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Effects of a Simulation on Eighth Grade Students' Business Management Knowledge and Entrepreneurial Intent in an Exploratory Agriculture Course

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Abstract

Entrepreneurship education has historically been part of agricultural education; yet few researchers have studied entrepreneurship-related outcomes for youth in formal and nonformal educational settings. Entrepreneurship education programs develop entrepreneurial attitudes and intentions, but limited studies exist regarding junior high school youth. This quasi-experimental study utilized a business management simulation with eighth grade students and focused on teaching, learning, and outcomes of entrepreneurship in an exploratory agriculture course. Junior high school students had higher business management knowledge when an educational simulation (playing a board game using double-entry accounting and computing financial statements) was used compared to students who were taught using a board game and tracked a cash balance. Students' entrepreneurship intent was similar between the control and treatment groups after the two-week unit. However, students who previously completing a 4-H animal science project had higher entrepreneurship intent than their peers who did not complete a 4-H animal science project. This study supports the premise that educational simulations can effectively teach business management skills and offers educators an enhanced understanding of how to capitalize on the value of SAEs and 4-H animal science projects when building entrepreneurial skills in youth.

Keywords: business management simulation; entrepreneurship education and intent

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Introduction

Simulations used in education can be an effective way to teach students' problem solving, critical thinking, and business management. Entrepreneurial skills are best learned through active student involvement in experiential learning (Dollisso, 2010) and simulations offer students an opportunity to actively engage in the classroom. For decades, simulations have been a commonly accepted method in business education and curricula (Brennan & Vos, 2013; Gredler, 2004; Klassen & Willoughby, 2003; Wawer et al., 2010). Simulations model the application of knowledge in real-world settings and provide students the opportunity to practice problem-solving and decision-making skills relevant to careers in business and management (Lunce, 2006). Learning is enhanced when students are actively involved in the learning, when assignments reflect authentic tasks aligned with real-life contexts and experiences

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(McKibben & Murphy, 2021), and when critical thinking or deep learning is promoted through applied and reflective activities (Smart & Cappel, 2006). As such, simulations enhance learning, problem-solving, decision-making, and application of knowledge; increase students' confidence, motivation, interest, participation, and transfer of learning; reinforce the connection that behaviors are connected to financial decisions; and foster enhanced student-teacher relations (Cooper & Grinder, 1997; Gredler, 2004; Lunce, 2006; O'Neill, 2008; Winsted & Graham, 2013).

Successful educational simulations are fun, intrinsically motivating, and offer the right amount of challenge for students. An effective simulation enables students to better understand and remember concepts when compared to conventional classroom instruction (Klassen & Willoughby, 2003). A well-designed simulation: (1) offers students the opportunity to interact with an adequate model of a complex, real-life situation; (2) provides students with defined roles with responsibilities and constraints; (3) allows students to execute a range of decision-making strategies in a data-rich environment; and, (4) provides students with a mechanism of feedback in the form of changes in the problem or situation (Knobloch, 2005). Facilitation of the learning process through debriefing, feedback, or scaffolding is critical to the educational success of a simulation (Lunce, 2006; Cooper & Grinder, 1997; Garris, 2002). Much of the experiential benefit of a simulation takes place during the debriefing session (Cooper & Grinder, 1997).

Entrepreneurship education in elementary and secondary schools has received increased attention in recent years (Peterman & Kennedy, 2003; Dioneo-Adetayo, 2006). Introducing entrepreneurship programs to children earlier in their lives enhances the development of entrepreneurial opportunities and skills (Dioneo-Adetayo, 2006). Schoon and Duckworth (2012) suggested entrepreneurship is a type of planned behavior that begins early in life. Specifically, the childhood and adolescent years are the ideal stages for youth to acquire basic knowledge about entrepreneurship and to foster a positive attitude toward entrepreneurship (Peterman & Kennedy, 2003). Participation in entrepreneurship education programs significantly influenced entrepreneurial attitudes and intentions (Peterman & Kennedy, 2003), which may lead to one's desire to pursue a future career related to those learning experiences and ultimately lead to starting a business. Entrepreneurship education is important because entrepreneurs drive the U.S. economy and account for the majority of the nation's new job creations and innovations. According to the U.S. Small Business Administration, small businesses employ roughly 50% of the private workforce (Small Business Administration, 2018). Results from a Junior Achievement (2010) survey indicated 51% of teen respondents would like to start their own business someday. Furthermore, 84% of teens agreed that entrepreneurial skills should be taught in schools.

