well as undergraduate students, by using the Leuven Research Skills Test (LRST) in Belgium. The LRST is a paper-pencil-based test that does not use the internet or electronic calculators, lasting up to 100 minutes. This LRST was developed following the standards for psychological and educational testing of AERA. Maddens et al. (2019) measured students' competence in "evaluating research questions" through two multiple-choice questions (MCQ). For example, posing the situation "a researcher is interested in the relationship between grade retention and motivation of students in secondary education", followed by four options for the student to choose the best one. The researchers measured students' competence for "selecting a method for data collection" through six MCQs. An example question was, "Rudy wants to know if students can learn better when there is music playing," and students had to choose the best options between Questionnaire, Interview, Experiment, and Observation. Finally, Maddens et al. evaluated the students' "evaluating an interview" skills through a written conversation between an interviewer and an interviewee, "evaluating results" skills through logical explanation, "drawing conclusions" skills through data-based tables and graphs, "evaluating a poster" skills through two posters, and "reporting" skills through two situations where students had to indicate the correct order by numbering the fragments. Similarly, researchers in Indonesia (Widihastrini et al., 2020) employed a diagnostic test to evaluate undergraduate students' research skills. No scale for measuring faculty members' research skills that are not self-report has been developed and tested. A crucial first step in developing valid content for such a test would be a systematic review of the related literature on the key components of research competence.

The Current Study

The aim of this study was to conduct a systematic literature review to identify the core components of faculty research competence, specifically in the field of social sciences. Our research question was: What competencies are essential for a faculty member to be proficient in research? Developing a competency-based diagnostic test for measuring faculty research competence will allow us to better understand its impact on research productivity.

Methodology

For conducting this systematic literature review, we followed Petticrew and Roberts (2006) guidelines for systematic literature review in social sciences: (a) clearly define the research question (we defined that in the earlier section), (b) identify the search terms and databases to locate literature, (c) define the inclusion and exclusion criteria, (d) synthesize the study findings with quality matrix, (e) report the risks and biases, (f) analyze and writing report for wider dissemination.

Identify Search Terms and Databases

This study was conducted following the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines for systematic review (Page et al., 2021; see Figure 1). To complete this review researchers followed eight steps: formulating the research problem, developing and validating the review protocol, searching the literature, screening for inclusion, assessing quality, extracting data, analyzing and synthesizing data, and reporting the findings (Xiao & Watson, 2019).

The search for articles included four databases: SCOPUS, PubMed, EBSCOhost, and Google Scholar. Searched keywords were "Research Skill" or "Research Proficiency" or "Research Competence", including "Measuring" or "Assessing" or

"Evaluating" (see Table 1). These searches were made in the first and second weeks of January 2022 and the range of searches was limited to the last 12 years.

Table 2 . Searching Strategy of This Study

Database	Key Words
EBSCOhost	TI Title (("Research Proficiency" OR "Research Skills" OR "Research Competence") AND ("Measuring" OR "Assessing" OR "Evaluating))
PubMed	Research Skills [Title] OR "Research Proficiency"[Title]
Google Scholar	allintitle: "Research Skills" OR "Research Proficiency" OR "Research Competence" "Measuring" OR "Assessing"
Scopus	(TITLE-ABS-KEY-AUTH ("Research Proficiency") OR TITLE-ABS-KEY-AUTH ("research skill*") OR TITLE-ABS-KEY-AUTH ("research competenc*") AND TITLE-ABS-KEY ("Measur*" OR "Assess*") AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (SRCTYPE , "j"))

Note. ABS= Abstract, KEY= Keywords, AUTH= Author, "ar" =articles, "j" = journal

Inclusion and Exclusion Criteria

The inclusion criteria for studies to undergo full-text review were: (a) available online; (b) written in English; (c) participants were faculty working in higher education institutions; (d) focus on measuring or assessing research skills or research competence; (e) disseminated as peer-reviewed journal articles; and (f) published between 2010 and 2022.

