"Providing for the educational needs of all students"

The teacher as reflective decision maker is the model on which the College of Education has built its teacher preparation program. It represents the effort to prepare teachers for ever-changing roles and continuous personal and professional self-improvement. A reflective decision maker is one who knows how to evaluate and modify current teaching approaches to meet emerging student needs. This ability is grounded in a thorough knowledge of current theory and the ability to evaluate these theories and beliefs in light of new information and circumstances. The College of Education places particular emphasis on the themes of diversity, technology, assessment and evaluation, intellectual vitality, and the professional community.

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Textbook & Course Materials:
Kentucky Division of Water. (1986). A field guide to Kentucky rivers and streams.
Kentucky Division of Water. (1986). A field guide to Kentucky wetlands.
Kentucky Watershed Watch Program 2000:
  Watershed watch biological stream assessment
  Watershed habitat assessment protocols
  Watershed watch water chemistry sampling methods
Excerpted from Master Watershed Stewards, Ohio State University Extension. (1998). Streams, the rivers in your backyard
Water quality education course handbook (2002). Highland Heights, KY: NKU

Course Rationale
The objectives of EDG 695 are derived from the essential knowledge, established and current research findings, and sound professional practices as they relate to the National Science Education Standards, as well as the following Kentucky’s Experienced Teacher Standards: Standard 1 (Professional Leadership), Standard 2 (Knowledge of Content), Standard 3 (Designs/Plans Instruction), Standard 5 (Implements/Manages Instruction), Standard 6 (Assesses/Communicates
Learning Results), Standard 7 (Reflects/Evaluates Teaching/Learning), Standard 8 (Collaborates with Others), Standard 9 (Professional Development), and Standard 10 (Implementation of Technology). The evaluation measures of this course will assess the student’s understanding of the standards listed above and her/his ability to apply these concepts to the teaching/learning process.

**Course Description**

This course consists of a one-week summer workshop and one-day follow-up session in the fall. The location for the course is the Thomas More College Ohio River Field Station in California, KY. Specific hands-on sessions will focus on the biology, chemistry, ecology, and geology of the Ohio River in the context of water quality. Topics collectively will help teachers understand the complex natural and human forces that impact the water quality of streams.

Throughout the week during the summer, teachers will be actively involved in the learning process. The teaching sessions will occur in a field-based setting and be integrated with a first-hand study of the topics. Fieldwork, instructor/speaker presentations, and group discussions will increase the teachers’ content knowledge and process skills, technical skills, and problem-solving abilities. Course instruction will include time for discussion and reflection about the classroom applications of what the teachers are doing and learning.

During the fall follow-up session, teachers will present the lesson activities that were developed for use with their K-12 students. Curriculum resources will be shared by teachers and instructors. Opportunities for further networking will be discussed.

**Course Goals and Objectives**

Teachers will develop a curriculum product to be taught during the 2002/03 year which integrates the water quality topics studied during the course around the KY Science Core Content for Assessment. The curricula submitted by all participants will be complied and made available to others on the NKU Science Education website.

The overall goal of this course is to improve the content knowledge, pedagogical skills, and confidence levels of teachers in regard to science teaching. The specific objectives of the program are:

1. Teachers will learn ways to integrate sciences.
2. Teachers will learn ways to integrate other curricular area with science.
3. Teachers will learn applications of technology in the science classroom.
4. Teachers will learn hands-on, inquiry-based teaching strategies.
5. Teachers will learn ways to integrate the use of community resources in their teaching.
6. Teachers will learn how to conduct field-based investigations.
7. Teachers will learn ways to connect science with real-life, societal issues, and careers.
8. Teachers will develop a curriculum product based on their learning during the course.
9. Teachers will align the course content and curriculum product with the KY Science Core Content for Assessment.

The course places emphasis on each of the College of Education’s themes of diversity, technology, assessment and evaluation, intellectual vitality, and the professional community, specifically addressing the following Kentucky Experienced Teacher Education Standards (means of assessment include course participation, course notebook, and curriculum product):

**Standard 1:** The teacher provides professional leadership within the school, community, and education profession to improve student learning and well-being.

Performance Criteria:

1.1 Builds positive relationships within and between school and community.
1.4 Writes and speaks effectively.
1.5 Contributes to the profession knowledge and expertise about teaching and learning.
1.8 Initiates and develops educational projects and programs.
1.9 Practices effective listening, conflict resolution, and group-facilitation skills as a team member.
Standard 2: The teacher demonstrates content knowledge within own discipline(s) and in application(s) to other disciplines.

