## Flex Course Request

### Academic Organization and Curriculum Handbook

<table>
<thead>
<tr>
<th>College</th>
<th>EHE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Bulletin Listing</td>
<td>EDU T&amp;L</td>
</tr>
<tr>
<td>Course Prefix</td>
<td></td>
</tr>
<tr>
<td>Course Number</td>
<td>727</td>
</tr>
<tr>
<td>Generic course or decimal subdivision?</td>
<td>☑</td>
</tr>
<tr>
<td>Course Decimal</td>
<td>27</td>
</tr>
<tr>
<td>Full Course Title</td>
<td>Science Education</td>
</tr>
</tbody>
</table>
| Level | Undergraduate  
☑ Graduate |
| Credit Hours | 3 |
| Proposed Effective Year | 12 |
| Proposed Effective Term | Spring Quarter |
| Previous term(s) of offering and enrollment |  |

### Flexibly Scheduled/Off-Campus/Workshop Course Information

#### Course Description
Using the four C's of 21st century, this course will focus on promoting deep understanding of scientific concepts for success in a competitive global workforce.

#### Offering Pattern
☑ This year  
☐ Every other year

☐ GEC Course

#### General Course Information Statement

☐ Offered in Distance Learning Format?  
☐ Service Learning?

#### Date Range(s)
3/27-6/1/2012
Complete this section for off-campus courses

Off-campus ZIP code 43229

Explain differences in distribution of contact time with on-campus offerings

Instructor Lisa Huelskamp

Rank Adjunct

Explain differences in instructor rank/qualifications with on-campus offerings

Explain differences in teaching arrangements from on-campus offerings

Explain how student services will be provided to off-campus students (registration, office hours, academic advising, etc.)

General Information

Expected Section Size 20

State the need and purpose of the course. Indicate how the course relates to the primary goals of the academic unit/school/college/university
This course is contracted through the office of Outreach and Engagement in the College of Education for the Columbus City School Teachers.

Describe any changes in library, equipment, or teaching aids needed

Expected Enrollment for Proposed Offering Term

Please complete and attach the form(s) on the following page before completing the package.

Course Contact Information

Faculty Name: Lisa Huelskamp

Faculty Email: huelskamp.8@osu.edu

Contact Name: Sarah McNeill

Contact Dept: EDUTL

Contact Email: mcneill.27@osu.edu

Contact Phone: 2-2476

THE OHIO STATE UNIVERSITY  WWW.OSU.EDU
The Ohio State University
College of Education and Human Ecology
School of Teaching and Learning ED T&L 727
Spring 2012

Pedagogy and the 21st Century Science Learner

Time: Mondays, 5:00-8:00
Location: Northgate Center, 6655 Sharon Woods Blvd., Columbus, OH 43229
Credit Hours: 3
Instructor: Lisa M. Huelskamp, PhD / Geri Granger, MA+
E-mail: huelskamp.8@osu.edu
ggranger9556@columbus.k12.oh.us
Phone: Huelskamp: 614-371-5000 (cell) / Granger: 614-268-9493 (cell)

Dr. Huelskamp’s Office Hours: 4:00-5:00 PM at Northgate, Mondays by appointment in
person or by phone; Dr. Huelskamp’s Office Location: Morrill Hall, rm 236

Geri Granger’s Office Hours: 7:30-3:30 PM, Monday-Friday or by
appointment in person or by phone; Geri Granger’s Office Location: Northgate Center, rm E

COURSE OVERVIEW:

Bringing to life the four C’s of the 21st Century – Critical thinking, Communication,
Collaboration, and Creativity and Innovation – this course will focus on promoting deep
understanding of scientific concepts in preparation for success in a competitive global
workforce. Participants will explore various instructional strategies (i.e., inquiry-based
instruction, problem/project based learning, Socratic Seminar. Bloom’s higher-level thinking,
etc.) and learn how to incorporate the strategies into their classroom to support the academic
achievement of all students. Our emphases include promoting lab safety, inquiry-based
teaching strategies, use of a variety of instructional approaches for culturally and
developmentally diverse classrooms, and will prepare teachers to utilize approaches to
teaching and learning which integrate content relevant to student’s lives.

