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EXPERIENTIAL LEARNING CURRICULAR DEVELOPMENT MODEL FOR STIMULATING STUDENT INTEREST IN GREEN COLLAR CAREERS

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Abstract

Green jobs are in high demand, yet there is lack of a trained workforce for the green industries. Early exposure to green careers can stimulate future employment interest among students. The purpose of this study was to evaluate the effectiveness of an experiential learning unit of instruction designed to expose students to and develop knowledge about the green collar workforce. The study used a mixed method research design. A purposive sample of 101 (n=101) secondary students in career development type classes were given a pre-test, treatment, and post-test that involved both quantitative and qualitative responses. The findings revealed that the developed curriculum did increase student awareness of, and knowledge about the green collar workforce. Educators interested in career guidance and work force preparation may adopt the curriculum examined, or choose to develop their own based off the same experiential learning theory principles used in the development of the green collar workforce curriculum.

Key Words: Green Careers, Green Collar Workforce, Curriculum Development, Curriculum Assessment, Experiential Learning

Experiential Learning Curricular Development Model for Stimulating Student Interest in Green Collar Careers

Energy and environmental sustainability in the United States is an increasingly important national priority, stimulated by high oil prices, air pollutants, non-disposable goods, and harmful chemicals. These "stimulates" have many negative consequences, including detrimental effects on human health, financial challenges, and environmental costs (Stone, 2010). Driven by consumers, businesses, and government interests; the sustainable or "green" movement has increased demand for "green" products, services, and practices (Gittel, Magnusson, & Shump, 2009). For example, the manufacturing of hybrid automobiles, development and installation of wind turbine technology, organic farming, or recycled textiles for fashion and furnishings have flourished as niche industries from the green movement. According to the National Governor's Association Center for Best Practices, as a result of this demand, every state is experiencing growth in the green industry sector (Melville, 2009); thus impacting workforce education and development needs.

Impact of the Green Movement on the Workforce

Green employment occupations encompass what is termed as, the *green collar workforce*. Green jobs are defined as occupational positions that improve the quality of the environment and provide a family living wage (White & Walsh, 2008). Building retrofitting, mass transit, energy-efficient automobiles, wind power, solar power, and cellulosic biomass fuels have been the leading employment markets in the green economy (Pollin, Wicks-Lim, & Luce, 2008). These markets have created two types of workforce needs, the first being the development of new careers for the green industries, such as solar power operators; and the second being the 'greening' of existing jobs (White & Walsh, 2008). For example, an architect may green his/her

skills by developing competency for designing a house using energy efficient materials and construction principles.

Green jobs encompass a range of skills, educational backgrounds, and occupational profiles. Stone (2010) reported that the bulk of green jobs will require more than a high school education, but less than a bachelor's degree. Specifically, many of the new green jobs projected will require professional certification, apprenticeship, or an associate's degree.

Successive presidential administrations and many states have initiated investment and workforce-development initiatives to promote the growth of sustainable industries. The *Green Jobs Act of 2007*, part of comprehensive energy legislation, signed into law by President George W. Bush; allocated millions of federal dollars to establish job training programs, curricula, and job standards at the federal and state levels. Co-author of the legislation, Massachusetts congressman John Tierney indicated "Thirty-five thousand people per year can benefit from cutting edge, vocational education fields that will provide for secure employment for job seekers in this country" (Collaborative Economics, 2008, p. 2). President Barack Obama furthered committed federal dollars for expansion of "green" technologies. The actions of the federal government [through policy and support], demonstrates the belief in the economic vitality and importance of the green industry.

Greenhouse (2008) reported that in 2006, more than eight million Americans worked in the "green collar" workforce sector. Further estimates indicated that by the year 2030, a quarter of all Americans will be employed directly or indirectly in this sector (Bezdek, 2007; Miller, 2007); signifying that "green" jobs are in high demand (White & Walsh, 2008). In fact, the "green" sector has been recognized as a high growth employment area, especially in

economically struggling zones (Collaborative Economics, 2008; Gittel, Magnusson, & Shump, 2009).

