An investigation of environmental education instructors: motivations, autonomy, experience, and their influences on student outcomes

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Academic Abstract

Environmental education (EE) programming has been found to lead to positive

behavioral and attitudinal outcomes in student participants. Among a variety of factors, the

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outcomes. This thesis investigates the specific motivators of EE instructors and the links between

instructor autonomy, prior experience, and program outcomes. I used a multi-methods approach

to investigate these themes and have organized the results between two chapters that are

manuscripts intended as separate journal publications. Chapter 2 presents a qualitative study that

identifies the salient motivators of EE instructors, as well as organizational practices that affect

EE instructor feelings of autonomy, competence, relatedness, and the meaningfulness these

instructors feel within their jobs. Chapter 3 presents a quantitative study analyzing the impact of

autonomy and prior experience on program outcomes by linking instructor and student

participant survey responses from a sample of 166 EE programs performed throughout 57

different organizations across the US. Results led to the following recommendations for EE

organizations: (1) promote job enrichment elements for their instructional staff, including the

implementing of participatory evaluation processes; (2) encourage instructors to take

"ownership" of programming, such that they continue to practice and develop competence over

time; (3) increase instructor autonomy as they gain further experience.

General Audience Abstract

Environmental education (EE) programming has been found to lead to positive behavioral and attitudinal outcomes in student participants. Among a variety of factors, the characteristics of EE program instructors have been found to play a role in driving these outcomes. This thesis investigates the specific motivators of EE instructors and the links between instructor autonomy, prior experience, and program outcomes. I used a multi-methods approach, employing semi-structured interviews and surveys to investigate these themes, and have organized the results between two chapters that are manuscripts intended as separate journal publications. Chapter 2 presents a qualitative study that identifies the salient motivators of EE instructors, as well as organizational practices that affect EE instructor feelings of autonomy, competence, relatedness, and the meaningfulness these instructors feel within their jobs. Chapter 3 presents a quantitative study analyzing the impact of autonomy and prior experience on program outcomes by linking instructor and student participant survey responses from a sample of 166 EE programs performed throughout 57 different organizations across the US. Results led to the following recommendations for EE organizations: (1) promote job enrichment elements for their instructional staff, including the implementing of participatory evaluation processes; (2) encourage instructors to take "ownership" of programming, such that they continue to practice and develop competence over time; (3) increase instructor autonomy as they gain further experience. This research provides information to better EE organizational management in the aims of promoting motivated employees and ultimately effective program outcomes.

Acknowledgements

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Chapter 1: Introduction

Environmental education (EE) programming is broadly focused on establishing relevancy and connection between elements of the natural world and program participants. Comprehensive reviews of studies on EE programming have concluded that EE programming has the ability to lead to a variety of positive outcomes focused around environmental and learning behaviors and attitudes in student participants (Ardoin et al., 2018; Rickinson, 2001; Stern et al., 2014). The characteristics and motivations of program instructors have been found to impact outcomes (Stern & Powell, 2013).

Extensive prior research on organizational and workplace behavior suggests that the motivations of employees can influence the resulting quality of their work performances (e.g., Deci & Ryan, 1985; Herzberg, 1966). Research also suggests that employee workplace autonomy and prior experience can affect the quality of work performance (Gagné & Bhave, 2011; Schmidt & Hunter, 1998). However, there are limited empirical studies that have investigated the implications of these findings in the context of EE organizations, instructors, and program outcomes.

To address this gap in knowledge, I developed and carried out a multi-methods study. Chapter 2 of this thesis presents a qualitative study informed by interviews with EE instructors and supervisors across 42 different organizations throughout the US. This chapter draws upon elements of Deci & Ryan's (1985; 2002) self-determination theory and Herzberg's (1966) motivation-hygiene theory to identify the salient motivators of EE instructors. This chapter also examines organizational practices that affect EE instructor feelings of autonomy, competence, relatedness, and the meaningfulness these instructors feel within their jobs. I address the following research questions in Chapter 2:

1. *What motivates EE instructors?*
2. *How might organizational practices influence EE instructor motivations?*

Chapter 3 presents a quantitative study informed by self-determination theory, motivation-hygiene theory, and various empirical studies suggesting that employee prior experience leads to effective work performance (e.g., Schmidt & Hunter, 1998; McDaniel et al., 1988; Morrow & McElroy, 1987). I analyzed the impact of autonomy and prior experience on program outcomes by linking instructor and student participant survey responses from a sample of 166 EE programs performed throughout 57 different organizations across the US. The research question for this study is as follows:

How do instructor autonomy and prior experience influence EE program outcomes?

Results led to the following recommendations for EE organizations: (1) promote job enrichment elements for their instructional staff, including the implementing participatory evaluation processes; (2) encourage instructors to take "ownership" of programming, such that they continue to practice and develop competence over time; (3) increase instructor autonomy as they gain further experience. This thesis aims to provide EE organizations with findings that can inform targeted managerial approaches leading to better program outcomes. The findings are organized into two manuscripts, each intended to be a separate journal publication. The chapters that follow introduce relevant literature informing the study framework, review key findings, and suggest implications that can inform targeted supervisory practices throughout EE organizations.

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Motivations within environmental education organizations: a qualitative study.

Daniel F. Pratson

Abstract

Drawing upon elements of self-determination theory and motivation-hygiene theory, we conducted and analyzed semi-structured interviews with environmental education (EE) instructors and their supervisors to examine the roles of organizational practices in influencing instructor motivations and feelings of autonomy, competence, relatedness, and sense of job meaningfulness. We identified two instructor types, based on their long-term commitment to EE: *exploratory* and *career*. Motivations were largely shared between instructor types. However, exploratory instructors tended to feel more motivated by professional development opportunities, while career instructors reported being more motivated by a commitment to their organization's mission. A sense of shared organizational and personal values appeared to drive feelings of both relatedness and meaningfulness. Both employee types desired more feedback on their work. The authors recommend that organizations focus on instructor job enrichment to further promote motivations. This may include undertaking a participatory evaluation process that works to clarify organizational mission and develop feedback tools.

Keywords: Environmental education, instructors, motivation, self-determination theory, motivation-hygiene theory

1. Introduction

Environmental education (EE) programs are led by a variety of organizations across the United States and have been shown to lead to a variety of learning and behavioral outcomes for program participants (Ardoin et al., 2018; Rickinson, 2001; Stern et al., 2014). Among other factors embedded in programming, the characteristics of program instructors, including their

motivation and the specific pedagogical practices they employ, can have meaningful influences on the quality of their teaching, as well as participant outcomes (Stern & Powell, 2013).

Decades of prior research have demonstrated that motivation can strongly influence the performance of employees, particularly with regard to persistence and work quality, in varying work environments (e.g., Lawler, 1973; Porter et al., 2003; Vroom, 1964). Additionally, numerous organizational practices and policies can influence employee motivation (Herzberg, 1966). We draw from Deci and Ryan's (1985; 2002) self-determination theory (SDT) and Herzberg's (1966) motivation-hygiene theory to examine the influences of organizational practices on EE instructor motivation. We also examine the influence of instructor career stages, which have been suggested to impact how employees respond to organizational practices.

SDT distinguishes between extrinsic and intrinsic motivations, and identifies conditions most favorable for supporting intrinsic motivation (Deci & Ryan, 1985; 2002). Extrinsic motivation in the workplace is driven by external factors, including deadlines, benefits, and rewards. Intrinsic motivators refer to feelings of interest in or enjoyment of performing the work itself. Employees who are intrinsically motivated to perform job tasks commonly achieve more positive and persistent performance outcomes than employees who are extrinsically motivated (Deci et al., 1989). Workplaces that support employee autonomy, competence, and relatedness can foster intrinsically motivated employees (Deci & Ryan, 1985; 2002). Autonomy refers to feeling a sense of discretion in the workplace, competence refers to feeling a sense of mastery of work tasks, and relatedness refers to feeling valued by coworkers. Numerous empirical workplace studies have linked employee autonomy, competence, and relatedness to effective work behaviors and performances. (e.g., Baard et al., 2004; Deci et al., 1989; Theurer et al., 2018; Van den Broeck et al., 2016)

Herzberg's (1966) motivation-hygiene theory distinguished between "hygiene" factors and "motivation" factors in the workplace. *Hygiene factors* are necessary for basic operation of an organization and can cause dissatisfaction among employees if they are not present at a certain threshold. These factors include organizational policies, pay, workplace conditions, and relationships among coworkers and supervisors. *Motivation factors*, which include achievement, advancement, and an interest in the work itself, can generate intrinsic motivation to perform. Herzberg referred to the addition of meaningful tasks and growth opportunities within a position as *job enrichment*. These practices can promote intrinsic motivation. In contrast, the addition of various meaningless tasks or busywork within a position is termed *job enlargement*, which might act against employee intrinsic motivation. Thus, managers must focus on the meaningfulness of new tasks for employees, not just task variety.

Motivation-hygiene theory has also been studied and supported throughout many work contexts (e.g., House & Wigdor, 1967; Hur, 2017; Lundberg et al., 2009; Sanjeev & Surya, 2016). However, there is some debate about whether employee relationships with coworkers and supervisors act more as hygiene or motivation factors. Studies have suggested that the motivating role of coworker relationships may be influenced by contextual factors, including characteristics of the work environment and job tasks (Baard et al., 2004; Hines, 1973; Holmberg et al., 2018). For instance, Holmberg and colleagues (2018) determined that relatedness was a motivating factor among nursing personnel, as it provided support in their collaborative workplace.

As employees develop further experience in their careers, their attitudes towards organizational practices and motivations may change. A body of literature suggests that an employee progresses through distinct stages throughout their careers, and that these stages are characterized by distinct attitudes towards work and resulting behaviors (Aryee et al., 1994;

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Bedeian et al., 1991; Cohen, 1991; Morrow & McElroy, 1987). Career stages are often defined by employee age and the years of experience that an employee has in a particular type of work (Bedeian et al., 1991; Morrow & McElroy, 1987). Though studies may adapt the names and specific groupings of career stages to account for differences in specific work environments, career stages generally represent: (a) individuals entering a career; (b) individuals actively advancing through a career; (c) individuals finishing their careers and moving towards retirement. Employees progressing through career stages have been found to display higher organizational commitment and less intent to leave their positions (Kooij et al., 2008). Additionally, employees in later career stages have been found to feel more commitment as a result of professional advancement opportunities, whereas employees in earlier career stages note supervisory support as a stronger driver of commitment (Ayree, 1994).

