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Evaluating Attitudes Toward Non-formal Science Education Programs Among High School Science Teachers in Southeast Louisiana

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EVALUATING ATTITUDES TOWARD NON-FORMAL SCIENCE EDUCATION PROGRAMS AMONG HIGH SCHOOL SCIENCE TEACHERS IN SOUTHEAST LOUISIANA

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Abstract

The Louisiana Department of Education (LDOE) has begun implementing Louisiana Student Standards for Science (LSSS), as well as developing high school science certification programs. The LDOE recognizes that teaching science using three-dimensional learning methods and phenomena based inquiry learning will be a challenge that would be addressed in part by partnerships between formal science teachers and nonformal science education programs. However, limited available information on this topic shows that utilization of nonformal science education opportunities by science educators has declined and, in some instances, have been relegated to unstructured "fun" outings to reward students, often after the final quarter has ended. This study evaluates the attitudes and behaviors among high school science teachers in southeast Louisiana related to the use of nonformal education programs and materials to enhance student outcomes. A thirty-one question survey based on The Theory of Planned Behavior (TBP) was developed to gather data on teacher demographics, teacher attitude, intention, and perceived social pressure to incorporate nonformal education programs in their curriculum. TPB constructs include attitude toward the behavior, subjective norms, perceived behavioral control and intention. The survey was conducted using the Qualtrics program, and data were analyzed using SPSS® version 28 software. Major findings of this study showed a statistically significant positive response related to teacher attitude, intention, and perceived social pressure to incorporate nonformal education programs in their curriculum. Positive perceived behavioral control was found to be less robust, but still favorable. These outcomes suggest that high school science teachers are likely to partner with and utilize materials from nonformal science education providers.

Chapter 1. Introduction

The Louisiana Department of Education (LDOE) is restructuring its science curriculum which presents an opportunity to create stronger bonds between formal and nonformal science education programs in our state. The Louisiana Student Standards for Science (LSSS), which resulted from the 2013 Next Generation Science Standards (NGSS), incorporates three-dimensional learning. Three-dimensional learning consists of student exploration of scientific phenomena, then identification of concepts central to the curriculum, and application of common ideas to describe those phenomena. Additionally, several Science Engineering Technology and Math (STEM) "Pathways" are being developed that will offer high school students' certification upon graduation. The development of the LDOE STEM Environmental Protection and Sustainability Pathway includes verbiage that says they will "Partner with and release guidance on nonformal education opportunities..." (Cowart, 2020, slide 20). This provides an avenue for increased partnership between nonformal science educators and formal learning institutions, i.e., Louisiana high schools. Participation in such programming, however, has been declining. Heck et al. (2012), reported that while inquiry based experiential learning formats show positive results, not much attention is given to nonformal education programs that offer science programming. The Louisiana Department of Education (LDOE) and nonformal science education community have recognized the importance of partnering with nonformal education programs (NFEPs). This study will evaluate the attitudes, awareness, prior experience, motivation, barriers and needs of public-school science teachers in Jefferson and St. Tammany Parishes, in Louisiana regarding NFEPs. This study will aid the LDOE and NFEP community in building a bridge to Louisiana science teachers leading to beneficial and lasting partnerships.

Significance of the Study

The positive effects of nonformal education (NFE) programming on student outcomes have been documented. Sevdalis and Skoumios (2014) reminded readers that "Wellington (1990) found that the atmosphere of informal science learning, which included 'voluntary, unstructured, non-assessed, open-ended, and learner-centered features (p.248) led to increased student interest and learning'" (p. 14). A study by Tabacaru (2018) found that when formal education teachers taught curriculum using nonformal methods, the following outcomes were reported: "educational activities had a great impact on learning outcomes, students demonstrated a more engaging attitude and motivation to the subjects taught" (p.232). Participation by formal educators and administrators of kindergarten-12th grade schools in NFE programs, however, has declined. Greene, Kisida, and Bowen (2014) offer possible reasons for a decline in field trips taken by school groups may be due to limited funding and increased pressures to raise performance on standardized tests. Schools have also begun using school trips as rewards rather than enrichment opportunities. The authors cited a survey taken of 500 teachers in Arkansas in 2012-2013 in which results showed that senior teachers viewed school field trips as enrichment, and junior teachers viewed field trips as fun.

Work by Gonzales and Ortega (2018) and Griffin (2004) reported agreement by teachers on the educational value of NFEPs. However, Gonzalez and Ortega (2018) also found that teacher focus has mostly been placed on logistical considerations when participating in NFE programs and that due to a lack of training, teachers struggle to identify the specific goal and purpose of incorporating NFEP experiences. This causes a lack of connection between the formal and informal learning process. Aguirre & Vasquez (2004) suggest teachers can overcome this by developing related activities such as student investigation of the topic before participation, facilitation of student investigation during the event, and guided student analysis and summary of the topic after the experience.

The aim of this research is to illuminate the connection between formal and nonformal science teachers. It is hoped that doing so will inform formal and nonformal education professionals about how best to increase and strengthen these connections. If teachers and school administrators are to fully take advantage of the available nonformal programming opportunities, they must be aware of these programs and understand how these resources will fit their curriculum. Doing so will create positive attitudes and buy-in towards these programs and build positive relationships with these partners.

Definition of Terms

As the use of NFE programming by formal education teachers is investigated, the definitions of formal, nonformal and informal educational strategies are defined here:

- Formal Education - Compulsory education to which a detailed strategy and curriculum is applied resulting in certification. These include most notably kindergarten – 12th grade schools, technical schools, and colleges and universities (Ainsworth, 2010).
- Nonformal Education - intentional, non-compulsory learning, where "programs are organized for learning, coming to complement, support or as a source of valorization of the learning experiences formally acquired." (Tudor, 2013. p. 822).

- Informal Learning - Unintended learning by individuals participating in new experiences. Examples include "what a person is reading, viewing and listening to, and also in his or her hobbies and social life" (Maarschalk, 1988, Tamir, 1990, and Eshach, 2007, p 172). There is no formal structure, curriculum, certification, or teacher or mediator of discussion.

Study Purpose and Objectives

The purpose of this study was to gauge the intentions of science teachers in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes to incorporate NFEPs into yearly curriculum plans. The objectives of this study were:

1. To describe public high school science teachers in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes using the variables of gender, age, race/ethnicity, years of teaching experience, grades taught this year, parish where respondent teaches, highest level of education, major field of study, number of science courses, and number of nonformal science activities completed;
2. To describe teachers' in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes willingness to incorporate NFEPs, perceived subjective norms about incorporating NFEPs, perceived behavioral control to incorporate NFEPs, and intention to incorporate NFEPs;
3. To determine if differences existed in teachers' in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes willingness to incorporate NFEPs, perceived subjective norms about incorporating NFEPs, perceived behavioral control to incorporate NFEPs,

and intention to incorporate NFEPs based on the variables of gender, race, place of employment, and level of education;

4. To determine if relationships existed between teachers' in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes willingness to implement NFEPs, subjective norms about using NFEPs, perceived behavioral control to incorporate NFEPs, intention to incorporate NFEPs, gender, age, years of teaching experience, race, level of education, and parish in which they taught.

This study investigated the current climate and attitudes among science teachers in Jefferson and St Tammany Parishes, in Louisiana toward incorporating and promoting science based NFEP opportunities. Doing so sheds light on the steps NFEP administrators, the LDOE, school administrators, and teachers can take to build participation and stronger partnerships in the future.

Limitations

Because this study had a small sample size and was limited in geographic range, these results cannot be broadly generalized to science teachers.

Chapter 2. Review of Literature

This review of literature serves to provide a foundational structure for this study. It offers a historical and contemporary review of science education in the United States, including legislation and practices. Additional discussion examines the connections between formal and nonformal science education and its relevance to changes in Louisiana science curriculum. Unfortunately, research assessing the connections between formal and informal science providers is limited. Most studies focus on one day class field trips to museums. Furthermore, as this study strives to illuminate key factors that predict decisions by formal science teachers to partner with nonformal science education providers, a review of relevant theories related to attitude and behavioral changes are also provided.