Given the increased interest in "green" jobs and the real potential for their development, job growth is hindered because of a lack of trained workers to meet employment demands (Bezdek, 2007; Miller, 2007; White & Walsh, 2008). This suggests that human capital is a barrier to further expansion and continued growth in the sustainability effort (Hyslop, 2009). To ensure a pipeline of qualified individuals, education and training are essential to continued progress (Reich, 1994).

Historically, career and technical education (CTE) has been an essential component in preparing and training the nation's workforce, being particularly responsive to industry needs. CTE programs at the secondary level can be used to meet the needs of the "green" workforce by assisting students in considering a "green" career pathway. Early exposure to green-related careers, their pathways, and educational requirements is an initial step to effectively and efficiently produce skilled workers for the green industry.

Conceptual Framework

Early exposure to career interest activities is important to attract students into particular professions (Magnusson & Starr, 2000) such as careers in sustainability. Teachers play a key function in shaping the learning environment (Zayas & McGuigan, 2006). This includes selecting content topics and learning activities for the course curricula. Involvement in activities that produce efficacious results and positive outcomes usually contributes to interest development (Lent, Brown, & Hackett, 1996). With interest development, behavior motivation occurs to acquire specific knowledge that in turn may clarify academic and future goals.

The experiential learning theory is the theoretical framework that guided this study. The theory defined learning as the process whereby knowledge is created through the transformation of experience. The theory presents a cyclical model of learning, consisting of four stages – concrete experience (do), reflective observation (observe), abstract conceptualization (think), and active experimentation (plan) (Kolb, Boyatzis, & Mainemelis, 1999).

According to the four-stage learning cycle, concrete experiences are the basis for observations and reflections. These reflections are assimilated and distilled into abstract concepts from which new implications for action can be drawn. These implications can be actively tested and serve as guides in creating new experiences (Kolb, Boyatzis, & Mainemelis, 1999).

Timpson, Dunbar, Kimmel, Bruyere, Newman, and Mizia (2006) encouraged the use of experiential learning strategies for teaching about the concepts of sustainability. For example, students who are actively engaged in a learning cycle in which their classroom work in sustainability activities can form the basis for reflection. Then under the guidance of the teacher, reflective work is used to form abstract concepts, which then are cycled back into further concrete experiences. To this end, directly involving students in the learning process with the underlying motive of creating awareness of careers associated with sustainability can assist the student(s) to clarify if this is a viable career path.

The experiential learning theory has "roots" in curriculum development. Laschinger (1990) found that the theory's cycle of learning, which requires the use of a variety of learning modalities, appears to be a valid and useful model for instructional design in the human service profession, which includes career and technical education. In fact, K-12 education research has been primarily focused on the use of experiential learning theory as a framework for curriculum design (Hainer, 1992; McCarthy, 1996).

The experiential learning theory in curriculum development is useful because it focuses on the breadth of interactions between participants and the social environments that could influence their career choice and because it emphasizes process over outcome. The process for purpose of this research is in relation to exposure of careers in sustainability.

Purpose

Reisch (1994) stated that there is a relationship between economic development and workforce education. As the green economy is prospering, so is the need for a trained workforce. White and Walsh (2008) suggested that an increased investment in career-related experiences for students during the high school years could improve their post-secondary intentions in relationship to education and/or labor market prospects.

Baker (2008) and Eisen (2007) noted that schools needed to revamp their curriculum to train and educate a green collar workforce. In fact, both Konopnicki (2009) and Stone (2010) challenged CTE programs to develop new academic approaches to sustainability curriculum paradigms at the high school level.

Hyslop (2009) observed that several high schools were offering integration of green concepts in the individual CTE areas. For example, in technology education a student could learn about specific green trade skills such as designing a room that is energy efficient. However, a review of literature found no studies exposing secondary students to careers within the green industries. Therefore, the purpose of this study was to evaluate the effectiveness of an experiential learning unit of instruction designed to expose students to and develop knowledge about the green collar workforce.

Research Questions

The following research questions guided this study:

1. What effect does the developed curriculum have on student knowledge of the "green collar" workforce?
2. What effect does the developed curriculum have on student knowledge of technical and employability skills in demand by the "green" collar industry?
3. What effect does the developed curriculum have on student knowledge of career opportunities in the "green" industry?
4. What effect does the developed curriculum have on student career interest within the "green collar" workforce?