This study draws from elements of SDT, motivation-hygiene theory, and career stage literature to develop an understanding of EE instructor motivations and the organizational practices that influence them. Figure 1 depicts the theoretical framework employed. Job meaningfulness encompasses motivation factors identified within motivation-hygiene theory. Autonomy, competence, and relatedness reflect key SDT factors. Our practical aim is to develop an understanding of how EE instructors are motivated within their organizations to enhance their performance, and ultimately, participant outcomes in EE programming. Research questions are as follows:

R1: What motivates EE instructors?

R2: How might organizational practices influence EE instructor motivations?
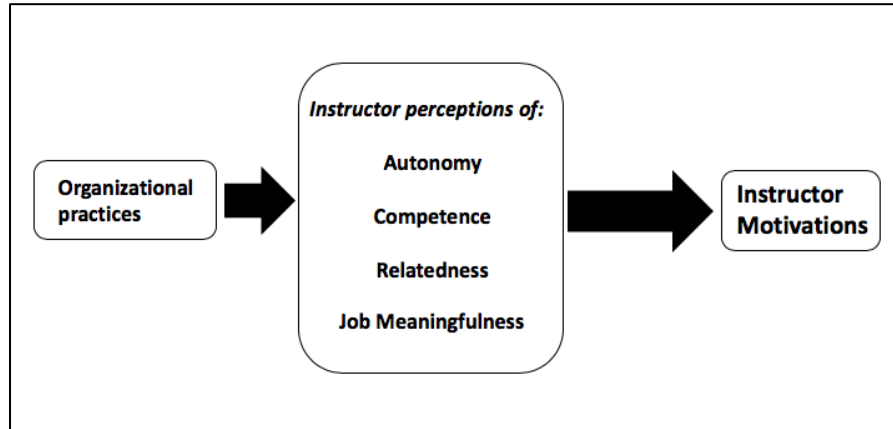
Figure 1. Conceptual diagram of the proposed relationship between EE organizational practices, employee perceptions, and resulting motivations.

2. Methods

2.1 Study Overview

We took a semi-structured, qualitative approach to examine the factors most strongly related to EE instructor motivations. Qualitative inquiry in EE research has been identified as effective in acknowledging the lived experiences of others, and can measure concepts that may be difficult to measure quantitatively by allowing for interview participants to elaborate on their personal experiences (Creswell, 2013; Smith-Sebasto, 2000). Although we began with a general theoretical framework, we felt that a qualitative approach would enable other pertinent themes to emerge as well, while a quantitative approach would limit these opportunities.

This research was conducted with various organizations involved in providing EE-focused field trip programming for students, including units of the National Park Service, regional nature centers, and other various non-profit and governmental educational centers. Organizations were initially selected to participate in a larger, nation-wide study examining the strongest drivers of student outcomes in EE programming. The authors conducted interviews with employees at a subset of organizations that were sampled in the larger study (see Chapter 3

of this thesis for more detail). The present study reports on interview data collected at 42 organizations in 15 different states between January and June, 2018.

2.2 Data Collection

We aimed to interview as many lead program instructors as possible while visiting each organization to identify motivations and their contributing factors across a diverse sample. Lead instructors were defined as the individuals who were observed as playing a significant role in leading programming to participants. Researchers also interviewed direct supervisors of instructors, in order to provide further contextual evidence regarding organizational practices influencing instructor motivations. This was an exploratory study, so we did not have a set number of instructors or supervisors that we aimed to interview over the course of the data collection period. Rather, data was collected by two field researchers within the larger study. Each field researcher aimed to interview each lead instructor that was observed during the study period, as well as the instructor's respective supervisor. Interviews were not performed when: (a) lead instructors were unable to allocate time to participate; (b) supervisors were not present on site or were unable to allocate time to participate; (c) researchers were unable to allocate time due to logistics involved with observing other programming (e.g., needing to travel to other program providers).

Our final sample consisted of 72 instructors and 33 supervisors from a total of 42 different organizations. In 14 organizations, we were only able to interview instructional staff. In 1 organization, we were only able to interview supervisory staff. We were able to collect data from both instructors and supervisory staff in 27 organizations (Table 1).

Table 1. Locations of organizations in the study, and participating instructors and supervisors

State	Number of participating organizations	Number of instructors interviewed	Number of supervisors interviewed
Arizona	7	8	6
California	11	25	9
Connecticut	1	1	1
Illinois	2	3	3
Indiana	2	3	3
Massachusetts	1	1	0
Maryland	2	5	3
Maine	2	3	0
Michigan	1	0	1
Minnesota	1	2	1
New York	3	8	0
Ohio	1	1	2
Pennsylvania	4	5	0
Virginia	2	2	2
Wisconsin	2	5	2

Instructors and supervisors were asked a series of open-ended questions that aimed to identify and elaborate on the various organizational practices within their organizations that led to job motivations. Specifically, instructors were asked to identify their motivations for working in EE, their autonomy in lesson planning and teaching, how feedback mechanisms worked within their organization, the prevalence of job training opportunities, their sense of relatedness with their coworkers, and the elements of their jobs that motivated them the most (Appendix A). Supervisory staff were asked to provide information regarding how they promoted elements covered in instructor interviews (e.g., how they granted lesson planning autonomy, how they provided feedback), as well as to identify any specific elements driving their organization's culture including their specific hiring techniques (Appendix B).

Before each interview, interviewees read and agreed to a consent form, and were given a short explanation of the types of questions they were going to be asked. Interviews were normally conducted on site. However, seven instructors and eight supervisors participated in

phone interviews due to logistical difficulties of arranging a meeting time on-site. There were seven instances when supervisory staff were also observed leading programming, so we utilized both instructor and supervisor interview scripts in these cases. Only paid employees were interviewed.

Researchers asked follow-up or probing questions whenever appropriate. There was no specific protocol for follow-up questioning, so it was up to the discretion of the researcher in determining whether or not a question was adequately addressed.

2.3 Data Analysis

The length of interviews ranged from 6 minutes to 52 minutes, with an average of 18 minutes. The length of the interviews was mostly dictated by the propensity of the interviewee to elaborate during their responses, and if these elaborations spurred any follow-up questions. All interviews were recorded and transcribed verbatim, with the exception of minor edits to remove minor repetitions and filler words (e.g. like, um, ah, etc.). Interview transcripts were analyzed in NVivo 12, a software that allows for transcript coding and categorization into thematic categories.

Transcripts were read several times, often accompanied by their corresponding audio recordings to identify any instances of ambiguity or emphasis not captured in the interview transcriptions. We then used codes informed by both motivation-hygiene theory and self-determination theory to categorize individual responses that referred to instructor feelings of autonomy, competence, relatedness, and elements driving meaningfulness. We also coded for emergent themes within the data that helped to explain the nature of work tasks, employee types, and specific motivating factors.

3. Results

3.1 Instructor Typologies

We developed a typology of three different instructor types based on their level of commitment and motivation. The three different instructor types include, *exploratory*, *career*, and *transitional*. These types were similar to stages established in career stages literature, which suggest that work commitment increases as employees progress through their careers (Kooij et al., 2008). We identified 27 exploratory instructors and 40 career instructors in our sample of instructors. Five instructors were categorized as *transitional* instructors between the two categories. We refer to the first two typologies, which are described in more detail below, throughout the paper. Transitional instructors typically shared characteristics with each of the other two groupings.

3.1.1 Exploratory Instructors

Exploratory instructors were characterized by responses indicating a noncommittal approach to working in EE. Themes of impermanence and inexperience often emerged in interview responses from these instructors. Often, exploratory instructors indicated that they were unsure of their future career path and were trying out the EE instructor position. They noted that prior experiences that aligned with tasks or responsibilities common in EE instructor jobs (e.g. working with kids, experiences in the outdoors, degree in the natural sciences) had led them to their current positions.

For example, one exploratory instructor had recently been hired as a naturalist educator. He indicated that he had recently graduated from college with a degree in secondary education, but he was unsure if classroom teaching was what he wanted to do. He sought out EE as a way to explore the possibility of pursuing a career in teaching in less formal environments.
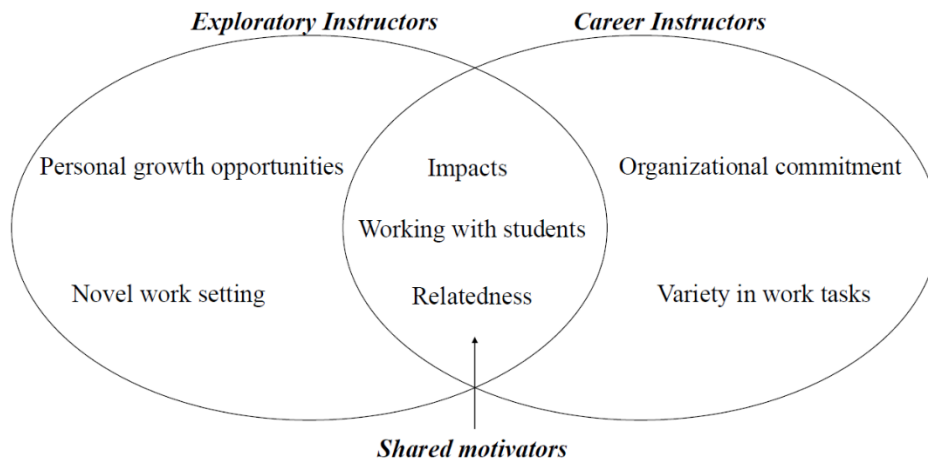
3.1.2 Career Instructors

Career instructors were characterized by a marked commitment to working in EE. The career instructor type included a wider range of employees than that of exploratory instructors; examples of career instructors included those who switched career paths later in life and those who have worked in EE for their entire career. Career instructors were generally older than exploratory instructors, but there were exceptions. The key differentiator between career instructors and exploratory instructors was that of a clear, marked commitment to working as an educator in EE.

One career instructor, for example, noted that he began to search for positions with nature centers in his region and worked in a few centers after graduating college, splitting his time between volunteering and working at a local retailer. After working multiple, part-time jobs for some time, he applied for an educator position with a nearby suburban nonprofit nature center. He has been working there for over 20 years.

3.2 Instructor motivators

We asked each instructor that we interviewed to indicate the elements of their jobs that motivated them the most. We identified major themes that were consistent among each unique instructor response. We found that exploratory and career instructors shared certain motivator themes. We also found that motivator themes were more pertinent and specific to either exploratory or career instructors. The thematic categories and their relations to exploratory and career instructors are illustrated in Figure 2.

Figure 2. Differing and shared motivator themes among instructor types.

