A Case Study in Do-It-Yourself Projects: Utilizing Learning Contracts to Facilitate Global Learning in Agriculture[1]

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Abstract

Agriculture graduates must have the knowledge, skills and dispositions to meet the complex needs and pressing challenges in the global agriculture system. Differentiation of instruction through learning contracts is one method to encourage students to self-direct and further their global learning. Individualized learning contracts allowed students in three different agriculture courses to customize class assignments to develop global knowledge, skills and dispositions. The individualized approach allowed students a space to explore their own interests, preferred modes of learning and development of learning artifacts. Data for this study were obtained through student focus groups, instructor observation, a survey of students and through an analysis of the learning artifacts produced. The data were analyzed using a grounded theory approach. Four themes that emerged from this study were: 1) engagement and motivation, 2) frustration with ambiguity, 3) student choice and creativity and 4) skill development. The individualized learning contracts did contribute to development of student learning experiences that address the skills and competencies required for meeting the needs of a changing agriculture industry. Instructors utilizing this method of differentiation are advised to provide clarity in the scope of the assignment and support students as the project progresses.

Introduction

Students of agriculture must have the knowledge, skills and dispositions to meaningfully operate in an increasingly complex and interconnected global food economy (National Research Council, 2009). Pressing global challenges, such as climate change and food security, rely on agriculture for innovative and sustainable solutions. Higher education has a responsibility to further global learning and prepare globally competent agriculture graduates in order to adequately address the key issues facing the global agriculture industry.

Global competence is "the capacity and disposition to understand and act on issues of global significance" (Mansilla and Jackson, 2011; p. xiii). In order to address the world's most pressing challenges, students must be open-minded, informed and understand how their actions have an effect on both local and global levels (Association of American Colleges and Universities, 2010).

Knowing that global learning does not take place in a single unit, course or in the content of a single experience (Association of American Colleges and Universities, 2010), students must direct and further their own global learning. Students must be motivated, confident and ready to face difficult challenges. In short, a "growth mindset" (Dweck, 2006) is vital to students aspiring to high levels of global competency and encouraging them to persist through difficulty.

One method to encourage students to take the helm in their global learning is to differentiate classroom instruction. Differentiation is regarded not as a specific set of pre-defined strategies, but rather a framework for thinking about teaching and learning (Sousa and Tomlinson, 2011). The principle function of differentiation is that it is not the instructor's role to plow through the course content, but rather to maximize learning by

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creating a flexible learning environment and allowing for more than one mode of learning (Sousa and Tomlinson, 2011). The underlying teaching and learning foundation to differentiation is rooted in the "zone of proximal development" seminal work of Vygotsky (1978) that essentially states learners have different capacities with a zone or a difference between what a learner can do without help and can do with help.

In global learning, students enter the classroom with varying levels of knowledge, skills and dispositions related to global competency. Some students may have extensive travel experience or well developed language skills, while other students have never traveled from their home country or have any experience with a course focused on global issues. Differentiation takes into account diversity in student backgrounds and allows for instruction to challenge students on an individual basis rather than a one-size-fits-all learning format (Tomlinson, 2014), which aligns with Vygotsky's (2012) work on addressing learners' levels of readiness.

Differentiation allows learners the opportunity to have a hand in defining their learning; thus, allow the student to pursue a topic of particular interest. Allowing students to connect new content with their own interests can lead to greater student engagement, productivity and achievement (Amabile, 1996; Csikszentmihaly, 1990; Torrance, 1995). Students are supported in meeting the learning challenges they set for themselves and are held accountable for the learning outcomes. The entire process promotes the development of a "growth mindset" by demonstrating that learning can be cultivated through effort by setting appropriate learning goals and following through with them (Dweck 2006; Souza and Tomlinson, 2011).

Differentiation of instruction addresses the strategic points of action put forth by the National Research Council (2009) related to the transformation of undergraduate agricultural education to meet the demands of a changing world including: working in diverse teams and communities, working across disciplines, communication, critical thinking and analysis, ethical decision making and leadership. Differentiation of learning is a pathway to give students the opportunity to develop these skills in agriculture courses.

Heutagogy, the putting of students at the center of their own learning or self-determined learning, was a term developed by Hase and Kenyon in 2000. Since 2000, the term has been found to be particularly usable in e-learning environments (Chapnick and Meloy, 2005). Student learning contracts are the specific application for high education (Laycock and Stephenson, 2013). While the utilization of learning contracts in higher education is found in the literature (Anderson et al., 1996; Knowles, 1986; Coulson and Harvey, 2013; Wade, et al., 2013), literature on use specifically in colleges of agriculture or to determine global learning advancement is limited.

