

*Protocol and associated data can be found at <https://hdl.handle.net/10919/118669>

**Protocol Update Note - April 22, 2025: While rerunning searches from this protocol in April 2025, an error in the syntax of the search string for Academic Search Complete was found. Comparative searches were run, and results were deduplicated. 23 additional, unique results were found. All additional records were reviewed and it was determined they would have been eliminated based on the criteria of the study; the findings of the study were not impacted. Researchers interested in conducting future studies should use the updated search string located in the Addendum at the end of this protocol.

Scoping Review Protocol

Written in alignment with the PRISMA-P 2015 statement with modifications for a scoping review (Moher et al. 2015).

Administrative Information

Title

A protocol for a scoping review: Literature on undergraduate research and career readiness

Registration

This protocol has not been registered. This protocol was published retrospectively in VTechWorks to serve as an extension of the methods section of the associated published scoping review, "A scoping review: Literature on undergraduate research and career readiness" in the fall 2024 issue of *Scholarship and Practice of Undergraduate Research (SPUR)*.

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Contributions

AM led protocol development, analyses, and dissemination. AM, JM, EH, KP, and RR served as reviewers of the protocol. AM, JM, EH, and KP served as reviewers during the scoping review and participated in article drafting in the author order listed. RR served as a reviewer of the full draft. Thank you to C. Cozette Comer and Virginia Pannabecker for providing methodological guidance and feedback throughout this review, peer review for the search strategy, and software training.

Support

No funding supported this scoping review.

Introduction

Rationale

To date there has not been a thorough review of the extent to which undergraduate research, scholarship, and creative inquiry (URSCI) experiences have intentionally included career preparation.

Objectives

Taking into account the value shift in higher education and the foundational skills desired by employers, a scoping review was conducted to gain an understanding by systematically mapping what the literature reveals that faculty, programs, and institutions are intentionally providing to successfully bridge this articulation gap. As such, the associated scoping review aims to answer the following question:

What intentional career readiness competency programming are faculty, programs, and higher education institutions delivering and assessing in undergraduate research, scholarship, and creative inquiry experiences to help students become career ready?

Methods

Eligibility Criteria

Inclusion Criteria

Population

- Undergraduate research, industry based research, research internships, scholarship or creative inquiry OR
 - Mentions UR as defined by the Council on Undergraduate Research (CUR) (*i.e.* “a mentored investigation or creative inquiry conducted by undergraduates that seeks to make a scholarly or artistic contribution to knowledge” (CUR 2024)) OR
 - Addresses a formal UR experience that is mentored, which would describe student researchers as receiving one on one training, research experience, or co-creation of knowledge, scholarship, or creative works
 - CURE’s (course-based undergraduate research experience) or capstone courses that align with CUR definition of UR

Intervention/Exposure

- Any undergraduate research program in a higher education context; all 2-4 year accredited institutions, including community colleges, public and private schools

Characteristics of Study

- UR, scholarship, and/or creative inquiry can be in any discipline.
- Publications can be published by an outlet (*e.g.*, journal) from any discipline within the United States.
- Publication types can include peer review articles, book chapters, white papers, and reports.
- No date limits.

Outcome

- Career readiness as defined by the National Association of Colleges and Employers (NACE) (*i.e.* “a foundation from which to demonstrate requisite core competencies that broadly prepare the college educated for success in the workplace and lifelong career management” (NACE 2024)) OR
 - NACE competencies (“career & self-development, communication, critical thinking, equity & inclusion, leadership, professionalism, teamwork, technology” (NACE 2024)) OR
 - Industry-based research experience, industry internships with research, employment, professional skills, workplace skills, workplace preparation

Other (Additional criteria for full-text screening)

- During the full-text screening, the primary goal of the study must include a career readiness intervention regarding one or more NACE competencies (whether explicitly named as NACE or not) with an associated assessment/outcome that is described and designed to measure student mastery of the competency(ies). (*We expect to see language that states the goal to prepare students for the world of work in regards to a NACE competency (whether explicitly named as NACE or not) with an intervention and associated assessment designed to measure student mastery of a NACE competency.*)

Exclusion Criteria

Population

- Graduate students of graduate school programs. Middle school or high school students. (Except if undergraduate research etc. programs / initiatives (as defined in Inclusion)) are also included and data or descriptions of interest are or can be disaggregated.

Intervention/Exposure

- Undergraduate courses with research components only (CURE's or capstone courses that align with CUR definition of UR would be included).
- UR programs hosted by companies outside of higher education institutions (NASA).

Characteristics of Study

- Outside of the 50 United States; territories of the United States are excluded.
- Publication types excluded are conference proceedings, conference abstracts, opinion pieces, editorials, and reports that can only be purchased from associations.

