A COMMUNITY OF PRACTICE MODEL SUGGESTS PRACTIAL IMPLICATIONS FOR TEACHING GEOLOGIC MAPPING IN THE FIELD

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PURPOSE AND GOALS

- Fieldwork is a key component of gaining expertise in geology (Petcovic et al., 2014)
- Learning bedrock mapping has long been a cornerstone of field instruction
- As part of a larger naturalistic study of mapping strategies (Hambrick et al., 2012; Baker et al., 2012; Baker & Petcovic 2012; 2016), undergraduate through professional geoscientists were asked during semi-structured interviews to reflect on experiences that promoted their personal competence and confidence in mapping
- Using Lave & Wenger's (1991) theory of situated learning, we captured how learning to map is "situated" relative to the instructional, physical, and cultural environments
- Here we describe our resulting model as well as practical implications of this analysis for teaching geologic mapping in the field

METHODS

PARTICIPANTS

Demographics	N=67
Age (range, mean)	20-68 (36.4)
Yrs since highest degree (range, mean)	0-29 (7.3)
Gender (no., % female)	31 (46.3%)
Race/ethnicity (no., % persons of color)	6 (9.1%)
Current undergraduate student (no., %)	14 (20.9%)
Current graduate student (no., %)	19 (28.4%)
Current or former professional geoscientist (no., %)	36 (53.7%)
Took undergraduate field methods/mapping course (no., %)	64 (95.5%) / 50 (74.6%)
Graduate field/mapping research experience (no., %)	44 (65.7%) / 32 (47.8%)
Professional mapping or teaching mapping experience (no., %)	21 (31.9%)

DATA COLLECTION & ANALYSIS

Participants were recruited and selected for the larger study (2009 & 2010)

Participants completed cognitive tests, a mapping task and a post-mapping interview. Part of the interview asked "How (or where) did you learn to make geologic maps?"

Responses to mapping and experience questions were isolated for analysis

Authors independently read a random sample of 10 interviews and generated potential codes.

Codes were compared and consolidated. Mogk & Goodwin (2012) was used to organize initial codes.

Authors iteratively applied codes to a sample of 5 transcripts, compared results, and refined the coding scheme until a final coding scheme was agreed upon

Transcripts were divided for coding among all authors. One author identified text passages to code. This author and a second author independently coded each passage. Mean 76.5% agreement was achieved. All disagreements were resolved.