Performance Criteria:
2.1. Communicates a breadth of content knowledge across the discipline(s) to be taught.
2.2. Communicates a current knowledge of discipline(s) taught.
2.3. Demonstrates a general knowledge that allows for integration of ideas and information across the disciplines. approaches to instruction.
2.5 Connects content knowledge to real-world applications.
2.6. Plans lessons and develops instructional material that reflect knowledge of current constructs and principles of the discipline(s) being taught.
2.9 Collaborates with teachers in other disciplines to analyze and structure cross-disciplinary approaches to instruction.

Standard 3: The teacher designs/plans instruction that develops student abilities to use communication skills, apply core concepts, become self-sufficient individuals, become responsible team members, think and solve problems, and integrate knowledge.

Performance Criteria:
3.1 Focuses instruction on one or more of Kentucky’s learning goals and academic expectations.
3.2 Develops instruction that requires students to apply knowledge, skills, and thinking processes.
3.3. Integrates skills, thinking processes, and content across disciplines.
3.4 Creates and utilizes learning experiences that challenge, motivate and actively involve the learner.
3.8 Includes creative and appropriate use of technologies to improve student learning.
3.10 Secures and uses a variety of appropriate school and community resources to support learning.
3.11 Develops and incorporates learning experiences that encourage students to be adaptable, flexible, resourceful, and creative.

Standard 5: The teacher introduces instruction that develops student abilities to use communication skills, apply core concepts, become self-sufficient individuals, become responsible team members, think and solve problems, and integrate knowledge.

Performance Criteria:
5.2. Connects learning with student's prior knowledge, experiences and backgrounds, and aspirations for future roles.
5.3 Models the skills, concepts, attributes, and/or thinking skills to be learned.
5.4. Uses and develops multiple teaching/learning strategies that are appropriate to student developmental levels and actively engages students in individual and cooperative learning experiences.
5.6 Stimulates students to reflect on their own ideas and those of others.
5.7 Uses appropriate questioning strategies to help students solve problems and think critically.
5.8. Manages student examination of social issues relative to course content, possible responses, and associated consequences.
5.10. Presents differing viewpoints when integrating knowledge and experiences across discipline.
5.11 Makes effective use of media and technologies.
5.12 Makes efficient use of physical and human resources and time.
5.13 Provides opportunities for students to use and practice what is learned.

Standard 6: The teacher assesses learning and communicates results to students and others with respect to student abilities to use communication skills, apply core concepts, become self-sufficient individuals, become responsible team members, think and solve problems, and integrate knowledge.

Performance Criteria:
6.1. Selects and uses appropriate assessments.
6.2. Makes appropriate provisions for assessment processes that address social, cultural, and physical diversity.
6.3. Assesses student performance using the established criteria and scoring guides consistent with Kentucky's assessment program.

**Standard 7: The teacher reflects on and evaluates teaching/learning.**

**Performance Criteria:**
7.1 Assesses and analyzes the effectiveness of instruction.
7.3 Assess programs and curricula; proposes appropriate recommendations and needed adjustments.

**Standard 8: The teacher collaborates with colleagues, parents, and other agencies to design, implement, and support learning programs that develop student abilities to use communication skills, apply core concepts, become self-sufficient individuals, become team members, think and solve problems, and integrate knowledge.**

**Performance Criteria:**
8.1. Initiates collaboration with others and creates situations where collaboration with others will enhance student learning.
8.5. Secures and makes use of school and community resources that present differing viewpoints.
8.6. Recognizes and responds appropriately to differences in abilities, contributions, and social and cultural backgrounds.
8.7. Invites colleagues, parents, community representatives, and others to help design and implement collaborative instructional projects.

**Standard 9: The teacher evaluates own overall performance in relation to Kentucky’s learner goals and implements a professional development plan.**

**Performance Criteria:**
9.4. Applies to instruction the knowledge, skills, and processes acquired through professional development.

**Standard 10 The teacher uses technology to support instruction; access and manipulate data; enhance professional growth and productivity; communicate and collaborate with colleagues, parents, and the community; and conduct research.**

**Performance Criteria:**
10.6. Uses the computer to do work processing, create data bases and spreadsheets, access electronic mail and the Internet, make presentations, and use other emerging technologies to enhance professional productivity and support instruction.

10.14. Uses computers and other technology for individual, small group, and large group learning activities.

**Student Activities, Evaluation, and Grading Policy**

1. **Course Attendance** is required to receive credit for this course.

2. **Course Notebook:** The notebook will include a record of all data collected and analyzed during the course, core content/school curriculum addressed each day, and daily assessment questions/tasks developed for use with students. The notebooks will be evaluated by course instructors on the last day of the class.

3. **Curriculum Product:** Develop a curriculum product to be taught during the 2002/03 school year which integrates the water quality topics studied during the workshop around the core content being taught. Specific guidelines and the format to be used for this curriculum will be provided during the course.