Other (Additional criteria for full-text screening)

- During the full-text screening, the primary goal of the study does not include a career readiness intervention regarding one or more NACE competencies (whether explicitly named as NACE or not) with an associated assessment/outcome that is described OR the associated assessment/outcome is mentioned but not described. (*We will exclude studies that include surveys/assessments gathering student feedback on how a UR experience prepared them for their career without a career readiness intervention regarding one or more NACE competencies.*)

Information Sources

5 databases were searched in December 2023 and Google Scholar was searched in January 2024:

- Academic Search Complete (1980s-)
- Business Search Complete (1980s-)
- Education Research Complete (1865-)
- Scopus (1800s-)
- Web of Science (1900-)

- Google Scholar (exported first 205 results)

Search Strategy

Academic Search Complete -- As conducted originally in December 2023. See Addendum for revised search strategy.

Search conducted with title, abstract, and keywords fields. No limits or filters.

Each paragraph of the search strategy below was run on a separate line. Then, lines were combined with AND or OR, as appropriate, using the Search numbers from the Search History.
Yield = 336

S1

TI ((undergrad*) N3 (scholarship OR creativ* OR research*)) OR AB ((undergrad*) N3 (scholarship OR creativ* OR research*)) OR KW ((undergrad*) N3 (scholarship OR creativ* OR research*))

S2

TI ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* ORwork* OR employ* OR occupation*) N3 (readiness OR readyOR development* OR competen* OR skill* OR prepar*))) OR AB ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR readyOR development* OR competen* OR skill* OR prepar*))) OR KW ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* ORjob OR jobs OR profession* ORwork* OR employ* OR occupation*) N3 (readiness OR readyOR development* ORcompeten* OR skill* ORprepar*))) OR AB ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* ORwork* OR employ* OR occupation*) N3 (readiness OR readyOR development* OR competen* OR skill* OR prepar*))) OR AB ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR readyOR development* OR competen* OR skill* OR prepar*))) OR KW ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* ORjob OR jobs OR profession* ORwork* OR employ* OR occupation*) N3 (readiness OR readyOR development* ORcompeten* OR skill* ORprepar*))) OR KW ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* ORwork* OR employ* OR occupation*) N3 (readiness OR readyOR development* OR competen* OR skill* OR prepar*))) OR KW ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* ORjob OR jobs OR profession* ORwork* OR employ* OR occupation*) N3 (readiness OR readyOR development* ORcompeten* OR skill* ORprepar*)))

S3

(DE "ATTITUDES toward work" OR DE "CAREER development" OR DE "CAREER education" OR DE "CORE competencies" OR DE "EMPLOYABILITY" OR DE "INTERNSHIP programs" OR DE "JOB qualifications" OR DE "JOB skills" OR DE "OCCUPATIONAL training" OR DE "PROFESSIONALISM" OR DE "PROFESSIONAL education" OR DE "SCHOOL-to-work transition" OR DE "WORK" OR DE "WORK & education" OR DE "WORKPLACE literacy")

S2 OR S3

S1 AND S4

Business Search Complete

Search conducted with title, abstract, and keywords fields. No limits or filters.

Each paragraph of the search strategy below was run on a separate line. Then, lines were combined with AND or OR, as appropriate, using the Search numbers from the Search History.

Yield = 57

S1

TI ((undergrad*) N3 (scholarship OR creativ* OR research*)) OR AB ((undergrad*) N3 (scholarship OR creativ* OR research*)) OR KW ((undergrad*) N3 (scholarship OR creativ* OR research*))

S2

TI ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*))) OR AB ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*))) OR KW ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*)))

S3

(DE "CAREER development" OR DE "CAREER education" OR DE "CORE competencies" OR DE "EMPLOYABILITY" OR DE "INTERNSHIP programs" OR DE "JOB qualifications" OR DE "JOB skills" OR DE "OCCUPATIONAL training" OR DE "PROFESSIONAL education" OR DE "SCHOOL-to-work transition" OR DE "WORK" OR DE "WORK & education" OR DE "WORKPLACE literacy")

S2 OR S3

S1 AND S4

Education Research Complete

Search conducted with title, abstract, and keywords fields. No limits or filters.

Each paragraph of the search strategy below was run on a separate line. Then, lines were combined with AND or OR, as appropriate, using the Search numbers from the Search History.

Yield = 373

S1

TI ((undergrad*) N3 (scholarship OR creativ* OR research*)) OR AB ((undergrad*) N3 (scholarship OR creativ* OR research*)) OR KW ((undergrad*) N3 (scholarship OR creativ* OR research*))

S2

TI ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*))) OR AB ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*))) OR KW ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*)))

S3

(DE "CAREER development" OR DE "CAREER education" OR DE "CORE competencies" OR DE "EMPLOYABILITY" OR DE "INTERNSHIP programs" OR DE "JOB qualifications" OR DE "JOB skills" OR DE "OCCUPATIONAL training" OR DE "PROFESSIONAL education" OR DE "SCHOOL-to-work transition" OR DE "WORK & education" OR DE "WORKPLACE literacy")

S2 OR S3

S1 AND S4

Google Scholar

Yield = 68,400. Reviewed the first 205 results.

