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Kindergarteners Can Do It—So Can You: A Case Study of a Constructionist Technology-Rich First Year Seminar for Undergraduate College Students

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Constructionism is a theory of learning proposed by Seymour Papert of MIT. Co-instructors for a first year seminar for undergraduate students provided education students with a one-semester constructionist experience to learn by engaging with technology. Students used LEGO® construction bricks and pieces to solve problems by building, working on personally meaningful projects, and sharing their work with others. Participants had an opportunity to observe young children in local schools who are learning this way. One class meeting per week was scheduled in the school of education computer lab to learn and practice LEGO®/Logo computer programming language. During the other weekly class period, students developed a firm grounding in the learning theory of Seymour Papert and Jean Piaget through readings, discussion, and lecture. Another aspect of this class period included intense writing experiences. Student responses and essays revealed meta-cognitive growth from constructionist learning activities, problem solving, collaboration, and reflection.

Times have changed. At Drake University in Des Moines, Iowa the English Department is no longer solely responsible for teaching the undergraduate level English 101. In fact, every college or school on campus is required to offer at least one section of a new version of introductory English. This new version, renamed First Year Seminar (FYS), requires all first year students to take a three-hour semester long course. Limited to 20 students each, FYS courses are taught across all university disciplines and must include a substantive writing component. Content area development, however, is at the discretion of the instructor and must first meet expectations of an approval committee. FYS topics vary from the History of Rock and Roll to Mayan Civilization. Our course, entitled Constructionist Teaching and Learning, was team-taught. This course was an induction to first year education students, as well as other first year students interested in technology and young children, into the world of educational technology and programming that can be used with young children.

While outcome data or longitudinal follow-up has yet to determine whether or not this approach in students' first year of college will make them more technologically aware, adept, or better teachers of young children, it is hoped that it will do all three. To this end, a semi-structured computer lab experience once a week for 75 minutes was combined with a once-a-week 75 minute more traditional class in which theory, writing skills, and adjustment to college was discussed. In addition, two class meetings were scheduled as off-campus field trips so students could observe early childhood classrooms using the same software they are mastering. Guest speakers were invited to one class period to offer additional assistance in using constructionist technologies and validation of their role in teaching and learning.

WHY TEACH A CONSTRUCTIONIST COURSE?

According to Charles Dunlop and Rob Kling (1996) in *Computerization and Controversy,* introducing new technologies in American classrooms to rescue them "from the Dark Ages" has historically dismal results. Schools, including universities, remain fundamentally unchanged in their approach to teaching and learning. In fact, most of the first year students in this class, while they grew up in the Information Age using computers since early childhood, were taught in traditional school environments using the static medium of pencil and paper as the primary vehicle for class instruction and representing ideas. Consequently, this new course was developed to challenge future teachers of young children to approach learning in new ways. Results are far from dismal.

Why would college students want to take a class on constructionist teaching and learning? First, the course was grounded on the idea the people learn by actively constructing new knowledge, not by having information poured into their heads. Commonly, a majority of college students, including education students, experience a first year course through time spent in their seats in a university lecture hall taking notes and reading thick textbooks and related articles to take objective exams given two or three times per semester. They may or may not have writing requirements. This course deviated from a traditional “instructionism” (Papert, 1993, pp. 137-156) approach. Instead, it was a constructionist, hands-on course without objective exams. Students were required to construct their own understanding and to analyze their own learning based on prior knowledge and experience.

Second, constructionism asserts that human knowledge is stored in clusters and organized into schemata that people use to interpret familiar situations and to reason about new ones. Information isolated from these structures is either forgotten or inaccessible (Brooks & Brooks, 1999; Perkins, 1999). Therefore, effective learning took place as students engaged in constructing personally meaningful artifacts using computer technology. For example students worked together in activities such as creating computer animations, constructing battery-powered vehicles (using light, touch, or heat sensors), creating music, or pictures representing one’s own learning (Harel & Papert, 1991; MIT Epistemology & Learning Group, 2000). Again, most first year education students who are fulfilling general education requirements do not regularly interact with each other, much less collaborate with the peers in their courses. Primarily, the professor does most of the talking and little listening. Students may or may not even know the names of peers in their classes. Students discussed ideas in small groups, worked with technology in teams, and presented a final multimedia project as well as personal learning story demonstrating their growth throughout this semester.