Entrepreneurship education has historically been part of school- and community-based agricultural education through FFA and 4-H projects, yet few researchers in this context have studied the development of entrepreneurship-related outcomes regarding youth experiences in formal and nonformal educational settings. This study focused on teaching, learning, and outcomes of entrepreneurship in the context of school-based agricultural education (SBAE). As such, SBAE students need realistic opportunities to learn entrepreneurial skills. Teachers need effective teaching methods to provide positive learning experiences for students and to help motivate them to see the importance of engaging in out-of-school projects that develop business management and entrepreneurship skills, which aligns with American Association of Agricultural Education's research agenda priority area #4 (meaningful and engaged learning environments (Edgar et al., 2016).

The conceptual model of SBAE consists of classroom instruction, experiential learning through supervised experiences, and leadership activities (Dailey et al., 2001). The agribusiness systems career pathway encompasses the study of agribusinesses and management including record keeping, budget management, business planning, and sales and marketing (National AFNR Standards, 2015). The interdisciplinary nature of SBAE programs has enabled students to receive classroom instruction and reinforcement of principles in science and math within the context of agriculture (Dailey et al., 2001; Kararo & Knobloch, 2018). According to Dailey (2001) and her colleagues, "agricultural education incorporates a

combination of diverse teaching methodologies (i.e., hands-on learning, vocational skills training, academic concept development) and technical content (i.e., agriculture, business, science, marketing, economics), with intracurricular experiential learning and leadership development" (p. 18).

Outside of the classroom, youth may also learn agricultural business management skills through Supervised Agricultural Experiences (SAE), FFA Career Development Events, and participation in 4-H exhibitions. The 4-H and FFA youth organizations offer experiential learning environments where students have the opportunity to gain life skills like self-motivation, responsibility, decision-making, communication, problem solving, record keeping, and leadership (Anderson & Karr-Lilienthal, 2011; Cummins & Nash, 2014; Johnson, 2017; Rusk et al., 2003; Smith et al., 2006). Smith et al. (2006) cited numerous research studies that showed a positive relationship between animal science projects and the development of life and project skills. Moreover, youth participation in 4-H livestock projects increased a variety of life skills that could be useful in students' everyday lives (Johnson, 2017; Rusk et al., 2003). Anderson and Karr-Lilienthal's (2011) findings support that participation in the horse project can assist youth in making educated career choices to help them become productive citizens.

SAE programs focusing on entrepreneurship have been central to SBAE (Hanagriff et al., 2010), yet there is a trend that fewer students are engaged in SAEs (Bird, et al., 2013; Retallick & Martin, 2008; Rubenstein & Thoron, 2015; Steele, 1997). Heinert and Roberts (2018) found teachers of SBAE programs used SAEs to teach entrepreneurship to high school students. SAEs engage students to apply knowledge and skills they learn in SBAE courses to real-world settings outside of the classroom. Through experiential learning, students can explore their interests, document knowledge and skills attained, keep financial records, and engage in self-reflection and career planning (National Council for Agricultural Education, 2015). SAE projects expose students to a variety of occupations and careers (Hanagriff et al., 2010; National Council for Agricultural Education, 2015; Retallick, 2010). Although there are internal and external factors that contribute to students' desires to participate in an SAE (Rubenstein & Thoron, 2015), we posited that a business management simulation could effectively teach and motivate students to consider the possibility of an entrepreneurship SAE project outside of the classroom. Moreover, we posited youth with previous 4-H animal project experiences would have higher entrepreneurship intent and business management knowledge because of students' schemas informed by previous experiences.

Theoretical Framework

The relational developmental systems meta-theory approach to development (Lerner & Damon, 2012) served as the theoretical framework for the study because it can be used to identify personal and contextual factors that are involved in developing youth entrepreneurial outcomes. Theoretically, people take action as active agents in "relational, spontaneously active, complex systems" (Overton, 2013, p. 102). They do so through self-creating, self-organizing, and self-regulating processes. As such, youth use adaptive developmental regulations when personal and contextual factors provide beneficial two-way influences in developing entrepreneurial intent (Geldof et al., 2014a). Relational developmental systems meta-theory research emphasizes the importance of youth to purposefully influence interactions in their environment, which is known as intentional self-regulation. Intentional self-regulation is one's personal agency to choose and direct the interactions he or she experiences in the given context. Intentional self-regulation is informed by a goal-directed behavior model (known as selection, optimization, and compensation) to promote adaptive developmental regulations. First, youth select goals and may need to adapt based on resources and challenges. Second, youth optimize by seeking strategies and resources to pursue their goals. Finally, youth compensate when a goal-relevant means cannot be implemented and a different means is used to replace the previous one. Entrepreneurship intention was measured as a combination of intentional self-regulation and innovation orientation. Innovation orientation is the extent youth "see themselves as generating and implementing new ideas, as well as championing these new ideas to others" (Geldoff et al, 2014a, p. 85). Lerner and Damon (2012) suggested it is important to cultivate youth's entrepreneurship capacities because entrepreneurship interest is linked to future