Theoretical Foundation

Grounded theory, while one of the more popular research designs in the world, is a complex, iterative process (Creswell, 2009). Researchers develop questions which guide the research, but are not limiting. As the data is gathered, themes or linkages are identified between core questions and data (Charmaz, 2006).

Conceptual Framework

Self-directed learning is "a process in which individuals take the initiative, with, or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies and evaluating learning outcomes" (Knowles, 1975, p. 18). When working with self-directed learning, motivation of the learner is critical and two motivational theories were utilized in this study: Expectancy x Value Theory (Wigfield and Eccles, 2000) and Self-De-

Figure 1: Grounded Theory Approach as adapted from Young, 1996

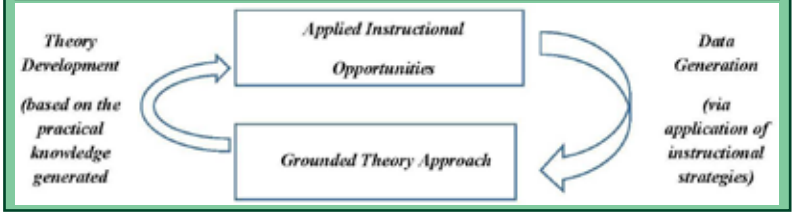
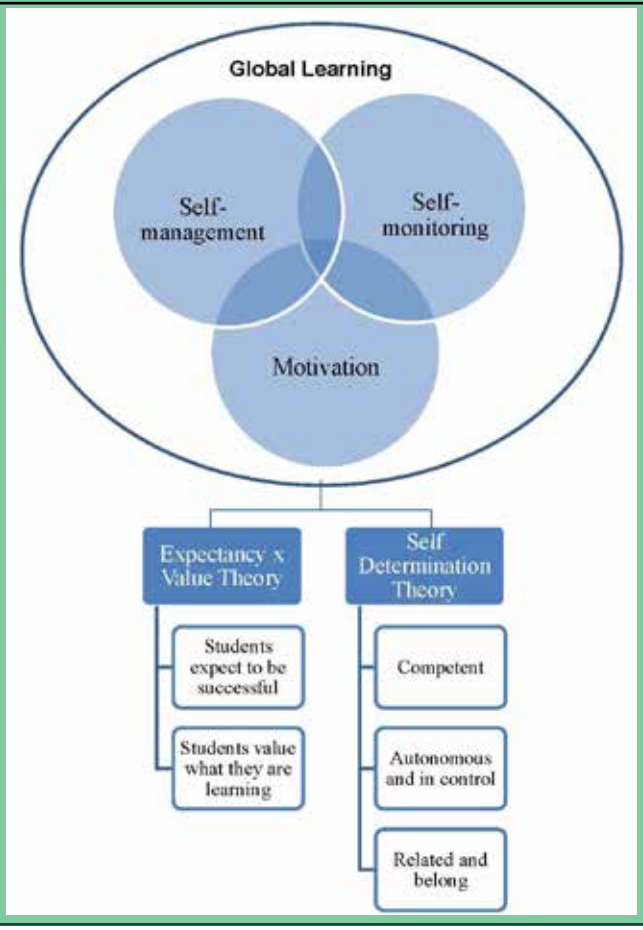


Figure 2: Conceptual Framework of Self Directed Learning to Encourage Motivation for Global Learning



termination Theory (Deci et al., 1991). The integration of these theories was inspired by Ramsay et al., (2015).

With Expectancy x Value motivation theory, motivation is increased when students expect to be successful and value what they are learning (Wigfield and Eccles). Motivation increases in self-determination theory when students feel competent, autonomous and in control and related or belonging to the effort (Deci et al.)

Purpose and Objectives

While conducting critical reflection and review to identify the most effective instructional strategies to develop global learning that promote self-directed learning, grounded theory (Glaser and Strauss, 1967; Charmaz, 2006; Creswell, 2009) was utilized in an iterative and inductive process; retroactively researchers developed the following objectives:

- Determine effectiveness of differentiation with utilization of learner contracts through instructor satisfaction with learning.
- Identify themes of student perceptions in utilizing learning contracts for global learning.