Central to this approach was the belief that people learn most effectively when they are engaged in collaboration, design, construction, and problem-solving activities.

> The idea that we can have a fixed set of knowledge that teachers know and transmit [to children] is becoming radically and rapidly impossible. Half the people in the United States are doing jobs that did not exist when they were children, and that ratio is going to increase. We want people to know how to do what they were *not* taught (Papert, 1999).

Thus, the FYS provided an opportunity for students to interact and learn from their peers, as well as to learn what they, indeed, were not taught. It was hoped that students would engage in a constructionist experience to build knowledge, skills, and dispositions for future careers in various fields or disciplines. Also, this course was expected to help them be more effective in their work with young children.

WHAT IS "CONSTRUCTIONISM?"

Students were confused at the beginning of the course (and a few still at the end of the course) about the meaning of *constructionism*. According to Swiss psychologist, Jean Piaget (1952), children are not simply empty vessels into which adults pour knowledge. Piaget has shown that children actively construct knowledge out of their own experiences (Gruber & Voneche, 1977). This is commonly referred to as constructivism. Seymour Papert, Professor of Learning Research and Director of Epistemology and Learning Group of Massachusetts Institute of Technology (MIT), who worked extensively with Piaget, developed the Logo computer language in the 1970s. Logo, as an "intelligent tool," was believed to develop logical thinking and reasoning. From the program, the Lego® Company has marketed a little computer, sold under the name of MindStorms™ (1980), named after Papert's seminal book. He coined the term constructionism.

Based on more recent research at MIT, the Lego® Company has opened the door to programming for children, with the development of their RCX™ brick. The brick contains a computer chip and firmware that allows for a connection between a computer and the motors and sensors incorporated into a Lego® construction. The MindStorms™ set contain gears, motors, building bricks, light and touch sensors and a CD-ROM, with *Robotics Invention System*™ Software. Using Legos® as intelligent tools, children build machines out of the Lego® pieces. Then they connect their machines to a computer and write Logo programs, to control the machines. With *Microworlds*™ software, students use mathematics for creating pictures, animations, music, games, and simulations on the computer. "Given a good programming language, I see children struggling to make a program work in a way that they seldom sweat at their paper-and-pencil mathematics" (Papert, 1999). College students were observed struggling and eventually succeeding to make the technology work for them in ways that traditional courses with "instructional" approaches failed to do.

GENERAL DESCRIPTION OF THE FYS CONSTRUCTIONIST TEACHING AND LEARNING COURSE

For this FYS for undergraduate students, a one-semester course was designed by the co-instructors to engage students in learning through experiences with technology. Future teachers of young children used Lego® construction bricks and pieces to solve problems by building, working on personally meaningful projects, and sharing their work with others. Learning Goals included:

- To plan, organize, revise, edit, and critique writing at the college level.
- To understand, analyze, and critique a learning theory.
- To observe the application of a learning theory.
- To experience the application of a learning theory.
- To make and share meaningful products using computer technologies.

As an introductory exercise, students participated in a constructionist exercise called Create a Contraption whereby they collaborated in small groups to construct an invention, then, present it to the class. One goal was to use as many materials as possible to create an original product and second goal was to present an interesting use of that product. Each group analyzed their own product (Table 1).

Table 1

" Create a Contraption" Construction Scoring

	Use of materials available:	**Points Possible**	**Points Earned**
1.	1 spring clothespin	5	
2.	2 balloons	10	
3.	4 cotton balls	10	
4.	2 thumb tacks	10	
5.	1 rubber band	5	
6.	2 drinking straws	10	
7.	Aluminum foil	5	
8.	Plastic lid	10	
9.	Plastic bag	5	
10.	Cut-out magazine picture	10	
11.	Pencil	5	
12.	2 Q-tips	5	
13.	2 paper cups	10	
		100 total points	(your total)

After listening to each of the small groups of approximately five students describe the function and structure of their contraption, they evaluated one another using the Create a Contraption Presentation Scoring Guide (Table 2). Instead of traditional methods that most first year education students experience of attending a class, silently taking notes, and leaving the room with relevant remarks for the following period, these students were interacting and collaborating. They engaged in creative tasks, used humor in exchange, relied on one another for ideas and expertise, and evaluated the group work of their peers. These skills would be necessary in order to be successful in the remainder course.