In addition to the database search, 17 papers were included manually that were selected through forward and backward searches. After the removal of 22 duplicate articles, the first author screened 553 articles based on their title and abstract according to three inclusion criteria: (1) Measuring, assessing, or evaluating research skills or competence; (2) Identifying indicators or factors for measuring research skills or proficiency or competence; (3) Conducting research in an academic setting where the population was faculty. After screening, six articles met all criteria and were considered for a full-text review. Conversely, the other 40 articles focused on non-faculty (i.e., secondary students, undergraduate students, graduate students, and staff) research competence issues were excluded from this systematic review.

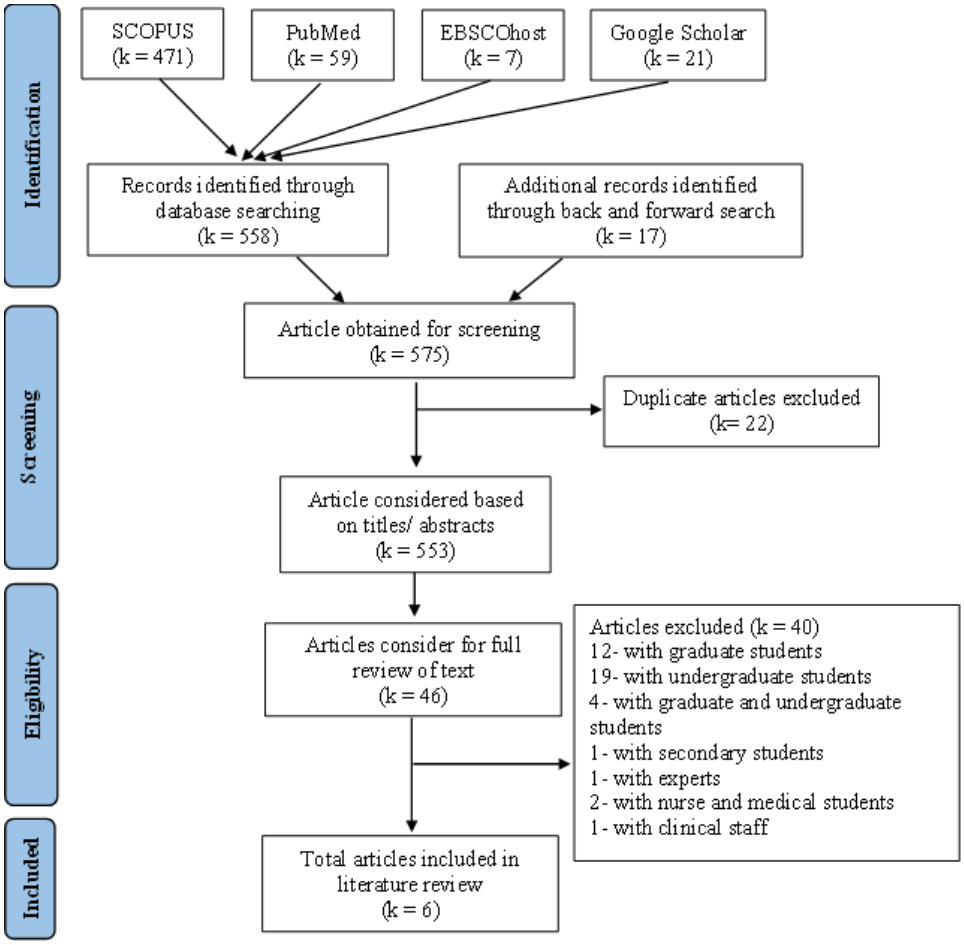

Figure 2. PRISMA Flow Diagram for this Study

Initial Data Extraction and Quality Check

The initial data extraction and quality check were made following Petticrew and Roberts (2006) guidelines: context and setting, population, intervention, study design, and outcomes with the general information of articles (i.e., title, authors, year, journal, volume, issue). After 46 full-text reviews, the first author came to the second author with 10 articles, though he was ambivalent about four articles. These four articles focused on measuring the research competence of experts, nurses, medical students, and clinical staff. Following this study's inclusion-exclusion criteria and objectives, both authors agree to remove these four articles from the final list. Finally, six articles were identified following PRISMA guidelines that met all our inclusion criteria as studying the components of faculty research competence (see Figure 2). These studies were conducted in different countries: France, Germany, Finland, Netherlands, the United Kingdom, Switzerland, Japan, Kazakhstan, Afghanistan, and the United States. The studies utilized different methodologies: four quantitative methods, one qualitative, and one mixed method. The sample sizes ranged from small (22) to large (790). Data collection was primarily conducted using Likert scales, except the qualitative studies used interviews and document analysis (see Appendix: A). Below is an overview of the quality of research competence measurements used in each study.