To do this, classes will be active and interactive in a focused, learning environment. Each
session will comprise a mixture of presentations, activities, discussions, group inquiry. To
assist you, the course schedule identifies topics, readings, and activities for each session. We
will also try, however, to be responsive to emerging concerns, interests, and issues.

The basis for the course stems from the Ohio Academic Content Standards for Science
(current and new drafts), the National Science Education Standards (NSES), and the
Standards for Ohio Educators (SOE) as listed below.

NSTA Standards for Science Teacher Preparation
These standards apply to programs, including those at The Ohio State University, that
prepare science teacher educators at the middle and secondary level (undergraduate
programs, post degree programs, Master’s programs, and alternative certification programs).
**NSTA Standard 1**

- Effective teachers of science understand and demonstrate the knowledge and practices of contemporary science. They interrelate and interpret important concepts, ideas, and applications in their fields of licensure. Below are the elements of the standard.

Teachers will:

1a) Demonstrate the major concepts, principles, theories, laws, and interrelationships of their fields of licensure and supporting fields as recommended by the National Science Teachers Association.

**NSTA Standard 2**

- Effective teachers of science understand how students learn and develop scientific knowledge. Preserves teachers use various methods including scientific inquiry to develop this knowledge. Below are the elements of the standard.

Teachers will:

2a) Plan multiple lessons using a variety of inquiry approaches that demonstrate preserves teachers' knowledge and understanding of how students learn science.

2b) Include active inquiry lessons where students collect and interpret data in order to develop and communicate concepts and understand scientific processes, relationships and natural patterns from empirical experiences.

2c) Develop Design formative and summative assessment strategies to achieve the appropriate learning goals.

2d) Design instruction and assessment strategies that confront and address naïve concepts/preconceptions.

**NSTA Standard 3**

Effective teachers of science develop an instructional unit plan that is consistent with the goals and recommendations of State and/or National Science Education Standards. Preservice teachers will plan a unit in a specific science discipline that includes the nature of science, inquiry, the social context of science, and safety. The unit includes the construction of fair, equitable, and effective assessment strategies that are designed to measure student learning. Below are the elements of the standard.

Teachers will design a Unit of Study that:

3a) Address the goals of State and/or National Science Education Standards which consists of multiple lesson plans.

3b) Includes the nature of science, the social context of science, and safety.

2c) Develop and design formative and summative assessment strategies to achieve the appropriate learning goals.
3c) Includes scientific investigation through the inclusion of laboratories and/or field experiences.

**NSTA Standard 4**

Effective teachers of all science licensures are able to create a learning environment and learning experiences for all students that demonstrate chemical safety, safety procedures, and the ethical treatment of living organisms. Effective teachers of science can, in a P-12 classroom setting, demonstrate and maintain chemical safety, safety procedures, and the ethical treatment of living organisms needed in the P-12 science classroom. Below are the elements of the standard.

Teachers will:

4a) Understand safe and proper techniques for the preparation, storage, dispensing, supervision and disposal of all materials used within their subject area science instruction.

4b) Understand emergency procedures, how to maintain safety equipment, and ensure the candidate has the knowledge of how to design safety procedures for the activities and abilities of students in the classroom, on the school grounds, and in the planning of field experiences.

4c) Understand the proper treatment of all living organisms used in the classroom or found in the field in a safe, humane, and ethical manner and comply with legal restrictions on their collection, keeping, and use.

4d) Practice in a P-12 classroom the safe and proper techniques for the preparation, storage, dispensing, supervision, and disposal of all materials used within their subject area science instruction as applicable to licensure area and P-12 school setting.