Table 2

"Create a Contraption" Presentation Scoring Guide

	Criterion for scoring:	Points Possible	Points Earned
1.	**Originality:** Device is totally different from anyone else's. Unique, not obvious, new ideas!	20	
2.	**Flexibility:** Items used with imagination, not necessarily as they were intended when made by the manufacturer, but used differently.	20	
3.	**Craftsmanship:** Work is carefully constructed and displayed, not sloppy or careless.	20	
4.	**Group membership:** Students worked together, shared and valued ideas, were good listeners as an audience, were ready on time.	10	
5.	**Name and reasoning:** Group has written down the name and explained the function of the contraption; Clever and fitting explanations.	10	
6.	**Presentation:** Students are imaginative in the how, what, where, who of the presentation.	20	
		100 total points	(your total)
GRAND TOTAL: _______ points/200 possible			

Throughout the semester, one class meeting per week was scheduled in the School of Education computer lab to learn and practice LEGO®/Logo computer programming language. Students practiced designing meaningful products themselves using *Microworlds*™ software and Lego®/Logo technologies. Future teachers of young children engaged in "constructionist" learning, which states that children learn best by making meaningful products and sharing them with others. College students learned this way too.

Most students were not used to the lack of structure that they met in the computer lab. They eventually came to appreciate it, but at the beginning, they felt frustrated. They wanted to be assigned a task. So they were assigned a task: make something move using the constructionist tools at your disposal. In a 75-minute period, all students accomplished this task and felt successful. Their next task: work on a project. One student, Emily, later admitted to staring at the computer screen for what, to her, was a disturbingly long period of time. Then she had an idea. It was her own idea. She thought she could animate a jigsaw puzzle that would automatically assemble itself. She pursued this idea for the next two months. Others started projects, abandoned them, and began afresh with new ideas. But after two to three lab sessions, all students were productively engaged in projects that would sustain their energy, attention, and creativity for two months. Students who chose to focus their energy on *Microworlds* ™ worked either alone, in pairs, or in groups of three. Students who chose to focus on Lego® (interestingly, all the males in the class), worked individually on components of a larger group project. They built their own versions of bulldozers, front loaders, and a cement mixer, and named their final project after the on-campus construction project that was prominently visible all semester near the university student center.

During the other weekly class period, students developed a firm grounding in Papert's theory, as well as its historical predecessors, including the constructivist theory of Piaget through readings, discussion, and lecture. In addition to computer lab participation and class discussion, students reacted to a number of reading assignments. Required readings included Papert's influential book, *MindStorms: Children, Computers, and Powerful Ideas* (1980) and his sequel *The Children's Machine: Rethinking School in the Age of the Computer* (Papert, 1993). Eleanor Duckworth's book, *The Having of Wonderful Ideas: And Other Essays on Teaching and Learning* (1996) provided vivid field-based examples of learning from the "Virtues of Not Knowing" to "Teaching as Research." Students read *Einstein's Dreams* (1994) by well-known author and physicist, Alan Lightman. Later in the semester, when Dr. Lightman spoke on campus, he provided provocative, beguiling insights from his book. Finally, this class period included intense writing experiences using *Transition to College Writing* (Hjortshoj, 2001) as a guidebook. FYS students were required to ask questions of themselves from the readings, to reflect upon and analyze this theory and practice, and to complete personal essays on their Technology Autobiography as well as a summative Personal Learning Story resulting from this course.

DESCRIPTION OF WRITING ASSIGNMENTS

The following is an excerpt from Appendix A, the course syllabus, explaining students' writing assignments in this class.

1. Technological Autobiography: What has your experience been with technology up until now? (You may include technologies such as desktop or laptop computers, computer software, the Internet, e-mail, medical equipment, TVs, VCRs, automobiles, microwaves, calculators,

voice mail, ATM machines, etc.) What impact has technology had on your life? How is this different from the presumably less-technology-laden lives of your parents and/or grandparents? How might your life have been different without these technologies? How might your life have been different with alternate (not available to you, or perhaps not yet invented) technologies? Approximately 5 pages, 10% of your final grade.