3.2.1 Shared motivators

Responses from both exploratory and career instructors indicated that the following three themes were strong drivers of motivation for both: working with children, feeling a sense of relatedness with coworkers, and the potential for inspiring meaningful impacts. Both instructor types also indicated that they felt motivated by novelty they experienced within their work, but this manifested differently between exploratory and career instructors.

Instructors who felt most motivated by working with students mentioned the enjoyment they felt from observing candid student reactions to lesson content and the exciting or novel activities that were present in their programming. Some instructors mentioned that student feedback regarding the programming or their experience was the most motivating element of their positions. An exploratory instructor stated, "I had a student tell me that this was the best field trip he had ever taken in his life at school and that we were some of his favorite instructors." Instructors also indicated that working with students played an instrumental role in

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keeping them engaged in their work. A career instructor indicated this by saying, "The energy of youth can take you out of any bad situation and really keep you present."

Feelings of relatedness appeared to be driven by shared interests and values among the instructors. Instructors noted feeling kinship over similar values, political ideologies, life circumstances, and hobbies. For example, an exploratory instructor noted, "We're pretty much all the same age… and we all have a love of the ocean and science and teaching." Some instructors also noted that their coworkers had a diverse array of prior experiences which allowed for the opportunity to learn from one another. One career instructor summarized her feelings of relatedness within her organization by saying, "I have found my people."

While some supervisors made explicit efforts to build community through trainings or social events, interviewees rarely mentioned these as key drivers of their feelings of relatedness. Rather, assumptions of shared values and identities seemed to create comfortable social interactions between coworkers.

Both types of instructors were also motivated by the opportunities afforded by their positions to create meaningful impacts, both in inspiring the behaviors and attitudes of children, and in ultimately creating positive environmental change. Instructors who were most motivated by their potential impacts indicated that these impacts helped to create a sense of meaning or purpose in their positions. An exploratory instructor noted, "I think it's the fact that, in a way, I know I'm making a difference. I think that's pretty important. I think it makes you feel like you have a purpose, you're important." Similarly, a career instructor stated, "I really kind of realized that inspiring the next generation is one of the most important things that we can do."

Both exploratory and career instructors indicated drawing motivation from novel elements of their positions. Novelty for exploratory instructors most commonly manifested in

elements characteristic of the positions, namely an ability to work outside in interesting settings with kids. "I love being outside. I love the outdoors. And so to be able to teach, and that's my job, is being outside, that's pretty motivating in itself." Career instructors were more motivated by the novelty of varied work tasks, which appeared to keep these instructors engaged in their positions. One career instructor explained, "I think particularly after 10 years of essentially the same job, 20 years at the same park, and 26 years with the same agency, that anything that's different from a standard day is... I'm more excited about that day usually."

3.2.2 Differences in motivators

We also observed differences in salient motivators between each instructor type. Exploratory instructors indicated that they felt motivated by opportunities that allowed for professional growth more frequently than career instructors. Many noted that they were motivated by the ability to take advantage of elements of their positions that offered the opportunity for learning opportunities or progression as working professionals. One exploratory instructor explained that the challenges they faced in their work helped them to grow as an educator, saying, "Every day is like a new challenge to see if I can get the kids interested or get a tough group of kids to behave better."

Career instructors more commonly indicated feeling motivated by an alignment between their interests, values and their organizations more frequently than exploratory instructors. A park ranger for the US Park Service, for instance, indicated how the mission and goals of his organization motivated him to perform well: "That's part of the reason why we are in this green and grey, because we get to work in absolutely amazing areas around the US telling the national story, our heritage. In following that motto, that mission statement." Additionally, career instructors with prior work experience in other types of organizations (e.g. public schools,

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research labs, etc.) indicated that the differences between the missions of their former organizations and current organization was a strong driver of motivation.

3.3 Organizational Practices

There were a range of specific organizational practices that appeared to influence instructor autonomy, competence, relatedness, and job meaningfulness. The following section identifies the common themes throughout the organizations in our study, as well as how they may have influenced feelings in both exploratory and career instructors.

3.3.1 Instructor Autonomy

The ability of instructors to take a role in developing programmatic content differed among organizations. However, the most consistent theme was that formal student learning standards provided a clear framework for developing program content. Most organizations noted, however, that standards were broad enough to allow for significant creativity in program design.

> "*We try to allow programs to have internal flexibility to meet standards that the kids have to adhere to in school. So for example, a class that's doing canoeing, they may not have any requirement whatsoever to do canoeing…but they might have some physical education requirements and so our canoe program, where we get to teach them about aquatic wildlife and aquatic plants and just general ecology in water environment, might actually meet some physical education requirement that they have... So the job of the teacher…would be to communicate with the school in advance, and then try to formulate his tour or his trip around that.*"

Conversely, some organizations indicated that they had established programs that were designed to meet specific learning objectives, and that instructors were tasked with learning how to deliver these programs consistently and proficiently to visiting groups. These organizations essentially offered a "menu" of programs for visiting school teachers or administrators to choose

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from, often referring to leading programming as delivering a "product". Despite this focus on

meeting specific pre-determined objectives, both exploratory and career instructors noted that

they felt autonomy in their ability to experiment with the delivery of program content. A career

instructor noted,

> "*I try really hard to stick to the curriculum and to try to hit our challenges, but I can*
>
> *change kind of the direction in which I want it to go. And so I'll still hit all of our*
>
> *challenges and all of our curriculum, but me personally, I'll go at it in a more mellow*
>
> *way or trying to be a lot more scientific or make it a little goofier, depending on how*
>
> *bored I am with the program.*"

3.3.2 Instructor competence

Organizations encouraged instructor professional development by sponsoring external

trainings or professional conferences and offering in-house training opportunities. However,

some instructors mentioned that various factors stood in the way of taking advantage of the

opportunities, including high workloads and insufficient funding. In some cases, exploratory

instructors indicated that their organizations only tended to offer opportunities to those in more

senior positions. In-house training was more common throughout our sample of organizations. In

some cases, opportunities for peer learning enhanced feelings of competence. A career instructor

mentioned how she was able to lead an organizational training session on topics she felt

passionate about, allowing for her to share her knowledge with her coworkers.

Exploratory instructors noted that they were encouraged to observe programming led by

their coworkers, and that they used these observations to inform their personal teaching styles.

An exploratory instructor explained this process by saying, "I shadowed people…I pick up on

their ways, so it kind of becomes a hodge-podge of what you want to talk about…and then you

can kind of create your own style." Career instructors indicated that they would utilize their autonomy by soliciting feedback from coworkers and program participants. One instructor mentioned that she took the initiative to develop an evaluation sheet for classroom teachers to complete after programming to supplement the other types of performance feedback that she received

3.3.3 Feedback

Exploratory instructors indicated that the supervisory performance feedback they received was inconsistent and was focused around their initial training. As exploratory instructors entered into an organization and became familiar with programmatic content, they were often subject to intensive feedback from supervisory staff. However, as the instructors became more familiar with program content and protocol, the performance feedback began to taper off. One explained this gradual decline in performance feedback by saying, "It was more often in the beginning. I'd receive feedback maybe once or twice a week from the supervisors or from other co-workers. And I had more evaluations because I was just starting…But I don't receive feedback more than maybe once a month now."

Career instructors indicated that they received very little performance feedback from their supervisors, and that the feedback they did receive was sometimes ineffective. Career instructors noted that their performance feedback generally entailed informal chatting with supervisors after programs, yearly written reviews, or feedback forms distributed to classroom teachers. Classroom teacher feedback forms appeared to be the most common organizational practice in delivering feedback to their career instructors, though many instructors indicated that classroom teachers did not provide critical advice useful for improvement. Most instructors noted that the

most useful feedback they received was from coworkers or supervisors who were familiar with leading programming and could provide specific advice on how to improve.

Both exploratory and career instructors also noted that they had been working in their organizations through turnover in various supervisory staff. These instructors noted that the shifting supervisory staff created even more inconsistencies for their performance feedback, both in its delivery and frequency.

3.3.4 Instructor relatedness

We accounted for instructor feelings of relatedness by asking about events sponsored by organizations focused on building relationships among the staff. Organizations occasionally sponsored events for their instructors, including cookouts, group sporting events, and hosting yearly group retreats. Some organizations also indicated that they held frequent meetings (e.g. weekly, bi-weekly) with their education staff to allow for the group to brainstorm and work through issues together. Instructors noted that these meetings also helped to build feelings of community among the education staff.

Instructors noted some factors that may have worked against group relatedness. Various career instructors indicated that age differences developed feelings of disconnect between themselves and younger staff, and both exploratory and career instructors noted feeling tired of being around their coworkers after long work days in varying work conditions.

Even with these compromising factors at play, most instructors indicated that the shared values and interests within their organizations ultimately inspired positive feelings of relatedness. One exploratory instructor indicated, "A lot of us are passionate about the same things and that's why a lot of us work here. And not only that, but we're basically living the same lives right now." Similarly, a career instructor mentioned, "A lot of us have the common thread of wanting

to be outside and connect with this park in some way, shape, or form…so we just have shared interests that link us."

Some supervisors indicated that they looked for specific traits when they interviewed applicants for instructor positions. Many specifically indicated that the apparent enthusiasm and interest that an interviewee displayed with regard to job tasks and the overall aims of the organization was one of their most important hiring benchmarks. Relatedness driven by value and interest alignment may be dictated both by the individuals who are attracted to working as EE instructors, as well as specific screening practices utilized by employers.

3.3.5 Job Meaningfulness

One of the most prevalent elements driving feelings of meaning was that of task alignment, or motivations driven by an interest in the work itself. The values-driven nature of work in EE, as well as the tasks that are characteristic of the work (e.g., working with children in the outdoors, teaching environmental-based concepts) appeared to contribute to a strong sense of meaning among instructors. Many instructors indicated that they were most strongly motivated by the enjoyment they felt by teaching and working with children.

There were limited opportunities for instructor advancement within organizations, likely due to funding constraints and organizational structure. The prevalence of advancement opportunities, as well as full time positions, may have influenced instructor turnover. One supervisor indicated that instructors worked in his organization for an average of 6 months total, due to temporary or seasonal positions. In some organizations, we observed "middle management"-type positions that were responsible for tasks at both instructor and supervisory levels (e.g., providing performance feedback for instructors, teaching programs). The presence of

these positions may work to retain instructional staff due to the visible opportunity to advance in their organizations.