4e) Demonstrate in a P-12 classroom an ability to implement emergency procedures and maintenance of safety equipment, policies and procedures that complies with established state and/or national guidelines. Preservice teachers ensure safe science activities appropriate for the abilities of all students as applicable to licensure area and P-12 school setting.

4f) Establish and practice in a P-12 classroom ethical decision-making with respect to the treatment of all living organisms in and out of the classroom. They emphasize safe, humane, and ethical treatment of animals and comply with the legal restrictions on the collection, keeping, and use of living organisms as applicable to licensure area and P-12 school setting.

**NSTA Standard 5**

Effective teachers of science provide evidence to show that P-12 students’ understanding of major science concepts, principles, theories, and laws have changed as a result of instruction by the candidate and that student knowledge is at a level of understanding beyond memorization. Preservice teachers will collect, organize, analyze, and reflect on diagnostic, formative and summative evidence of learning. Below are the elements of the standard.

Preservice teachers will collect, organize, analyze, and reflect on pre-, formative and summative evidence to demonstrate that preservice teachers will:
5a) Engage P-12 students in developmentally appropriate inquiries that require them to develop concepts and relationships from their observations, data, and inferences.

5b) Teach content for understanding.

5c) Teach social context of science.

5d) Teach students to distinguish science from other ways of knowing, and critically analyze assertions made in the name of science.

REQUIRED TEXTBOOKS/MATERIALS/RESOURCES (Both can be ordered at www.nsta.org/store/):


NSTA Articles / Position Papers found at:
http://www.nsta.org/about/positions/21stcentury.aspx

New Science Standards (Draft) and Standards-Based Science Instruction and Classroom Inquiry
http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDetail.aspx?page=3&TopicRelationID=1705&ContentID=76585

SUPPORT TEXTBOOKS/MATERIALS/RESOURCES:


(Can be ordered at www.nsta.org/store/.)


(Can be ordered at Amazon.com.)


(Can be ordered at http://www.dinah.com/manipulatives.php)

COURSE EXPECTATIONS:

Grading Scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Range</th>
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<tbody>
<tr>
<td>A</td>
<td>93-100%</td>
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<tr>
<td>A-</td>
<td>90-92</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
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<tr>
<td>B</td>
<td>83-86</td>
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<tr>
<td>B-</td>
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<td>C+</td>
<td>77-79</td>
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<td>C</td>
<td>73-76</td>
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<td>C-</td>
<td>70-72</td>
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<tr>
<td>D+</td>
<td>67-69</td>
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<tr>
<td>D</td>
<td>60-66</td>
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<tr>
<td>E</td>
<td>59% or less</td>
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Academic Integrity: The Ohio State University’s Code of Student Conduct (Section 3335-23-04) defines academic misconduct as: “Any activity that tends to compromise the academic integrity of the University, or subvert the educational process.” Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Ignorance of the University’s Code of Student Conduct is never considered an “excuse” for academic misconduct.

If I suspect that a student has committed academic misconduct in this course, I am obligated by University Rules to report my suspicions to the Committee on Academic Misconduct. If COAM determines that you have violated the University’s Code of Student Conduct (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in this course and suspension or dismissal from the University. For additional information, see the Code of Student Conduct.

Plagiarism, cheating, and other forms of academic dishonesty are serious offenses. For more information, please review the Code of Student Conduct which is printed in both the student phone book, the student handbook, and online at http://www.osumarinon.osu.edu/files/Policies_and_Procedures.pdf and the Grand School Handbook at http://www.gradsch.ohio-state.edu/Depo/PDF/Handbook/Handbook.pdf for expectations and consequences.

Grievances and Solving Problems - According to University Policies, available from the Division of Student Affairs, if you have a problem with this class, “You should seek to resolve a grievance concerning a grade or academic practice by speaking first with the instructor or professor.” Then, if necessary, with the department chairperson, college dean, and provost, in that order. Specific procedures are outlined in Faculty Rule 3335-7-23, which is available from the Office of Student Life, 208 Ohio Union.” “Grievances against
graduate, research, and teaching assistants should be submitted first to the supervising instructor, then to the chairperson of the assistant’s department. “

Statement on Diversity — The College of Education and Human Ecology affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.

