

Preparing **Curriculum & Instruction** Manuscripts for the *Journal of Geoscience Education*

The main purpose of a Curriculum & Instruction paper is to share innovative materials or approaches relevant to teaching and learning in the geosciences. These educational innovations may include classroom, virtual, laboratory, or field-based activities, courses, or programs; teaching approaches; professional development programs; informal education; or outreach to schools or the general public.

- **Curriculum** papers describe new materials developed for geoscience-related instruction and provide evidence of their effectiveness.
- **Instructional Approaches** papers describe new teaching methods developed for geoscience-related instruction and provide evidence of their effectiveness.

All C&I papers must be grounded in the appropriate educational literature, and must provide evidence of how the proposed innovation meets its learning goals.

The review criteria for C&I manuscripts outlined below serve several purposes. In addition to providing clear and consistent guidelines for authors and reviewers, they align with the standards of other STEM discipline-based education research communities and ensure consistency in presentation of educational innovations.

The following criteria should be used to guide both the content and organization of the manuscript; reviewers will be asked to comment on the same components. In addition, see the ***Information for Authors*** page, which address formatting, submission, and revision requirements.

Title: The title should describe the type of educational innovation and the setting where it was implemented.

Abstract: The abstract should be a succinct summary (≤ 250 words) of the manuscript, not an introduction, and should summarize the purpose of the educational innovation, what took place during the innovation, the data that supports the effectiveness of the innovation, and “lessons learned” that could help readers implement the innovation elsewhere.

Purpose and learning goals: The purpose of the educational innovation should be clearly explained, including a justification of why it is needed in geoscience education. In some cases, the purpose may include learning goals stated in terms of what participants should know or be able to do after completing the activity, program, course, or other intervention.

Literature context: The literature context should (1) identify theories or constructs that frame the design of the educational innovation, (2) explore related empirical studies that suggest how or why the activity, program, or method proposed in the paper should be effective, and (3) identify existing, related innovations and describe how the authors’ work is both similar to and distinctive from these existing innovations.

Study Population and Setting: The participant population and the research or instructional settings should be described completely. Participant population characteristics include individual or aggregated demographic variables such as age, gender, or ethnicity. The setting includes the type (e.g., museum, undergraduate course, large research university) as well as the target

participant size. The identity of participating institutions should remain anonymous as far as possible.

Materials and implementation: The materials and instructional approach should be sufficiently detailed that a reader could implement the innovation. We encourage authors to make use of online supplements to share materials (e.g., survey items, curriculum documents, powerpoints, rubrics, additional figures or other supporting information). If supplements are not included and the manuscript includes links to materials archived online, only URLs with stable long-term storage should be used.

Evaluation: Authors should answer the question: to what extent does the innovation meet its goals? In doing so, the alignment between the goals and objectives of the innovation, the specific questions that the evaluation addresses, and the data sources used to address these questions should be clear.

A complete description of evaluation should include:

- *Overall Design and Strategy.* The goals of the evaluation, the specific questions being asked, types of data collected, and a rationale for why this approach was taken, with reference to appropriate literature.
- *Data Sources.* These might include examples of participant work, performance on graded assignments or exams (with grading criteria or rubrics), pre and posttest performance, self-reported surveys, performance of comparison groups, focus groups, interviews, or other qualitative or quantitative sources of information. If assessment instruments are used (such as pre/posttests, surveys, interview scripts, or assignments), information about how they were developed and who developed them should be included.
- *Data Collection.* Who collected the evaluation data, and how and when it was collected.
- *Data Analysis.* For quantitative data, such as test scores and surveys, any statistical procedures as well as the software package should be indicated. For qualitative data, such as student work or interviews, the procedures by which the data were coded or otherwise interpreted should be described.
- *Validity and Reliability.* In the context of C&I papers, validity refers to the ‘truthfulness’ of the data. Are the data measuring what they are intended to measure? Reliability refers to how “reproducible” the findings are. If another person analyzed this data, would she or he reach the same conclusions? Papers should consider both validity and reliability in the description of the evaluation methods.

Results: Key results of the evaluation should be provided in the text of the paper in the form of raw or analyzed data as appropriate to the innovation and the evaluation design. Authors are encouraged to also provide instruments in the paper or as an online supplement.

Interpretations/Discussion: Authors should interpret their evaluation data, highlighting strengths and weaknesses of the innovation based on the data and addressing anomalous data or findings. They may also describe how the innovation could be improved, as supported by evaluation data.

Limitations: Any limitations of the evaluation and/or the educational innovation, including potential sources of bias, should be discussed. These might include limitations for when, where, and with whom the innovation is likely to work, or limitations of the instruments or metrics used in the evaluation.

Implications: The paper should describe key “lessons learned” from the authors’ experiences with the educational innovation that would help readers use the materials, curriculum, or program. The authors should also suggest how the innovation could be adapted to other educational contexts.

Figures, Tables, Supplements: All materials that are needed for a reader to adopt the educational innovation should be included in the paper or in supplemental files.