2. Feedback on two peers' autobiographies: Did your peer address the assignment? List the strengths of the paper. How could the paper be improved? Approximately 1 page each, 5% of your final grade.
3. Written response to 2 chapters of *MindStorms:* List what you think are the 10 most important points of the two chapters you read (five points per chapter): Summarize each point, and pose at least one reflective question for class discussion concerning each point. Approximately two pages, 5% of your final grade.
4. Theory/summary paper: According to Piaget, how do children learn? How should teachers teach? How is language ability related to thought? Approximately four pages, 10% of your final grade.
5. Analytical feedback on two peers' theory/summary paper: Did your peer address the assignment? List the strengths of the paper. How could the paper be improved? Approximately 1 page each, 5% of your final grade.
6. Written response to two chapters of *Children's Machine:* List what you think are the 10 most important points of the two chapters you read (five points per chapter): Summarize each point, and pose at least one reflective question for class discussion concerning each point. Approximately two pages, 5% of your final grade.
7. Personal Learning Story: What have you learned in this class? How have you learned in this class? Tell your story, then, analyze your own learning. Are you a constructivist learner? Are you a constructionist learner? What would your ultimate learning situation be and why? Can we teach that way at the college level and why or why not? Can we teach that way at the elementary and/or secondary level and why or why not? Approximately five pages, 10% of your final grade.

In addition to the focus on computer technology as topics for assigned writing, field observation, and hands on construction each student logged in to the class website on Blackboard.com. In this web-supported site, they could check grades, submit files, communicate in a discussion forum, and view digital images of their Contraptions. Their final exam, true to the authors' philosophy, was a *Microworlds*™ or Lego®/Logo project to be presented in class. A rubric, the Constructionist Teaching and Learning Final Project Assessment Tool, was made available to the class in advance and could be revised if they had suggestions for change (Appendix B).

STUDENT RESPONSE TO CONSTRUCTIONIST TEACHING AND LEARNING

Education students observed young children in several technology rich early childhood constructionist classrooms learning new and meaningful ways to build and construct things using technological tools. They too, increased their levels of competence. The class mantra seemed to be, "Kindergarteners can do it—so can you!!"

By mid-semester point, students were diligently working on projects in *Microworlds*™ or programmable Legos®, conversant with the theories of Jean Piaget and Seymour Papert, and reflected verbally and in writing on the impact of technology in their own lives. Students report that "my roommate couldn't believe that we played with Legos for an entire class period!" yet they actively engaged in learning about gears, motion, and computer programming in this playful activity in the same way that children in the classrooms visited were learning through play.

During their sophomore years, those who intend to become teachers will take traditional course offerings of Foundations of Education, Human Development, and Exceptional Children. In a way, they were unprepared for the information and experiences offered to them during their first semester in college because they have not yet had these preparatory classes. In fact, one student came to this class pronouncing Piaget "PEE-A-GET" (true story!). Within weeks, they were expected not only to be able to pronounce his name correctly, but to be able to program in Logo, as well as to read, understand, and critique essays on Piagetian classrooms. As part of their final exam, they needed to analyze their own learnings in class in light of their new found understandings through a five-page personal learning story.

The students enrolled in this first-year seminar who will eventually became elementary education students with endorsements in early childhood education will be introduced to a standard theory and application sequence in early childhood education during their junior year. They will learn about the importance of play in early childhood education, developmentally appropriate practice, learning theories other than Piaget, and a multitude of skills essential to early childhood educators. It is expected that the students who took the first year seminar will be much better prepared for these courses than will the students who opted to take History of Rock and Roll or Mayan Civilization as their first year seminar.

FINAL STUDENT REFLECTIONS

Students revealed in their personal learning stories, insights about the theory and the experiences of learning. Brigid stated, “I am not sure that anybody in this class knew what to expect on the first day. I wondered if we would play with Legos® all day. This was not too far from the truth!” Philip said, “This class has allowed me to think about how we learn.” Kane considered the influence of technology in his life.