Farsani et al. (2022) conducted a quantitative study and collected data from 175 linguistics faculty. They used 54 items to measure professional experience, personal viewpoints, mixed methods knowledge, and mixed methods skills. They reported several indicators of reliability including Cronbach's alpha (>.96), composite reliability, and Dijkstra and Henseler's reliability. Tahsildar and Hasani (2021) conducted a mixed-method study where they surveyed 152 faculty and interviewed 12 faculty through an interview schedule. The survey questionnaire included four subscales of research competencies: understanding research basics, application of research methods, use of research technological tools, and research writing. Two education professors attested to the content validity of the items and Cronbach's alpha (>.95) to determine the internal consistency of the scales.

Koshmaganbetova et al. (2020) conducted a cross-sectional study to evaluate the research competencies faculty in Kazakhstan. They modified a questionnaire first developed by the Center for Excellence in Teaching and Learning Applied Student Research Skills at the University of Reading. Koshmaganbetova et al. used multi-item scales assessing general skills, research skills, and motivation skills. The researchers measured the internal consistency of the scales using Cronbach's alpha: general skills (0.94), research skills (0.93), and motivation skills (0.84). Behar-Horenstein et al. (2018) conducted a study in the USA to assess self-reported confidence among pharmacy faculty for conducting educational research. Twenty-two faculty gave their response on 33 items. Behar-Horenstein et al. did not report Cronbach's alpha coefficients of internal consistency of items, though they mentioned that items were adopted from Phillips and Russell (1994) who previously found good overall internal consistency.

Griffioen et al. (2013) conducted a quantitative study in the Netherlands to measure the research self-efficacy of lectures through 20 items. They found support for internal consistency reliability using Cronbach's alpha (.97). Moreover, the researchers mentioned that a principal component analysis was done on the scale in a past study, which suggests support for scale validity. Ulrich and Dash (2013) wrote an article based on a collaborative qualitative study conducted in eight countries. The purpose was to identify the essential skills of research that gave a forward-looking for future research. They interviewed industry top management and university deans in the public sector (higher education institutions, national research institutes, ministries, bodies providing research funding, etc.) and 35 in the private sector (businesses and heads of competitive hubs).

Finally, we concluded that the selected six articles were well written based on empirical data where these studies were theoretically well designed, used multi-item scales and interviews to measure faculty research competence, and reported reliability and validity of measures to ensure the quality of papers.

Risk of Bias Assessment

To avoid personal bias, authors used different software applications (e.g., Zotero, Abstrackr) to search, add, and screen during the full-text review process. Software was used to select synthesizes for screening and downloaded RIS files. The first author uploaded these files to the Abstrackr for anonymous screening. He worked independently to avoid any bias in the synthesis screening process. Finally, the selective articles were collected through online access to an R2 University Library and Google Scholar open access.

Data Collection and Analysis Process

Data extraction was performed using a predetermined checklist that includes publication details: author's name, title, year of publication, and name of the journal. We also extracted study details such as aims and objectives, study design, measures, population, sample and sampling, data collection tools, analysis methods, and major findings.

The selected articles were analyzed following the six phases of thematic analysis: data familiarization, generating initial codes, searching for themes across the data, reviewing themes, defining and meaning themes, and producing the report (Braun & Clarke, 2006). In general, thematic analysis is often used in qualitative analysis, and meta-analysis in quantitative literature review. Qualitative analysis was a better fit for the current systematic literature review to answer our research questions as it identifies, analyzes, and reports patterns of themes within a text (Braun & Clarke, 2006).