4. Discussion

We set out to determine the most salient motivators of EE instructors and the organizational practices that influenced these motivators. Three factors were particularly salient within our sample of instructors: values alignment, autonomy, and the relative career stage of employees based on their commitment to working in EE. The organizations in our sample appeared to attract employees with similar values and interests based around the importance of teaching children to value the environment. These values and interests served some specific functions in terms of instructor motivation. First, the alignment between instructors' values and the values reflected in the missions of these organizations generated feelings of meaningfulness in their work. Moreover, shared values between employees helped to establish feelings of relatedness within organizations. Herzberg (1966) theorized that the relationships among coworkers in the workplace functioned as hygiene factors. Our evidence suggests that relatedness worked as a motivating element within the EE organizations in our sample, supporting literature indicating that relatedness may play more of a motivating role in more collaborative work environments (e.g., Hines, 1973; Holmberg el al., 2018).

In some organizations, the prevalence of values alignment was the result of recruiting instructors. In others, it seemed that individuals self-selected to apply for positions within these organizations, due to an interest in the tasks that are characteristic of these positions. Regardless of its source, the baseline of assumed values within organizations has significant implications for instructor autonomy and competence.

Employee autonomy can be most effective in organizations with strong missions, as the clarity of the mission can guide decision making towards favorable outcomes (Lipsky, 1980; Wilson, 1989). Autonomy generally enhances performance outcomes when employees are competent and when their work requires creativity and responsiveness rather than simple mechanistic or routine tasks (Hersey et al., 2007; Theurer et al., 2018). Competent teachers, particularly on field trips, should thus benefit from high degrees of autonomy. Instructors clearly valued their autonomy in teaching their programs and also described taking on personal initiatives and developing activities in support of programming. Instructors also indicated that their autonomy was helpful in furthering their feelings of competence, as they felt the "latitude" to seek out varying forms of performance feedback that was most effective for them and to participate and lead certain training opportunities.

The most salient motivators and responses to organizational practices differed somewhat between *exploratory* and *career* instructors. While exploratory instructors were more commonly motivated by opportunities to grow professionally, career instructors more commonly discussed the role of meaningful variety within their work tasks in their own motivations. Herzberg (1966) provides an important caveat to diversification of work tasks. He cautions against task diversification for its own sake (which he terms "job enlargement"), advising that "job enrichment" only occurs when new tasks add depth, variety, and meaning to a job. Examples of job enrichment include tasks that are more holistic (following an initiative from beginning to end), are perceived to make significant impact, that use a variety of skillsets, that grant higher degrees of autonomy, or that provide tailored feedback to an employee (Hackman and Oldham, 1980; Stern, 2018). Our study suggests that more experienced employees may yearn for these types of opportunities more than those in the exploratory phase. However, there may be

opportunities to work across the spectrum of experience levels for enhancing the meaningfulness of the work.

Herzberg's motivation-hygiene theory suggests that hygiene factors can cause dissatisfaction if they fall below a certain threshold (1966). Exploratory instructors indicated that the ability to work outdoors in exciting areas was a motivating element of their job, whereas career instructors indicated that they were strongly motivated by variety in their work. As instructors develop further experience and commitment to EE, the novelty of working outdoors may shift from a motivating element to a hygiene factor; instructors may expect a certain amount of work outdoors and begin to become more motivated by other elements of their jobs (such as more variety in work tasks).

The typology we developed was based upon the relative levels of commitment towards involvement in EE among instructors. These typologies were similar to career stages, as exploratory instructors generally had lower amounts of experience and career instructors generally had higher experience in EE. Studies utilizing career stages note the moderating effect of these stages on work performance and behaviors, as work commitment has also been found to increase as employees progress along career stages (Kooij, 2008), a finding also displayed by our instructor types. In a study of work attitudes in various public and private sector organizations, Aryee and colleagues (1994) concluded that work commitment in later career stages was driven by opportunities for skill development, whereas work commitment in earlier stages resulted from effective supervisory support. We found similar results in our study. Using career stages to help identify instructor types may be useful for EE organizations to develop tailored supervisory approaches cognizant of the relative stage of each instructor. For instance, facilitating opportunities for career instructors to become more involved with organizational decision-

making may recognize their motivations for meaningful variety in their daily work. Encouraging exploratory instructors to become involved in program design and evaluation may offer opportunities aligned with their motivations opportunities for professional development and growth.

The shared relevance of values alignment, autonomy, and desire for additional feedback speak to the potential importance of participatory evaluation efforts within organizations. For example, Powell and colleagues (2006) describe a framework for using participatory evaluation to crystallize a shared vision for organizational goals, to generate excitement about collecting data that can provide meaningful feedback to all employees, to promote continual improvement based on ongoing evaluation, and to enhance organizational performance and commitment as a result. These processes have the potential to enhance relatedness between employees through the recognition or establishment of clear values alignment.

5. Conclusion

Our research found that strong values alignment between employees and their organizations played a powerful role in instructor motivations for EE programs. We also uncovered desires for additional feedback, professional development, and job enrichment through the diversification of meaningful tasks. The organizations in the study were marked by considerable levels of autonomy for employees, which enabled many to find ways to enrich their own experiences. Targeted efforts at expanding positive feedback through participatory evaluation, calling greater attention to the positive impacts of the work, and providing greater opportunities for organizational advancement may further enhance instructor motivation. Similarly, perpetuating consistent values alignment through purposeful screening in hiring processes appears to be a valuable practice for maintaining healthy organizational commitment.

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Chapter 3.
Analyzing the relationships between instructor autonomy, prior experience, and environmental education program outcomes.

Daniel F. Pratson

Abstract.

Environmental education (EE) programming has been found to lead to beneficial student learning and behavioral outcomes. Characteristics of program instructors, among other programmatic factors, can influence those outcomes. Drawing upon elements of self-determination theory, motivation-hygiene theory and situational leadership theory, we explore the impacts of instructor job autonomy and prior experience on student outcomes in single day EE field trip programs. Results revealed three conditions that related to better student outcomes: (1) younger instructors who perceived low job autonomy; (2) older instructors with high perceived job autonomy; and (3) instructors who had taught the same program content frequently, regardless of their work autonomy. The authors recommend (1) enabling instructors to take ownership of certain programs, such that they can continually practice and develop competence over time; and (2) increasing levels of autonomy for instructors as they gain experience.

Key words: Environmental education, instructors, autonomy, prior experience, student outcomes

1. Introduction.

A growing body of literature suggests that environmental education (EE) programs can yield a variety of beneficial learning and behavioral outcomes in participants (Ardoin et al., 2018; Rickinson, 2001; Stern et al., 2014). These outcomes can include diverse knowledge, skills, behaviors, and dispositions connected to the development of environmental literacy and positive youth development (Ardoin et al., 2018; Powell et al., 2019). Prior research has

indicated that individual characteristics of instructors, including the specific pedagogical practices they employ and their degree of motivation, can have meaningful influences on their performance and resulting outcomes (Stern and Powell, 2013). Building on this finding, we explore two themes that we hypothesize may impact instructors' motivations and student outcomes in EE programming: instructors' autonomy and their prior work experience.

Autonomy, or the relative discretion that an employee has regarding their work, can lead to increased motivation to perform effectively (Baard et al., 2004; Deci & Ryan, 1985). Both self-determination theory (Deci & Ryan, 1985; 2002) and motivation-hygiene theory (Herzberg, 1966) posit that organizational support for employee autonomy is critical in influencing employee motivations, which can inspire more effective performance. Empirical studies in a variety of organizational contexts (see Gagné & Bhave, 2011; Spector, 1986) have supported these theoretical claims.

Prior research indicates that employee autonomy can be most effective in driving performance when it is appropriately assigned. Employee autonomy is favorable in positions requiring creativity, as well as in organizations with clear consensus around missions and goals (Lipsky, 1980; Wilson, 1989). Hersey and Blanchard's (2008) situational leadership theory suggests that organizational leaders provide higher autonomy to employees with higher levels of competence. This competence often is a product of prior experience. Prior experience, a measure closely aligned with employee attitudes toward and abilities to do work (Quiñones et al., 1995), may serve as an effective benchmark in predicting when autonomy is appropriate and effective in driving work performance.

2. Literature Review

2.1 Autonomy and work performance

Decades of organizational research looking to uncover the antecedents to job performance have, in part, focused on the roles and influences of employee autonomy in the workplace (see Gagné & Bhave, 2011 for a detailed review). Various, well-vetted frameworks regarding effective work design (e.g. Hackman & Oldham, 1975; Campion & Thayer, 1985; Warr, 1995), indicate that employee autonomy is a critical ingredient for driving employee success, often measured through performance outcomes.

Deci and Ryan's (1985; 2002) self-determination theory and Herzberg's (1966) motivation-hygiene theory posit that organizational support for employee autonomy can enhance motivations and subsequent work performance. These theories are established on the premise that the type of motivation that drives an employee is linked to the resulting effectiveness of performance. Extrinsic motivation, which is considered to lead to lower quality performance, is influenced by external rewards or pressures on employees. Intrinsic motivation refers to employee interest or enjoyment in the job itself, and it is common associated with higher quality performance. Thus, organizations that support employee autonomy can enhance intrinsic motivations within employees and thus drive more effective performance.

2.2 Work experience

Employee prior work experience sometimes serves as a proxy for competence, which may also drive effective performance (Quiñones et al., 1995). Employee age, years of experience in the workforce, and years of experience in a particular job have all been utilized as measures of prior experience, predicting employee performance throughout differing job contexts (Schmidt & Hunter, 1998; Morrow & McElroy, 1987; McDaniel et al., 1988). As employee experience increases, so does the potential for performance (Kanat-Maymon & Reizer, 2017). The relationship between employee experience and performance may also inform hiring practices and appropriate levels of supervision.

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As individuals accrue progress throughout their careers, their receptiveness to supervisory inputs and work tasks may shift. Lyon and Kuron's (2014) extensive review of differences among generational groups in the workplace (e.g. "Baby Boomers", "Millennials", etc.) concluded that generational divides may contribute to differences in a variety of factors in the workplace, including differences in preferred leadership characteristics and work tasks. For instance, Sessa and colleagues (2007) found that older generations valued leaders who delegated effectively and focused on long-term problems, and that younger generations valued leaders who were dedicated and invested in their employees. O'Connor and colleagues (2018) concluded that younger generations display anxiety when approached with ambiguous work tasks than members of older generations. These findings, among many others, indicate that elements driving work performance may change among employees in different generations, and that supervision may be most effective when these differences are taken into account.