Format Requirements: All assignments should be typed, double spaced, in 11-12 point font (Times or Arial), with standard margins and numbered pages, unless the syllabus specifies that the assignment may be handwritten. Either on a cover page or in the header, include your name, course number, the date, and the name of the project or paper. Please use staples or binder clips rather than paper clips. Number each page if there is more than one page.

Attendance/late work: OSU’s academic program operates on the assumption that learning is advanced by regular attendance at class and laboratory. It is the responsibility of the student to arrange to make up, at the convenience of the instructor, class assignments or previously scheduled presentations, quizzes and/or exams missed due to absence. When you miss a class, you are missing out on all that material. Do not miss class unless it is absolutely necessary.

The rubric below will be used to assess preparation for, substantive contributions made during, professional conduct and dispositions demonstrated during, and attendance at each class session.

<table>
<thead>
<tr>
<th>Ratings</th>
<th>Expectations</th>
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<tbody>
<tr>
<td>0 – 1</td>
<td>PREPARATION: came prepared for class by having thoroughly completed all assigned tasks for the class session</td>
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<tr>
<td>0 – 1</td>
<td>SUBSTANTIVE CONTRIBUTIONS: made appropriate and thoughtful independent, critical, and creative substantive contributions to in-class learning experiences which extended the thinking of others and self; separate from Weekly Formal Discussion assessment</td>
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<tr>
<td>0 – 1</td>
<td>PROFESSIONAL CONDUCT and DISPOSITIONS: demonstrated a willingness to learn, actively engaged in learning experiences, and did not engage in side conversations, interrupt class events, and/or use cell phone/pager/email/text messaging during class session</td>
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<tr>
<td>0 – 1</td>
<td>ATTENDANCE: attended the entire class session, 5PM-8PM</td>
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A student absent from an entire class session will automatically receive a zero in each category with the exception of PROFESSIONAL CONDUCT/DISPOSITION AND PREPARATION. Credit may be given for PROFESSIONAL CONDUCT/DISPOSITION if a valid reason is given for missing class and PREPARATION as long as assigned work is submitted PRIOR to the beginning of class on the date it is due. All work is due before the end of the semester.
Assignments Overview:

Different assessments provide a variety of response opportunities and will be evaluated as follows:

**Task** = percentage of course grade

- a. Preparation, Contribution, Professionalism, Attendance = 10%
- b. Weekly Formal Discussions (read/participate) = 10%
- c. Summary of websites (read/report/reflect) = 10%
- d. NSTA Position Statements, 1 topic selected + 1 of your choice (read/respond) = 15%
- e. Professional Development Action Plan = 25%
- f. Science Inquiry Design Project (prepare/present) = 30%

Assignments Details:

a. **Preparation, Contribution, Professionalism, Attendance (10) = 10%** (in class)

b. **Weekly Small Group Formal Discussions (4) (read/participate) = 10%** (in class)

   Read the assigned reading each week for comprehension. Listen respectfully and participate actively in the discussions in your small group each week. Contributions should demonstrate higher orders of critical thinking, i.e. Blooms Taxonomy Levels.

   Each time a different person (or teams of two as needed) will serve as the discussion leader(s). See handout on discussion leader guidelines and the rubric for both the leader and the participants.

c. **Summary of Websites (2) (read/report/reflect) = 10%**

   For each of the two summaries, select a current website focusing on 21st Century Skills. Explore, summarize, and reflect on the content of the website and how it relates to your teaching. Summary must be typed. Be prepared to share and/or post in the classroom. See handouts regarding directions, cover page, and the rubric.

d. **NSTA Position Statements (1 assigned, 1 your choice; read/respond) = 15%**

   “NSTA provides national and international leadership in science education by identifying the qualities and standards for good science education; these are set forth in the form of position statements, which are used to support the improvement of science education at all levels…NSTA position statements are developed by teams of science educators, scientists, and other national experts in science education, with the input of the NSTA membership.” (NSTA, 2010)