Science Literacy

Educational professionals, such as researchers and policy makers, regularly strive to quantify what constitutes scientific literacy to meet the needs of society. This framework helps to build educational goals and guide instruction. In 1989, the American Association for the Advancement of Science asserted that citizens should be able to apply scientific knowledge for "personal and social purposes" (Introduction, para 26). The association asserts that this can be accomplished by instilling the following foundational components: an understanding of the natural world and its interconnectedness; math, technology and science rely on each other and are human enterprises; key scientific concepts and principals; scientific ways of thinking; strengths and limitations of science. Additionally, Ainsworth (2010), reported that scientific literacy affords the understanding of "potential possibilities and potential abuses" (p. 18). In this way, science literacy aids individuals in advocating for their own interests and the good of society.

Types of Learning

The process required for achieving science literacy requires multiple styles of learning. Three types have been identified: formal, nonformal, and informal learning. Formal education is systematic and stems from an organized educational model where laws and norms dictate structure and methods. Curriculum is rigid in objectives, methodology and content (Melnic & Botez, 2014). Hence, formal education can be found in institutions offering set curriculum where learning goals and pace of instruction are pre-determined. Knowledge gained is evaluated through testing, where successful completion results in diplomas, degrees, or certifications. Publications by Rata, Dobrescu, Rata, and Rata (2013), Tabacaru (2018), and Widodo (2020) define nonformal education by the following features: learning that occurs outside the institution, is organized and systematic, and covers selected topics which serve varying subgroups. Melnic and Botez (2014) define it as education where; time is not a factor, attendance is not required, contact between teacher and student is decreased, i.e., teacher acts as a facilitator, and methods of instruction and curriculum are flexible and adaptable to the needs and interest of the students. Nonformal science learning operates in the realm of student-centered science investigation, which encompasses the inquiry learning teachers are being encouraged to incorporate. Jeanpierre (2006) reported that though the definition has not been formalized, "...science educators and scientists alike would agree that there are specific habits and processes that are pertinent in the inquiry process which models the work of scientists" (p.18). An example includes the 4-H youth development program, whose nonformal educational framework rests on the experiential learning model published by Kolb in 1984. This model is inquiry-based and consists of four stages involving students in the scientific process, by asking them to: conceptualize a particular abstract scientific phenomenon, contribute to active experimentation, participate in concrete experiences, and thoughtfully observe and reflect upon their experience. Nonformal education encompasses a wide range of programs for youth, adults, and families. They can include after school sports and arts programs, out-of-school day field trips, in-school visits by an outside nonformal educator, overnight camps, family visits to museums, aquariums, living history sites, and teacher professional development amongst others. Informal education occurs over a lifetime and generally comes from personal daily experiences (Rata et. al., 2013; Tabacaru, 2018). The Organization for Economic Cooperation and Development (2007) and Ainsworth (2010) characterize it as spontaneous learning that is often experiential. This type of learning happens from birth and occurs throughout one's life.

Efficacy of Learning Types

There have been conflicting views among researchers regarding which type of learning is most effective. Most education professionals agreed that the systematic application of formal education is a necessary component for education. Miller (2006) discussed its importance as a foundation for lifelong learning. Nevertheless, Tabacaru (2018) asserted that youth in formal school settings "seem not to enjoy and the majority of them develop an attitude of disengagement" (p.229). Others support the position of *deschooling society*, which makes the assertion that mastery occurs in settings which are student centered and participatory. This notion is supported by evidence that shows information that is investigated intrinsically (i.e., by interest of the student) is enjoyed more and has more successful outcomes than does extrinsic (i.e., delivery of pre-determined sets of information by the educator).

Inquiry-based science education adds layers of participation resulting in cognitive independence as it allows one to critically evaluate information and problem solve. Ibanez and Vincent (2012) and Gonzalez and Ortega (2018) reported that student learning experiences occurring in real life contexts, outside of school, result in more successful educational outcomes and increased interest. These ideas go back to Dewey (1909), who advocated for practice which invites students to participate in, and experience scientific phenomena firsthand, as opposed to students acting as passive observers. This style of teaching aligns with nonformal programs.

Acts and standards – changes through time

Because of a growing choir of voices which advocated for a blend of these practices. Researchers and policy makers have encouraged formal education bodies to validate, support, and incorporate student centered, experiential, nonformal learning strategies and programs for at least the last three decades.

In 1996, the National Science Education Standards (NSES) by the National Research Council (NRC) encouraged teachers to utilize an array of tools and methods for instruction, including the practice of inquiry, and stated that "Inquiry is central to science learning" (p. 2). The NRC described the process of inquiry learning as being similar to the steps of the scientific method, i.e., students describing a scientific phenomenon, generating questions and possible explanations, testing those explanations, and presenting their ideas and findings to others. The NSES also asserted that "school science programs must extend beyond the walls of the school to include the resources of the community" (Sevdalis and Skoumios, 2014, p. 14). The National

Science Teacher Association (NSTA) posited that nonformal learning positively influences engagement and curiosity in science that lasts forever (NSTA, Informal Science Advisory Board, 1998).

In 2013, the1996 NSES were replaced by the Next Generation Science Standards (NGSS). The NGSS drastically changed the framework for teaching science. First, the practice of science is incorporated on a much greater scale. The Grade Level Expectations or GLE's of the NES focused primarily on teacher-based instruction, where many concepts were presented, but lacked student investigation and opportunities for deep content knowledge.

The NGSS restructured how science is taught by focusing on 5E and 3-Dimensional learning. The 3 Dimensional or 3-D learning model helped to provide a framework for instruction. 3-D learning incorporates inquiry learning and consists of practice, cross-cutting concepts, and disciplinary core ideas. Using phenomena, i.e., "something that exists and can be seen felt tasted etc. especially something new or interesting", (Cambridge Dictionary, 2021), science teachers present a problem or question to be answered. Phenomena can also act as a 'hook' to excite and engage students in the next stages of learning. Students then generate questions about the phenomena. To answer these questions, students apply current knowledge from varied disciplines. Teachers help guide students to the disciplinary core idea or cross-cutting concept. 5E learning directs teachers to aid students in engaging, exploring, explaining, elaborating, and evaluating science and engineering concepts.

Contrary to research, legislation such as the No Child Left Behind Act (U.S. Department of Education, 2002), and Every Student Succeeds Act (U.S. Department of Education, 2015), evaluates district, teacher and student outcomes with high stakes standardized testing.

Researchers report that the implementation of standardized testing and resulting accountability measures often result in instructional practices that stand in stark contrast to teaching methods advocated by the NSES (Aydeniz & Southerland, 2012). According to Darling-Hammond & Adamson, (2010) teachers rely on 'teach to the test' instruction methods to boost scores on standardized tests. "This emphasis on increasing students' test scores undermine reform efforts that encourage science teachers to use assessments that are aligned with the instructional goals promoted by the science education reform documents such as the National Science Education Standards [NSES] (NRC, 1996) (Aydeniz, 2007; Madden, 2008)" (Aydeniz & Southerland, 2012 p. 234).

Educational outcomes

Unfortunately, little had changed, and science education outcomes have been abysmal. In 2015, U.S. science scores were ranked 23rd among 15-year-old students in developed nations (DeSilver, 2017). Within the U.S., Louisiana student science scores consistently rank among the lowest. In 2011, Louisiana's 8th grade science scores were tied with six other states for the rank of 44th (U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress, 2011). "The Louisiana State Report Card 2020-2021" reported that out of the 98.5% public school students assessed, 47% scored Below Basic in science (Louisiana Department of Education, 2022). Additionally, educational experts have weighed in, asserting that modern workforce needs dictate the demand for new skill sets. Tudor (2013) and Melnic and Botez (2014) assert that the ever changing information age requires workers to not only master concepts but to be successful in making "rapid adjustment", i.e., "moving from a set of knowledge and information to competencies (to know how to do/ how to act) to learning through experience/practice...” (Tudor, 2013, p. 821). Likewise, Tabacaru (2018) asserted that change has become the norm in modern working life referring to the adaptation to technological advances and the decrease in likelihood of professionals to stay with one company throughout their working life.