Differences among employees with varying levels of work experience have also been investigated in studies involving employee career stages (Aryee et al., 1994; Bedeian et al., 1991; Morrow & McElroy, 1987). These studies suggest that individuals progress through distinct stages during their careers as they accrue further work and life experiences. Morrow and McElroy (1987) operationalize three major career stages through groupings of employee age, occupational experience, and specific position experience (Table 1). Studies have indicated increases in organizational commitment and decreases in intent to leave a position as employees progress through these stages (Kooij, 2008). Literature has also suggested that specific drivers of employee work attitudes change with progressing career stages. Aryee and colleagues (1994), for instance, concluded that commitment in later career stages was driven by continuous work skill development opportunities, whereas commitment was driven in earlier career stages by

supervisory support. Menguc and Bhuian (2004) determined that high work autonomy and effective feedback were more salient in driving job satisfaction in sales employees in later career stages. These findings indicate that differing instructor career stages may perform best with supervision that is cognizant of these differences.

Table 1. Career Stage groupings established by Morrow and McElroy (1987)

Career Stage	Age range	Occupational Experience range	Position experience range
Entry	≤30	≤2	≤2
Advancement	31-44	>2-≤10	>2-≤10
Maintenance	≥45	>10	>10

*Note: All values are years

2.3 Situational autonomy

Research suggests that autonomy may be best assigned in consideration of levels of employee experience and competence. For instance, Hersey & Blanchard's (2008) situational leadership theory indicates that employees with lower competence perform better under leadership that provides high structure around tasks and relationships, and employees with higher competence perform better with less structure guiding tasks. Similar patterns might be expected through different career stages. For instance, Aryee and others (1994) concluded that "trial stage" employees (those with less than two years of experience in their work) benefitted from more structured supervisory support. More experienced employees, however, did not benefit from this increased structure. Additionally, Fraccaroli and colleagues (2017) proposed that older employees require more autonomy to perform well, as a result of cognitive shifts that occur as they age and develop more competence.

Contextual factors of workplaces may also dictate when employee autonomy is most favorable. Employees in positions that require high creativity and adaptability, such as teaching students, can benefit from high autonomy to most effectively respond to the varying situations

that can arise in their jobs (Loughland, 2019). Lipsky (1980) and Wilson (1989) indicated that employee autonomy is also favorable in organizations in which clear goals are agreed upon. This provides for employees to innovate and adapt to achieve common goals.

Research Question and Hypotheses

Based on the findings outlined in the discussion above, we developed the following research question and hypotheses:

RQ: *How do instructor autonomy and prior experience influence EE program outcomes?*

Hypothesis 1: Students experiencing programs in which instructors have more prior experience will exhibit more positive program outcomes.

Hypothesis 2: Students experiencing programs in which instructors have more job autonomy will exhibit more positive program outcomes.

Hypothesis 3: The relationship between job autonomy and student outcomes will become stronger with greater instructor experience.
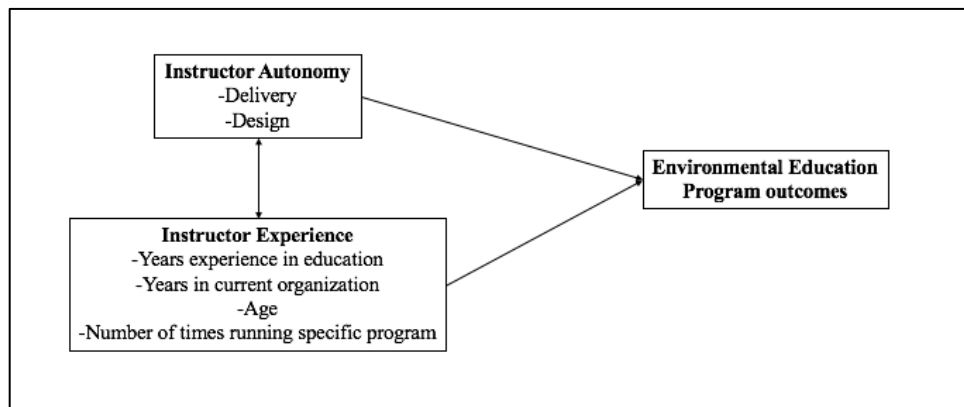
Figure 3.1. Conceptual framework detailing the relationships between the independent variables (instructor autonomy, prior experience) and dependent variables (program outcomes) of this study.

3. Methods

3.1 Study Overview

This study was part of a larger national study of single day, EE-focused field trip programs that aimed to determine the contextual and teaching factors most consistently linked with positive student outcomes. To determine the impacts of instructor autonomy and prior experience on program outcomes, we surveyed both instructors and participating students of a subset of the larger sample. Instructor surveys included items that measured two elements of instructor perceived autonomy within their positions: (a) the freedom that instructors felt to design programming and create program content (referred to as "Design autonomy"); (b) the freedom instructors felt to teach programming how they wanted to (referred to as "Delivery autonomy"). We measured instructor prior experience by their reported age, years of experience in education, and years of experience in their current organization. Student surveys occurred immediately following each program.

3.2 Site Selection

This study reports on data collection between January and June, 2018, from 166 programs provided by 57 organizations in 19 states (Table 2). Organizations that offered single day EE field trip programs for students in grades 5-8 were identified throughout the country in partnership with the North American Association for Environmental Education (NAAEE), the National Park Service (NPS), and the Association of Nature Center Administrators (ANCA). To ensure diversity among the proposed study sites, we utilized Ruggiero's (2016) evaluation of Environmental Literacy Plans (ELPs) in the US. This resource ranks every state in terms of the presence and overall quality of their ELP, defined as "state-specific comprehensive frameworks that support school systems in expanding and improving environmental education programs" (NAAEE 2014, p. 4). ELPs represent the degree of formal support for statewide EE initiatives and indicate the general standing of EE within each state. The list of state rankings was divided into quartiles representing: (1) most up to date with formal EE requirements; (2) high levels of

progress on ELPs, room to develop; (3) low to minimal progress on formal EE requirements; and

(4) minimal to no ELPs or no formal EE plan in progress. We quota sampled within each quartile

with an aim to sample programs in at least 10 different organizations within each quartile. Our

subsample met these criteria in all but one quartile, where programs from only nine different

organizations were sampled.

Table 2. Study sample distribution of programs, organizations, and states among ELP quartiles

ELP Quartile	State	Number of Organizations	Number of Programs
1	Colorado	2	3
	New Hampshire	1	3
	Oregon	4	6
	Washington	4	16
TOTALS:	**4 States**	**11 Organizations**	**28 Programs**
2	California	10	28
	Florida	9	41
	Maine	1	3
	Ohio	2	5
	Pennsylvania	2	3
	Wisconsin	2	3
TOTALS:	**6 States**	**26 Organizations**	**83 Programs**
3	Indiana	2	9
	Michigan	1	1
	Nebraska	1	4
	New York	2	3
	Texas	3	4
	Virginia	2	6
TOTALS:	**6 States**	**11 Organizations**	**27 Programs**
4	Arizona	6	16
	Georgia	1	5
	Massachusetts	2	7
TOTALS:	**3 States**	**9 Organizations**	**28 Programs**

3.3 Student Surveys

Immediately following each program, all attending students were asked to complete a

survey regarding their opinions of the program and its influence on them. The average

completion time was between 8-10 minutes. Three specific program outcomes measured in the

student survey were used in this study. *Behavioral Intention* was measured through a process of coding written student responses to the question "As a result of this field trip, do you intend to do anything differently in your life?" If the students marked "Yes," they were instructed to write what they planned to do in a space below the prompt. Reponses that were not relevant in any way to the content of the program (e.g., "I want to play video games," or "I will become a pro basketball player") were removed. The final outcome variable represents the percentage of students in the program group that expressed intentions that were relevant to the program content (e.g., "Become a scientist" or "Save water"). *Satisfaction*, or how much the students enjoyed the overall field trip, was operationalized by the question "How would you rate this field trip on a scale from 0 to 10?", with 0 labeled as "Terrible" and 10 labeled as "Excellent." *EE21* is an index representing the mean combination of mean responses to twelve "crosscutting" program outcomes identified as by Powell and colleagues (2019) (Table 3).

Individual student responses for the *Satisfaction* and *EE21* outcomes were scaled up to the group level for analyses to match the scale of the independent variables. Intraclass correlation coefficients further justified this aggregation, showing that most variance occurred between groups, rather than within (Woehr et al., 2015). ICC(1) = 0.24 and 0.21 and ICC(2) = 0.80 and 0.78, respectively for satisfaction and EE21.

Table 2. Mean scores and standard deviations for student-reported outcomes included in the EE21 index. *All items were measured on a scale of 0-10. Self-efficacy and environmental attitudes were measured as a change score, and the means reflect the difference between how students viewed these outcomes before and after the program, each on a 0-10 scale.*

Outcome	Definition	Items	Mean	SD
Place connection	Appreciation and the development of personal relationships with the physical location and its story.	*How much do you agree with the following statements? (anchors: not at all, some, totally)*		
		· Knowing this place exists makes me feel good.	7.80	1.19
		· I want to visit this place again.	7.74	1.36
		· I care about this place.	8.18	1.18
Learning	Knowledge regarding the interconnectedness and interdependence between human and environmental systems.	*How much did you learn about each of the following things as a result of . . .? (anchors: nothing at all, a fair amount, a huge amount)*		
		· How different parts of the environment interact with each other.	7.13	1.12
		· How people can change the environment.	7.61	1.18
		· How changes in the environment can impact my life.	7.58	1.16
		· How my actions affect the environment.	7.94	1.17
Interest in Learning	Enhanced curiosity, increased interest in learning about science, the environment.	*Did this . . . make you feel any <u>more interested</u> in any of the following things? (anchors: not at all, more interested much more interested)*		
		· Science.	6.51	1.52
		· How to research things I am curious about.	6.63	1.48
		· Learning about new subjects in school.	6.27	1.59
21st Century Skills	Critical thinking and problem solving; communication; and collaboration.	*How much did this . . . help you <u>improve</u> any of these skills? (anchors: not at all, a fair amount, a huge amount)*		
		· Solving problems.	5.79	1.56
		· Using science to answer a question.	6.45	1.40
		· Listening to other people's points of view.	6.83	1.39
		· Knowing how to do research.	6.47	1.58
Meaning/Identity	A heightened sense of self-awareness, critical reflection, and purpose.	*Did this . . . do any of the following things for you? (anchors: not at all, a fair amount, a huge amount)*		
		· Taught me something **that will be useful to me** in my future.	6.94	1.38
		· Really made me think.	6.96	1.42
		· Made me realize something I never imagined before.	6.66	1.53
		· Made me think differently about the choices I make in my life.	6.82	1.50
		· Made me curious about something.	6.87	1.30
Self-Efficacy	Belief in one's own ability to achieve one's goals and influence their environment.	*The difference between retrospective pre/post items (post minus pre); anchors: not at all, somewhat agree(d), strongly agree(d):*		
		· I believe in myself	0.99	0.80
		· I feel confident I can achieve my goals	0.86	0.63
		· I can make a difference in my community.	1.15	0.67

