

Development of Educational Curricula Based on Digital Microscopes

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Although the scanning electron microscope (SEM) is an essential scientific research tool, its utilization in education has been modest. Only a handful of high schools in the U.S. have access to SEM instrumentation, and availability at colleges and universities at the undergraduate level is limited. This is unfortunate because the image-based, interactive nature of the SEM appeals to the inquisitive nature of students. With its ability to provide highly detailed images of microscopic features as well as information on composition, the SEM is an ideal analytical tool to incorporate into science curricula.

In an effort to help bring the SEM into the classroom, RJ Lee Group has been working for several years with educators to explore new and innovative ways to utilize the SEM to enhance science classes. These efforts have led to the development of an SEM microscopy laboratory at a middle-high school in southwestern Pennsylvania, incorporating a unique school-to-work component. Complementing the use of the local microscope, RJ Lee Group has developed WebSEM technology that allows Internet access to the SEM at remote locations. While programs such as these are major steps forward, any program based on access to real analytical instrumentation is unlikely to serve all students on a continuing basis.

To move the SEM experience into the classroom on a grand scale will require development of SEM simulators. Effective simulation would retain the excitement while permitting all students to have access to "SEM" technology throughout a school year. With funding support from the National Science Foundation [1], RJ Lee Group has developed CD and Web-based versions of an SEM simulator that permit "specimens" to be examined and analyzed in a manner similar to a real SEM. This technology has the potential to open the door to widespread use of the SEM in the classroom. The technology can also be expanded to other image-based analytical instruments such as high-quality light microscopes.

Development of microscope simulators is only half the solution in that they will have limited impact in education if it is left to teachers to understand the underlying technology and to develop and implement their own lessons. To this end, RJ Lee Group is developing Web-based curriculum extensions which provide background information on the technology, content area, and defined lesson plan activities. These modules are being developed with the support of educators and the assistance of ASSET Inc., an independent, non-profit organization developed to help educators foster outstanding student achievement in science and technology in the Pittsburgh, PA area.

SEM and light microscope simulators provide for new opportunities to bring microscopy into prominence in science education. Combined with effective curriculum, the simulators will enable students to perform more sophisticated scientific experiments and help schools meet the increasing mandates for scientific literacy.

[1] This research was supported by NSF SBIR Phase II Grant #DMI-0321679.

Module: Rock Identification and the Rock Cycle (3rd Grade)

Erosion causes rocks to wear away. Water and wind are the chief eroding forces. Most erosional debris is sand, silt, and gravel.


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Sign-Out

Resources

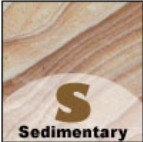
[Glossary](#)

[Suggested Links](#)

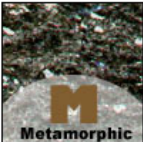
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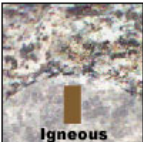
Magnify




Sedimentary



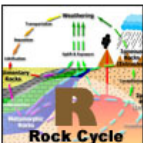
Metamorphic




Igneous



Unknown Rocks



Rock Cycle



Extension Investigation

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Fig. 1. Example of Web-based curriculum being developed for Rocks & Minerals lesson extension.