> As a pharmacy major, not an education major…I chose “Constructionist Teaching and Learning” because the description included activities with children and the opportunity to play with Legos®. It was within the first week that I realized there would be much more to this course than playing with kids and Legos®. I realized how much influence technology has had in my life and how my life would have differed if not for numerous forms of available technology.

Jon and Wade reflected on their own learning processes.

> What I have learned is not as important as how I have learned. I have learned hard facts such as Piaget’s ideology, his perfect learning environments, and Piagetian believers’ additions and disagreements with his ideas. What is more important, though, is that I have gained insight on the learning process of problem solving and manipulation (Jon).

> This course has helped me realize I am a kinesthetic learner. I improved my writing techniques, my understanding of how knowledge is gained, different styles of teaching that maximize understanding and how to interact with children in a way that engages their minds and expands their life experiences (Wade).

Michelle discovered differences in instructionist and constructionist learning.

> In this class, I have learned in many ways. In Monday classes…we experienced instructionist learning when we would take notes over information Dr. B presented to us. In our Wednesday computer lab days…our learning was constructionist. All that Dr. G would do was show us the basics of *Micro Worlds*® and Logo and the rest we learned on our own. She helped us with questions, but after awhile we no longer went to her with questions. We went to our peers who had

> been working on similar projects. This is so evident in constructionist teaching.

Morgan summarized that she and her classmates gained much knowledge on their own. “We were taught to ask questions of ourselves and explore things on or own instead of the teacher telling us what to do.” She gave, as an example, the Create a Contraption introductory activity. “This project really made me think outside of the box.”

Megan valued “tinkering” and trial and error in a constructionist classroom.

> When in the computer lab there was not much instruction on what to do. We could choose the topic. I think tinkering is a good way to learn how to do something…because we are more likely to remember it by doing it ourselves, instead of it being shown to us. It made me go through the process of trial and error.

Tanner learned that constructionist learning requires problem solving and persistence. He learned to identify with a child’s way of knowing.

> While building my bobcat for the Helmick Commons project, I had to overcome many problems. It took many tries to get the motor and gears to work properly. After different attempts to solve the problem, I came across a solution. Once I had the mechanics of the Lego® bobcat finished, I had to program the Logo code on the computer. The Logo code was downloaded into the Yellow brick. After the Logo code was successfully compiled and downloaded into the yellow brick, I connected it to the bobcat. After running the Logo program on the Yellow brick, the Lego® bobcat ran the commands and the Logo programming code. I felt like I had experienced the same process that a child would have gone through in a constructionist environment.

Robyn valued collaborative work in the constructionist class. “Working on *MicroWorlds* ™ myself, I learned what a tedious and difficult process it is to get everything to work right and to get all the commands to go at the same time. Without the help of Megan, I don’t think I would know half of what I know right now.” She noted gender differences, as well. “The boys are making some kind of thing with the Legos® and yellow brick, but most of the girls are making books or games.”

Because a constructionist class involves problem solving and collaboration, students had opportunities to chat about campus life, sharing conversations about their adjustment to college and challenges they face. Drew says, "This class has done much more than expose me to *MicroWorlds Pro*™ or different theories of teaching and learning, it has taught me how to make friends and adjust to college life." Would this growth have occurred in a traditional college classroom? For Molly, the FYS course may prove to be life changing. "This experience has made me think twice about my major [computer science]. I have enjoyed working with youth, but never considered teaching for myself until the past few months."

Student responses and essays revealed meta-cognitive growth from constructionist learning activities, problem solving, collaboration, and reflection. Arguably, computers, like any learning material, are "neither a panacea nor pernicious" (Clements, 1987). Nevertheless, in the Constructionist Teaching and Learning course, university students will leave their first semester in college well versed in learning theory, familiar with computer programming and project design, and skillful in collaborative communication with their peers. They called upon each other to help with problems and to persist in problem resolution. Goals for increasing literacy and for using technology in learning were articulated in a variety of ways. University professors were not the dispensers of knowledge, rather they acted as facilitators inviting students to use technologies in innovative ways. While the authors were not trying to rescue American classrooms "from the Dark Ages," they were trying to shed light on the value of a technology rich constructionist learning experience in helping new students make a successful transition to university life. Hopes for student growth include learning from one's mistakes and inviting intellectual inquiry. In summary, Regina says it all. "I noticed that they [older students] learn through trial and error and asking questions, just like the kindergarteners."