((undergrad*) AROUND (3) (scholarship OR creative* OR research*)) AND (NACE OR "National Association of Colleges and Employers" OR ((career* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) AROUND (3) (readiness OR ready OR development* OR competen* OR skill* OR prepar*)))

Scopus

Search conducted with title, abstract, and keywords fields. No limits or filters.

Yield = 915

TITLE-ABS-KEY ((((undergrad*) W/3 (scholarship OR creativ* OR research*)) AND (nace OR "National Association of Colleges and Employers" OR ((career* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) W/3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*)))))

Web of Science

Topic search conducted. No limits or filters.

Yield = 631

TS=(((undergrad*) NEAR/3 (scholarship OR creative* OR research*)) AND (NACE OR "National Association of Colleges and Employers" OR ((career* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) NEAR/3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*))))

Study Records

Data Management

Records were imported into Covidence, a systematic review tool ([covidence.org](https://www.covidence.org)) (Veritas Health Innovation 2023). Covidence was used for the title and abstract screening stage, full-text screening stage, and data extraction. Data extraction form was created and used within Covidence as well.

Selection Process

AM, JM, EH, and KP served as reviewers. For all stages of the review, 2 team members screened each study. All conflicts were discussed and resolved by consensus. Pilots were conducted at the start of each stage of the review. During the title and abstract screening, 50 studies were reviewed for the pilot. During the full-text screening, 25 articles were reviewed for the pilot. The team noted a high rate of conflicts during the full-text screening pilot, discussed the conflicts, and decided to add additional inclusion and exclusion criteria specifically for this round. To resolve the high rate of conflicts, the team repeated the full-text screening stage of the pilot using the revised criteria. During the extraction stage, 5 studies were screened for the pilot.

Data Collection Process

AM, JM, and EH extracted data using a standardized form.

Data Items

The following data items were extracted:

- Publication characteristics (eg. reference identification number, journal title, study title, lead author, and year of publication)
- Study characteristics (eg. type of institution, aims/purpose, sample size, and discipline of students)

- Career readiness aspect (eg. NACE competency or skill and associated career readiness intervention)
- Career readiness assessment (eg. how was it assessed, what were the outcomes of the assessment, and are there any practices or recommendations that we would like to share from this work)

The data extraction file from Covidence is included in the VTechWorks records for this protocol.

Data Synthesis

Data was summarized in a table. Synthesis was provided within the discussion section of the article.

References

- Council on Undergraduate Research (CUR). 2024. "What Is CUR's Definition of Undergraduate Research?" Accessed November 20, 2023. <https://www.cur.org/about/what-is-undergraduate-research/#:~:text=With%20an%20emphasis%20on%20process.or%20artistic%20contribution%20to%20knowledge>
- Moher, David, Larissa Shamseer, Mike Clarke, Davina Gherzi, Alessandro Liberati, Mark Petticrew, Paul Shekelle, Lesley A. Stewart, and Prisma-P Group. "Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement." *Systematic Reviews* 4 (2015): 1-9. <https://rdcu.be/dFLtd>
- National Association of Colleges and Employers (NACE). 2024. "What is career readiness?" Accessed November 20, 2023. <https://www.nacweb.org/career-readiness/competencies/career-readiness-defined>
- Veritas Health Innovation. 2023. "Covidence systematic review software." Accessed December 14, 2023. www.covidence.org

Addendum

Academic Search Complete -- Revised search strategy. Recommended for future work.

Search should be conducted with title, abstract, and keywords fields. No limits or filters.

Each paragraph of the search strategy below should be run on a separate line. Then, lines should be combined with AND or OR, as appropriate, using the Search numbers from the Search History.

S1

TI ((undergrad*) N3 (scholarship OR creativ* OR research*)) OR AB ((undergrad*) N3 (scholarship OR creativ* OR research*)) OR KW ((undergrad*) N3 (scholarship OR creativ* OR research*))

S2

TI ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*))) OR AB ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*))) OR KW ((NACE OR "National Association of Colleges and Employers" OR ((career* OR industry* OR job OR jobs OR profession* OR work* OR employ* OR occupation*) N3 (readiness OR ready OR development* OR competen* OR skill* OR prepar*))))

S3

(DE "ATTITUDES toward work" OR DE "CAREER development" OR DE "CAREER education" OR DE "CORE competencies" OR DE "EMPLOYABILITY" OR DE "INTERNSHIP programs" OR DE "JOB qualifications" OR DE "JOB skills" OR DE "OCCUPATIONAL training" OR DE "PROFESSIONALISM" OR DE "PROFESSIONAL education" OR DE "SCHOOL-to-work transition" OR DE "WORK" OR DE "WORK & education" OR DE "WORKPLACE literacy")

S2 OR S3

S1 AND S4