entrepreneurial intent. Further, potential key contextual factors like mentoring, parent-child relations, and extracurricular activities can develop entrepreneurial capacities. Specifically, participation in FFA and 4-H was noted as having relevance to the development of entrepreneurial interests and activities in youth (Lerner & Damon, 2012).

Although researchers have focused on developing entrepreneurship in adults, less is known about how youth interact with social and economic contexts to acquire entrepreneurial capacities (Damon & Lerner, 2008). Previous work indicates that pre-teen youth displayed entrepreneurial capacities and had early life experiences that may have fostered their capacities and interests toward entrepreneurship. Attitudes and interests in youth shape their plans regarding their own entrepreneurial futures (Geldof et al., 2014b). Whereas researchers have not confirmed that early entrepreneurial intentions are linked directly to future entrepreneurial careers, previous studies suggested that entrepreneurial interest during adolescence is linked to the adolescent's intention to pursue an entrepreneurial career (Schoon & Duckworth, 2012). Additional research is needed to expand knowledge on predictors that contribute to the entrepreneurial success in today's youth (Geldhof et al., 2014b). It is important to understand how youth develop the capacity to become successful entrepreneurs to help determine the educational experiences that can best foster entrepreneurship during adolescence (Lerner & Damon, 2012).

Although there are a variety of educational strategies that can be used to implement entrepreneurship education in the classroom, we chose an educational simulation for this study because it closely models a real-world experience with limited financial risk for youth. Business games and simulations actively involve students in problem-solving and decision-making processes. These learning experiences allow students to evaluate the results of their decisions and react with new decisions (Lunce, 2006; Winstead & Graham, 2013). Whereas research shows that business games and simulations generate beneficial learning outcomes, more evidence is needed on the specific entrepreneurship effects of these simulations (Winstead & Graham, 2013; Huebscher & Lendner, 2010). Prior research on entrepreneurship education has primarily focused on adults, and there is limited knowledge about how young people acquire entrepreneurial capacities (Damon & Lerner, 2008). Lerner and Damon (2012) recommended more research be done to determine what types of experiences motivate adolescents to take on the challenges and risks of entrepreneurship, as well as what they must learn to prepare them for an entrepreneurial career.

Purpose and Research Questions

The purpose of this research study was to determine the effects of a business management simulation on eighth grade students' business management knowledge and entrepreneurial intent in a junior high exploratory agriculture course. The study had two research questions: (1) Did eighth grade students have higher levels of business management knowledge and entrepreneurship intent after engaging in a business management simulation when compared to their peers who participated in a board game unit? (2) Upon completion of the business management simulation, did eighth grade students who completed at least one year of an animal science project via 4-H have higher levels of business management knowledge and entrepreneurial intent when compared to their peers who did not have an animal science project?

Method and Procedures

This quasi-experimental study used a non-equivalent control group design to study six classes of eighth grade students enrolled in an exploratory agriculture class in a rural junior high school (approximately 320 students in Grades 6-8) located in Indiana. Class sections were randomly assigned to a treatment or control group. Two SBAE teachers individually taught the business management unit for two weeks in their respective class periods. The teachers taught both control and treatment groups based on random assignment. A local 4-H youth educator was present in the classrooms to ensure the treatment and control units were implemented as planned and that the content was the same for both the treatment and

control units. There were 42 students in the control group and 59 students in the treatment group. Purdue University's Institution Review Board approved the study (Protocol #1502015806).

Two parallel agricultural business management lesson plans based on the curriculum, *Reap: A Business Management Simulation* (Knobloch, 2004), and were used simultaneously during the two weeks of instruction. Both groups played a board game of managing a farm business (i.e., *The Farming Game*), but they were different in how they tracked financial transactions: (1) the control group used single-entry accounting to track cash and completed the balance sheet upon completion of five rounds (aka, years) of playing the game (i.e., a game unit); and, (2) the treatment used double-entry accounting with six accounts on a transaction worksheet and completed yearly financial statements (i.e., a simulation unit). Both the control and treatment units consisted of 10 50-minute lessons.