Environmental Attitudes	Sensitivity, concern, and positive dispositions towards the environment.	*The difference between retrospective pre/post items (post minus pre);anchors: not at all, somewhat agree(d), strongly agree(d):*		
		· I feel it is important to take good care of the environment	0.82	0.50
		· Humans are a part of nature, not separate from it.	1.03	0.62
		· I have the power to protect the environment.	1.24	0.73
Environmental Stewardship	Motivations to perform stewardship-related behaviors.	*Did this . . . make you any <u>more likely</u> to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely)*		
		· Help to protect the environment.	7.62	1.26
		· Spend more time outside.	7.31	1.23
		· Make a positive difference in my community.	7.32	1.22
Collaboration	Motivation to collaborate more with others.	*Did this . . . make you any <u>more likely</u> to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely)*		
		· Listen more to other people's points of view.	7.04	1.26
		· Cooperate more with my classmates.	7.01	1.26
School motivations	Motivation to work harder in school.	*Did this . . . make you any <u>more likely</u> to do any of the following things within the next year? (anchors: no more likely, somewhat more likely, way more likely)*		
		· Work harder in school.	7.28	1.43
		· Pay more attention in class.	7.19	1.51

3.4 Instructor Surveys

Researchers distributed surveys to the instructors who led the programs, either prior to the start of the program or directly after the program. Average survey completion time for instructors was between 2-5 minutes. Instructor design autonomy was measured categorically, with instructors indicating the degree of input they had in designing the program (Table 4).

Table 4. Survey items measuring instructor design autonomy

Design autonomy level	Survey Prompt
Low	"I was provided with a full script and the topic was already chosen for me"
	and
	"I was provided with the topic and script, but I had some freedom to inject my own style into how I led the program."
Moderate	"The program topic was suggested, and I wrote my own script and chose the information to use"
High	and "I selected the topic and developed the entire program free from restrictions"

Surveys measured instructor delivery autonomy through the prompt "In my work with this organization, I feel that I have freedom to teach programs in the way I see fit," using an 11-point Likert-type scale with 0 labeled as "Disagree" and 10 labeled as "Completely agree." Instructors wrote in their own responses to indicate their prior experience in education, years working in their organizations, number of times they had performed programming, and age.

Some instructors responded to the question about the number of times they had previously run a program with a range (e.g., 10-15 times) or other estimates (e.g., 100+; "a lot"; "2x a week"). For responses that indicated a range of times, the average whole number between the two range values was taken. For responses indicating a number and a plus sign, we added one more year to the indicated value (e.g., 100+ became 101). Responses that did not indicate a quantifiable number of times (e.g., "a lot") were dropped.

We transformed instructor responses to prior experience variables into categorical data, drawing from career stage literature (Morrow & McElroy, 1987) to transform instructor years of experience, years in their organization, and age variables. Morrow and McElroy (1987) established three distinct career stages measured through employee age, years in an occupation, and years in a specific position. We adopted these measures and used them to establish distinct cut points for instructor years of experience, years in organization, and age. We used quartiles to establish cut points for the number of times employees performed programming. This created four distinct groups (Table 5.)

Table 5. Values making up each of the cut points for instructor prior experience and perceived autonomy variables used in two-way ANOVA analyses.

Variable	Cut point groupings	*n* respondents in each grouping
*Years of experience	≤2 years	31
	>2 to 10 years	81
	>10 years	46

*Years in organization	≤2 years	63
	>2 to 10 years	69
	>10 years	32
*Age	≤30 years old	72
	31-44 years old	46
	≥45 years old	44
Number of times performing program	≤8 times	47
	9-30 times	45
	31-80 times	31
	81+ times	37
Delivery autonomy	≥7 (low delivery autonomy)	54
	8-10 (high delivery autonomy)	113
Design autonomy	Low	91
	Moderate	58
	High	16

(*Cut points adopted from Morrow & McElroy, 1987)

The mean of the delivery autonomy variable was 8.01 (on an 11-point scale) and displayed a strong left-tailed distribution. Discussions with instructors regarding the variable scoring during the fieldwork period also suggested that a score of 7 on this scale (also the cutoff for the lowest quartile) represented a distinct cutoff for respondents. Respondents reporting a 7 or lower on the scale were recorded as experiencing "low delivery autonomy," and those reporting an 8 or above were recoded as experiencing "high delivery autonomy".

3.5 Data Cleaning and Preparation

A total of 345 programs were sampled in the larger national study, amassing 5,317 student surveys and 674 instructor surveys. Student survey data were cleaned first, where a total of 941 student surveys and 11 programs were dropped due to incompletion, invalid response patterns, or low response rates from program participants. We further limited the sample for this study to programs that were either taught by only one instructor or programs where we could identify one clear lead instructor. Lead instructors were defined as those who were observed as teaching a majority of the program content to student groups during a program, different from other instructors that had less meaningful or impactful interactions with the group during the

program. We limited our sample in this way to more confidently identify the direct influence of lead instructors on resulting program outcomes. This also allowed us to perform bivariate analyses between instructor variables and student outcome data. Our final sample included 166 programs, 166 instructor surveys, and 2,131 student surveys (Table 6).

Table 6. Steps involved with data reduction to inform final study sample

Step	Removed Data	Programs Remaining	Instructor Surveys Remaining	Student Surveys Remaining
Initial Collection	N/A	345	674	5,317
Student Survey Data Cleaning	941 student surveys; 11 programs	334	674	4,376
Limited sample to one lead instructor	2,245 student surveys; 168 programs; 508 instructor surveys	166	166	2,131

3.6 Analyses

Data was input and analyzed in Stata version 15.1, a statistical analysis software package.[1] We performed a series of means-comparisons analyses using the transformed, categorical instructor variables and each of the dependent variables described above. To test our first and second hypotheses, we performed one-way ANOVAs comparing mean outcome scores for programs where instructors reported different levels of design autonomy and prior experience variables. We also performed T-Tests comparing outcome means in the delivery autonomy variable. We then performed two-way ANOVAs to examine interactions between instructor autonomy, prior experience, and program outcomes. The two-way ANOVAs tested our third hypothesis.

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[1] We initially explored the raw, continuous data by running series of Pearson's correlations between instructor prior experience, delivery autonomy data and program outcome data. We also ran a series of linear regression models looking to determine the effects of instructor prior experience, delivery autonomy, and design autonomy on program outcomes. Results from these analyses are included in tables D1 and D2 in Appendix D.

4. Results

Table 7. Descriptive statistics of dependent and independent variables in this study.

Dependent Variable	*n*	Mean	Standard Deviation
EE21	166	5.88	0.98
Satisfaction	166	7.74	1.14
Behavioral Intention	166	0.52	0.23
Place Connection	166	7.91	1.17
Learning	166	7.57	1.06
Interest in Learning	166	6.47	1.44
21st Century Skills	166	6.39	1.40
Meaning/Identity	166	6.85	1.33
Self-Efficacy	166	1.00	1.34
Environmental Attitudes	166	1.03	0.49
Environmental Stewardship	166	7.41	1.15
Collaboration/Cooperation	166	7.02	1.23
School Motivations	166	7.23	1.44
Independent Variable	*n*	Mean	Standard Deviation
Delivery Autonomy	166	8.00	1.51
Years of experience in education	158	9.74	9.43
Years working in organization	164	6.12	6.75
Number of times running program	160	49.63	55.38
Age	162	36.43	13.53

4.1 Bivariate relationships between experience, autonomy, and program outcomes.

Instructors with less general experience in EE were associated with somewhat more positive results than instructors with more general experience in the field. Results from one-way ANOVAs indicated that instructors with 10 years of experience in education or less were associated with higher satisfaction outcomes than instructors with more than 10 years of experience (Table 8). This analysis yielded an eta-squared value of 0.07, indicating the presence of a moderate effect between instructor years of experience and satisfaction. Instructors aged 30 years or younger were associated with higher behavioral intention outcome scores than instructors aged 45 and older, but with only a small effect size (η^2=0.04; Table 9).

Specific programmatic experience, however, was associated with more positive outcome scores. Instructors that indicated performing programs more than 8 times were consistently associated with higher program outcome scores, across all outcomes (Table 10). Eta-squared values for these tests ($\eta^2 > 0.07$) indicated the presence of a moderate effect between instructors performing programs more than 8 times and all measured student outcomes.[2]

No other statistically significant differences were observed between instructor experience variables and program outcomes. Additionally, there were no significant differences in mean outcome scores among different degrees of instructor delivery and design autonomy. See tables D3 through D5 in Appendix D for detailed analysis outputs.

Table 8. One-way ANOVA results of mean program outcome scores between instructor prior experience categories.

Program Outcomes	Instructor years of experience in education			F	p	η^2
	0-2 years **(n=31)**	**3-10 years** **(n=81)**	**11-50 years** **(n=46)**			
EE21	5.88 (1.02)	6.08 (0.98)	5.61 (0.87)	3.61	0.03	
Satisfaction	7.91$_a$ (1.09)	7.97$_a$ (1.06)	7.32$_b$ (1.14)	5.48	<0.01	0.07
Behavioral Intention	0.53 (0.23)	0.55 (0.23)	0.47 (0.22)	1.58	0.20	

Note: Eta-squared value was only reported for statistically significant results. Differences in superscripts highlight differences between groups statistically significant at $p<0.05$.

Table 9. One-way ANOVA results of mean program outcome scores between instructor age categories.

Program Outcomes	Instructor Age			F	p	η^2
	20-30 years old (n=72)	**31-44 years old (n=46)**	**45-76 years old (n=44)**			
EE21	5.98 (0.95)	5.83 (1.10)	5.76 (0.85)	0.78	0.46	
Satisfaction	7.93 (1.12)	7.64 (1.21)	7.47 (1.05)	2.44	0.09	

[2] Eta-squared scores that are between 0.01 and 0.06 indicate the presence of a moderate effect (Cohen, 1988).

Behavioral Intention	0.55$_a$ (0.23)	0.53$_{ab}$ (0.23)	0.44$_b$ (0.20)	3.35	<0.05	0.04

Note: Eta-squared value was only reported for statistically significant results. Differences in superscripts highlight differences between groups statistically significant at $p<0.05$.

Table 10. One-way ANOVA results of mean program outcome scores between program frequency categories.