Shaheen et al. (2023) stated a few steps to ensure validity and reliability in conducting systematic reviews that includes: "formulating clear research questions, implementing rigorous search strategies, employing strict inclusion criteria, utilizing appropriate evaluation tools, conducting a thorough evaluation of study quality, employing suitable data synthesis methods, disclosing conflicts of interest, acknowledging limitations, and addressing bias within the systematic review" (p. 8). We followed all mentioned steps in this study to ensure the validity and reliability of analyzing data from the selective articles.

Limitations of Study Selection Process

The current systematic review includes consideration of only four online databases, only including peer-reviewed articles, and documents only written in English. These are the potential limitations of the study selection process.

Results

Based on a thematic analysis of the six studies that met the inclusion criteria, we identified six major competencies of faculty research: (a) finding and reviewing the literature, (b) planning a study, (c) collecting and analyzing data, (d) writing research protocol and report, (e) disseminating research findings, and (f) managing research projects. (see Table: 2)

Finding and Reviewing Literature

In this systematic review, five papers identified "finding and reviewing literature" as a component of faculty research competence. Behar-Horenstein et al. (2018) measured the self-reported perceptions of faculty members and identified that "reviewing the relevant literature is an area of research skills" (p. 36) was one of the highest reported confidence areas of faculty members. In addition, Griffioen et al. (2013) conducted a study among Dutch lecturers who were working at four regionally spread non-university higher education institutions (teaching university) and identified "read, find and understand research literature" (p. 29) as one of five key indicators of research self-efficacy. Under this core competency, we identify three sub-competencies: gathering research literature (Farsani et al., 2022; Griffioen et al., 2013; Tahsildar & Hasani, 2021; Ulrich & Dash, 2013), writing literature review (Behar-Horenstein et al., 2018; Tahsildar & Hasani, 2021), and using an appropriate reference format in wring literature review (Tahsildar & Hasani, 2021).

Table 2. Indicators of Faculty Research Competencies.

Indicators	**Finding and reviewing the literature**			**Planning a study**			**Collecting and analyzing data**		**Writing research protocol and report**			**Disseminating research findings**		**Managing research project**	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Behar-Horenstein et al. (2018)		x		x	x	x	x	x	x	x	x	x	x		x
Farsani et al. (2022)	x			x	x	x	x			x		x	x		x
Griffioen et al. (2013)	x			x	x		x		x						
Koshmaganbetova et al. (2020)					x	x	x	x				x	x	x	
Tahsildar and Hasani (2021)	x	x	x	x	x	x	x	x	x						
Ulrich and Dash (2013)	x			x			x	x						x	x

Note. 1= Gathering research literature, 2= Writing literature reviews, 3= Using an appropriate reference format, 4= Formulating research questions, 5=Designing research studies, 6= Determining sampling strategies, 7= Collecting data, 8= Analyzing data, 9= Writing tables and graphs of study results, 10= Writing research manuscripts, 11= Writing grant proposals, 12= Preparing papers for a peer-reviewed journal, 13= Preparing presentations for conferences, 14= Working with a research team, 15= Communicating with collaborators.

Planning a Study

We found all six articles included planning a study as a key factor of faculty research competency. Farsani et al. (2022) revealed experts in applied linguistics had identified the purpose of research, rationale, research questions, research design, mixing area, philosophical assumptions, and diagram of the mixed methods design considered as planning a study. Tahsildar and Hasani (2021) studied Afghani faculty members' perceptions of research skills. They considered different issues as part of planning a study: choosing a proper research topic, determining and defining the variables, developing research objectives questions and hypotheses, designing a qualitative and quantitative approach, and determining the sampling methods. For example, they asked faculty to rate their level of agreement with the statement, "I am able to choose a proper method (quantitative/qualitative) for my research" (p. 237).

Koshmaganbetova et al. (2020) evaluated the research competencies of medical university faculty in Kazakhstan and identified "designing a study and sampling" (p. 184) as a component of faculty research competence. Furthermore, Behar-Horenstein et al. (2018) identified "research design" (p. 34) as the key category of research skills out of five skills for the pharmacy faculty. Similarly, Griffioen et al. (2013) identified "design research" (p. 29) as one of the key indicators of five research skills.