Methodology

Research Design

The study used a mixed method, pre-test post-test, single- group design. The participants in the study received a pre-test, treatment, and a post-test. An identical instrument was used for the pre-test and post-test and the curriculum implementation was the treatment.

Limitation

The research design was a single-group design, and thus did not include a control group. The researchers chose not to use a control group because the data were gathered at multiple high school locations. Given the investigatory nature of the study, a single control group would have not been a comparable measure across the selected schools (e.g., each school's typical career development curricula are different).

Treatment

During the 2008-2009 school year, a unit of instruction was developed by teachers and career development experts to enhance existing curriculum by exposing students to "green" careers. Those selected to develop the unit of instruction were chosen based on their expertise in

career development, science, technology education, and workforce education. The objective was to provide an integrated approach to exposing students to careers in the "green" industry.

The curriculum material was designed for teachers who taught career development courses at the secondary level. Career development courses include resource management, consumer education, cooperative education, and cooperative work training. The unit of instruction was scheduled to be completed in 10 class sessions and included five lessons, with specific objectives, content, and activities. The experiential learning principles guided the development of each lesson. Each lesson involved students in an activity (e.g., problem solving, investigating, researching, and brainstorming) pursuant of their own interest. Throughout the duration of the lessons, teachers encouraged students to reflect upon future career opportunities. Below is a description of each lesson and activity.

Lesson 1: Introduction to sustainability. The first lesson completed during this study was a problem solving activity that introduced students to sustainability. In teams, students determined an area of improvement within their school (e.g., reduction of paper or electrical use). Students investigated a problem, collected data, developed an improvement plan, and presented their projects to their classmates. A select few teams presented their projects at a school board meeting. At the completion of the lesson, the teacher initiated a discussion of potential careers in sustainability based on the class projects. Therefore, the objective of this lesson was to introduce students to sustainability to initiate conversations about future career options in the "green collar" workforce.

Lesson 2: Connecting STEM to green careers. The second lesson that the students completed sought to connect science, technology, engineering, and mathematics (STEM) with "green" careers. The objective of this lesson was for students to understand the importance of

high school math and science courses and how they relate to skills needed to pursue a rewarding career. Students selected five green jobs from a list of green occupations. Using a guided activity sheet (included in the unit), students researched the minimum educational requirements for each job and recorded the requirements in the table. Next, they determined the STEM related courses required to complete a college degree or industry certification. At the conclusion of the lesson, students used provided questions to reflect upon their experience.

Lesson 3: Green careers. The objective of the third lesson was to inform students of green careers. Utilization of a brainstorming activity served to identify existing and potential "green" jobs. Students read news articles identified in the instructional unit and then participated in guided small group discussions, followed by a large group discussion related to the lesson's objective.

Lesson 4: Green career pathways. The objective of the fourth lesson was to promote student interest in green careers by allowing students to investigate green career pathways using the career cluster framework. First, students completed a career interest survey to determine career categories that best matched their interests. Next, each student selected the career cluster (from the 16 State's Career Cluster set) based on the result of their survey and answered questions relating to the career (e.g., job outlook, pay, skills and education needed, etc.). Then students were tasked with selecting one specific career from their cluster to modify and make green. Students presented their findings to the class. From the student presentations, students were able to discover a variety of green jobs and their pathway requirements.

Lesson 5: Prerequisite skills needed for green careers. The final lesson's objective was to research and identify green post-secondary educational courses/programs and perquisite skill sets for green jobs. Students conducted library and/or online research to compile a list of

specific "GREEN" community college programs, university majors, online courses, certificate training programs, internships, and/or apprenticeships. Then students sorted their "finds" according to five ROLEs; these included Management Role, Technical Role, Hands-on Role, Non-Technical Role, and Marketing/Sales Role. After sorting the entire list that the class generated, each student selected the role that most interested him/her and completed a table for each course, major, or training program found. Then students were organized into teams by *roles* to create a skill set required for their chosen role in a "green" economy based on the research conducted.