Program Outcomes	Number of times performing program				F	p	η^2
	0-8 times (n=47)	9-30 times (n=45)	36-80 times (n=31)	90-201 times (n=37)			
EE21	5.47$_a$ (1.00)	5.95$_{ab}$ (0.88)	6.12$_b$ (0.99)	6.19$_b$ (0.73)	5.48	<0.01	0.10
Satisfaction	7.26$_a$ (1.19)	7.94$_b$ (1.06)	7.89$_{ab}$ (1.15)	7.97$_b$ (0.89)	4.39	<0.01	0.08
Behavioral Intention	0.43$_a$ (0.24)	0.52$_{ab}$ (0.21)	0.57$_b$ (0.19)	0.57$_b$ (0.23)	3.85	<0.01	0.07

Differences in superscripts highlight differences between groups statistically significant at $p<0.05$.

4.2 Interactions between experience and autonomy and their relationships to program outcomes

The interaction between instructor age and delivery autonomy was found to have a significant effect on the satisfaction program outcome [$F_{(2, 156)}= 3.33$, $p<0.05$]. Instructors with low delivery autonomy in the first age grouping (≤30 years old) were associated with higher satisfaction scores than instructors in the same age grouping with higher perceived autonomy (Figure 2). This relationship showed a moderate effect size (Cohen's $d = 0.62$[3]).
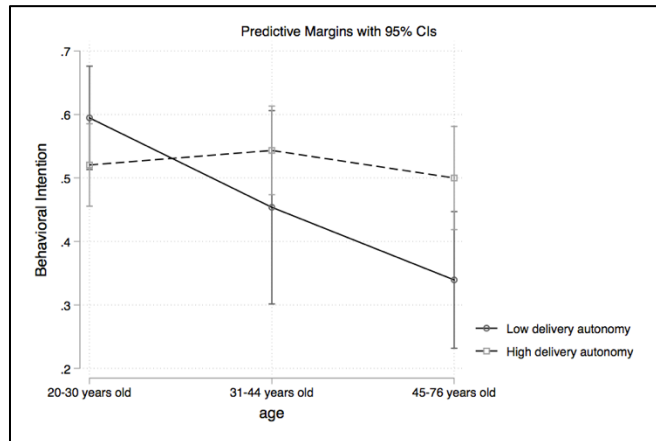
The interaction between instructor age and delivery autonomy displayed a significant effect on the behavioral intention outcome [$F_{(2, 156)}= 4.03$, $p<0.05$]. In situations with high delivery autonomy, there were no significant changes in behavioral intention outcomes between age groups. In situations with low delivery autonomy, behavioral intention outcomes decreased with age, suggesting that low autonomy related to less positive outcomes for older instructors (Figure 3). We calculated a Cohen's d of 0.86 between the mean outcome scores in age group 3

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[3] Cohen's d scores that are between 0.5 and 0.8 indicate the presence of a moderate effect (Cohen, 1988).

(instructors ≥45 years old), which indicates the presence of a large effect between these two

mean outcome scores.
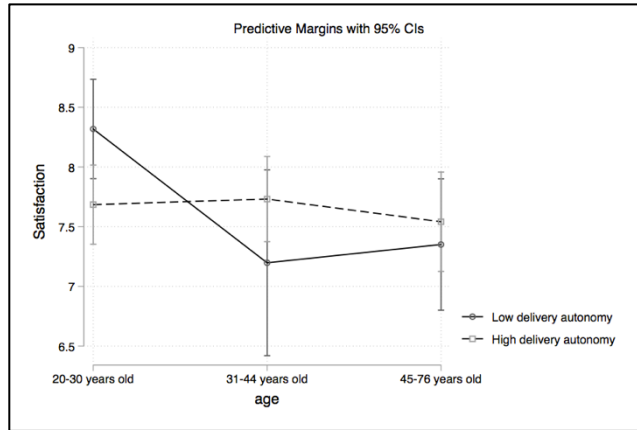
Figure 2. Interactions between instructor age, perceived autonomy, and satisfaction outcomes.

Figure 3. Interactions between instructor age, perceived autonomy, and behavior intent outcomes.

5. Discussion

Our first hypothesis predicted that students experiencing programs led by instructors that

had more prior experience would exhibit positive program outcomes. One-way ANOVA results

indicated that instructors who led programming more than 8 times were associated with positive

program outcomes. Practice, an element of work experience (Quiñones et al., 1995), may lead to

feelings of preparation and confidence in instructional staff, which may, in turn, have impacted

program outcomes. Effective programming allows room for spontaneity and opportunity based on the knowledge of the setting at hand (Stern et al., 2013). For these elements to surface, instructors require a certain level of comfort and familiarity with programmatic content. Our findings are consistent with these stipulations, suggesting that the relative frequency that an instructor performs a program is tied to positive outcomes.

The number of times performing programming serves as proxy measure of instructor competence in leading EE programming. Situational leadership theory (Hersey et al., 2007) suggests that less competent employees benefit from more directive supervision and more competent employees benefit from less directive supervision. Our results suggest that increasing instructor competence has a positive effect on program outcomes, and that the frequency that EE instructors run programming represents an observable factor that can assist in determining instructor competence. When paired with recommendations from situational leadership theory, these results suggest that instructors who are more familiar and practiced with program delivery may benefit from less directive supervision. Conversely, instructors who are jumping into a program for the first time may benefit from more direction and oversight.

One-way ANOVA results indicated that instructors with more than 10 years of experience in education were associated with lower satisfaction program outcomes. Results also indicated that instructors aged 45 years or older were associated with lower behavioral intention program outcomes. These results are somewhat contradictory to theory; studies suggest that employee performance may increase in effectiveness as they develop further life and work experiences (e.g. Vecchio 1987; Kanat-Maymon & Reizer, 2017). Though possessing high levels of prior experience is generally considered to be an asset in the workplace, it appeared that students responded more strongly to younger, less experienced instructors. These findings may

be related to teaching effectiveness among members of different generations; younger instructors may have been more aware and familiar with trends or references relevant among program participants (Lyons & Kuron, 2014), potentially creating a stronger connection and sense of relatedness between themselves and students. This finding would benefit from further studies.

Our second hypothesis predicted that students experiencing programs led by instructors that had higher job autonomy would exhibit positive program outcomes. We found no statistically significant results between instructor delivery or design autonomy and program outcome scores. These results do not align with prior research indicating that greater autonomy leads to effective performance (e.g., Hackman & Oldham, 1980; Campion & Thayer, 1985; Warr, 1995), and may be due to the fact that autonomy was fairly high among all organizations. The autonomy that instructors felt rarely dipped below a threshold that may have driven significantly negative programmatic outcomes.

Our third hypothesis stated that the relationship between job autonomy and student outcomes would become stronger with greater instructor experience. Two-way ANOVA results indicated that the autonomy instructors felt to deliver program content interacted with their age, in connection to satisfaction and behavioral intention outcomes. Younger instructors (age 30 and below) achieved somewhat better participant outcomes with lower perceived delivery autonomy. Older instructors ($<$ 30 years old) achieved better program outcomes with higher perceived delivery autonomy. These findings suggest that younger instructors may have benefitted from more structure or supervisory oversight, while older instructors may have benefitted from greater autonomy.

These results are consistent with findings that the importance of autonomy may increase as employees age (Thompson & Vecchio, 2009; Truxillo et al., 2015). Generational differences

among employees may help to further explain interactions between autonomy, age, and outcomes. Studies have explored the impacts and presence of generational differences in varying work contexts (e.g., Hansen & Leuty, 2012; Lyons & Kuron, 2014; O'Connor et al., 2018). Employees in older generational groupings have been found to value higher levels of autonomy in the workplace than employees in younger generations (Hansen & Leuty, 2012). Additionally, research has suggested that employees in younger generations may feel more anxiety when granted high levels of discretion in approaching ambiguous or multi-faceted tasks (O'Connor et al., 2018). Though the causes of differences in preferences and attitudes between generations may range from differing cultural norms, parenting styles, and technologies, the presence of these differences can inform supervisory approaches. EE instructors belonging to older generational groups may expect a higher amount of autonomy to teach programming due to the expectations and norms consistent with their lived experiences, regardless of their levels of competence[4]. Conversely, instructors in younger generational groups may perform best with more guidance and oversight, especially early in their careers.

6. Limitations and Suggestions for future research

There are a number of limitations to this study that impact the ultimate claims that we feel we are able to make. First and foremost, though site selection was rigorous, the sample of instructors is not statistically representative of the greater population of EE instructors in the United States. This study was limited to organizations providing programs during the school year to participants in 5th-8th grades. A larger instructor sample size would allow for further multivariate statistical testing, which could provide more meaningful insights regarding the presence or absence of interactions between experience and autonomy. Finally, not all dependent

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[4] We did not find a statistically significant, positive correlation between the number of times instructors performed programming (a proxy measure of competence) and age. See Table D1 in Appendix D for correlation outputs.

program outcome variables in this study displayed significant relationships with instructor independent variables. As such, our results were mixed. This may be due to the high number of factors that may drive student outcomes (e.g., lesson content, activity characteristics, location, etc.; Stern et al., 2014). Follow up studies that account for these additional variables may paint a more complete picture of the impacts of instructors.

Follow up studies may consider taking an approach that is more explicitly guided by self-determination theory by developing methods to measure the prevalence of competence and relatedness within instructional staff to determine their impacts on motivations, and ultimately, outcomes. Qualitative studies that further identify the specific organizational practices leading to employee feelings of autonomy, competence, and relatedness, task meaningfulness, and other key organizational context factors identified in the literature (Deci & Ryan, 1985b; 2002; Herzberg, 1966) could inform future quantitative measures, taking the contextual elements of EE programming and organizational cultures into account. Ideally, these measures could be useful for similar studies regarding other types of informal education (e.g., museum, aquaria, and park interpretation programs). Further investigation on the effects of instructor experience on student outcomes would also be useful in further explaining the statistically significant negative trends that we found.

7. Implications

EE organizations should consider the importance of program repetition, practice, and adaptation by individual instructors, such that they can enhance their level of comfort, flex their creativity, and continually improve their programs. The competence that instructors gain from this repetition may also help in informing effective supervision levels. Younger instructors may benefit from more guidance in these processes than more experienced or older instructors. Also,

allowing for instructors to take a significant role in program development and design may increase feelings of "ownership," as well as intimate knowledge of program content. Organizations may also consider the importance of autonomy for older instructors. Supporting the discretion of older instructors, by encouraging them to teach programming how they see fit, may influence more positive program outcomes. This may also work to eliminate potential feelings of dissatisfaction from a lack of autonomy (Herzberg, 1966).