References

Brooks, J.G., & Brooks M.G. (1999). *The case for constructivist classrooms*. Alexandria, VA: Association for Supervision and Curriculum Development (ASCD).

Clements, D.H. (November, 1987). Computers and young children: A review of research. *Young Children*, *43*(1) 34-44.

Duckworth, E.R. (1996). *The having of wonderful ideas: And other essays on teaching and learning*. New York: Teachers College Press.

Dunlop, C., & Kling, R. (Eds.) (1996). *Computerization and controversy: Value conflicts and social choices*. Boston: Academic Press.

Gruber, H., & Voneche, J. (Eds.) (1977). *The essential Piaget*. New York: Basic Books.

Harel, I., & Papert, S. (1991). *Constructionism*. Norwood, NJ: Ablex

Hjortshoj, K. (2001). *Transition to college writing*. Boston: Bedford/St. Martins.

Lego® MindStorms™. (1980). LEGO Systems, Inc., Enfield, CT [Online]. Available: http://legomindstorms.com

MicroWorlds 2.03® (1997). Logo Computer Systems Inc., Highgate Springs, VT [Online]. Available: http://www.lcsi.ca.

MicroWorlds Pro® (2000). Logo Computer Systems Inc., Highgate Springs, VT[Online]. Available: http://www.lcsi.ca

Lightman, A.P (1994). *Einstein's dreams*. New York: Warner Books. MIT Epistemology and Learning Group. (2000). [Online]. Available: http://el.www.media.mit.edu/groups/el/elprojects.html

Papert, S. (1980). *MindStorms: Children, computers, and powerful ideas*. New York: Basic Books.

Papert, S. (1993). *The children's machine: Rethinking school in the age of the computer*. New York: Basic Books.

Papert, S. (1999, April). *Vision-making, new technologies, and powerful ideas in education*. A talk at Heartland Area 11 Educational Agency/ Drake University, Des Moines, IA, April 30, 1999.

Perkins, D.N. (1999, November). The many faces of constructivism, *Educational Leadership, 57*(3), 6-11.

Piaget, J. (1952). *The origin of intelligence in children*. (M. Cook, Trans.). New York: International University Press.

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APPENDIX A

First Year Seminar Course Calendar
Constructionist Teaching and Learning
First Year Seminar Fall 2001

Week #1

Monday, August 27—Meet in SOE Room #213 w/Dr. Beisser
Peer introductions to each other and to the course. Introduction to the theory of constructionism. Exercise: "Create a Contraption." Introduce Technological Biography Assignment. Video of IECPP project featuring Seymour Papert.

Wednesday, August 29—Meet in SOE computer lab (downstairs) w/Dr. Gillespie
Bring 4 copies of first draft of technological autobiography (1 for Dr. G, 1 for Dr. B, 2 for peers). We will share these in class. Overview of course syllabus and SOE computer lab policies. Demonstration of *MicroWorlds Pro*®.

Week #2

Monday, September 3
LABOR DAY HOLIDAY—NO CLASS

Wednesday, September 5—Meet in SOE computer lab w/Dr. Gillespie
Bring 3 copies of written feedback on your 2 peers' technological autobiography (1 copy of each for Dr. G., 1 copy of each for Dr. B., 1 copy for the peers). Introduction to *MicroWorlds Pro*®.

Week #3

Monday, September 10—Meet in SOE Room #213 w/Dr. Beisser
Bring to class:*Transition to College Writing* and Read introduction and Ch. 1 (Orientation). Dr. Beisser will discuss various forms of college reading and writing.

Wednesday, September 12—Meet in SOE computer lab w/Dr. Gillespie
Bring 4 copies of your revised technological autobiography (1 for Dr. G., 1 for Dr. B., 2 for the peers who gave you feedback). We will spend class time discussing your writing process and experience with peer feedback. The balance of class time will be devoted to working on *MicroWorlds*®.