Within this core competency, we identify three sub-competencies: formulating research questions (Behar-Horenstein et al., 2018; Farsani et al., 2022; Griffioen et al., 2013; Tahsildar & Hasani, 2021; Ulrich & Dash, 2013), designing research studies (Behar-Horenstein et al., 2018; Farsani et al., 2022; Griffioen et al., 2013; Koshmaganbetova et al., 2020; Tahsildar & Hasani, 2021), and determining sampling strategies (Behar-Horenstein et al., 2018; Farsani et al., 2022; Koshmaganbetova et al., 2020; Tahsildar & Hasani, 2021) as essential competencies for faculty research competency.

Collecting and Analyzing Data

"Collecting and analyzing data" was identified as an indicator of faculty research competence in all six articles. Tahsildar and Hasani (2021) developed a Likert-type scale with six statements (out of 24) focusing on managing and analyzing quantitative and qualitative data, as well as statistical analysis using SPSS and STATA (validity, reliability, ANOVA and t-tests, correlation, and regression). For example, two statements were "I am able to do different statistical analyses" and "I am able to use tests such ANOVA and t-test" (p. 237). Koshmaganbetova et al. (2020) identified participant recruitment and biostatistics skills as the key indicators of faculty research competencies in medical sciences. Griffioen et al. (2013) mentioned collecting and interpreting data as a fundamental skill in faculty research self-efficacy. Also, Ulrich and Dash (2013) stated that a researcher must have the capacity for data analysis, including the mastery of sophisticated IT tools. Behar-Horenstein et al. (2018) posited statistical skills as an essential indicator of faculty research competence, which included knowing which method to use, entering data, using simple and multivariate statistics with software packages, and writing computer programs. For example, they measured faculty level of agreement with 30 items, including one statement, "using multivariate statistics (e.g., multiple regression, factor analysis)" (p. 37).

Under this core competency, we also identified two more sub-competencies: collecting data (Behar-Horenstein et al., 2018; Farsani et al., 2022; Griffioen et al., 2013; Koshmaganbetova et al., 2020; Tahsildar & Hasani, 2021; Ulrich & Dash, 2013) and analyzing data (Behar-Horenstein et al., 2018; Koshmaganbetova et al., 2020; Tahsildar & Hasani, 2021; Ulrich & Dash, 2013) as essential competencies for faculty research competency.

Writing Research

Four studies included scholarly writing as a component of faculty research competence. Tahsildar and Hasani (2021) measured research writing with seven statements (out of 24) that included writing an introduction and problem statement, analytical literature review, methods, discussion, conclusion, references, and statistical analysis outputs. For example, they asked questions to the faculty such as, "I am able to write the references in different styles" and "I am able to write the outputs of the statistical analysis" (p. 237). Behar-Horenstein et al. (2018) identified "writing skills" (p. 34) as one of the key components of faculty research competence. They described writing skills as writing introduction and literature review, method sections, result sections, and discussion sections for a research publication. For example, they posed this statement for faculty to rate their level of agreement with "writing a result section of an education research paper for publication" (p. 37). Similarly, Griffioen et al. (2013) stated that "interpret and reporting results" (p. 29) is also an important indicator of faculty research skills.

Moreover, we also identified three more sub-competencies: writing tables and graphs of study results (Behar-Horenstein et al., 2018; Griffioen et al., 2013; Tahsildar & Hasani, 2021), writing research manuscripts (Behar-Horenstein et al., 2018; Farsani et al., 2022), and writing grant proposals (Behar-Horenstein et al., 2018) as essential competencies for faculty research competency.

Disseminating Research Findings

Three out of six papers mentioned "disseminating research findings" as an essential research skill for a faculty. Behar-Horenstein et al. (2018) identified "research management and dissemination" (p. 34) as a key skill of research competence, which includes "preparing and education research presentations for conferences" and "keeping records during education research" (p. 37). Koshmaganbetova et al. (2020) mentioned "paper preparation and presentation" (p.184) as a specific research skill for university teachers. Moreover, Farsani et al. (2022) cited disseminating research results as essential for faculty research using, specifically "presenting results involving both quantitative and qualitative methods to non-academic audiences" (p. 17).