New Directions in Science Education

As a result, educational decision makers in Louisiana have now formally incorporated inquiry based learning into curriculum and advocated for partnership with nonformal education programs (Cowart, 2020). Institutions such as museums, nature centers, aquariums, and even universities have continued to develop inquiry-based, nonformal educational programs even as the trend has shifted away from them (Greene et al., 2014).

As the Louisiana Department of Education adopted the NGSS and created the LSSS, efforts were also made to create career pathways for high school students. The career pathways were designed to prepare students for entrance into local industry or post-secondary education with a focus on growing industries throughout the state (Louisiana Department of Education, n.d.). The first iteration, Jump Start, was created in 2014, with an updated version, Jump Start 2.0 being released in 2018 (Advance CTE, 2016). To develop Louisiana’s Jump Start Program or Career and Technical Education Program (CTE) the LDOE requested input from formal educators, industry leaders, and institutions of higher learning (Advance CTE, 2016). Connection to the LSSS objectives is apparent through the STEM pathway goals of providing students hands-on experiences, practice of math and science with integrated experiences, and completion of 4 to 8 courses focusing on high demand skills (Cowart, 2020). Graduates participating in the program receive a “Career Diploma” (Louisiana Department of Education, n.d.). The relevance to this study cannot be understated as the LDOE includes in its environmental education initiatives, their intention to "Partner with and release guidance on nonformal education opportunities" (Cowart, 2020). As such, efforts are underway by the LDOE to create a database of nonformal education resources of the state. Industry leaders can provide guidance on training for in demand jobs and on-site real world experiences.

Inquiry Practices of Teachers

The results of a longitudinal study by Jeanpierre regarding the implementation of inquiry-based science teaching were published in 2006. Though teachers self-reported facilitating 'full' inquiry learning, survey questions revealed the opposite. Chinn and Malhotra (2002) reported that science "simple inquiry" is the most common method of science teaching. Simple inquiry jumps from the introduction of a topic or phenomena to the conclusion, not allowing for student involvement in the scientific process which gives a false view of how science is practiced. This is indicative of classical formal education techniques where teachers impart information to be learned and outcomes are assessed within set structures and time constraints.

A study from Greece done by Sevdalis and Skoumios (2014), found that the most common nonformal education components used by teachers was the in-class use of print, video, and internet sources. The authors cite difficulties in connecting with outside institutions. This difficulty is also highly likely in other countries, including the United States.

Teaching science using inquiry-based methods may be challenging for teachers if they have not had opportunities to practice and hone such methods. Jeanpierre (2006) suggested that teachers begin practicing partial inquiry. 'Partial' inquiry includes the opportunity for students to practice a few elements of full inquiry which includes "developing their own questions, designing their own experiments, analyzing an array of data, and drawing and reporting conclusions” (p. 64) Further, he asserts that teachers who lack deep content knowledge may also have difficulties leading students in inquiry-based learning. Nonformal learning programs, however, have been using these models for some time and are well situated to support formal learning as well as provide training to pre- and in-service teachers.

Tabacaru (2018) conducted a study to ascertain what changes in learning outcomes would occur by switching to nonformal inquiry-based delivery methods for a week in a Romanian school. Both teachers and students were surveyed after the program. Teacher observations included increases in positive attitude, participation, and positive educational outcomes such as improved ability to recall details. Students self-reported other types of benefits mostly focusing on personal, social, and cognitive benefits. Both teachers and students agreed that the change in delivery mode facilitated opportunities to explore the physical world and the inner world of self-discovery.

Theoretical Foundations of Nonformal Learning

Much of the research supporting nonformal education is dependent on studies focused on how people learn. Student centered, participatory learning, is backed by the social science theory of constructivism, which has become widely accepted in the field of education. Constructivism asserts that knowledge stems from the experiences and perspective of the individual, therefore, how knowledge is created is unique. Schwandt (1998) offered that truth is not discovered but created. Goodman and Eglin (1998) succinctly made this point reporting that knowledge begins “from what happens to be currently adopted and processed to integrate and organize, weed out and supplement, not in order to arrive at truth about something already made but in order to make something right- to construct something that works cognitively that fits together and handles new cases, that may implement further inquiry and investigation" (Schwandt, 1998, p. 239). Its foundations come from Piaget, who in 1971, advocated for cognitive constructivism, that is, learners refine, organize, and apply new information to connect with current knowledge. This does mean that learning happens in a vacuum of interpersonal relationships. Socioconstructivists reported that the situation is quite the opposite. They posit that "knowing" is a product of culture and socialization (Vygotsky, 1978), hence, learning is a social process. Gilbert and Priest (1997) applied these notions to how students are taught. They reported that the educator should facilitate focused conversation on a topic allowing for dialogue between students and the sharing of prior experiences or relationships and synthesis of new information. Educational researchers such as Eshach (2006) asserted that these necessary elements of learning are perfectly suited to nonformal education learning environments, as open dialogue and teamwork is typically encouraged.

Participation in Nonformal Education

Nonformal educational activities come in many forms and can be facilitated by parents and or schools. Families can enroll their children outside of school time in programs such as sports, arts, 4-H, Boy Scouts, Girl Scouts, libraries, community center-based programs, as well as visiting museums, zoos, and nature centers. Family supported, nonformal education activities often require additional time, transportation, and funds. One common example-is after school sport programs that require enrollment fees, uniforms, equipment, and transportation. Weekend visits to museums, cultural centers and the like often require entrance fees for the entire family, along with food, and travel costs. Not all families are able to provide these experiences.

Therefore, some have pointed to school organized out of class nonformal education experiences "the great equalizer" (Green et al., 2014, p.79).

School facilitated nonformal opportunities can include field trips to local nature centers, aquariums or museums, scientific field work experiences. They can also utilize inquiry-based curriculum developed by nonformal educators by bringing guest speakers and other local resources to the classroom. Youker (2002) reported the incorporation of nonformal education within formal education frameworks, which are highly structured and slow to change, are most often controlled by the teacher. Likewise, Hirzy (1996) asserted that teachers most often decide if partnerships are formed with outside institutions. In recognizing that decisions to use inquiry based and nonformal educational experiences and materials are largely decided by individual teachers, it is useful to look at why some teachers incorporate such methods.

Kisiel (2005) surveyed teachers who have incorporated nonformal educational resources to discover their motivations and beliefs. He reported that teachers recognized the following benefits: strengthening and relating concepts delivered in curriculum; new learning experiences; change in setting and routine, which creates interest, excitement and memorable experiences; and creation of positive relationships to lifelong learning. Student enjoyment, reward, and school requirements were also mentioned. Further, several studies (Pedretti, 2002; Ramey-Gassert, Walberg, & Walberg, 1994), asserted that field trip experiences can instill "a sense of wonder, interest, enthusiasm, motivation, and eagerness to learn, which are much neglected in traditional formal school science" (Eshach, 2006, p.178). Michie (1998), added that opportunities to connect classroom concepts to real-life scientific work through hands-on experiences is something they cannot get at school.

Though some educators see the benefits, others do not see the need or are uncomfortable and unfamiliar about how to incorporate such experiences. Some teachers experience apprehension towards field trips, including keeping the group together, presenting a positive view of their school, being unfamiliar with the site, and answering student questions in an unfamiliar setting (Eshach, 2006). This may be the result of a lack of teacher training when it comes to implementation. Gonzalez and Ortega (2018) reported that teachers who participated in their study had never received training in utilizing nonformal education programs. As such, Griffin and Symington (1997), pointed out that teachers did not formulate goals for the field trip and its connection to classroom curriculum. They further stated that teachers did not make use of the differing learning environments and were unfamiliar with the learning programs the site had to offer. Pre trip logistical planning can be daunting on its own as it usually includes securing permission from administration and parents, finding substitutes, preparing lessons to be delivered in their absence, securing transportation, contacting the site, careful time management, ensuring student safety, and correlating site visit activities to school curriculum.

