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Integrating Digital Tools in Remote Learning to Enhance the Delivery Methods of Technical Contact in Undergraduate Geosciences

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Abstract

The global transition to remote learning due to the COVID-19 pandemic was an extremely difficult task for both students and faculty in geological sciences. Technical courses, such as Structural Geology, Mineralogy, Petrology, and Invertebrate Paleontology, that require in-person lectures and laboratory sessions involving various rocks and mineral samples, fossils, maps, and models, were a major concern at the start. The challenge of delivering the technical content via Microsoft Teams, Skype, WebEx, Blackboard Collaborate Ultra, Zoom, and other internet based platforms was not only a burden for the faculty to carry, as students were struggling to conceptualize outcrop-and-type-section-based information and link these to pertinent geological phenomena dealing with depositional environment, provenance and diagenesis. Traditional classroom teaching heavily depends on signature samples and scaled models routinely used in the classrooms. However, the adaptive approach that integrates ArcGIS Pro, Google Earth Pro, and other geospatial tools coupled with digital libraries of rock samples, video simulations, and 3D scaled models can yield positive results. A preliminary assessment followed by subsequent surveying among the students enrolled in gateway geology courses mentioned above at York College – The City University of New York - revealed that not only was the delivery of the content effective for the most part, students managed to comprehend the conceptual aspects of various plate tectonic processes, key deformational features, association of mineral(s) and rock types with particular tectonic setting, post depositional and geomorphological changes on both a micro- and – macroscale.

The Adaptive Transition

The transition of structural geology, a course traditionally taught in person and relied on field trips and outdoors activities, into remote learning posed a challenge for all parties involved. At the start, students were struggling to conceptualize the various structural and deformational features and faculty were trying relentlessly to develop adaptive methods of delivery. Arc GIS Pro and Google Earth were excellent tools that enabled the sharing, edits, and modification of surficial structural features particularly in Rosendale NY and Sussex NJ where fieldtrips are traditionally held.

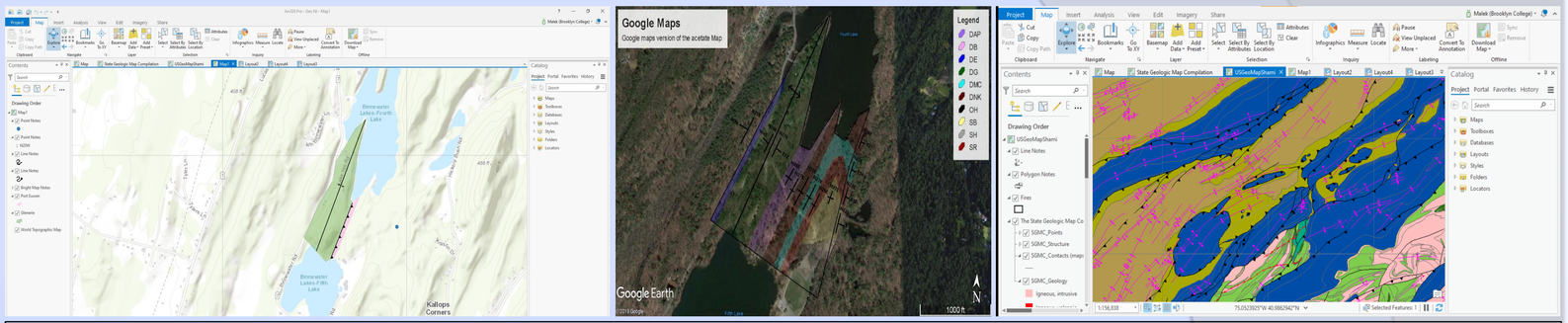


Figure. 3 – Screen Sharing Arc GIS Pro and Google Earth Pro

Digital Platforms

As previously noted, the transition to digital platforms was an extraordinary challenge particularly for courses that require in person sessions. The sudden shift into remote prompted a immediate adaptation to online platforms such as WebEx, Zoom, Skype, Microsoft Teams, Adobe Connect, and Blackboard Collaborate Ultra. Out of all the options, Blackboard Collaborate Ultra was utilized the most for due to its efficiency and familiarity with both the faculty and students. Zoom was also utilized as a backup plan.