Instrumentation

The teachers who created the unit of instruction also developed the test instrument used in this study. The development of the test instrument was guided by the overall purpose of the research project, exposing students to the "green collar" workforce.

The instrument consisted of two sections, (a) knowledge assessment of the green collar workforce and (b) demographic background. The first section was comprised of questions assessing student knowledge using a nominal data scale for measurement (1=yes, 2=no, 3=unsure). A follow up qualitative component was included after each question. If the participant selected yes for an item, he or she was asked to write a response that was related to the question (e.g., If yes, define or If yes, identify). The second section asked participants to specify their (a) age, (b) gender, (c) grade level, (d) ethnicity, and (e) plans after high school.

The instrument was subjected to three revision cycles before a final version was established. The first cycle consisted of an internal review by the researchers. The second cycle consisted of a pilot test that was administered to a cohort of practicing CTE teachers. This was done to determine whether the instrument was at the appropriate level for secondary students and

to identify any problematic questions. Their estimates were based on many years of experience of working with secondary level students. The researchers refined potentially problematic questions. The third cycle consisted of an expert panel review of CTE teacher educators and practitioners. This panel evaluated the instrument for content validity. Based on the feedback from the expert review panel, the instrument was further refined and revised by the researchers. This process resulted in an instrument that was believed to be appropriate for data collection. The same instrument was used for both the pretest and posttest. The reliability of the test instrument using Cronbach's coefficient alpha was $r = .811$, indicating a high degree of internal consistency among the questions.

Participants

A non-probability purposive sampling method was utilized for this study. Purposive sampling is one in which participants are selected by the researcher with the purpose in mind. The unit was designed for students in career development classes, therefore students in these classes were the targeted participants. Three teachers delivered the unit of instruction to six secondary career development type classes, specifically four consumer education classes and two cooperative work-training classes. A total population of 101 ($n = 101$) students participated in the study.

Procedures

This study was conducted in two phases. Phase One was the development of the experiential learning unit of instruction to be delivered to high school level career development students. Phase Two consisted of delivering and assessing the unit of instruction with the participants of this study.

Phase One took place during the fall of 2008. The experiential learning unit of instruction was developed using the backward design process (Wiggins & McTighe, 2005). To develop the unit of instruction; the team 1) first determined the learning objective of the entire unit, 2) then identified concept topics and determined objectives for each lesson topic, 3) next, identified appropriate assessment strategies and tools for each lesson, and 4) finally, compiled each lesson plan and activities including all supporting materials (worksheets, PowerPoint slides, assessment rubrics, etc.). The lead researcher compiled and formatted the unit of instruction into an instructional manual. At the conclusion of unit development, three teachers who would deliver the unit of instruction were asked to review the unit. Once the review was complete, the instructional manual was refined and a final copy was given to each teacher.

The second phase was conducted in early 2009. First, the participants were administered the pre-test. The participants were given an identification code number to use on the pre-test and post-test, solely for the purpose of comparing results. Then the career development teachers delivered the unit of instruction (treatment) in two cooperative workforce training courses and four consumer education courses. Because the teachers were working within the limitations of their existing curriculum, it was not feasible for all sites to begin delivery of the unit of instruction on the same day. The unit of instruction was delivered over the span of 10 class sessions. Immediately following the conclusion of the last class session, the post-test was administered to the participants. As previously noted, the pre-test and post-test instruments were identical.

Findings

A mixed method research design was used to collect and analyze the data, and to address the research objectives. The set of quantitative data collected measured as nominal data;

therefore, descriptive statistics including frequencies were calculated using the Statistical Packages for the Social Sciences (SPSS), version 14. The qualitative data were categorized by common themes.

Participant Demographics

The participants were between the ages of 15 and 19 and most were female (n = 74). Tenth graders made up 36.9 percent (n=37) of the sample, eleventh graders represented 19.8 percent (n=20), and twelfth graders represented 40.6 percent (n=41) (*note.* no ninth graders participated in this study). Hispanic students comprised 54 percent (n=54) of the sample, Caucasians 33percent (n=33), and African Americans 11percent (n=11). Fifty-seven percent of students (n=58) planned to attend a four-year college or university after high school, 24 (23.8%) planned to attend a community college; and eight (8.0%) students planned to enter the workforce.