A pre-test was administered prior to beginning the lesson on Day 1 of the unit, and a post-test was administered following a review session on the Day 10 of the unit. The 10 lessons included: (1) business management and planning, (2) introduction to accounting, (3) introduction to the game, (4) learning how to play the game, (5) playing the game – year 1, (6) playing the game – year 2, (7) business planning and decision making, (8) continue to play the game, (9) analyze the business, and (10) final session – wrap up. The unit was designed to engage junior high students in learning business management and financial literacy using a board game simulation to increase knowledge of business management and interest in entrepreneurship. The lesson plans created for both groups were aligned with Indiana learning standards for agricultural science, business and entrepreneurship, and financial literacy. Each lesson had clearly defined learning objectives, content listed on PowerPoint slides for the teacher to use, and discussion questions designed to review the lesson.

The unit for the treatment group consisted of a board game designed to simulate managing a farm business using double-entry accounting. Students used a double-entry transaction register worksheet for six account balances: asset account, equity account, notes payable, income account, expense account, and cash account. Students also completed financial statements at the end of each farming year, which was one time around the board. The financial statements consisted of an income statement, owner's equity statement, and balance sheet. In the simulation, students worked in pairs and played another pair for a total of four students per game board. Students were required to take turns completing the transaction register worksheet and financial statements so each student had an opportunity to perform all of the steps in the double-entry accounting process. Playing the board game provided students the opportunity to manage their own businesses and engage in an entrepreneurial experience. The multiple years of managing their businesses provided students opportunities to make decisions to improve profitability. Students were not explicitly and deductively taught the definition of entrepreneurship. Rather, students experienced learning about entrepreneurship inductively and embedded in experiential learning (Heinert & Roberts, 2017) by managing their own businesses when they played the board game.

A comparison of the control and treatment are summarized in Table 1. The unit for the control group consisted of a board game where students used a checkbook style entry with only one account balance to keep track of cash flow and the cash balance. The only account recorded was the cash account. Students in the control group also used the same board game, but only computed the balance sheet at the end of the unit as part of a class discussion exercise. Students worked in pairs and played another pair for a total of four students per game board. The teacher taught the students double-entry accounting using PowerPoint slides, but they were not required to use double-entry accounting to keep track of their transactions to play the game. Because students did not use double-entry accounting, there was no method to reconcile the year-end cash balance to determine if it was accurate.

Table 1

Comparison of the Board Game (Control) and Simulation (Treatment) Unit

Component	**Board Game Unit** (Control)	**Simulation Unit** (Treatment)
Length	10 days (50-minute periods)	10 days (50-minute periods)
Content	Business management cycle (planning, deciding, accounting & analyzing); accounting transactions using six basic accounts; key terms such as debits, credits, assets, liabilities, & owner's equity; year-end financial statements; how to play the game	Same as control group
Use of PowerPoint	Introduction & Lessons	Introduction
Use of the Board Game	Students played 8 rounds	Students played 8 rounds
Accounting Worksheets	Check-book Style Entry with one account balance; no double-entry	Transaction Register Worksheet; double-entry for 6 account balances
Financial Statements	Balance Sheet	Income Statement, Owner's Equity Statement, and Balance Sheet completed at the end of each year around the board
Unit Review	Review Worksheet & Teacher-led Discussion	Review Worksheet & Teacher-led Discussion

Data were collected using a knowledge test and questionnaire. Identical pretests and posttests were administered to students to assess their knowledge of business management and double-entry accounting. The knowledge assessment consisted of multiple choice and matching questions related to business management vocabulary, and double-entry accounting. The knowledge assessment and associated key was modified from the existing business management curriculum and revised to align with the goals of the unit. Discrimination and difficulty indices were computed to determine if items were too easy or difficult for students. Nine items were removed before computing performance scores because they had less than a 0.25 difficulty index.

The entrepreneurship questionnaire given to participants was adapted from the Entrepreneurship Intentional Self-Regulation (EISR) questionnaire developed by Weiner et al. (2012). The EISR questionnaire measures self-regulation skills pertinent to entrepreneurial behavior and was designed to measure college students' intentional self-regulation based on the selection, optimization, and compensation (SOC) model (Weiner et al., 2012). The entrepreneurship questionnaire was adapted for junior high students and administered on the second to last day of the unit. The questionnaire was given prior to the post-test knowledge assessment to limit possible testing fatigue.

