USE OF THE VERNIER MINI GC™ IN AN ORGANIC CHEMISTRY DISTILLATION LAB
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BACKGROUND
A traditional experiment in first term Organic Chemistry lab has been a distillation experiment. While the separation has typically been monitored by temperature, this poster presents data on using temperature and GC's to show the separation. Both Vernier Mini GC's™ and conventional GC's were used.

THE EXPERIMENT
Working as a team of two students, each team performed a simple and a fractional distillation of a 50 mole% of ethyl acetate, 50 mole% of propyl acetate. At specified volumes of distillate a sample was collected, diluted with pentane, and analyzed for % propyl acetate, using GC. Some teams used a Vernier Mini GC™ while others used a conventional GC.

GC EXPERIMENTAL CONDITIONS

<table>
<thead>
<tr>
<th>Vernier Mini GC™</th>
<th>Conventional GC – SRI 8610C</th>
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</thead>
<tbody>
<tr>
<td>11 m Restek MXT®</td>
<td>30 m MXT-5</td>
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<tr>
<td>Chemical/active detector</td>
<td>FID detector</td>
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<tr>
<td>Temperature, 40 – 80 °C</td>
<td>Temperature, 50 – 100 °C</td>
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</table>

SUPPLEMENTAL MATERIALS
Copies of the poster, the experimental procedure, instructor comments, and typical student data are available from the Roanoke College Chemistry Department homepage. (http://roanoke.edu/Academics/Academic_Departments/Chemistry.htm)

REFERENCES

EXAMINING THE DATA
Shown directly below are student chromatograms for a simple distillation done using the Vernier Mini GC™ (left) and a conventional GC (right). Both instruments have baseline separation and show variability in injection volumes and in coordination of injection and starting the chromatography. Note that while the samples on both instruments were diluted with pentane, the pentane did not show on the Vernier because the detector does not respond to hydrocarbons.

Below the chromatograms are graphs showing student temperature (left axis) and % propyl acetate (right axis) as a function of distillate volume. Note the experimental error (blunders) in the data.

CONCLUSIONS
While probably not the choice for most upper level labs and research, the Vernier Mini GC™ provide introductory students with more time on the instrument. This “time-on-instrument” translates into more practice with basic techniques and into more data.

ADVANTAGES OF MINI GC™s
- Portability: These GCs can be moved easily from lab to lab. They can be brought to the students who will use them.
- Cost: The lower cost means more instruments can be purchased. More instruments give each student more time on the instrument.
- More Data: Greater student access allows for more runs to be completed within the lab period. For this experiment, more runs provides a more complete profile of the distillations.
- Resolution of Peaks: Complete separation of peaks was achieved in the mix of ethyl and propyl acetates.

DISADVANTAGES OF MINI GC™s
- Peak shape: Although sufficient resolution can be achieved in the separations, the shape of the peaks was asymmetric and variable. Should students be taught that these peak shapes are acceptable?
- Run time: Compared to the conventional GC, longer runs times (roughly double) were necessary.
- Reproducibility: Greater variability in peak shape, resolution, and run times were seen. These GCs appear to be more sensitive to change in room temperature and humidity.

CONCLUSIONS
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ACKNOWLEDGMENTS
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