Methods

Differentiation of instruction in this study took the form of individual learning contracts, also referred to as Do-It-Yourself (DIY) Projects. The DIY Projects were included as mandatory graded assignments in three different courses in the College of Agricultural Sciences at Pennsylvania State University. One course focused on global learning in a resident education course, the second was a preparation course for a summer immersion experience and the third was a month-long study abroad experience in Costa Rica. All researchers were instructors for a minimum of one of the courses. One researcher involved in the project was an instructor for all three courses. All three courses included graduate students and undergraduate students of various academic ranks. The learning contract had a similar format for each course. As the first step of the project students identified areas of interest, possible methods of learning and useful resources. Students were tasked with clearly identifying a learning artifact that would evidence learning. After selecting the learning artifact and to promote metacognition, the students were asked to determine how the artifact would be assessed both by themselves and the instructor. The learning contract also defined a method to evidence progress on the project by sharing weekly updates, often taking the form of a social media interaction or email. All of this information was formulated into a contract. The contract was then discussed at an individual consultation between the student and the instructor. Upon completion of the consultation, students revised the contract to take into account instructor feedback. The learning contract was finalized and considered a binding agreement between student and instructor.

An important consideration for implementation was instructor flexibility in the output product or "learning artifact." The learning artifact was not limited to standard forms of output products such as research papers or multimedia presentations. Rather, the instructors stressed creativity as students designed their output products; underscoring the cultivation of personal development skills such as creativity (Crawford et al., 2011).

The learning contract aligns with differentiation because it empowers students to select three important considerations: 1) choose a meaningful topic, 2) the methods of learning about that topic and 3) the parameters of the output product. Throughout the learning process, students are assisted by the instructor in meeting the learning goals and held accountable for meeting the mutually agreed upon targeted outcomes.

Data for this study were obtained through student focus groups facilitated by instructors, instructor observation, a survey of students and a thorough analysis of the learning artifacts produced. The data were analyzed using a grounded theory approach as described by Corbin and Strauss (2008) which emphasizes ongoing reflection and analysis to determine categories and themes. Researchers merged the data and categorized them into emergent themes. The four themes identified were engagement and motivation, frustration with ambiguity, student choice and creativity and skill development. This study was deemed exempt by the Pennsylvania State University Institutional Review Board.

Results

A description of how the DIY Project functioned in the context of each course, as well as several examples of DIY Projects, is included here.

Resident Course

Individualized learning contracts were utilized in the Agricultural and Extension Education resident course titled "Educational Programs in Agriculture in Developing Countries" to encourage students to pursue a project related to their particular interests in global agriculture education.

Instructors observed that students were creative in overlapping the DIY Project with other learning goals related to their major or future careers. For example, one pre-service agriculture educator created a lesson on international agriculture geared toward secondary students and presented it at the school where she planned to complete her student teaching internship the following year. Observing the secondary student reactions to her lesson, she determined that she needed to provide more background material to allow the students to grasp the fundamental concepts that she had targeted as her learning objectives for this lesson. The teacher educators involved in the project found this level of instructional reflection on scaffolding required at this point of teacher development to be very beneficial for a teacher candidate to realize prior to the student teaching internship.

Another example included a group of five students that self-selected to collaborate in pursuit of an agri-

culture innovation prize offered by the College of Agricultural Sciences. Working in partnership with a local non-governmental organization, the student group designed an agricultural education program for youth in Haiti. The instructors observed meaningful difference in student motivation and disposition to the project. The student group was motivated by the idea that if funded, the project could come to fruition as a reality and not just a concept. Presenting to a panel of potential investors was a meaningful experience that compelled students to be meticulous and thoughtful in all aspects of their work. When the student group advanced to the final round of the competition, the entire class celebrated in acknowledgement of the amount of work that the group had put into the project. A group member noted that the most rewarding aspect of the DIY was "seeing a project turn into something that we cared so much about." Another group member commented that "the most rewarding aspect is how this initiative is going to change people's lives."

Preparation for Immersion Experience

At Pennsylvania State University, many short-term study abroad opportunities in the College of Agricultural Sciences take the form of an embedded course, which have both a resident education and a travel component. Individualized learning contracts were employed during the resident portion of the Agricultural & Extension Education embedded course "School-Based Agricultural Education across the Globe" with a one-month travel component to Korea.