For the purpose of this study, the EISR questionnaire was modified for use with an eighth-grade audience with input from an expert panel consisting of a pedagogy and motivation expert, agricultural education expert, and youth entrepreneurship expert. The modified youth EISR questionnaire consisted of 37 items in six sections: youth challenge (seven items), youth initiative (nine items), youth problem solving (six items), youth pursuit (three items), youth career interest (seven items), and youth activities (five items). The scale for youth challenge, youth initiative, youth problem solving, and youth pursuit were (1) almost never, (2) rarely, (3) sometimes, (4) often, and (5) almost always. The youth career interest scale consisted of (1) not important, (2) a little important, (3) somewhat important, (4) quite important, and (5) extremely important. For youth activities, students were asked how many times they had done something with the five

answer choices (0, 1, 2, 3, and 4 or more times). These activities included organizing a club, bring together people around a cause, creating ways to make money, designing a new product or service, and starting a business.

The modified questionnaire was pilot-tested with students who did not participate in the study. Thirty-three students of similar age and at a school with similar demographics were in the pilot-test group. The questionnaire was reviewed for face and content validity by three experts and the two junior high teachers. Cronbach's *alpha* coefficients from the pilot test were youth challenge = 0.90, six items; youth initiative = 0.85, nine items; youth problem solving = 0.89, six items; youth pursuit = 0.17, three items; youth career interest = 0.80, seven items; and youth activities = 0.64, six items. Based on the results from the pilot-test, 10 items were removed and minor wording revisions were made to the instrument. Cronbach's *alpha* coefficients were computed for post-hoc reliability: youth challenge = 0.80, six items; youth initiative = 0.76, eight items; youth problem solving = 0.90, six items; youth pursuit = 0.84, three items; youth career interest = 0.78, seven items; and youth activities = 0.74, five items. Based on the Cronbach's alpha coefficients, one item was removed from youth initiative.

Student characteristics were also included as part of the questionnaire. Basic demographic questions included gender, ethnicity, race, and grade. Students were also asked questions about their previous 4-H experience. These questions included the number of years enrolled in 4-H, and the number of years completing animal projects (i.e., beef, sheep, swine, goat, horse, poultry, rabbit, llama/alpaca, and companion animal such as dog/cat).

Because class sections were randomly assigned to the treatment, differences between the treatment or control groups were analyzed. As such, the two groups were compared on five selection variables using independent samples *t*-test because the data met the assumption of normal distribution (Field, 2013). There were no significant differences found between the two groups based on pretest knowledge, gender, standardized test score, Individualized Educational Plan (IEP) status, or free and reduced lunch status. The research project utilized six class periods of eighth grade students. Three classes were in the control group ($N = 42$), and three were in the treatment group ($N = 59$). Of 42 students in the control, 38% were male ($n = 16$) compared to 37% who were male in the treatment ($n = 22$). In the control, 83% of the students ($n = 35$) were white Caucasian compared to 78% ($n = 46$) who were white Caucasian in the treatment group. In the control group, 38% ($n = 16$) did not receive free or reduced lunches compared with 51% ($n = 30$) who did not receive free or reduced lunches in the treatment group. Five percent of the students ($n = 2$) in the control group had an IEP compared to 7% ($n = 4$) with an IEP in the treatment group.

Data were analyzed using the Statistical Package for the Social Sciences. Descriptive statistics were used to analyze the data from the pre-test, post-test, and questionnaire. Means and standard deviations were reported for summated rating scale variables from the EISR questionnaire. Scores from the knowledge test were reported as percentages. Because of the small sample size, significant differences were determined using non-parametric tests. Alpha was set at 0.05, *a priori.* Caution should be used in interpreting the results due to the limited number of participants in the study. Effect sizes were computed for mean differences using Cohen's *d* (1988). Medium effect sizes of 0.33 were interpreted for the knowledge test and 0.50 for the variables representing entrepreneurship intent.

Results

For the first research question, students' knowledge of business management increased from the pretest to the posttest for both the control and treatment groups (Table 2). Students in the control group ($N = 39$) correctly answered 38.14% ($SD = 11.13$) on the pretest and 49.47% ($SD = 13.48$) on the posttest. The control group students' mean difference in knowledge score was 11.33% ($SD = 13.12$), which was statistically significant ($p < .01$) with a large effect size ($d = .92$). In comparison, students in the treatment group ($N = 57$) correctly answered 32.49% ($SD = 10.27$) on the pretest and 48.83% ($SD = 15.69$) on the

posttest. The treatment group students' mean difference in knowledge score was 16.34% (*SD* = 13.41) with a large effect size (*d* = 1.23). There was a significant difference ($p < .01$) with a small effect size (*d* = .39) in the mean difference in posttest knowledge scores between control and treatment groups (5.21%).