A study from Chile, Gonzalez and Ortega (2018), asked what the attitudes of teachers towards nonformal education are and what if any changes occur after participating in a nonformal education training program. Researchers discovered that before participating in the training, the teachers focus centered on previous experiences, administrative responsibilities, and the behavior of students. They also see these experiences as "playful and entertaining" (Gonzalez and Ortega, 2018, p. 57). Opportunities for formative observation i.e., observing how students learn in the moment, were also cited. Teachers viewed their role in the educational experience as largely passive and that nonformal educational sites and schools were separate entities. After the training, teachers still agreed that the experiences were playful and entertaining, and accounted for administrative duties, but newly recognized a greater potential for learning. They saw their role not as passive, but active as they reconstructed their roles to creating materials that connect class curriculum to site offerings (Gonzalez and Ortega, 2018). As nonformal educational programs and materials are largely inquiry based, engaging teachers and students in these programs would be highly beneficial.

Reward Based Field Trips

Some schools have begun using out-of-classroom experiences not as a learning opportunity, but as a reward after attaining higher testing scores or positive behavior. The field trip reward system is often separated by a generation of teachers, stating that "...those who had been teaching for at least 15 years were significantly more likely to believe the primary purpose of a field trip is to provide a learning opportunity, while more junior teachers were more likely to see the primary purpose as 'enjoyment'." (Greene et al., 2014, p. 80). As a result, museums reported a significant decrease in traffic from school groups, citing a 30% decrease in attendance by art institutions in Cincinnati, Ohio during the years 2002 and 2007. (Greene et.al., 2014).

Arguments Against Combining Formal and Informal Education

It should be mentioned here that not all educational researchers are in favor of school supported out of class learning. Shortland (1987) asserted that "when education and entertainment are brought together under the same roof, education will be the loser" (p. 213). He asserted that many visitors do not take the time to read the information associated with it or listen to the educator's explanation. This may be the case, though he advocates for science centers to present a more realistic view of science. Champaign (1975) offered a similar argument after visiting a new science museum in Ontario, Canada. He described a new building with family friendly amenities and high-end exhibits, displays, and movies. Champaign asserted that the demonstrations, although captivating, were lacking in the true meaning of science. He stated that science is a process of asking questions then finding the answers. Champaign asserts that true science will: develop questions, set problems, discover relationships, evaluate cause and effect and will operate on a methodological or conceptual scheme. This process is not conveyed to the visitor, but, he argued is more interesting than “showing the unconnected and mysterious magic of science products” (Champagne, 1975, p.37).

The implementation of nonformal education programs and even the certification of the educators is not standardized. This may result in vastly different experiences and sometimes unmet expectations. Feedback is critical, as it allows for nonformal institutions to make improvements as well as educating teachers on potential pitfalls and the benefits of pre-site visits and planning.

Research based on these negative experiences has aided in the creation of recommendations and sets of best practices for both teachers and informal educators. Eschach (2006) supported the notion that teachers should; identify a purpose and goal for the trip, conduct a pre-trip site visit and meet with onsite educators, communicate the purpose and expectations to the students;, familiarize students with the agenda and site through the organizations website, conduct related activities in the classroom before the trip, develop tasks for the students to accomplish while at the site, invite and share information with parents including related activities to be done at home, and familiarize students with onsite educators by inviting them to present pre-trip activities in the classroom before the trip. Eshach (2006) also advocated for the development of courses for teachers “to increase awareness of what out-of-school learning environments may offer and second, to teach them how to execute scientific field trips more effectively” (p. 188). Further, researchers have identified the following elements as increasing the likelihood of teachers facilitating off site field trips: previous positive experience at the site, freedom to choose site, and positive effects of learning on students.

Quantifying Teacher Attitude

How can educational researchers predict and encourage the adoption of new standards? Studies focusing on the implementation of educational shifts related to teacher attitude provide some insight. A critical aspect to any change in teaching methods or content is the attitudes and perception of teachers. Research shows that teachers are most successful integrating materials and methods which align with their conceptions. Therefore, the practices of teachers are dictated by their attitude and beliefs. Attitude can be defined as the formation of opinions attached to phenomena that dictate the response to them, (Pratt, 1992). Another definition asserted that “Attitude change may be defined as a process of transformation, alteration, or reorientation of the general attitudes of an individual or group, by modifying the elements or rapports that favored their original formation” (Anghelache & Bentea, 2012, p. 599). Most can identify from personal experience that a positive attitude towards a task is more likely to produce a positive outcome. Attitude is also contagious. Rhoton and Shane (2006) found that teacher enthusiasm, regardless of content knowledge, can positively influence a student's perception of science.

Research into the conceptions of teachers towards inquiry learning and nonformal education programming has not been addressed. “Therefore, there is an emerging necessity for systematically studying teachers’ conceptions (in both primary and secondary public and private education) about all forms of nonformal and informal science learning" (Sevdalis & Skoumios, 2014, p. 14). This has implications as the results of these studies would inform pre-service and professional development teacher training.

Theories Predicting Adoption

Since it is evident that the attitude and behavior of teachers toward adopting educational change is critically important to successful implementation, the need arises to predict and quantify these personal characteristics. The foundations of this work lie in psychological attitude and behavior theories. Fishbein and Ajzen (1975) theorized that behaviors arise from intentions and that intentions evolve from personal nature and social behavior influences. This chain of reasoning formed the Theory of Reasoned Action (TRA), whereby if an individual's personal nature is positive towards incorporating novel methods and social pressures are felt, they are more likely to adopt the new practices. Zint (2002) reported that after testing this theory, the results were supportive of TRA, however personal nature was shown to be a stronger influence than perceived social pressures. As research progressed Ajzen (1991) used the terms 'attitude toward behavior and 'subjective norms' in place of 'personal nature' and 'social behavior' respectively and added the construct of perceived behavioral control. Perceived behavioral control is an individual's perception regarding how easy or hard it is to acquire the desired behavior. However, he noted that it differs from Bandura's concept of "self-efficacy", in that it includes an individual's past experiences and expected success or failure in completing tasks required to perform a behavior. See figure 1.

Theory of Planned Behavior

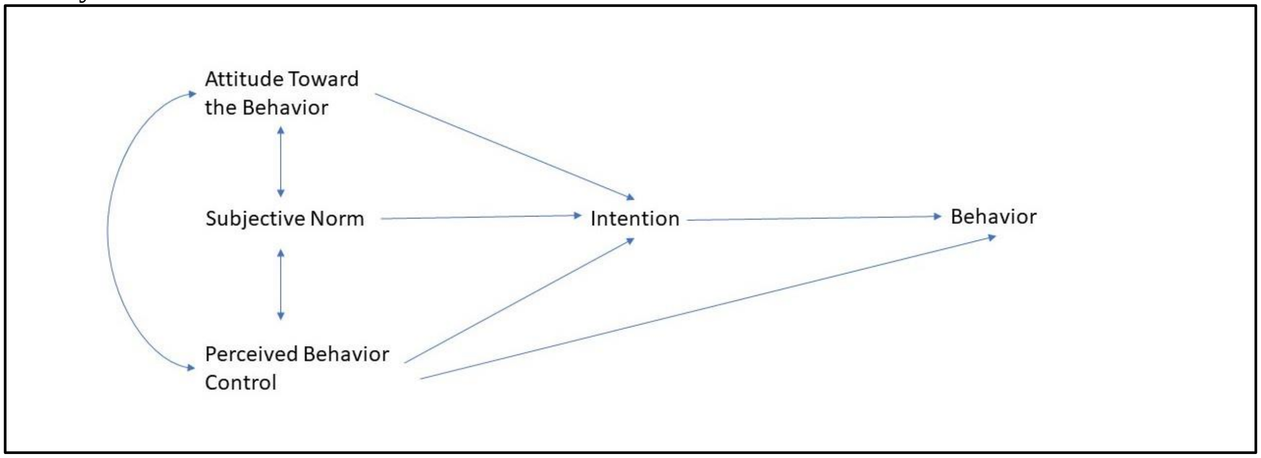

Figure 1. Theory of Planned Behavior *Source:* Adapted from Ajzen (1991)

The theory of reasoned action has stood the test of time with multiple researchers supporting data resulting from the construct. Ajzen (1991) notes that some situations may not require the element of perceived behavior control if there is no question to the access or resources an individual has. Conversely, if it is an unknown, data shows the more accurately it is assessed, the more likely predicted outcomes parallel reality (Ajzen, 1991).