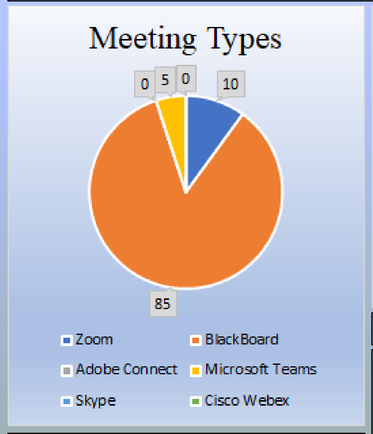


Figure 1 – Mode of Content Delivery

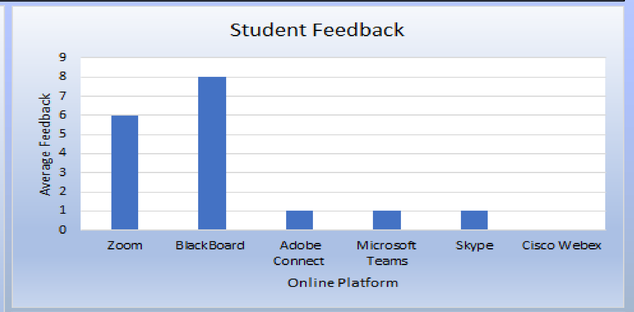


Figure. 2 – Student Feedback to Various Web Platforms

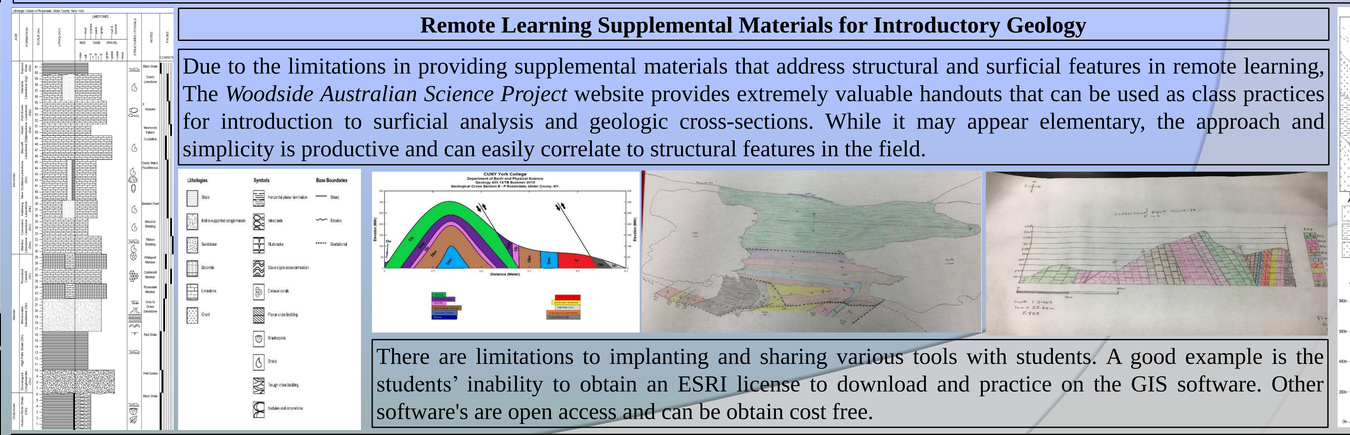
After multiple trials and errors with different platforms, students generally preferred Blackboard collaborate ultra due to their relatively low technical issues, ability to have clear recording, and all the other features that other platform provide.

Other Digital Tools

In addition to Arc GIS Pro and Google Earth, various tools via screensharing were utilized in the remote method of delivering structural geology content. Platforms such as D-Plot enabled students to integrate and plot surface elevations, topographic features, and cross sections. Due to the complexity of projecting structural and deformational features such as slickensides on a physical sample, pictures, maps, and videos were utilized as supplemental formats to aid the delivery of such materials. Student feedback varied at the beginning of the semester but ultimately, the comfort level and understanding of the materials was enhanced. In addition, edited field images from previous field trips were shared to facilitated the visualization of various folding and faulting features for the students.

Remote Learning Supplemental Materials for Introductory Geology

Due to the limitations in providing supplemental materials that address structural and surficial features in remote learning, The *Woodside Australian Science Project* website provides extremely valuable handouts that can be used as class practices for introduction to surficial analysis and geologic cross-sections. While it may appear elementary, the approach and simplicity is productive and can easily correlate to structural features in the field.



There are limitations to implanting and sharing various tools with students. A good example is the students' inability to obtain an ESRI license to download and practice on the GIS software. Other software's are open access and can be obtain cost free.

Figure. 4 – Sed Log and other handouts used during the transition to remote learning