Under this core competency, we identify two more sub-competencies: preparing papers for a peer-reviewed journal and preparing presentations for conferences (Behar-Horenstein et al., 2018; Farsani et al., 2022; Koshmaganbetova et al., 2020) as essential competencies for faculty research competency.

Managing a Research Project

This systematic literature review identifies "managing a research project" as unique to faculty research competence. Four out of six papers recognized "managing a research project" as an important factor of faculty research competence. Koshmaganbetova et al. (2020) also identified some common transferable skills that help a faculty to manage a research project, including teamwork, working independently, project management, time management, and problem-solving. Ulrich and Dash (2013) mentioned some key management competencies for conducting research, specifically working in an interdisciplinary environment, working in a team, developing a network, communication skills, language skills, business culture and management skills, project management skills, and the ability to manage and steer teams. Similarly, Behar-Horenstein et al. (2018) measured research management with six statements (out of 30) of their Likert assessment tool. For example, they set a statement to measure faculty research skills as "identifying funding sources to help pay for education research" and "preparing and submitting grant proposals to obtain funding for education research" (p. 37). Besides, we found similar components that are also essential for measuring the research competence of non-faculty.

Within this core competency, we also identify two sub-competencies: working with a research team (Tahsildar & Hasani, 2021; Ulrich & Dash, 2013) and communicating with collaborators (Behar-Horenstein et al., 2018; Farsani et al., 2022; Ulrich & Dash, 2013) as essential competencies for faculty research competency.

Conclusion

This study aimed to identify the core components of faculty research competence. Following PRISMA guidelines, this systematic review identified six core competencies of faculty research: finding and reviewing literature, planning a study, collecting and analyzing data, writing research protocol and report, disseminating research findings, and managing research projects. Our findings support past authors' assertions; for example, Creswell (2014) mentioned six steps as an essential process for conducting research: identifying a research problem, reviewing the literature, specifying a purpose for research, collecting data, analyzing and interpreting the data, and reporting and evaluating research. Also, following Bandura's (1977) Self-efficacy Theory, Hardré et al. (2007, 2011) identified six indicators of faculty research competence that were very near to our identified core components: identifying a topic, designing research, gathering data, analyzing data, presenting at conferences, and publishing research. Similarly, Robson and McCartan (2016) identified nine main steps as important steps of research, including identify the focus of the research project, developing a set of research questions, choosing a research design, selecting the method(s), arranging practicalities for data collection, collect data, prepare the data for analysis, analysis and interpret the data, and report and disseminate findings. This study also detected 18 sub-competences nested in the core six competencies (see Table 3), a new contribution to the literature.

Table 3. Core Competencies in Faculty Research.

Types of competencies	Descriptions	Sub-skills
1. Finding and reviewing the literature	Competency to gather related literature from different sources and write literature review by using proper referencing style.	1.1 Gathering research literature 1.2 Writing literature review 1.3 Using appropriate reference format
2. Planning a study	Competency to design a study properly following a research paradigm.	2.1 Formulating research questions 2.2 Designing research studies 2.3 Determining sampling strategies
3. Collecting and analysing data	Competency in collecting, analyzing, and visualizing data using different kinds of statistical software and tools.	3.1 Collecting data 3.2 Analysing data 3.3 Creating visualizations of data
4. Writing research protocol and report	Competency in writing study results in research manuscripts and grant proposals.	4.1 Writing study results 4.2 Writing research manuscripts 4.3 Writing grant proposal
5. Disseminating research findings	Competency in preparing peer-reviewed journal articles and presenting in scholarly forums.	5.1 Preparing peer-reviewed journal articles 5.2 Addressing the peer-review process 5.3 Preparing presentations for conferences
6. Managing research project	Competency in managing research teams, collaboration, and finance.	6.1 Working in a research team 6.2 Managing research budgets 6.3 Communicating with collaborators

Faculty versus Non-faculty Research Competencies

To further examine the unique research competencies of university faculty, we additionally compared the six identified faculty research competencies to the competence of non-faculty in the 40 articles identified during our systematic review. These articles studying non-faculty populations measured undergraduate students (k=19), graduate students (k=12), both undergraduate and graduate students (k= 4), nurse and medical students (k=2), secondary level students (k=1),

experts (*k*=1), and clinical staff (*k*=1). Methodologies used to study non-faculty research competencies followed quantitative research design (*k*=30), qualitative research design (*k*=7), and mixed method (*k*=3).