   Students will be asked to read the two (approximately one page) position statements and respond to those statements in thoughtful and critical ways. One of the two must be either the Scientific Inquiry or Quality Science Education and 21st-Century Skills topics. The other topic to be selected by the student based on need and interest. Be prepared to share with classmates and/or instructor and submit your response. Summary must be typed. See handouts regarding directions and the rubric.
e. **Professional Development Action Plan = 25%**

Prepare and conduct a site-based conversation with the focus: “What are 21st Century Skills and how do we proceed from here?” Your colleagues should be the audience and the conversation should take place during a class level/team meeting, department meeting, or staff meeting. Requirements are: planning out the meeting, creating meeting activities/questions/format, creating an agenda, summarizing the results of the meeting which should include a description of the next steps you and/or your colleagues will take in order to prepare yourselves and your students for the future.

f. **Science Inquiry Design Project (prepare/present) = 30%**

A great way to understand science concepts and science education is by actually exploring and investigating science in real terms. Working in teams of two and using the 4 C’s: Creativity, Critical Thinking, Communication, and Collaboration, the team will dissect a “cookbook” lab of their choice and change it into an inquiry-based lab. The lab will then be taught in each of the team’s classrooms. The team will then be asked to share the experience, analyze and discuss each teacher’s student work, and reflect on possible changes for the lesson. The team’s procedures and effort will also be analyzed. When creating the inquiry lab, remember the scientific method which includes writing and conducting the experiment safely, display the findings including in text and graph form, and present the science inquiry design project to the class. Students will be asked to demonstrate the connection to the 4 C’s of 21st Century Skills.

“We must not forget that when radium was discovered no one knew that it would prove useful in hospitals. The work was one of pure science. And this is a proof that scientific work must not be considered from the point of view of the direct usefulness of it. It must be done for itself, for the beauty of science, and then there is always the chance that a scientific discovery may become like the radium a benefit for humanity.”