Table 2

Means and Standard Deviations of Students' Knowledge of Business Management

Group	*N*	*Pretest*	*Posttest*	*Mean Difference*	*P (d)*
Control	39	38.14% (11.13)	49.47% (13.48)	11.13% (13.12)	<.01 (.92)
Treatment	57	32.49% (10.27)	48.83% (15.69)	16.34% (13.41)	<.01 (1.23)

Related to entrepreneurial intent, there was no significant difference between the control and treatment groups. Eighth grade students in the control group (*M* = 3.18, *SD* = .68) and treatment group (*M* = 3.40, *SD* = .73) "sometimes" agreed they like to face challenges as youth. Students in the control group (*M* = 3.37, *SD* = .58) and treatment group (*M* = 3.49, *SD* = .62) "sometimes" agreed they take initiative as youth. Students in the control group (*M* = 3.77, *SD* = .82) and treatment group (*M* = 3.82, *SD* = .80) "often" consider themselves problem solvers as youth. Students in the control group (*M* = 3.55, *SD* = .72) "often" agreed and treatment group (*M* = 3.34, *SD* = .86) "sometimes" agreed they pursue projects as youth. Students in the control group (*M* = 3.98, *SD* = .70) and treatment group (*M* = 3.98, *SD* = .63) believed that entrepreneurship work-related qualities and characteristics are "quite important" as youth. Students in the control group (*M* = 1.12, *SD* = .98) and treatment group (*M* = 1.24, *SD* = .95) have been involved in one entrepreneurship activity as youth.

Table 3

Means and Standard Deviations of Students' Entrepreneurial Intent

Group	*Group*	*N*	*Mean*	*SD*	*P*
Youth Challenge[1]	Control	41	3.18	.68	.13
	Treatment	57	3.41	.73	
Youth Initiative[1]	Control	41	3.37	.58	.32
	Treatment	57	3.49	.62	
Youth Problem Solving[1]	Control	41	3.77	.82	.77
	Treatment	56	3.82	.80	
Youth Pursuit[1]	Control	41	3.55	.72	.21
	Treatment	56	3.34	.86	
Youth Career Interest[2]	Control	41	3.98	.70	.96
	Treatment	56	3.98	.62	
Youth Activities[3]	Control	41	1.12	.97	.55
	Treatment	56	1.24	.95	

Note: [1]Scale: (1) almost never, (2) rarely, (3) sometimes, (4) often, and (5) almost always; [2]Scale: (1) not important, (2) a little important, (3) somewhat important, (4) quite important, and (5) extremely important. [3]Scale: 0, 1, 2, 3, and 4 or more times.

For the second research question, we did not disaggregate the data into treatment and control comparisons because of the small number of students who had completed at least one year of an animal science project in 4-H. There was no significant difference in post-test business management knowledge between students who had completed at least one year of an animal science project in 4-H and those students who had not. Students who did not complete an animal science project in 4-H (*N* = 74) correctly answered

35.28% (*SD* = 10.99) of the questions on the pre-test and 49.92% (*SD* = 13.77) on the post-test. Students that completed at least one year of an animal science project in 4-H correctly answered 34.72% (*SD* = 11.03) of the questions on the pre-test and 48.33% (*SD* = 17.66) on the post-test.

When analyzing data for students who had completed at least one year of an animal science youth project in 4-H compared to those that did not, there was a difference in entrepreneurial intent among those students (Table 4). Students without any previous 4-H animal science project experience (*M* = 3.23, *SD* = .73) "sometimes" agreed, and students with a year or more experience with a 4-H animal science project (*M* = 3.61, *SD* = .58) "often" agreed they like to face challenges as youth. This was a statistically significant difference at (p = .03; d = .54, medium effect size). Students without any previous 4-H animal science project experience (*M* = 3.36, *SD* = .58) "sometimes" agreed, and students with a year or more experience with a 4-H animal science project (*M* = 3.70, *SD* = .61) "often" agreed they take initiative as youth. This was a statistically significant difference (p = .02; d = .58, medium effect size).