Conclusion

As researchers make new discoveries about how people learn and what students need to know to meet ever-changing societal needs, enhancing our education system to prepare students for the future is imperative. The adoption and implementation of inquiry based learning, and partnerships with nonformal educational programs will help to facilitate the necessary changes. Working with teachers to assess their attitudes, current practices, potential barriers, and needs, decision makers can plan how best to help teachers, nonformal educators, and other community partners to work together successfully.

Chapter 3. Methods

The purpose of this study was to gauge the intentions of science teachers in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes to incorporate NFEPs into yearly curriculum plans. This study was descriptive and correlational, seeking to describe teacher attitudes and to determine if associations existed among attitudinal variables (Kumar, 2011).

Population and Sample

In this study, the target and accessible populations included public high school science teachers in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes in southeast Louisiana. For the purposes of this study, an urban parish was defined as one with 50,000 or more residents. Religious and privately owned schools in the parishes were excluded from this study. There was a total of 58 high schools with 232 science teaching faculty in the five parishes. The number of science teaching faculty was based on information publicly available on district websites. Emails were delivered to 58 principals who sent the survey to their science faculty members. Responses were garnered from 27 teachers for a response rate of 11.6%.

Instrumentation

For this study, information about the characteristics of high school science teachers in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes and their attitude toward and use of nonformal education materials was collected. The attitude survey (see Appendix A) was developed using Ajzen’s theory of planned behavior. Twenty-one survey statements were created to assess the following: willingness to incorporate NFEPs, perceived subjective norms about incorporating NFEPs, perceived behavioral control to incorporate NFEPs, and intention to incorporate NFEPs. Because the response rate was low, construct validity for the survey could not be assessed. Participants were offered 6 Likert-type response options for the attitude items: 1 = strongly disagree; 2 = disagree; 3 = slightly disagree; 4 = slightly agree; 5 = agree; 6 = strongly agree.

Willingness to incorporate NFEPs was defined as a person's willingness to use nonformal education programs to supplement their formal education plans. The construct consisted of five items. Cronbach's alpha reliability for this construct was 0.49. An example item was "I am willing to incorporate nonformal education programs into my class curriculum to enhance inquiry learning."

Perceived behavior control to incorporate NFEPs was defined as teachers' beliefs about their ability to incorporate NFEPs and use NFEP materials in their programs. The construct consisted of five items. Cronbach's alpha reliability for this construct was 0.83. An example item was "I am confident that I have the time to work with nonformal educators."

Perceived subjective norms about incorporating NFEPs was defined as the social pressures an individual perceives, whether real or imagined, related to the use of NFEPs. The construct consisted of five items. Cronbach's alpha reliability for this construct was 0.87. An example item was "Most teachers I respect participate in nonformal education programs."

Intention to incorporate NFEPs was defined as an individual's drive or will to incorporate NFEPs. The construct consisted of six items. Cronbach's alpha reliability for this construct was 0.96. An example item was "I plan to spend time investigating nonformal science education resources in my area."

The demographic survey items collected data on participant's gender, race, grade taught, highest degree completed, field of study using closed-ended questions. Open-ended questions were used to collect information on age, years of teaching experience, parish in which they taught, number of college courses completed in the sciences, and number of nonformal based science activities they completed with students in 2019-2020.

Data Collection

The study was approved by LSU AgCenter IRB (see Appendix B). Data collection began by sending an introductory message to high school principals via e-mail to explain the project. Principals were asked to forward a letter that described the study and that asked the high school science teachers to complete a survey via the provided Qualtrics link. The letter included detailed information on the project such as the study background, assurance of respondent anonymity, and estimated time of completion. To help increase the response rate, at the conclusion of the survey teachers were offered a link to a separate website where they could enter a drawing for a $400.00 Visa gift card. The standalone website created for the drawing ensured that personal information of the participants was isolated from survey responses.

The steps in collecting data included the following:

- High school principals in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes were contacted and provided an introductory message, explaining study purpose, format, and timeline. The researcher's contact information was also included, encouraging them to reach out if they had any questions or concerns.
- Principals were asked to forward an introductory message and survey link to their science teachers.

- Teachers used the Qualtrics link to access and complete the survey. If they chose to, they used a different link that was embedded at the end of the research study survey to go to another site to provide their contact information for the gift card drawing.
- After the initial request was sent to high school principals on April 5, 2022, follow up emails were sent on May 28, 2022, and August 8, 2022.

Data Analysis

Data were analyzed using SPSS® version 28. For objectives one and two, descriptive statistics were used including frequency, percentage, minimum, maximum, mean, and standard deviation, as appropriate for the data. For objective three, Mann-Whitney U was used, the non-parametric equivalent of an independent sample *t*-test, because of the extremely small sample size. For objective four, Pearson's *r* and point-biserial correlations were used as appropriate for the data.

Chapter 4. Results

Objective One Results

The purpose of objective one was to describe public high school science teachers in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes using the variables of gender, age, race/ethnicity, years of teaching experience, grades taught this year, parish where respondent teaches, highest level of education, major field of study, number of science courses, and number of nonformal science activities completed. Of the 27 respondents, most identified themselves as female (*n* = 17; 65.4%) (see Table 1). The age of respondents ranged from 23 – 59 (*M* = 37.50; *SD* = 9.88). The majority of high school teachers were white (*n*-= 14; 58.3%), with Black, Hispanic, Asian, and other also being represented. Years of teaching experience varied from one to twenty-six years (*M* = 8.35; *SD* = 6.82). Most respondents reported teaching 11th grade, followed by 9th grade and equal numbers for 10th and 12th grades. Jefferson parish teachers led responses (*n* = 11; 40.7%), while Tangipahoa parish had the least (*n* = 1; 3.7%). The highest level of education reached for most teachers was bachelor's degree (B.A., B.S.) (*n* = 17; 63%), followed by master's degree (M.A., M.S.) (*n* = 8; 29.6%). Science was most often listed as the major field of study (*n* = 15; 55.6%). Most teachers reported that they have completed 10 or more courses in the sciences (*n* = 20; 74.1%). The largest percentage of respondents had not completed any nonformal science activities with their students that year (*n* = 7; 26.9%).

Table 1. Demographic Characteristics of High School Science Teacher Participants

Characteristics	*f*	%
Gender		
Female	17	65.4
Male	8	30.8
Nonbinary	1	3.8

(table cont'd)

Characteristics	*f*	%
Total	26	100.0
Race[b]		
White	14	58.3
Black	6	25.0
Hispanic	2	8.3
Asian	1	4.2
Other	1	4.2
Total	24	100.0
Grades Taught This Year[c]		
9th	16	
10th	14	
11th	19	
12th	14	
Parish Where Respondent Teaches		
Jefferson	11	40.7
Orleans	10	37.0
Livingston	3	11.1
Ascension	2	7.4
Tangipahoa	1	3.7
Total	27	100.0
Highest Level of Education		
Bachelor’s degree (B.A., B.S.)	17	63.0
Master’s degree (M.A., M.S.)	8	29.6
Other (please specify)	2	7.4
Total	27	100.0
Major Field of Study		
Science	15	55.6
Education	3	11.1
English	1	3.7
History/Social Studies	1	3.7
Other (please specify)	7	25.9
Total	27	100.0
Number of Science Courses		
0	3	11.1
3	1	3.7
4	1	3.7
6	1	3.7
7	1	3.7
10 or more	20	74.1
Total	27	100.0

(table cont’d)

Characteristics	*f*	%
Nonformal Science Activities Completed[d]		
0	7	26.9
1	6	23.1
2	2	7.7
3	4	15.4
4	2	7.7
5	1	3.8
6	1	3.8
8 or more	3	11.5
Total	26	100.0

[a]There was one survey participant with missing data.
[b]There were three survey participants with missing data.
[c]Participants could select multiple responses.
[d]There was one survey participant with missing data

Objective Two Results

The purpose of objective two was to describe teachers' in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes willingness to incorporate NFEPs, perceived subjective norms about incorporating NFEPs, perceived behavioral control to incorporate NFEPs, and intention to incorporate NFEPs. Respondents indicated that they mostly intend to incorporate NFEPs in their classroom (M = 4.64; SD = 1.21), and that perceived subjective norms, or perceived social pressure, were mostly favorable towards incorporating these materials (M = 4.53; SD = 1.10), (see Table 2). The attitude of teachers toward incorporating NFEPs was highly favorable (M = 5.34; SD = 0.54), while perceived behavioral control (PBC) to implement NFEPs was slightly above moderate.