Week #4

Monday, September 17 - SOE Room #213
Read *Mindstorms*, Ch. 7 (LOGO Roots) and one other chapter of your choice. Bring a written response to class. List what you think are the 10 most important points of the two chapters you read (5 points per chapter). Summarize each point, and pose at least one reflective question for class discussion for each point. Approximately 2 pages.

Wednesday, September 19—Meet in SOE computer lab w/Dr. Gillespie.
Introduction to Lego/LOGO technologies. Time in class to practice.

Week #5

Monday, September 24—Meet on campus for lecture for FYS students
12:30 ALAN LIGHTMAN Lecture—Author and Physicist from M.I.T.
Attend this scheduled FYS session in Sheslow Auditorium on campus

Wednesday, September 26—Meet in SOE computer lab w/Dr. Gillespie
Read Ch. 1 and 2, Duckworth text. Write a paper summarizing Piaget's ideas. (See Ch. 4 in *Transitions to College Writing* for guidance). According to Piaget, how do children learn? How should teachers teach? How is language ability related to thought. Approximately 4 pages. As before, bring 4 copies to class.

Week #6

Monday, October 1—Meet in SOE Room #213 w/Dr. Beisser
SITE VISIT TO EDMUND'S ACADEMY for the FINE ARTS

Wednesday, October 3—Meet in SOE computer lab w/Dr. Gillespie
Discussion of classroom observations at Edmund's Academy for the Fine Arts
GUEST SPEAKERS (Lora Wunsch & Steve Linduska)
AEA 11)

Week #7

Monday, October 8—Meet in SOE Room #213 w/Dr. Beisser
Bring to class:*Transition to College Writing* and Read Ch. 4 (College Teachers Expect) and Ch. 5 (Reading). Dr. Beisser will continue discussing college reading and writing. Introduction to reflective writing exercises concerning site visit classroom observation and guest speakers.

Wednesday, October 10—Meet in SOE computer lab w/Dr. Gillespie
Reflective writing and discussion of what you learned from the classroom observations and guest speakers. Bring 3 copies of written feedback on your 2 peers' theory/summary paper.

Week #8

Monday, October 15
FALL BREAK—NO CLASS—Students may wish to attend Iowa Technology Education Connection conference at the Polk County Convention Complex (Monday and Tuesday) Student registration fee is approximately $25.00.

Wednesday, October 17—Meet in SOE computer lab w/Dr. Gillespie
As before, bring 4 copies of your revised theory/practice paper (1 for Dr. G., 1 for Dr. B., 2 for the peers who gave you feedback). Work on your own *MicroWorlds*® and Lego™/Logo projects. (Presentation of your final project is due during final week).

Week #9

Monday, October 22
CLASS VISIT TO NORWALK ELEMENTARY SCHOOL

Wednesday, October 24—Meet in SOE computer lab w/Dr. Gillespie
Discussion of classroom observations. Work on *MicroWorlds*® and Lego™/ Logo projects.

Week #10

Monday, October 29—Meet in SOE Room #213 w/Dr. Beisser
Read *Children's Machine*, Ch. 7 (Instructionism vs. Constructionism) plus one other chapter of your choice. As before, bring a written response to class. List what you think are the 10 most important points of the two chapters you read (5 points per chapter): Summarize each point, and pose at least one reflective question for class discussion for each point. Approximately 2 pages.

Wednesday, October 31—Meet in SOE computer lab w/Dr. Gillespie
Work on *MicroWorlds*® and Lego™ Logo projects.

Week #11

Monday, November 5—Meet in SOE Room #213 w/Dr. Beisser
Read and discuss Duckworth, Ch. 3 (Applying Piaget). Think about: What is the "it" that children learn? Read and discuss *Transitions to College Writing,* Ch. 6. Think about academic dishonesty and APA style.

Wednesday, November 7—Meet in SOE computer lab w/Dr. Gillespie
Work on *MicroWorlds*® and Lego™ Logo projects.

Week #12

Monday, November 12—Meet in SOE Room #213 w/Dr. Beisser
Read and discuss Duckworth, Ch. 4 (Children's Eye View). Complete freewriting in class. Top 10 concerns of first year students.

Wednesday, November 14—Meet in SOE computer lab w/Dr. Gillespie
Work on *MicroWorlds* ™ and Lego®/ Logo projects.