While the embedded course as a whole was focused on school-based agricultural education in Korea, the aim of using the contracts was to facilitate learning about Korea such as culture, geography, politics and history. While it is very important to have background knowledge about the destination country, the instructors wished to use the limited available class time to focus on Korean agriculture and agricultural education. Through the use of individualized learning contracts, students were afforded opportunities outside of class to explore some aspect of Korea or Korean culture to which they were particularly drawn and they shared their findings with the rest of the class at the end of the semester.

One of the most interesting learning artifacts developed was from a project focused on Korean art. After analyzing surviving images of tigers throughout the history of Korean art, the student created her own depiction of two tigers representing current events in Korea (see Figure 3). In her painting, two tigers bear their teeth at each other across a dividing line created by the yin and yang of the Korean flag and a magpie (symbolizing hope) flies in the distance. The learning artifact demonstrates not only knowledge of the use and importance of tiger symbolism in Korean art, but also an understanding of the relationship between North and South Korea.

Another example of a DIY Project consisted of spending time with a Pennsylvania State University student from Korea who was not affiliated with the agricultural teacher education program and course experience. The students met each other during a class session in which Penn State Korean students were invited into the classroom to share their culture and perspective with the Penn State agricultural educations students participating in the immersion experience. One agricultural education student chose to design their DIY Project around the new friendship and chronicled the experience of cooking and sharing a meal. The students shopped at the market together and then taught each other to create a dish from their respective regions of the world. In this particular case, global learning was advanced as the student learned intercultural communication skills and recognized her personal and social responsibility to create a welcoming environment for international students on campus.

During Study Abroad

Pennsylvania State University is home to the Spanish for the Agricultural Sciences program, a three-course sequence culminating in a one-month immersion experience in Costa Rica. During the one month experience, students lived with host families, attended Spanish language classes, participated in agriculture tours and activities and engaged in service-learning. Individualized learning contracts were utilized as a method to encourage student engagement with the host culture. Learning contracts were drafted pre-departure. The learning artifact was created in-country where most of the information was gathered.

The role and form of individualized learning contracts took on a unique role during the study abroad experience. Rather than passive consumers of the international experience, students became active

Figure 3. Learning Artifact from Student DIY Project on Symbolism in Korean Art

seekers of information relevant to their projects. The instructor maintained flexibility in the projects and was open to amending contracts if unique and previously unknown opportunities became available.

One example of a student project took the form of a video, which the student produced, edited and uploaded to YouTube. The video showcased the student and her host mother cooking a traditional Costa Rican meal together. Cooking was one way the student was able to integrate herself into the family. She wanted to record the process of making a traditional Costa Rican meal from start to finish to evidence her progress with the Spanish language made during the immersion experience. Through an entry on the course blog, the student shared her experience with program stakeholders, documented the recipe and shared details of connecting with the host family through food preparation and sharing meals.

Another DIY Project focused on learning agricultural vocabulary in Spanish. The student's goal was to chronicle fifty agriculturally-related Spanish vocabulary words and create a mini-dictionary as a reference for future students in the program. The student noted agricultural vocabulary words on agriculture tours that were new to the student. The student then engaged farmers and other experts to ask for further clarification. The list of Spanish agriculture words was shared online with stakeholders and passed on to students in subsequent cohorts.

During study abroad travel experiences, student feedback on the DIY Projects centered on the pedagogical notion that the contracts encouraged students to remain focused on their learning goals. Students shared that "a month is a long time" and "there will be time for the project later." The DIY Project gave students "an excuse" to further engage in the experience. Several students cooked meals with their host families as noted in the example above, which required them to plan ahead and set aside a dedicated time with the family. Some students felt that completing the projects in-country was "frustrating" because they could be "doing something else", but many acknowledged that they provided structure to help them maximize their learning experience.

Discussion

Four major themes emerged across all three courses through interpretive analysis: 1) engagement and motivation, 2) frustration with ambiguity, 3) student choice and creativity and 4) new skill development.

Engagement and Motivation

The reaction to the DIY Projects was the opposite of what instructors normally witness with a large project: students wanted to "make the project longer term" so they could "read more books" and "find more resources." In many cases, students were highly self-motivated and often wanted to work more on the project than what was outlined in the contract.

In terms of sharing learning artifacts, students wanted "to spend more time presenting" because "everyone found such interesting things and it would be nice to have more time to listen and discuss as a group." These comments evidenced the desire and enthusiasm shared by individual students as they presented their projects to their fellow students. In addition, the students who served as the audience for learning contract presentation shared that they found the learning outcomes of their peers interesting and enjoyable.