Table 2. Teachers' attitude toward incorporating NFEP's into their classroom

Factor	*N*	Minimum *M*	Maximum *M*	*M*	*SD*
Intention to Incorporate NFEPs	27	2.00	6.00	4.64	1.21
Perceived Subjective Norm about Incorporating NFEPs	27	2.67	6.00	4.53	1.10
Willingness to Incorporate NFEPs	27	4.20	6.00	5.34	0.54
Perceived Behavioral Control about Incorporating NFEPs	27	2.00	6.00	4.53	1.15

Note. Mean values for willingness to incorporate NFEPs, perceived subjective norms about incorporating NFEPs, perceived behavioral control to incorporate NFEPs, and intention to incorporate NFEPs were based on 6-point Likert-type 1=Strongly Disagree, 2=Disagree, 3=Slightly Disagree, 4=Slightly Agree, 5=Agree, 6=Strongly Agree.
Real Limits: 1.00 – 1.83 = Strongly Disagree; 1.84 – 2.66 = Disagree; 2.67 – 3.50 = Slightly Disagree; 3.51 – 4.33 = Slightly Agree; 4.34 – 5.16 = Agree; 5.17 – 6.00 = Strongly Agree

Objective Three Results

The purpose of objective three was to determine if differences existed in teachers in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes willingness to incorporate NFEPs, perceived subjective norms about incorporating NFEPs, perceived behavioral control to incorporate NFEPs, intention to incorporate NFEPs based on the variables of gender, race, place of employment, and level of education. Because of the small number of respondents, race was recoded into two categories (white and black, indigenous, or people of color), education was recoded to include only those with a bachelor's or master's degree, and parish was recoded to only include those individuals from Jefferson and Orleans parishes.

The perception of teachers with bachelor's degrees (*Mdn* = 5.00) of their perceived control to incorporate NFEPs was significantly different from that of teachers with Master's degrees (*Mdn* = 3.88, $U = 32.00$, $Z = -2.12$, $p = .04$, $r = 0.45$). This is a median effect size (Cohen, 1988). The intention of teachers with bachelor's degrees (*Mdn* = 5.25) to incorporate

NFEPs was significantly different from that of teachers with master's degrees (*Mdn* = 4.00, U = 32.50, Z = -2.08, p = .04, r = 0.44). This is a median effect size (Cohen, 1988).

There was no statistically significant difference between willingness to incorporate NFEPS and gender, race, place of employment, or level of education; perceived subjective norms about incorporating NFEPs and gender, race, place of employment, or level of education; perceived behavioral control to incorporate NFEPs and gender, race, or place of employment; and intention to incorporate NFEPs and gender, race, or place of employment.

Objective Four Results

The purpose of the fourth objective was to determine if relationships existed between teachers' in Ascension, Jefferson, Livingston, Orleans, and Tangipahoa parishes willingness to incorporate NFEPs, subjective norms about incorporating NFEPs, perceived behavioral control to incorporate NFEPs, intention to incorporate NFEPs, gender, age, years of teaching experience, race, level of education, and parish in which they taught. Because of the small number of respondents, for this objective race was recoded into two categories (white and black, indigenous, or people of color), education was recoded to include only those with a bachelor's or master's degree, and parish was recoded to only include those individuals from Jefferson and Orleans parishes.

Several variables were found to have a significant relationship. Willingness to incorporate NFEPs had a statistically significant relationship with subjective norms about using NFEPs ($p < 0.001$), perceived behavioral control to incorporate NFEPs ($p = 0.01$), intention to incorporate NFEPs ($p < 0.001$), and race ($p = 0.01$). Subjective norms about incorporating NFEPs had a statistically significant relationship with perceived behavioral control to incorporate NFEPs ($p < 0.001$) and intention to incorporate NFEPs ($p < 0.001$). Perceived behavioral control to incorporate NFEPs had a statistically significant relationship with intention to incorporate NFEPs ($p < 0.001$), and level of education ($p = 0.04$). See Table 3.

There were no statistically significant relationships between any attitude variables and gender, age, years of teaching experience, and parish where teaching. There were no statistically significant associations between perceived subjective norms about incorporating NFEPs and gender, age, years of teaching experience, race, level of education, and parish in which they taught. Perceived behavioral of control to incorporate NFEPs had no statistically significant relationships with gender, age, years of teaching experience, race, or parish in which they taught. Intention to incorporate NFEPs had no statistically significant relationships with gender, age, years of teaching experience, race, level of education, or parish in which they taught.

Table 3. Relationships Among NFEP Constructs

	Subjective Norms about Incorporating NFEPs	Perceived Behavioral Control to Utilize NFEPs	Intention to Include NFEPs	Race	Education
Attitude toward utilizing NFEPs	r = .59**	r = .50**	r = .603**	r_{pb} = -.49*	r_{pb} = -0.37
Subjective Norms about implementing NFEPs		r = .548**	r = .643**	r_{pb} = -0.11	r_{pb} = -0.07
Perceived Behavioral Control to incorporate NFEPs			r = .81**	r_{pb} = -0.23	r_{pb} = -.41*
Intention to use NFEPs				r_{pb} = -0.23	r_{pb} = -0.25

Note. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

Chapter 5. Conclusions, Implications, and Recommendations

Background research and data collected in this study provide the opportunity to offer conclusions, implications, and recommendations for future study on this topic. One of the major findings of this study shows that the likelihood that survey respondents in this study will partner with or use materials from NFEP providers seems fairly high. The Theory of Planned Behavior states that if attitude, subjective norms, and perceived behavioral control complete a task are positively associated, then completing that behavior is likely (Ajzen, 1991). This study found that the attitude of teachers towards incorporating NFEPs was highly favorable, and that teachers mostly intend to incorporate NFEPs in their classroom. It should be noted that the theory also counts positive perceived social pressure as a factor in completing behaviors, which was found to be mostly favorable in this study. However, Zint (2002) found that perceived social pressure was less indicative of completing the behavior than attitude. The variable of perceived behavioral control received the lowest scores with results showing only slightly above moderate. It is recommended that future studies evaluate the reasons for this perception. Doing so will allow NFEP managers to investigate methods or resources to overcome these factors. For example, if it is found that perceived behavioral control is low due to limited school funds available for bus transportation, other methods of funding such as grants or donations may be sought to resolve this issue.

It is also recommended that future studies gather and compare data about teacher perceptions regarding the purpose of out of class nonformal experiences with years of teaching experience. A study by Greene et al., (2014) showed that teachers with less than 15 years of teaching experience viewed these opportunities as fun outings to be used as a reward.

Conversely, teachers with over 15 years of teaching experience were found to view these experiences as useful learning experiences. In this study, years of teaching experience among respondents ranged from 1 to 26, and the median number of years was 8.35. This suggests that this study sample included teachers who were more likely to view out-of-class experiences as enjoyment. Further study asking how they view these experiences directly would be helpful. Importantly, research by Gonzalez and Ortega (2018) showed that this belief can be overcome with teacher training programs focusing on nonformal education. Researching this question is also supported by Hirzy (1996), who found that that teachers are most often the gatekeepers to participation. If organizations such as 4-H and other nonformal science education providers can assess how teachers view these experiences, existing partnerships, outreach efforts and school participation rates could be improved.

Additionally, it is suggested that nonformal science education providers offer training to teachers. The study mentioned previously by Gonzalez and Ortega (2018) evaluated teacher attitude and behavior before and after participating in a nonformal science education training program. The study found that as a result of participating in the training program, teachers gained an appreciation of the educational significance of such programs. Likewise, participating teachers also reported an increase in their intention to take an active role in the implementation of nonformal science educational activities. This includes plans to correlate nonformal science education material to their class curriculum and creating pre and post classroom activities to supplement nonformal programming. The study found that before the training program teachers most teachers saw themselves as passive program observers.