There were no significant differences between youth with no previous 4-H animal science program experience and students with a year or more experience with an 4-H animal science project on the following four variables (i.e., youth problem solving, pursuit, career interest, activities). Students with no previous 4-H animal science project experience (*M* = 3.78, *SD* = .84), and students with a year or more experience with a 4-H animal science project (*M* = 3.85, *SD* = .68) "often" consider themselves problem solvers as youth. Students with no previous 4-H animal science project experience (*M* = 3.46, *SD* = .86), and students with a year or more experience with a 4-H animal science project (*M* = 3.32, *SD* = .65) "sometimes" believed they pursue projects in general as youth. Students with no previous 4-H animal science project experience (*M* = 3.94, *SD* = .63) and, students with a year or more experience with a 4-H animal science project (*M* = 4.06, *SD* = .76) believed that entrepreneurship work-related qualities and characteristics were "quite important" as youth. Students with no previous 4-H animal science project experience (*M* = 1.14, *SD* = .98), and students with a year or more experience with a 4-H animal science project (*M* = 1.45, *SD* = .85) were involved in one entrepreneurship activity as youth.

Table 4

Means and Standard Deviations of Entrepreneurial Intent Based on Animal Science Project Involvement

Variable	4-H Animal Science Project	*N*	*M*	*SD*	*P*
Youth Challenge[1]	No	75	3.23	.73	.03
	Yes	21	3.61	.58	
Youth Initiative[1]	No	75	3.36	.58	.02
	Yes	21	3.70	.61	
Youth Problem Solving[1]	No	74	3.78	.84	.72
	Yes	21	3.85	.68	
Youth Pursuit[1]	No	74	3.46	.86	.49
	Yes	21	3.32	.65	
Youth Career Interest[2]	No	74	3.94	.63	.46
	Yes	21	4.06	.76	
Youth Activities[3]	No	74	1.14	.98	.19
	Yes	21	1.45	.85	

Note. [1]Scale: (1) almost never, (2) rarely, (3) sometimes, (4) often, and (5) almost always; [2]Scale: (1) not important, (2) a little important, (3) somewhat important, (4) quite important, and (5) extremely important. [3]Scale: 0, 1, 2, 3, and 4 or more times.

Conclusions, Implications and Recommendations

Junior high school students taught with an educational simulation (playing a board game using double-entry accounting and computing financial statements) had higher business management knowledge reflected in a large gain in knowledge when compared to students who were taught using a board game and tracked a cash balance. This conclusion supported previous studies that simulations can be effective educational tools to teach junior high school students knowledge and concepts of business management and entrepreneurship (Klassen & Willoughby, 2003; Wawer et al., 2010; Winsted & Graham, 2013). This conclusion also supported that students are engaged in learning using active learning activities that reflect real-life contexts and experiences, and when students think critically and learn deeply through experiential learning activities (Dollisso, 2010; Heinert & Roberts, 2017; Smart & Cappel, 2006). The simulation helped students learn, which suggested it offered students the opportunity to experience a real-life situation, allowed students to execute a range of decision-making strategies in a data-rich environment, and provided students with a mechanism of feedback in the form of changes in the problem or situation (Knobloch, 2005).

Students' entrepreneurship intent was similar after two weeks of participating in a business management unit, regardless if they participated in the simulation unit or board game unit. Both groups (control and treatment) were engaged when playing the board game, which created students' interests in learning how to manage a business (aka, entrepreneurship). While there is a link between entrepreneurship education and future entrepreneurial behavior (Peterman & Kennedy, 2003), this two-week study did not offer enough exposure to entrepreneurship education and development to increase entrepreneurship intent. Related to entrepreneurial intent, there was no significant difference between the control and treatment groups. This was not an expected result, but perhaps playing the board game provided students with experience in managing a business and the differences in accounting were not expressed by eighth grade students within a two-week period of time. Previous studies suggested that entrepreneurial intent can be expressed at an early age, and that early experiences influence later outcomes (Schoon & Duckworth, 2012). Changes in entrepreneurial intent likely take place over a longer period of time than two weeks. Further research is required to determine if the cumulative effect of repeated exposure to entrepreneurial education results in long-term changes in entrepreneurial intent (Peterman & Kennedy, 2003). Moreover, perhaps if students had more time to reflect on the value of the educational experience, their entrepreneurship intent would have been higher. Considering the relational developmental systems meta-theory, Geldolf and colleagues (2014a) explained that multiple experiences are needed to cumulatively predict the development of entrepreneurship in youth. Because youth develop through complex systems through self-creating, self-organizing, and self-regulating processes (Overton, 2013), it takes time to grow and develop cognitively, emotionally, and behaviorally.