Research Question One: What effect does the developed curriculum have on student knowledge of the "green collar" workforce?

Results indicated that prior to the curriculum implementation, three (0.03%) students had knowledge of the "green collar" workforce, 67 (67%) students were not knowledgeable, and 31(31%) students were uncertain. After the curriculum was delivered, 96 (96%) students were knowledgeable of "green collar" workforce, one (0.01%) student was not knowledgeable, and four (0.04%) were unsure (Table 1).

Table 1

Knowledge of the Green Collar Workforce (n=101)

	Yes		No		Unsure	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Pre-Test	3	.03	67	67	31	31
Post-Test	96	96	1	.01	4	.04

Students were asked to define the green collar workforce as a follow-up to their knowledge assessment. The three (0.03%) students who were knowledgeable defined the green collar workforce as, "Jobs that strive to better the Earth's condition or people to help companies operate more efficiently." After the instruction, 82 (82%) students penned a definition. Several students defined the green collar workforce as, "jobs that serve to provide a service or product that reduces use of environmental resources." Another set of students defined it as, "jobs that change the environment to promote healthier, less energy used." The most common theme among student definitions were the green collar workforce was, "made up of jobs that were green or environmentally friendly."

Research Question Two: What effect does the developed curriculum have on student knowledge of technical and employability skills in demand by the "green" collar industry?

As shown in Table 2, pre-test scores indicated that only 3(0.03%) of the 101 students were aware of the technical and employability skills needed for green jobs, 75 (75%) students reported no knowledge and 23 (23%) students were unsure. Post-test scores increased to 68 (68%) students reporting they were aware of green skills needed, 14 (14%) indicated no knowledge of skills needed and 19 were unsure.

Table 2

Knowledge of the Technical and Employability Skills Needed in the Green Collar Workforce (n=101)

	Yes		No		Unsure	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Pre-Test	3	.03	75	75	23	23
Post-Test	68	68	14	14	19	19

As a follow-up to the question, students were asked to identify green skills needed in the green collar workforce by writing in their response on a blank line. Prior to instruction, two (0.02%) students responded with, "science background," and "information on the environment." After instruction, the qualitative data responses were categorized into technical skills and employability skills. The most frequent responses for technical skills were 59 (59%) students reported a science background followed by 48 (48%) students indicated engineering, and 39 students penned math skills were needed. For employability skills, 85 (85%) students noted a type of post-secondary education ranging from trade school to a bachelor's degree as needed for the green collar workforce.

Research Question Three: What effect does the developed curriculum have on student knowledge of career opportunities in the "green" industry?

Prior to instruction, six (0.06%) students could identify "green" jobs, while 68 (68%) students could not, and 27 (27%) students were unsure. After instruction, 78 (78%) students could identify a "green" job while 9 (0.09%) students could not and 14 (14%) students were unsure (Table 3).

Table 3

Knowledge of Career Opportunities in Green Industries (n=101)

	Yes		No		Unsure	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Pre-Test	6	.06	68	68	27	27
Post-Test	78	78	9	.09	14	14

Corresponding to research objective three, students were asked to identify a green job by writing in a job title. The common theme expressed by the four (0.04%) students who wrote in a job title prior to instruction was, "a job related to recycling." After instruction, 69 (69%) students penned a specific green job title. The five (0.05%) most frequent green jobs identified by students were solar power engineer, waste management, carpenter, scientist, and automobile engineer.

Research Question Four: What effect does the developed curriculum have on student career interest within the "green collar" workforce?

Before the curriculum was delivered, pre-test scores indicated that one (0.01%) student was considering a green collar job, 38 (38%) students were not, and 62 (62%) students were unsure. After the curriculum, the post-test scores revealed five (0.05%) students were considering a green collar job, while 58 (58%) students were not, and 38(38%) students were unsure (Table 4).

Table 4

Consideration of a Green Job (n=101)

	Yes		No		Unsure	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Pre-Test	1	.01	38	38	62	62
Post-Test	5	.05	58	58	38	38

The follow-up question to, "what green job are you considering?" the one (0.01%) student prior to instruction stated, marine biologist. After instruction, the five (0.05%) students who indicated they were considering a green career identified jobs as a marine biologist, environmentalist, automobile engineer, green architect, and an urban planner as their possible career pathways.