A comparison between studies of faculty and non-faculty research competencies revealed many parallels on the first five identified in our review. Non-faculty focused articles identified skills to measure research competencies (see Appendix: B) including gathering research literature *(k=25),* formulating research questions *(k=20)*, designing research studies *(k=26)*, collecting data *(k=30)*, analyzing data *(k=35),* writing study results *(k=22),* writing research manuscripts *(k=11),* and preparing presentations for conference *(k=23)*. However, a research competence that was unique to faculty was managing research projects. The difference between faculty and students is logical as more often faculty lead projects and to do more manage the tasks of research project. Many faculty make research teams to secure grants involving collaboration with other researchers, maintain regular communication, and manage the research budget. Unfortunately, these competencies are rarely taught in graduate schools, mostly faculty learn through training and practical experiences.

This result should be considered with the following limitations in mind. First, the review included only peer-reviewed articles indexed in four online databases that were written in English. Some studies written in other languages on faculty research competence likely exist, but we were not able to review those for this study. Second, discipline-specific studies of faculty research competencies may exist that were not captured in this general review. The current review focused on studies involving competencies generally used in social science research, so future studies may seek to examine discipline-specific competencies beyond that, such as hard sciences and the humanities. And third, the studies reviewed here gathered data before the COVID-19 pandemic that accelerated virtual collaborations and conferences and the availability of artificial intelligence (AI) platforms that support scholarship. These technological advancements should be considered in future studies of faculty research competencies.

The findings of this study have several potential implications. First, these findings may lead to the development of a diagnostic test to measure faculty research competence, as none currently exists. University administrators, faculty members, and faculty search committees may use the test to assess the faculty research competence based on these key findings. In turn, these findings and that test will help university administrators and development officers to identify domains of faculty research competence they may wish to target by offering competence-specific research training. Faculty who are highly competent in their research skills are likely to be motivated to engage in research (Stupnisky et al., 2019, 2023), more productive in presenting and publishing their work, and more likely to receive external research funding, thus leading to higher university rankings (Kaycheng, 2015). University faculty are critical to maintaining the U.S. research infrastructure, fostering innovation in key and developing technologies, and enhancing the nation's competitiveness in the global economy (National Science Board- National Science Foundation, 2024); thus, understanding, measuring, and supporting their research competencies is critical.

Conflict of Interest

This paper is a part of a three-articles PhD dissertation project. We have no known conflict of interest to disclose.

Funding

There is no funding received for this study.

Generative AI Statement

There is no usage of any AI tools.

Authorship Contribution Statement

Salahuddin: Conceptualization, design, literature search, screening, data extracting, analysis, writing. Stupnisky: Supervision, manuscript editing, reviewing.

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Appendices

Appendix: A. Quality of Selected Articles.

Authors and Year	Study Design		Measures	Participants				Country	Population	Evidence Provided
	Quan.	Qual.		Male	Female	Others	Total			
Behar-Horenstein et al. (2018)	x		Scale	8	14	-	22	USA	Faculty	Writing skills (WS): gathering literature for and writing research papers; statistical skills (SS): identifying hypotheses, preparing and managing data, and selecting and interpreting statistical tests; research design (RD): addressing methodological considerations of a research study; and research management and dissemination (RM-D): management, organization, and presentation of research studies.
Farsani et al. (2022)	x		Scale	84	91	-	175	Multiple	Student and Faculty	Knowledge, experiences, ability, skills of Mixed method research.
Griffioen et al. (2013)	x		Scale	-	-	-	790	Netherlands	Faculty	Read, find, and understand research literature; apply results of research; design research; collect data; and interpret and report results.
Koshmaganbetova et al. (2020)	x		Scale	12	78	-	90	Kazakhstan	Faculty	Common transferable skills (information gathering, information evaluation, numeracy, teamwork, work independently, project management, time management, problem-solving); Specific research skills (designing a study, study sampling, participant recruitment, biostatistics skills, paper preparation, paper presenting).
Tahsildar & Hasani (2021)	x	x	Scale and Interview	96	56	-	162	Afghanistan	Faculty	Understanding research basics, application of research methods, use of research technological tools, and research writing.
Ulrich & Dash (2013)		x	Interview	-	-	-	80	Finland, France, Germany, Japan, Netherlands, Switzerland, UK, and USA	Faculty and Staff	Scientific knowledge, ability to learn and adapt, ability to formulate a research issue, ability to incorporate existing knowledge, the ability to assess research, an open-minded approach, research motivation and involvement, adaptability, and ability to self-assess one's competencies and research.