Upon completion of the two-week business management unit, junior high school students who completed an animal science project in 4-H had higher entrepreneurship intent regarding youth challenge and youth initiative than their peers who did not complete a 4-H animal science project. This conclusion supports that simulations can help students see opportunities to apply learning in other contexts (Gredler, 2004; Grinder, 1997). Further, this finding supports Eccles and Wigfield's (2002) expectancy value motivation theory, which states youth will be more motivated to engage in a task if the task aligns with their interests (intrinsic value) and goals (utility value). As such, students who had participated in at least one year of a 4-H animal science project were more likely to select challenging goals or goals that others have not considered, more likely to be a self-starter, as well as more likely to have diligence, innovation, and efficiency in goal attainment. These findings align with well-documented research indicating youth develop life and project skills by participating in 4-H animal science projects (Anderson & Karr-Lilienthal, 2011; Cummins & Nash, 2014; Johnson, 2017; Rusk et al., 2003; Smith et al., 2006). Although students in this study identified with youth challenge and youth initiative, they did not have higher business management knowledge after completing the two-week business management unit. Perhaps this reflects that having a 4-H animal science project may provide motivation, relevance and life skill development as reflected in having higher entrepreneurship intent, but 4-H animal science projects may not provide an

understanding of business management knowledge. It may be likely that students' schema of managing a business were similar regardless of having prior experiences of a 4-H animal science project.

Three limitations and recommendations are worth noting. First, the knowledge assessments were originally designed for high school students, which was reflected in students correctly answering about half of the knowledge items. As such, future studies should use knowledge assessments that are better adapted for eighth grade students. Second, the sample size of the study limited the analyses and generalizability. Future studies with more youth, especially with animal science projects, would help determine if there are between group differences in the type of educational experience (i.e., treatment vs. control) and an interaction between youth animal science projects and educational experience. The work done by Geldolf and his colleagues (2014b) indicated that additional longitudinal data is needed to answer the questions of how exactly entrepreneurship develops. Perhaps an opportunity exists for additional research with the students involved in this study to see what other educational and contextual factors influence entrepreneurial intent over time. Third, the brief nature of the unit (i.e., 2 weeks) was not likely long enough to reflect changes in entrepreneurial intent. Future studies should implement entrepreneurial education interventions over a longer period of time to determine if junior high school students' entrepreneurial intent changes because of an educational business management simulation. Because much of the experiential benefit of a simulation takes place during the debriefing phase (Cooper & Grinder, 1997), more time should be spent reflecting about the meaning, process, and value of the simulation (Lunce, 2006; Cooper & Grinder, 1997; Garris, 2002). Finally, the age level of participants might have been a limitation. Double-entry accounting may have been challenging for eighth grade students. As such, this study should be replicated with high school and college students. Entrepreneurship intent may be different for participants who used double-entry accounting because they would be able to analyze their financial statements and make evidence-based decisions. In doing so, they may have a higher entrepreneurial mindset.

This study advanced the knowledge base regarding the types of learning experiences that motivate (or do not motivate) adolescents to take on the challenges of entrepreneurship and support that business management can be learned by junior high school students (Lerner & Damon, 2012). Further, this study could be important to teachers, youth educators, and others interested in fostering entrepreneurial skills in youth. Damon and Lerner (2008) indicated that entrepreneurship education curriculum should emphasize the integration of life both in and out of school. The results of this study can help teachers better understand how to effectively teach entrepreneurship to youth and capitalize on the value of SAEs and 4-H animal science projects.

In summary, a simulation using a board game can increase junior high school students' knowledge about business management in a two-week unit. Furthermore, students learned more in the realistic simulation unit using double-entry accounting and computing financial statements compared to just playing the board game and keeping track of a cash balance. Although students' entrepreneurship intent did not increase after two week of the business management unit, students who had at least one year of managing an animal science project were more likely to face challenges and take initiative than their peers who did not manage an animal science project. As such, agriculture teachers and youth educators should consider leveraging the relevance that animal science projects can create for junior high school youth to learn entrepreneurship and business management. These types of school enrichment programs have the potential to enhance 4-H and SAE experience for youth interested entrepreneurship and agriculture business management. This is an opportunity to develop youth and communities by improving financial literacy, enhancing career development, and potentially sparking new entrepreneurs to start new businesses.

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