4. **Curriculum Product Presentation:** Each teacher will present the lesson activities developed as a result of the course during the fall follow-up session. Specific guidelines to be used for this presentation will be provided during the course.
5. **Professionalism:** Interact professionally with course instructors, speakers, and other participants. Students must demonstrate respectful standards of behavior during activities & discussion, collaborate responsibly with colleagues, work cooperatively, and fulfill their collegial responsibilities.

To take information directly from another source without giving credit to or citing the original source is plagiarism. Plagiarism is in violation of copyright laws and NKU's Student Honor Code which is attached to this syllabus. Refer to http://www.nku.edu/~library/howto/plagiarism.shtml for information on what constitutes plagiarism and how to avoid it:
http://www.nku.edu/~library/howto/plagiarism.shtml
For information about the violation of the Cheating and Plagiarism Student Honor Code, see the document attached.

The **final grade** will be determined in the following manner:

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Points</th>
<th>Required</th>
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<tbody>
<tr>
<td>Course Attendance</td>
<td>25</td>
<td>Required</td>
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<tr>
<td>Course Notebook</td>
<td>25</td>
<td>100</td>
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<tr>
<td>Curriculum Product</td>
<td>25</td>
<td>50</td>
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<tr>
<td>Lesson Presentation</td>
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<tr>
<td>Professionalism</td>
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<td><strong>TOTAL</strong></td>
<td>200</td>
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**GRADING SCALE**

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<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>Superior</td>
<td>92-100%</td>
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<tr>
<td>B</td>
<td>Above Ave.</td>
<td>85-91%</td>
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<tr>
<td>C</td>
<td>Average</td>
<td>75-84%</td>
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<tr>
<td>D</td>
<td>Below Ave.</td>
<td>70-74%</td>
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<tr>
<td>F</td>
<td>Failure</td>
<td>Below 70%</td>
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# COURSE SCHEDULE

<table>
<thead>
<tr>
<th>DAY</th>
<th>ACTIVITIES</th>
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<tbody>
<tr>
<td>9:00 AM Monday</td>
<td>• Course overview&lt;br&gt;• Pre-course survey&lt;br&gt;• Guidelines for curriculum product &amp; course evaluation&lt;br&gt;• Overview of Field Station&lt;br&gt;• Enviroscape Introduction (set up all week)</td>
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<tr>
<td>July 14</td>
<td>Geology and Chemical Cycling&lt;br&gt;1. Review of the hydrologic cycle&lt;br&gt;2. River systems &amp; flood plain development&lt;br&gt;3. How various constituents can enter a river system&lt;br&gt;4. Collect water samples (from the Ohio River at field station and upstream from a tributary)&lt;br&gt;5. Field station: Analyze samples and plot data in histograms using Excel&lt;br&gt;6. Discuss results&lt;br&gt;7. Hypothesize concentrations in downstream tributary, collect samples, and analyze/plot data&lt;br&gt;8. Discuss results and source of constituents</td>
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<tr>
<td>4:00-4:30 PM</td>
<td><strong>Core Content and Assessment Questions</strong>&lt;br&gt;(Core content: SC-M-2.1.5 and SC-H-2.2.2)</td>
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<tr>
<td>9:00 AM Tuesday</td>
<td>Discuss Monday assessment questions&lt;br&gt;Microbiology and Water Chemistry&lt;br&gt;1. Introduction to river ecosystem and sampling methods (30 min. - 1 hour)&lt;br&gt;2. Sampling of river-productivity line, collect plankton (pontoon boat) and water samples for chemistry testing, demonstrate use of YSI SONDE to instantly collect &amp; graph multiple river parameters, &amp; collect coliform samples (2 hours)&lt;br&gt;3. Lunch&lt;br&gt;4. Microscope study of algae, protista, &amp; microscopic invertebrates (2 hours minimum)&lt;br&gt;5. Measure oxygen levels in productivity bottles &amp; calculate river productivity.</td>
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<td>DAY</td>
<td>ACTIVITIES</td>
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<tr>
<td>1:00 PM</td>
<td>Discuss Tuesday assessment questions</td>
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<tr>
<td>Wednesday</td>
<td>Observe coliform results</td>
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<tr>
<td>July 16</td>
<td><strong>Fish and Macroinvertebrate Study</strong></td>
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<tr>
<td>8:30-9:00 PM</td>
<td>• Identification - taxonomy</td>
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<td>• Biodiversity</td>
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<td>• Adaptations</td>
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<td>• Ecosystem - food web</td>
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<td>• Bioindicators</td>
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<td>• Water quality</td>
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<tr>
<td></td>
<td><strong>Core Content and Assessment Questions</strong></td>
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<tr>
<td>9:00 AM</td>
<td>Discuss Wednesday assessment questions</td>
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<tr>
<td>Thursday</td>
<td><strong>Terrestrial, Wetlands, &amp; Upland Ecosystem Study</strong></td>
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<tr>
<td>July 17</td>
<td>Wetlands and floodplains orientations (St. Ann's)</td>
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<tr>
<td>Morning</td>
<td>Vegetation monitoring/research methods</td>
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<td>Data interpretation/forest evaluation</td>
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<td>Upland: Exotic species and their effects on ecosystems</td>
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<td>Watersheds/storm water management</td>
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<td>Afternoon</td>
<td>Habitat restoration (theory &amp; practice)</td>
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<td>4:00-4:30</td>
<td><strong>Core Content and Assessment Questions</strong></td>
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<tr>
<td>9:00 AM</td>
<td>Discuss Thursday assessment questions</td>
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<tr>
<td>Friday</td>
<td>Website demonstrations</td>
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<td>July 18</td>
<td>Conservation Districts</td>
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<tr>
<td>10:00</td>
<td>Work in small grade level groups to plan curriculum product assignment</td>
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<tr>
<td>11:00</td>
<td>Lunch</td>
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<tr>
<td>12:00</td>
<td>Continue small group work</td>
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<tr>
<td>2:00</td>
<td>Sanitation District No. 1</td>
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<tr>
<td>3:00</td>
<td>Sierra Club, Water Sentinel Project</td>
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<tr>
<td>4:00-4:30</td>
<td>Post-course survey</td>
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<tr>
<td>FOLLOW-UP SESSION</td>
<td><strong>ACTIVITIES</strong></td>
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<tr>
<td>9:00 AM - 4:00 PM</td>
<td>Presentations of lesson activities developed as a result of the summer portion of the course</td>
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<tr>
<td>September, TBA</td>
<td>Curriculum resources</td>
</tr>
<tr>
<td></td>
<td>Community resources</td>
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</tbody>
</table>
Water Quality Education for Middle School Science Teachers