Appendix: B. Indicators of Non-Faculty Research Proficiency

Indicators	Finding and reviewing the literature			Planning a study			Collecting and analyzing data			Writing research protocol and report			Disseminating research findings		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Khorsheed (2021)	x	x	x	x											
Maddens et al. (2021)	x			x	x		x	x		x					x
Kaeophanuek et al. (2021)	x			x			x	x		x					x
Bruthers et al. (2021)					x		x	x	x	x					x
Pavlova et al. (2021)	x			x	x			x	x	x	x				x
Kistner et al. (2021)	x			x			x	x			x	x			x
Maddens et al. (2020)	x			x	x		x	x		x					x
Rodríguez-Vargas et al. (2020)				x	x	x		x							
Uebel et al. (2020)		x			x			x		x	x	x			x
Widihastrini et al. (2020)				x	x		x	x	x	x					
Butz et al. (2020)				x	x		x	x		x					
Ain et al. (2019)	x			x			x	x		x					x
Sokolova et al. (2019)							x	x			x				x
Gyuris (2018)	x			x			x	x		x					x
Akuegwu et al. (2018)	x						x	x			x				x
Thompson et al. (2018)	x			x	x	x	x	x		x					
Forrest et al. (2018)	x			x	x		x	x	x						
Atibuni et al. (2017)			x				x	x			x				
Al-Tannir et al. (2017)	x						x	x			x	x	x	x	x
Jin et al. (2017)	x				x					x					
Maltese et al. (2017)	x	x		x	x		x	x		x	x				x
Michels (2016)	x				x		x	x		x					
Alvarado et al. (2016)	x				x			x							x
Gilmore et al. (2015)	x			x	x		x	x		x					
Fatima et al. (2014)					x	x		x		x		x	x		x
Fong (2014)	x	x	x											x	x
Tambe et al. (2014)	x		x		x			x				x			
Zee et al. (2014)							x	x		x	x				
McCurdy et al. (2013)				x			x	x							
Adedokun et al. (2013)	x						x								x
Timmerman et al. (2013)	x			x	x		x	x		x		x			
Gardner et al. (2012)	x			x	x										
Meerah et al. (2012a)					x		x	x							x
Meerah et al. (2012b)					x		x	x							x
Feldon et al. (2011)			x	x	x		x	x		x					

Appendix: B. Continued

Indicators	Finding and reviewing the literature			Planning a study			Collecting and analyzing data			Writing research protocol and report			Disseminating research findings		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Gilmore et al. (2010)	**x**	**x**			**x**		**x**	**x**		**x**					**x**
Burgoyne et al. (2010)					x	x	x	x					x		x
Murdoch-Eaton et. al. (2010)					x		x	x		x					
Devi et al. (2010)	x	x		x			x	x			x	x			x
Rogers et al. (2010)	x	x			x		x	x		x	x				x

Note: 1= Gathering research literature, 2= Writing literature reviews, 3= Using an appropriate reference format, 4= Formulating research questions, 5=Designing research studies, 6= Determining sampling strategies, 7= Collecting data, 8= Analyzing data, 9= Creating visualizations of data, 10= Writing tables and graphs of study results, 11= Writing research manuscripts, 12= Writing grant proposals, 13= Preparing papers for a peer-reviewed journal, 14= Addressing the peer review process, 15= Preparing presentations for conferences.