- **Marie Curie** (1867 - 1934), Lecture at Vassar College, May 14, 1921
<table>
<thead>
<tr>
<th>Session</th>
<th>Dates of Class Sessions</th>
<th>Instructional Events</th>
<th>Assignments for the following week</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>March 26</td>
<td>Ice Breaker</td>
<td>Read Chapters 1-4 in <em>The Teaching of Science: 21st Century Perspectives</em>.</td>
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<tr>
<td></td>
<td>“Tell me and I’ll forget; show me and I may remember; involve me and I’ll understand”</td>
<td>Class Journal</td>
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<td></td>
<td>- Chinese Proverb</td>
<td>What are 21st Century Skills?/“Kids and Adults Design New Tech Tools”</td>
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<td>3R’s x 4C’s = 21st Century Learning</td>
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<td>Sign up for discussion leaders by week/chapters</td>
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<tr>
<td>2</td>
<td>April 2</td>
<td>Communication: Websites</td>
<td>Summary of website, 1 of 2</td>
</tr>
<tr>
<td></td>
<td>“Too often we give our children answers to remember rather than problems to solve.”</td>
<td>Creativity and the Text: Discussion of Chap. 1-4</td>
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<tr>
<td></td>
<td>- Roger Lewin</td>
<td>Critical Thinking: Cookbook to Inquiry</td>
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<td>Collaborative Planning: Science Inquiry Design Project</td>
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<tr>
<td>3</td>
<td>April 9</td>
<td>Online Modules</td>
<td>Read Chapter 7 in <em>The Teaching of Science: 21st Century Perspectives</em>.</td>
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<tr>
<td></td>
<td>“When you make the finding yourself - even if you’re the last person on Earth to see the light - you’ll never forget it.”</td>
<td>Creativity and the Text: Discussion of Chap. 7</td>
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<td></td>
<td>Collaborative Planning: Science Inquiry Design Project</td>
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<tr>
<td>4</td>
<td>April 16</td>
<td>Critical Thinking and Communication: Comparing Approaches (cont.)</td>
<td>Summary of website, 2 of 2</td>
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<tr>
<td></td>
<td>“If teaching were the same as telling, we’d all be so smart we could hardly stand it.”</td>
<td>NSTA Position Discussion Groups</td>
<td></td>
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<tr>
<td></td>
<td>- Mark Twain</td>
<td>Collaborative Planning: Professional Development Action Plan</td>
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<td>5</td>
<td>April 23</td>
<td>“When we try to pick out anything by itself, we find it is tied to everything else in the universe.”</td>
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<td>- John Muir</td>
<td>NSTA Position Discussion Groups</td>
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<tr>
<td></td>
<td></td>
<td>Collaborative Planning: Professional Development Action Plan</td>
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<tr>
<td>Session</td>
<td>Dates of Class Sessions</td>
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| 6       | April 30                | Communication: What is Scientific Literacy?  
- Joseph Joubert  
Creativity: Functional Scientific Literacy with Marzano  
| 7       | May 7                   | Communication: Educational Technology vs. Technology Education  
Creativity and the Text: Discussion of Chap. 5  
Critical Thinking: “You Can’t be my Teacher!” and “A Vision of K-12 Students Today” | Summary of website, 2 of 2 |
| 8       | May 14                  | Technology in Real Life Science: Meet at the Columbus Zoo | NSTA Position Statements, 2 of 2: student choice |
| 9       | May 21                  | NSTA Position Discussion Groups  
Ohio Energy Project: Bringing the 4C’s to life | Final draft of Science Inquiry Design Project |
| 10      | June 4                  | Share Science Inquiry Design Projects  
Share Professional Development Presentations Projects | Final draft of Professional Development Presentation |
| 11      | Finals Week  
June 11  
“The art and science of asking questions is the source of all knowledge”  
-Thomas Berger | Final projects  
Course Wrap-up  
Evaluations | Have a great summer! |
Flex Course Request Form

College: __EDU__  Course Bulletin Listing: ___ EDUTL __________ (e.g. EDUTL – Education Teaching and Learning)

Course Number: 727  Generic course or decimal subdivision: Y  Course Decimal: .27

Level: Undergraduate ___ Graduate ___x__  Grade Option: Letter ___x__ S/U ___  Credit Hours: ___3___

Proposed Effective Year: ___2012___  Proposed Effective Term: ___SP___  Previous Terms of Offering: ___na___

Flexibly Scheduled / Off-Campus / Workshop Course Information

Course Description: 

25 word limit

Using the four C's of 21st Century, this course will focus on promoting deep understanding of scientific concepts for success in a competitive global workforce.

Course offered less than term length: N  Distribution of Class Time: ___3 hrs/10 weeks ___ (e.g. 3 hrs/10 weeks)

Offering Pattern: Distance Learning Format: N (means 100% online)  Section Size: ___20___  Date Range: ___SP 2012___

Off-Campus Offering: Y  Off-Campus ZIP code: ___43229___  Off-Campus Location: Northgate Center

Hours Out-of Class Preparation: ___60___  Total Class Meeting Hours: ___30___  Length of each Class: ___3hr___

Advertised Course Title: _ Pedagogy and the 21st Century Science Learner_

Faculty Name: _ Dr. Lisa M. Huelskamp_  Faculty Rank: ___adjunct_____________________________

Faculty Phone: 614-371-5000 (cell)  Faculty E-mail: _huelskamp.8@osu.edu_

Secondary Instructor: _ Geri Granger_  Desired Access: ________________

SI Phone: 614-268-9493 (cell)  SI E-mail: _ogranger9556@columbus.k12.oh.us_

Academic Advising Opportunity: ___ by appointment; before and after class ___

(community, after class, etc.)

Approved by the Graduate Studies Committee Chair: ___Date:___

Approved by the School Director: ___Date:___