Results of this study suggest that most teachers with bachelor's degrees agree that they have control to incorporate NFEPs and agree that they intend to implement NFEPs in their classrooms. Alternatively, science teachers with master's degrees slightly disagree that they possess control to incorporate NFEPs and report that they slightly agree with the statement that they intend to incorporate NFEPs in their classrooms. Two questions arise from this data. First, why do teachers with Masters' degrees perceive less autonomy in the implementation of NFEPs with their classes when compared with teachers with bachelor's degrees? And second, though teachers with master's degrees perceive less control to implement NFEPs why do they report they slightly agree that they plan to incorporate NFEPs in their classes? Does this mean that even though they do not feel fully supported to incorporate NFEPs, they feel it is important enough to advocate to school leaders incorporate NFEPs? Additional research on this topic would provide a better understanding of these attitudes.

When comparing the willingness of teachers in Jefferson and Orleans parishes to incorporate NFEPs in their curriculum plans, study results indicate that they slightly agree with perceived social pressure to implement NFEPs. Based on these findings, if school administrators support the integration of NFEPs into high school science curriculum, they may need to increase awareness of their approval of such programs among teachers and provide support and incentives for their participation.

Further research is needed to determine which delivery modes are most often utilized, i.e., curriculum materials for the classroom, guest presenters, or field trips etc. Additional questions include, "Why did they choose to implement NFEP materials?", "Was their experience positive?", and "What would they change about the materials they used?".

Though the reach of this study is limited, results can provide a starting point for larger, more inclusive, and intensive investigations to better inform school districts, school administrators, teachers, and nonformal science educators about the use of NFEPs. This information can also guide the creation of new nonformal science programs and materials that align more closely with the needs of school administrators and teachers. Doing so will not only build a stronger relationship between formal and nonformal educators, but will increase positive educational outcomes for our youth.

Appendix A. Institutional Review Board Approval

TO:	Melissa D Cater LSUAG | NE Region | Administration
FROM:	Michael Keenan Chair, Institutional Review Board
DATE:	14-Mar-2022
RE:	IRBAG-22-0009
TITLE:	New Protocol Created for Melissa D Cater on 07-Feb-2022 1:53 PM
SUBMISSION TYPE:	Initial Application
Review Type:	Exempt
Risk Factor:	Minimal
Review Date:	14-Mar-2022
Status:	Approved
Approval Date:	14-Mar-2022
Approval Expiration Date:	13-Mar-2025
Re-review frequency:	(three years unless otherwise stated)
Number of subjects approved:	200
LSU Proposal Number:	
By:	Michael Keenan, Chair

Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.

6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. **SPECIAL NOTE: When emailing more than one recipient, make sure you use bcc. Approvals will automatically be closed by the IRB on the expiration date unless the PI requests a continuation.**

** All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents.*

Mike Keenan O 225-578-1708
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Appendix B. Theory of Planned Behavior Survey

Note: Nonformal education programming can include offsite field trips led by a nonformal educator, such as an educational program at a university education and research facility, in-school programming developed or led by a nonformal educator, and resources or equipment provided by a nonformal education program.

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
1.	I am willing to incorporate nonformal education programs into my class curriculum to enhance inquiry learning.	O	O	O	O	O	O
2.	I am willing to use nonformal education resources to incorporate Louisiana-based science phenomena.	O	O	O	O	O	O
3.	I am willing to learn more about nonformal education opportunities.	O	O	O	O	O	O
4.	I am willing to incorporate nonformal education programming into my science classroom to increase student interest and engagement.	O	O	O	O	O	O
5.	I view off campus experiences for my students as a reward for achieving a goal or milestone.	O	O	O	O	O	O

(table cont'd)

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
6.	I am confident that I have the time to work with nonformal educators.	O	O	O	O	O	O
7.	My decision to participate in nonformal programs is supported by my school's administration.	O	O	O	O	O	O
8.	I am confident that I can manipulate and apply nonformal program materials in the classroom.	O	O	O	O	O	O
9.	I am confident that I have the time to integrate nonformal education programs into my planned school year activities.	O	O	O	O	O	O
10.	I am confident that I can work with nonformal educators to ensure program relevance for my students.	O	O	O	O	O	O
11.	Most teachers I respect participate in nonformal education programs.	O	O	O	O	O	O

(table cont'd)

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
12.	Science Teacher Leaders would approve of my incorporating nonformal science programs to enhance classroom learning.	O	O	O	O	O	O
13.	Most science teachers like me have participated in nonformal education programs.	O	O	O	O	O	O
14.	My school administration thinks that I should partner with nonformal science programs to enhance students learning in the sciences.	O	O	O	O	O	O
15.	Most teachers whose opinion I value would approve of me participating with nonformal education programs.	O	O	O	O	O	O
16.	I plan to spend time investigating nonformal science education resources in my area.	O	O	O	O	O	O
17.	I will try to work with school administration to plan offsite nonformal science	O	O	O	O	O	O

	experiences for my students.						

(table cont'd)

		Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
18.	I plan to use nonformal education resources to enhance inquiry learning in my classroom.	O	O	O	O	O	O
19.	I plan to use nonformal science program resources to increase the resources my students have access to.	O	O	O	O	O	O
20.	I will try to work with nonformal educators to ensure activities are relevant to classroom curriculum.	O	O	O	O	O	O
21.	I plan to use nonformal science program resources to increase the types of scientific equipment my students have access to.	O	O	O	O	O	O

22. Gender (Circle one): Male Female 23. Age _______

24. Race/Ethnicity (Circle one): Black or African American White
Hispanic
American Indian Asian Hawaiian/Pacific Islander
Other

25. How many years of teaching experience do you have? _______

26. What grade(s) are you teaching this school year? (Circle all that apply) 9th 10th
11th 12th

27. Name of parish where you teach ____________________

28. Highest level of education (Circle one): Bachelor's degree (B.A., B.S.)
Master's degree (M.A., M.S.) Specialist
Other (please specify) ____________________

29. What was your major field of study? (Circle one) Science Education
English

Mathematics History/Social Sciences/Social Studies Foreign Language
Special Education Physical Education
Other (please specify)____________________

30. How many undergraduate or graduate courses have you taken in a scientific area? Please report the number of courses, not credit hours. _____

31. How many nonformal based science activities or lessons did you complete with your students during the 2019-2020 school year? _____

Bibliography

Advance CTE. (2016). *Louisiana: Jumpstart.* Retrieved from https://careertech.org/resource/louisiana-jump-start

Aydeniz, M. (2007). Understanding the challenges to the implementation of assessment reform in science classrooms a case study of science teachers' conceptions and practices of assessment.

Aydeniz, M., & Southerland, S. A. (2012). A National Survey of Middle and High School Science Teachers' Responses to Standardized Testing: Is Science Being Devalued in Schools? *Journal of Science Teacher Education, 23*(3), 233–257.

Ainsworth, H.L., & Eaton, S.E. (2010). *Formal, nonformal and informal learning in the sciences*. Calgary, Canada: Onate Press.

American Association for the Advancement of Science. (1989). *Science for all Americans.* New York: Oxford University Press. Retrieved from project2061.org/publications/sfaa/online/intro.htm.

Anghelache, V., & Bentea, C.C. (2012). Dimensions of teachers' attitudes towards educational change. *Procedia – Social and Behavioral Sciences*, 33, 598-602.

Ajzen, I. (1991). The theory of planned behavior: Some unresolved issues. Organizational Behavior and Human Decision Process, *50*, 179-211.

Aydeniz, M., & Southerland, S. A. (2012). A National Survey of Middle and High School Science Teachers' Responses to Standardized Testing: Is Science Being Devalued in Schools? *Journal of Science Teacher Education*, *23*(3), 233–257.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychology Review, 84,* 191-215.

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, *37,* 122-147.

Cambridge University Press. (n.d.) Phenomena. In *Cambridge dictionary*. Retrieved April, 1 2022 from https://dictionary.cambridge.org

Champagne, D.W. (1975). The Ontario Science Center in Toronto: Some impressions and some questions. *Educational Technology*, *15*(8) 36-39.

Chinn, C.A., & Malhotra, B.A. (2002). Epistemologically authentic inquiry in schools: A theoretical framework for revaluating inquiry tasks. *Science Education*, *86*(2), 175-218.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Cowart, J. (2020) *Louisiana Environmental Education Commission February 2020 Meeting*. Presented at the meeting of Louisiana Environmental Education Commission, Baton Rouge, Louisiana.

