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Do digital mapping tools improve student understanding in the field? – Lessons from a pilot project

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Summary

Geologic mapping is a key component of geology field courses and is traditionally carried out with hand-written notes in field notebooks and hand-drawn orientation symbols and lithological contacts on paper basemaps. Similarly, ancillary deliverables such as geologic cross-sections are typically also constructed with pencil and paper. We conducted a study to identify and evaluate the challenges of using digital mapping tools in the field as a pilot project, prior to introducing such methods to field school classes.

For this purpose we selected a small field area with minimal structural complexity containing exposures of the Lower Cretaceous Cadomin and Gladstone Formations near Hailstone Butte, SW of Longview in SW Alberta. Four (4) undergraduate students that had some previous field experience in a single introductory Field Course mapped contacts and structures and recorded descriptive data for two days. In pairs, they carried out field mapping using a traditional field notebook and paper basemap (at 1:7,500) on one day, and on another day using 8" GPS-enabled Android and Apple tablets with touch-sensitive screens running the software FieldMove®. Participants also took pre- and post-field concept inventory quizzes, which formed the basis to assess conceptual understanding and visualization skills of the students, and a post-field survey to collect student feedback on field work experience and perception of learning impact.

We broadly categorize the results as those pertaining to (1) Collection and recording of data, and; (2) Visualization and understanding of the mapped geology. Recording field data is greatly facilitated by using tablets since descriptive notes, structural measurements, and annotated photos can all be pegged to the location of given stations of a traverse. Distinct advantages include quasi-automatic placement of structural data symbols, and the ability to zoom-in (or –out) of the digital basemap facilitating the representation of both small- and large-scale features. Although the data can be downloaded in multiple formats, finding the appropriate digital platform to apply that data to construct selected cross-sections is not a trivial problem.

Students continue to be hesitant to enter lithological contacts on their map in the field. For relatively novice geologists this is an age-old hurdle limiting the extent and quality of interpretations completed in the field, and requiring the scheduling of additional time to produce a finished map, just as with paper-based mapping exercises. Hence, although digital mapping tools offer the convenience/efficiency of digital note-keeping and data entry, student's struggles with 'in-field' visualization of geology and completion of maps, and if possible cross-sections, remain.