References

Kentucky Department of Fish and Wildlife:
Teacher’s Guide to Kentucky Fish
Teacher’s Guide: Small Stream Ecosystem
Teacher’s Guide: The Big River Ecosystem


Course Website

http://www.nku.edu/~scienceed/courses.htm

University Websites

Center for Environmental Education: http://www.nku.edu/~enved

Northern Kentucky University Science Education: http://ww.nku.edu/~scienceed

Thomas More College Ohio River Field Station
http://www.thomasmore.edu/academics/study/fieldstation/index.html

Water Education Websites

EE Link: http://nceet.snre.umich.edu/

EE Link Grants Page: http://eelink.net/grants-generalinformation.html

EPA
http://www.epa.gov/enviroed/
http://www.epa.gov/enviroed/oeecat/
http://www.epa.gov/enviroed/oeecat/
http://www.epa.gov/enviroed/oeecat/

KY Department of Fish and Wildlife Resources: http://www.kdfwr.state.ky.us/teacher.htm

Kentucky Division of Forestry: http://www.webcom.com/duane/wood/kdf.html

KY Division of Water: http://water.nr.state.ky.us/dow/dwhome.htm

Kentucky Natural Resources and Environmental Protection Cabinet
Water temperature: http://water.nr.state.ky.us/ww/wcptmp.htm
Dissolved oxygen: http://water.nr.state.ky.us/ww/wcpdo.htm
pH: http://water.nr.state.ky.us/ww/wcpph.htm

Kentucky Geologic Survey: http://www.uky.edu/KGS/
Water related web sites in and outside KY:  http://www.uky.edu/KGS/water/waterlinks.htm
Kentucky PRIDE Program:  http://www.kypride.org/cleanstreams.htm
Kentucky Water Watch:  http://www.state.ky.us/nrepc/water/wwhomepg.htm
Lamotte:  http://www.lamotte.com/
Licking River Watershed Watch:  http://water.nr.state.ky.us/watch/licking.htm
Natural Resources Conservation Service:  www.nrcs.usda.gov
Ohio Department of Natural Resources, Division of Water:  www.dnr.state.oh.us/water/programs/programs.htm
Reading the Licking River:  www.readingtheriver.org
Sanitation District No. 1, Northern KY:  http://www.sd1.org/
Tri-State Environmental Resource Center:  http://terc.uc.edu/
Water Environment Federation:  http://www.wef.org/
Water on the Web:  http://wow.nrri.umn.edu/wow/index.html

Educational Agencies
Kentucky Department of Education:  http://www.kde.state.ky.us/

Community Resources
Boone, Campbell and Kenton County Conservation Districts
Environmental Education Alliance
Licking River Watershed Watch
Sanitation District No. 1 of Northern KY
Northern KY Sierra Club and Water Sentinels Project

Professional Organizations
Kentucky Association for Environmental Education:  www.kaee.org
Kentucky Science Teachers Association:  www.ksta.org
National Science Teachers Association:  www.nsta.org
North American Association for Environmental Education:  www.naaee.org