Darling-Hammond, L. & Adamson, F. (2010). *Beyond basic skills: The role of performance assessment in achieving 21st century standards of learning.* Stanford, CA: Stanford University, Stanford Center for Opportunity Policy in Education.

DeSilver, D. (2017). *U.S. students' Academic Achievement still lags that of their peers in Many other countries. Fact Tank: News in the Numbers* (PEW Research Center). Retrieved from: PEW Research Center website: https://www.pewresearch.org/fact-tank/2017/02/15/u-s-students-internationally-math-science/.

Dewey, J. (1910). Science as subject-matter and method. *Science, 31*(787), 121-127.

Eshach, H. (2006). Bridging in-school and out-of-school learning: Formal, nonformal, and informal education. *Journal of Science Education and Technology, 16*(2), 171-190.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley. Retrieved from https://people.umass.edu/aizen/f&a1975.html.

Gonzalez, D. B., & Ortega, C. V. (2018). Change of the ideas of science teachers after participation in a training program on the use of non-foral educational places. *LUMAT: International Journal of Math, Science and Technology Education, 6*(2), 46-63.

Goodman, N., & Eglin, C. (1988). *Reconceptions in philosophy and other arts and sciences*. Indianapolis: Hackett.

Greene, J. P., Kisida, B., & Bowen, D. H. (2014). The educational value of fieldtrips. *Education Next*, *14*(1), 78–86.

Griffin, J., (2004). Research on students and museums: Looking more closely at the student in school groups. *Science Education, 88*(S1), S59-S70.

Griffin, J., & Symington, D. (1997). Moving from task-oriented to learning-oriented strategies on school excursions to museums. *Science Education, 81*, 763-779.

Gilbert, J., & Priest, M. (1997). Models and discourse: A primary school science class visit to a museum. *Science Education, 81,* 749-762.

Heck, K., Carlos, R. M., Barnett, C., & Smith, M. H. (2012). 4-H Participation and Science Interest in Youth. *Journal of Extension, 50*(2).

Hirzy, E.C. (Ed.) (1996). True needs true partners: Museums and schools transforming education. Washington. D.C.: Institute of Human Services.

Ibanez, A., & Vicent, N, (2012). Informal learning, heritage, and mobile devices. Evaluation of experience in secondary education. *Didactics of Experimental and Social Sciences, 26*, 3-18.

Jeanpierre, B. (2006). What teachers report about their inquiry practices. *Journal of Elementary Science Education*, *18*(1), 57-68.

Kisiel, J. (2005), Understanding elementary teacher motivations for science fieldtrips. Sci. Ed., 89: 936-955.

Kolb, D.A. (1984). *Experiential Learning: Experience As the Source Of Learning And Development.* Prentice Hall.

Kumar, R. (2011). *Research methodology: A step-by-step guide for beginners* (3^{rd} Ed.). Thousand Oaks, CA: Sage.

Louisiana Department of Education. (n.d.). *K-12 Science Resources.* Retrieved from https://www.louisianabelieves.com/resources/library/k-12-science-resources.

Louisiana Department of Education. (n.d.). *The Louisiana State Report Card 2020-2021*. Retrieved from https://www.louisianabelieves.com/resources/library/data-center/Statewide-Results.

Louisiana Department of Education. (n.d.). *All Things Jump Start.* Retrieved from https://www.louisianabelieves.com/courses/all-things-jump-start

Maarschalk, J., (1988). Scientific literacy and informal science teaching. *Journal of Research in Science Teaching, 25*(2), 135-146.

Madden, D. B. (2008). Middle school educators' perspectives of changes in teaching practices caused by implementation of the FCAT Science. Unpublished Masters Thesis, Florida State University, Tallahassee, FL.

Melnic, A.S., & Botez, N. (2014). Formal, nonformal and informal interdependence in education. *Economy Transdisciplinarity Cognition, 17*(1), 113-118.

Michie, M. (1998). Factors influencing secondary science teachers to organize and conduct fieldtrips. *Australian Science Teachers' Journal*, *44*(1), 43-50.

Miller, J. (2006, May). *Civic scientific literacy in Europe and the United States*. Paper presented at the annual conference of World Association for Public Opinion Research, Montreal, Canada.

Nassaji H. (2015). Qualitative and descriptive research: Data type versus data analysis. Language Teaching Research, *19*(2), 129–132.

National Academies of Sciences, Engineering, and Medicine. (1996). National Science Education Standards. Washington, DC: The National Academies Press.

National Science Teacher Association, Informal Science Advisory Board. (1998). *An NSTA position Statement: Informal science education*. Science and Children, *35*(8), 30-31.

National Research Council. (1996). *National Science Education Standards.* Washington, D.C.: The National Academy Press.

National Research Council. (2013). *Next Generation Science Standards, For States by States.* Washington, D.C.: The National Academy Press.

NGSS Lead States. (2013). *Next Generation Science Standards: For States, By State*s. Washington, DC: The National Academies Press. Retrieved from https://www.nextgenscience.org/.

Organization for Economic Development. (2007). *Annual Report*. (OED Publication No. 88113). Retrieved from oecd.org.

Pedretti, E. (2002). T. Kuhn meets T. Rex: Critical conversations and new directions in science centres and science museums. *Studies in Science Education*, *37*(1), 1-41.

Piget, J. (1971). *Biology and knowledge*. Edinburgh Press, Edinburgh, UK.

Pratt, D. (1992). "Conceptions of teaching". *Adult Education Quarterly*, *42*(4): 203-20.

Ramey-Gassert, L., Walberg, H.J.III, & Walberg, H.J. (1994). Reexamining connections: Museums as science learning environments. *Science Education*, *78*(4), 345-363.

Rata, G., Dobrescu, T., Rata, B.C., & Rata, M. (2013). The effectiveness of nonformal education in improving the effort capacity in middle-school pupils. *Procedia – Social and Behavioral Sciences*, Journal of the 5th World Conference on Educational Sciences – WCES, *116*, 2722-2726.

Rhoton, J., & Shane, P. (2006). *Teaching science in the 21s' century.* Arlington, VA: National Science Teachers Association.

Schwandt, T. A. (1998). Constructivist, interpretivist approaches to human inquiry. In N.K. Denzin & Y. S. Lincoln (Eds.) The landscape of qualitative research: Theories and issues. (pp. 221-259). Thousand Oaks, CA: Sage.

Sevdalis, C., & Skoumios, M. (2014). Nonformal and informal science learning: Teachers' conceptions. *International Journal of Science in Society*, *5*(4), 13-25.

Shortland, M. (1987). No business like show business. *Nature*, *328*, 213-214.

Tabacaru, C. (2018). Impact of nonformal education on the efficacy of school learning. *University Studies of Moldavia: Sciences of Education*, *9*(119), 229-233.

Tamir, P., (1990). Factors associated with the relationship between formal, informal, and nonformal science learning. *Journal of Environmental Education*, *2*(2), 34-42.

Tudor, S. (2013). Formal - nonformal – informal in education. *Procedia - Social and Behavioral Sciences*, *76*, 821-826.

U.S. Department of Education. (2001). *No Child Left Behind Act of 2001* (Executive Summary). Retrieved from https://www2.ed.gov/nclb/overview/intro/execsumm.html

U.S. Department of Education. (2015). *Every Student Succeeds (ESSA).* Retrieved from https://www.ed.gov/essa?src=rn

U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2011 Science Assessment. (2011). *The Nation's Report Card: Louisiana State Comparisons.* Retrieved from nationsreportcard.gov.

Vygotsky, L. (1978). *Mind in society: The Development of higher psychological processes*. Harvard University Press, Cambridge, MA.

Widodo, W. N. (2020). Analysis of nonformal education (NFE) needs in schools. *Journal of Nonformal Education*, *6*(1), 69-76.

Youker, C.R. (2002). Teachers' perspectives of why and how they use the resources of informal science education sites. Dissertation, University of Texas at Austin, 2002.

Zint, M. (2002). Comparing three attitude-behavior theories for predicting science teachers' intentions. *Journal of Research in Science Teaching*, *39*(9), 819-844.

Vita

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