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Appendix A.
Interview questions for EE Instructors

Environmental educator identity/value alignment
-What drew you to working as an environmental educator? How did you find yourself working at this organization?
-Tell me how you feel about your job and the impacts you are making in children

Autonomy
-Do you ever feel like you want to switch up how you teach lessons? Is this something that is encouraged in your work?
-How does your supervisor feel about switching things up? Do you think your supervisor appreciates your ideas?

Competence
-How often do you receive feedback about what you are doing?
-How do you feel about feedback? Is it positive and helpful? Does it hurt?
-Do you ever get opportunities to participate in professional development? Do you ever feel like you want to partake in similar opportunities?

Relatedness
-Do you like hanging out with your coworkers?
-Does your organization offer opportunities to socialize with your coworkers in a setting outside of work?
-Do you feel that you relate to your coworkers and supervisors? How?

Motivation
-What parts of your job motivate you the most?
-What about this job gets you excited to go to work every day?

Appendix B.
Interview questions for EE supervisors

Instructor Autonomy
-Tell me about how much freedom the environmental educators have with teaching lessons. Do you have them develop what they are going to teach?
-Do you feel like the environmental educators like that freedom (or lack thereof)?

Instructor Feedback/Competence
-I'd like to hear about how employees get feedback here. Is it a formal process or more casual?
-How often do the environmental educators get feedback on their performance?

Group Dynamics/Employee Relatedness
-Would you mind telling me about the group dynamic here? How often do you interact with the environmental educators?
-Are the interactions generally formal or casual?
-Do you all hang out outside of work?
-Do you feel like the instructors enjoy working here? With each other?

Organizational Culture
-Do you do anything unique to build a particular sort of culture within your organization? If so, what?

Desired instructor characteristics
-Tell me about the hiring practices at this organization.
-What kinds of characteristics do you look for when you are hiring new employees?

Survey for EE Instructors

Program Date/Time: _____ Observers: _____ Survey Date/Time: _____ Code: _____

This survey is part of a research study aiming to improve environmental education-related field trips. Your participation in this survey is voluntary, and your identity will be kept confidential when we publish the findings. Your responses will never be presented in a way that they can be identified.

Who designed the program you ran that we observed?

☐ I was provided with a full script and the topic was already chosen for me

☐ I was provided with the topic and script, but I had some freedom to inject my own style into how I led the program

☐ The program topic was suggested, and I wrote my own script and chose the information to use

☐ I selected the topic and developed the entire program free from restrictions

Instructor Information

Are you a volunteer here?   Yes:_____   No:_____

Years of experience in education:_____

Years with this organization: _____

Number of times performing this program (estimate): _____

Age: _____

Circle the number that corresponds with how much you agree with each of the statements. The closer the number is to 10, the more you agree with the statement.

In my work with this organization, I feel that...	Disagree					Somewhat agree					Completely agree
I have freedom to teach programs in the way I see fit	0	1	2	3	4	5	6	7	8	9	10
I am good at conducting educational programs for kids	0	1	2	3	4	5	6	7	8	9	10
I feel a sense of camaraderie with the people I work with	0	1	2	3	4	5	6	7	8	9	10
This organization's mission aligns well with my personal values	0	1	2	3	4	5	6	7	8	9	10
I love teaching kids	0	1	2	3	4	5	6	7	8	9	10
Teaching scientific concepts is enjoyable to me	0	1	2	3	4	5	6	7	8	9	10
Teaching kids about the environment is important to me	0	1	2	3	4	5	6	7	8	9	10
I love working outdoors	0	1	2	3	4	5	6	7	8	9	10

We understand motivations regarding your job can vary on a day-to-day basis. For this next section of statements, please answer reflecting your overall sense of motivation relating to your job in this organization.

In my work with this organization, I am motivated...	Not at all motivated					Somewhat motivated					Totally motivated
To be an awesome teacher	0	1	2	3	4	5	6	7	8	9	10
To continue to get better at my job	0	1	2	3	4	5	6	7	8	9	10
To impact the lives of students in a meaningful way	0	1	2	3	4	5	6	7	8	9	10
To be a positive role model	0	1	2	3	4	5	6	7	8	9	10
To represent this organization well	0	1	2	3	4	5	6	7	8	9	10
To contribute to achieving my organization's mission	0	1	2	3	4	5	6	7	8	9	10
To inspire environmental stewardship in kids through education	0	1	2	3	4	5	6	7	8	9	10

Which of the following best describes your racial or ethnic background? *(Check all that apply)*

☐ White, not of Hispanic descent   ☐ Hispanic   ☐ Mixed (two or more races)   ☐ American Indian or Alaskan Native

☐ Black, not of Hispanic descent   ☐ Asian   ☐ Native Hawaiian or other Pacific Islander   ☐ Other_____

For questions or concerns about this research, please contact Daniel Pratson at dpratson@vt.edu or (440) 465-3279. Should you have any questions or concerns about this study's conduct or your rights as a research subject, you may contact the Virginia Tech Institutional Review Board at irb@vt.edu.

Thank you for your time and input.

Appendix D.
Correlation and Regression Data

We performed a series of Pearson correlations to determine the relative strength and direction of associations between instructor perceived autonomy, prior experience, and program outcome variables. Correlation results indicated a statistically significant positive relationship between the number of times that an instructor ran a program and all of the program outcome variables at $p<0.01$, as well as statistically significant negative relationship between instructor years of experience and student satisfaction. To decrease the potential of Type 1 errors, we calculated a Bonferroni correction that adjusted the acceptable p value to 0.0025 (0.05 divided by 5), as there were a total of five variables assessed against each dependent variable (Curtin & Schulz, 1998; Table D1).

Table D1. Correlation coefficients of continuous dependent and independent variables in this study.

	EE21	Satisfaction	Behavioral Intention	Years of experience in education	Years in organization	Age	Number of times performing program	Delivery Autonomy
EE21	1.00							
Satisfaction	0.76	1.00						
Behavioral Intention	0.52	0.39	1.00					
Years of experience in education	-0.18	-0.27**	-0.21*	1.00				
Years in organization	-0.13	-0.21*	-0.07	0.74	1.00			
Age	-0.10	-0.19	-0.18	0.77	0.66	1.00		
Number of times performing program	0.25**	0.21*	0.22*	0.10	0.21	0.18	1.00	
Delivery Autonomy	-0.02	-0.06	0.11	-0.05	-0.06	-0.08	0.04	1.00

Note: * indicates $p<0.01$; ** indicates $p<0.0025$.

We ran a series of linear regression models to further illuminate relationships between instructor autonomy, experience, and program outcomes. We included both perceived and practical instructor autonomy in these analyses. Regression results indicated that out of all instructor independent variables, the number of times instructors had taught programs was the only positive significant predictor of student outcomes. Corresponding R^2 values for each analysis indicated that instructor independent variables explained approximately 11% of the variance in EE21 outcomes, 14% of the variance in Satisfaction outcomes, and 12% of the variance in Behavioral Intent outcomes (Table D2).

Table D2. Summary of linear regression analyses for instructor autonomy prior experience variables predicting student outcome scores (*n=147*)

Independent Variables	EE21			Satisfaction			Behavioral Intention		
	B	*SE B*	*β*	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Years of experience	-0.02	0.01	-0.17	-0.03	0.02	-0.24	0.00	0.00	-0.23
Years in organization	-0.02	0.02	-0.11	-0.01	0.02	-0.09	0.00	0.00	0.13
Age	0.00	0.01	0.05	0.00	0.01	0.01	0.00	0.00	-0.12
Number of times running program	0.00	0.00	0.30*	0.00	0.00	0.26*	0.00	0.00	0.24*
Delivery autonomy	-0.04	0.05	-0.07	-0.07	0.06	-0.08	0.00	0.01	0.06
Design autonomy	0.11	0.12	0.08	-0.03	0.14	-0.02	0.02	0.03	0.07
R^2		0.12			0.14			0.12	
F		3.15*			4.03*			3.40*	

Note: * indicates $p<0.01$

Tables D3 – D5 outline results from one-way ANOVAs without statistically significant finding

Table D3. One-way ANOVA results of mean program outcome scores between levels of instructor experience in their organization.

Program Outcomes	Instructor years of experience in their organization				
	0-2 years (*n=63*)	3-10 years (*n=69*)	11-39 years (*n=32*)	F	*p*
EE21	5.99	5.90	5.69	0.98	0.38
	(1.02)	(0.98)	(0.87)		
Satisfaction	7.88	7.79	7.36	2.27	0.11
	(1.17)	(1.13)	(1.08)		
Behavioral Intention	0.54	0.52	0.45	1.67	0.19
	(0.25)	(0.20)	(0.23)		

Table D4. T-Test results of mean program outcome scores among instructor delivery autonomy categories.

Program Outcomes	Instructor Delivery Autonomy		T	p
	0-7 (low delivery autonomy) (n=54)	8-10 (high delivery autonomy) (n=112)		
EE21	5.98 (0.93)	5.84 (1.00)	0.89	0.37
Satisfaction	7.90 (1.05)	7.66 (1.18)	1.27	0.20
Behavioral Intention	0.51 (0.24)	0.52 (0.22)	-0.33	0.70

Table D5. One-way ANOVA results of mean program outcome scores among instructor design autonomy categories.

Program Outcomes	Instructor Design Autonomy			F	p
	Low (n=91)	Moderate (n=58)	High (n=16)		
EE21	5.95 (0.93)	5.82 (1.06)	5.68 (0.98)	0.66	0.51
Satisfaction	7.88 (1.03)	7.64 (1.23)	7.16 (1.24)	2.98	0.06
Behavioral Intention	0.51 (0.22)	0.53 (0.24)	0.46 (0.23)	0.75	0.48

Appendix E.
IRB Approval Notice

VT VIRGINIA TECH.

MEMORANDUM

DATE:	January 14, 2019
TO:	Marc J Stern, Daniel Pratson, Robert B Powell
FROM:	Virginia Tech Institutional Review Board (FWA00000572, expires January 29, 2021)
PROTOCOL TITLE:	Organizational effects on instructor motivation in environmental education
IRB NUMBER:	**18-003**

Effective January 13, 2019, the Virginia Tech Institution Review Board (IRB) approved the Continuing Review request for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report within 5 business days to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at:

https://secure.research.vt.edu/external/irb/responsibilities.htm

(Please review responsibilities before the commencement of your research.)

PROTOCOL INFORMATION:

Approved As:	**Expedited, under 45 CFR 46.110 category(ies) 6,7**
Protocol Approval Date:	**January 25, 2019**
Protocol Expiration Date:	**January 24, 2020**
Continuing Review Due Date*:	**January 10, 2020**

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federal regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals/work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Invent the Future