Conclusions

The purpose of this study was to evaluate the effectiveness of a unit of instruction designed to expose students to and develop knowledge about green collar workforce careers. Results indicated that the developed experiential learning curriculum unit created awareness of careers within the green collar workforce.

The first phase of this study was the development of the unit of instruction. The team of researchers sought to close a gap between workforce needs and workforce education. The demand for green workers has been shown to be high, whether it represents new green occupations or greening of traditional jobs. Recognizing the influence of early career exposure, the researchers developed an instructional resource that introduced secondary students to careers in the green collar workforce.

The green collar workforce curriculum was developed guided by the principles espoused in the experiential learning theory. Results from the study confirm the suggestion of Timpson et al. (2006), that incorporating experiential learning strategies is useful in teaching about sustainability workforce concepts. Each lesson employed active participation, used critical thinking skills, and provided time for reflection. The reflection component was a critical element in the learning cycle process. During this time, as each lesson delved deeper into the green collar workforce, a student could start to consider whether a green career was a future employment possibility.

Phase two of the study was to measure the effectiveness of the developed curriculum unit. Based on the results, the unit of instruction increased knowledge of the green collar workforce. Prior to instruction, students had limited knowledge (0.03%) of the "green collar" workforce, while after instruction an overwhelming majority (96%) of students had knowledge about the existence of the "green collar" workforce. With regard to the technical and employability skills needed for green jobs, results were positive. Even more encouraging was the qualitative responses given when asked to identify required skills. Science, engineering, and mathematics were the top responses identified by students, which supports career and technical education's role with academic integration through science, technology, engineering, and mathematics (STEM) curriculum. Two important points can be made with this finding: (a) students were able to understand the importance and the use of academics in a future career, and (b) supports value-added nature of CTE classroom practices by reinforcing academics (in an applied setting) to help improve student testing scores as outlined by the current legislation of *No Child Left Behind*.

Additionally, most students recognized that some type of post-secondary education and/or training was needed for a green job, as suggested by Stone (2010). The majority of students before instruction could not name or were unsure (95%) about "green" jobs, but after instruction most students (78%) were able to identify a job within the "green collar" workforce.

Even though a large number of students were not considering a "green" career, prior to instruction, one student was considering a green job, and after instruction the number increased to five students. Although the intention of the curriculum was only to expose students to careers within the green collar workforce, an increase interest occurred. One could conclude that if these students ($n = 4$) were not exposed, this would have not been a career consideration. In the other categories, prior to instruction 38 students reported were not interested in a green career and 62 were unsure, whereas after instruction 58 students reported a green job was not in their future, and 38 were unsure. It could be concluded the interest, skills needed, and types of jobs learned throughout the curriculum implementation helped students to clarify whether a green job was their future career pathway. Interestingly, the noted "green" jobs that students were considering are existing jobs; this suggests that students from this study understand that traditional jobs can be transformed into "green" jobs that are marketable in this economy.

In conclusion, the unit of instruction did prove to significantly increase the knowledge and awareness of job opportunities and their requirements in the green labor market among the studied population. While the combination of experiential learning principles and the green collar workforce content were an effective instructional method, future research should include an experimental design to include a control group to compare groups using the same curriculum but with differing teaching methodologies.

Implications

Stone (2010) challenged the CTE profession to respond to new and emerging "green" occupations through the creation of new curriculum, thus creating awareness of labor market demands and business interest. This study sought to answer that challenge by (a) developing a unit of instruction grounded in experiential learning and (b) exposing students to in-demand career options in the green workforce sector.

CTE teachers are at the forefront of providing early career exploration for students. Whether new occupations or emerging jobs, career education teachers need to have access to current workplace curriculum or take the initiative in developing their own curriculum to keep students abreast of the present and future workforce needs and trends. Educators interested in career guidance and workforce preparation may adopt the curriculum examined, or choose to develop their own based off the same experiential learning theory principles used in the development of the green collar workforce curriculum.

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