Frustration with Ambiguity

Not all students found the DIY Project to be a joyful experience. Some students struggled to design individual projects as in each class there were many possible topics to pursue and the output product was intentionally undefined. Several students noted the absence of a rubric. Others expressed confusion on what the instructors wanted from them.

DIY Projects did not engage and motivate all learners. Students in each of the classes used the ambiguity of the assignment as an excuse for a haphazard project that lacked the breadth and depth of the project outlined in the individualized learning contract formulated at the beginning of the semester. Some students failed to adequately self-monitor their progress during the semester. Others remained frustrated with the ambiguity of the assignment.

Potential less than optimal results are among the reasons that some instructors hesitate to utilize individualized learning contracts (Caffarella and Caffarella, 1986); however, the instructors involved with this project saw evidence of more "successful" projects than projects that floundered. Clarity in the scope of the assignment and differentiated levels of support for the project to individual students are critical factors in optimizing learning.

Student Choice and Creativity

A positive reaction to the assignment was that students were excited by the freedom to choose their own topic and be creative in defining the learning artifact. An example of a student statement that reflected observations of many students was "*it was hard to narrow down what to do for the project because there were so many interesting things you could do*."

Several students embraced the call for creativity. Several unique output products emerged, such as the painting, meals, videos and a submission in a college-wide "business pitch contest". Other students expanded their individual conception of instructional "resource," such as those who met with international students and discovered a wealth of diverse cultural perspectives right on campus, or the students who accessed campus multimedia and computing resources for the first time.

Other students seemed to not take up the challenge to be creative and innovative with resources or output products. Some students stayed in comfort zone of familiarity with slide presentations and research papers

utilized as learning artifacts. In addition, many students utilized "traditional resources" such as internet sources, books and research articles.

New Skill Development

Several students developed new global skills as a result of their DIY Project. Some students practiced highly coveted "soft skills" (USDE, 2012; Soria and Troisi, 2013) such as intercultural communication and the ability to work on a diverse team. Others utilized the experience to gain new multimedia skills and leadership of a multi-disciplinary team.

Several students practiced the skills required for their discipline as a type of early field experience, such as the pre-service teacher who utilized the opportunity to teach an international agriculture lesson in a high school classroom. She realized that her lessons on international agriculture lacked clarity and needed to be reformulated before her student teaching experience.

Other students utilized the DIY Project as an opportunity to practice professionalism skills, such as the students who gave the business pitch to investors. Dressing professionally, maintaining a professional demeanor while under pressure and the acceptance of mentoring advice were professional skills practiced in this particular case.

Summary

Differentiation of instruction is one method to encourage lifelong global learning. In this study, the DIY Project assignment allowed students to develop individualized projects designed specifically to promote global learning. The individualized approach allowed students a space to explore their own interests, modes of learning and learning artifacts. The variation in quality and complexity of the DIY Projects could be due to differing levels of learner readiness as put forth by Vygotsky (2012). The DIY Projects allowed for learners to continue to develop their capacity for self-directed learning (Knowles, 1975), self-management, self-monitoring and an increased motivation improved by an increased value in learning tasks (Wigfield and Eccles, J., 2000) and a sense of individual autonomy (Deci, et al., 1991) in the learning process.

The four themes that emerged from this study of individualized learning contracts as a method of differentiation of instruction were: engagement and motivation, frustration with ambiguity, student choice and creativity and new skill development. The emergent themes connect to the charge of the National Resource Council (2009) to create a student experience that addresses the skills and competencies required for meeting the needs of a changing agriculture industry.

Of particular note, an emergent theme that arose during the study was the development of new skills. The DIY Project seemed to be an effective gateway that invited learners to develop select personal skills that are highly coveted by employers in agriculture and natural resources (Crawford et al., 2011).

From the perspective of an instructor, utilizing individualized learning contracts may seem like extra work that could be avoided. However, the instructors of the three courses in this study were enthusiastic about the change in their role from enforcer to mentor as learning became more student-centered.

Specific Recommendations for Practice

Instructors seeking to include learning contracts in their agricultural courses for global learning should:

- Clearly determine what learning outcomes are being addressed.
- Provide time for a submission and revision process. This could include student to student as well as student to teacher. Time for support and guidance is critical.
- Ensure that there are clear measures of evaluations and scope of assignment are mutually agreed upon between the instructor and the learner.
- Provide in course time for sharing of findings and reflections on learning processes. Metacognition can be the most powerful aspect of self-directed learning that is achieved through the utilization of learning contracts.

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