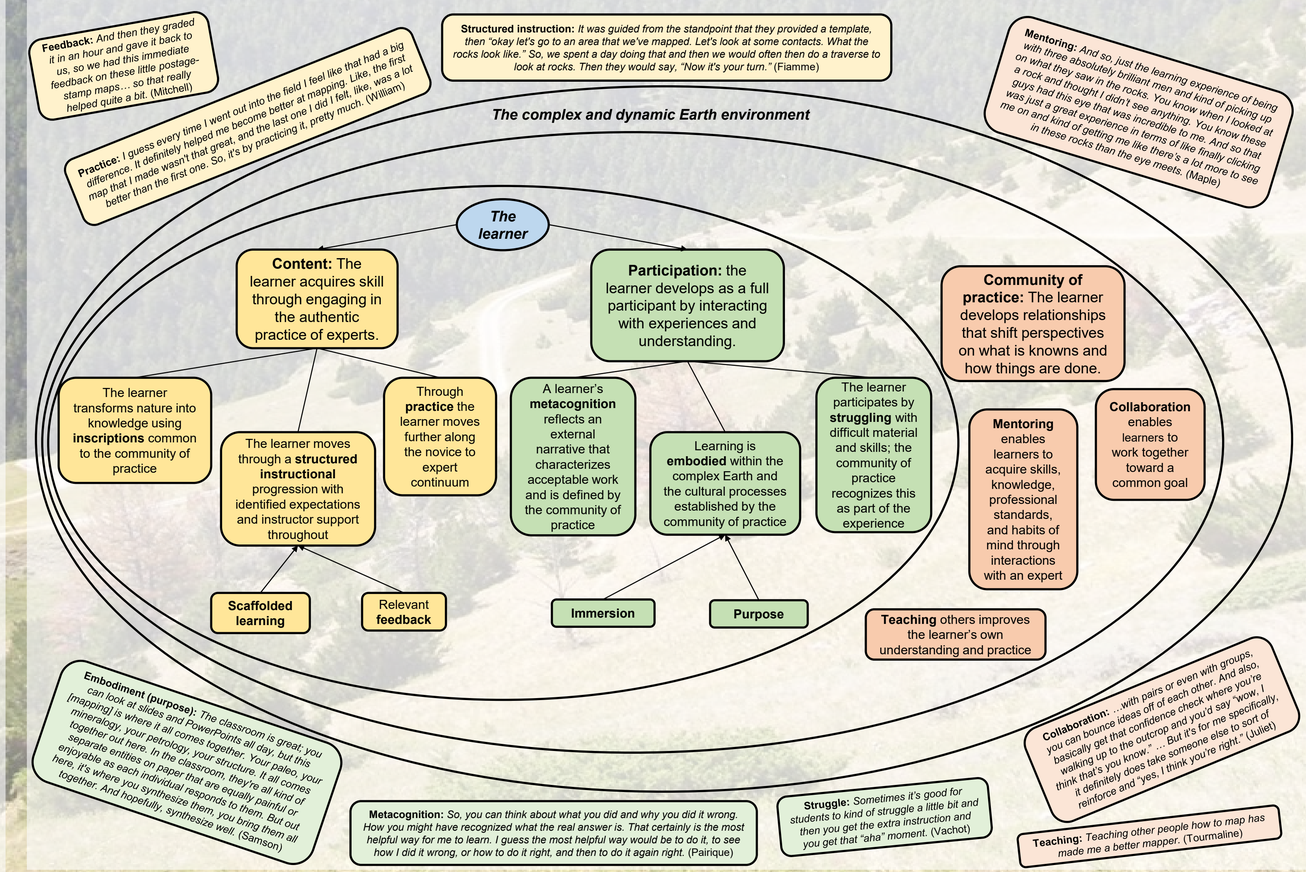
Coded text segments were compiled using NVivo 11.0. Coded segments were reviewed by all authors and an independent peer group to interpret key ideas within each code. Attendees at the 2018 GSA meeting commented on the poster by placing stickers on codes that they found particularly compelling.

Using the lens of Lave and Wenger (1991), we organized findings into three major categories: content, participation, and community. This allowed us to make sense of the findings, generate interpretations, and develop the model.

Learning to make geologic maps is enhanced by:

- *Structured instruction with regular feedback*
- *Immersion in the physical and cultural environment*
- *Productive struggle*
- *Working in a community of practice*

OUR MODEL OF SITUATED LEARNING TO MAP



Read more: Petcovic, H. L., McNeal P. M., Nyarko, S. C., & Doorlag, M. (2019). "How did you learn to map?" A model for describing influential learning experiences in geologic mapping. *Journal of Geoscience Education*. https://doi.org/10.1080/10899995.2019.1695096

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IMPLICATIONS FOR TEACHING

Structured Instruction and Feedback

- Structure learning as a gradual shift of responsibility from instructor to student.
  - Learners should have mastered all of the necessary knowledge and skills before being "let loose" to map.
  - Incorporate learning activities and assessments that teach the use of inscriptions such as topographic maps, aerial photos, microscope images, enhanced graphic displays, and the representation of measurements such as strike and dip.
- Provide regular and timely feedback on learners' performance, clearly indicating how performance can be improved.
  - Have instructors or teaching assistants available to answer questions during mapping activities.

Purposeful Immersion

- Provide opportunities for extended, deliberate and purposeful practice
  - Have students to map an area, receive feedback from their instructor, and map the area again in order to improve their understanding and performance.
- Model the type of metacognitive self-talk learners should engage in by demonstrating and explaining how the instructor would map the area.

Productive Struggle

- Struggle can be productive when used intentionally such that learners are adequately scaffolded and supported.

Community of Practice

- Use activities and assessments that encourage both teamwork and independent study
  - Design work to create an environment that fosters sharing of ideas, active participation, and respect for dissenting ideas – all important aspects of collaboration in the geoscience community.
- Set up field activities such that novice mappers benefit from being individually mentored by more experienced peers, teaching assistants, or instructors.
- Ask more experienced students to teach others.
  - Having more individuals fully participate in teaching others not only strengthens their own knowledge and skills, but fully engages both teachers and learners in the evolving community of practice.

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