Week #13

Monday, November 19—Meet in SOE Room #213 w/Dr. Beisser
Read and discuss Duckworth, Ch. 5 (The Virtues of Not Knowing).

Wednesday, November 21—Thanksgiving Holiday Break…no class

Week #14

Monday, November 26—Meet in SOE Room #213 with Dr. Beisser
Meet in Cowles Library Electronic Classroom-Dr. Karl Schaefer, Information Literacy Session held in the Cowles Library.

Wednesday, November 28, 2001—**Meet in SOE computer lab w/Dr. Gillespie**
Bring 4 copies of the first draft of your personal learning story. What have you

learned in this class? How have you learned in this class? Tell your story, then analyze your own learning. Are you a constructivist learner? Are you a constructionist learner? What would your ultimate learning situation be and why? Can we teach that way at the college level and why or why not? Can we teach that way at the elementary and/or secondary level and why or why not? Approximately 5 pages.

Work on *MicroWorlds* TM and Lego®/ Logo projects.

Week #15

Monday, December 3—Meet in SOE Room #213 w/Dr. Beisser
Read and discuss *Transitions to College Writing,* Ch. 7 (Rules & Errors) & Ch. 8 (Looking Ahead)

Wednesday, December 5—Meet in SOE computer lab w/Dr. Gillespie
Bring 3 copies of your written feedback on your 2 peers' learning story. Work on *MicroWorlds* TM and Lego®/ Logo projects.

Week #16

Monday, December 10—Meet in SOE Room #213 w/Dr. Beisser
Read and discuss Duckworth, Ch. 10 (Teaching as Research)

Wednesday, December 12—last class—Meet in SOE computer lab w/Dr. Gillespie
Bring 4 copies of the final draft of your learning story.
Work on *MicroWorlds* TM and Lego®/ Logo projects.

FINAL EXAM WEEK in December

Presentation of your *MicroWorlds* TM and Lego®/ Logo projects

Appendix B Drake University FYS (Constructionist Teaching & Learning) Final Project Assessment Tool

Drake Student Name: **"Project Name":** **Tech Medium? MW or Lego/Logo construction**

Grading Criteria:	Legend in Your Own Time 8	Excellent 7	-/+ 6	Good 5	-/+ 4	Getting There 3	-/+ 2	Not There Yet 1	Total Pts
DESIGN		Well organized. Great ideas. Clear. No errors.		Essential components included. Few errors.		Haphazard construction. Many errors.		Disorganized and unclear. What is that, anyway?	
PROGRAMMING		Flawless, elegant. Multi-faceted. Complex. Required a great deal of time.		Sound. Mostly works.		Shows some programming, but needs more. Doesn't work.		Little, if any, programming evident. Nothing moves.	
CHALLENGES OVERCOME		Many challenges sought and overcome. Can articulate where challenges were and how they were overcome.		Some challenges sought. Some or all overcome.		Some challenges sought, few overcome.		Few challenges sought. Most challenges avoided.	
LEARNING		Evidence of progressive learning throughout semester. Crystal clear articulation of many learnings throughout stages of project.		Demonstrates relatively clear articulation of many learnings by end of project.		Shows some learnings. Articulated in comprehensible manner.		Noticeably few learnings. Unclear articulation of learnings.	
EFFORT and ENGAGEMENT		Student spent time outside class working on project. Couldn't wait to get started in class. Spent class time working on project.		Student worked on project during class. Engagement or independent focus and industry was evident.		Student spent some time in class working on project. Consulted with others for specific assistance or instruction on project.		Student was regularly off task during class. Lack of focused attention. Reluctant to get involved.	
COLLABORATION		Student sought input or feedback from instructor, peers, and other sources (such as Help menu). Student offered expertise or feedback to peers.		Student sought input or feedback from instructor and peers. Student provided assistance to others.		Student sought input or feedback from only one source regularly. Did not engage in assisting others.		Student worked entirely independently.	
CREATIVITY		Highly imaginative. Original ideas. Unique approach to subject. Novel, complex project.		Imaginative. Clever blend of text, visual, and sound elements.		Shows some thought and originality. Needs development.		Mundane. Ordinary. Not well thought out. "Copycat" approach.	

TOTAL POINTS: