

“Black and White Thinkers” and “Colorful Problems”: Understanding Student Thinking in Outdoor Education

Rachel Collins
University of Utah

Karen Paisley
University of Utah

Jim Sibthorp
University of Utah

John Gookin
National Outdoor Leadership School

Effective outdoor educators need to understand the developmental characteristics of students to best tailor programs to capitalize upon their capabilities. To the extent that learning is a primary objective of outdoor education programs, understanding our students' intellectual processes, specifically, can enhance our effectiveness in achieving this goal. This article presents several frameworks for understanding the developmental knowledge construction of adolescent, college-aged, and young adult students that were developed in traditional education settings. The purpose of this study was to determine the relevance of these models in an adventure education setting. Qualitative data were collected from students of the National Outdoor Leadership School. Results indicate that, despite differences between traditional and adventure learning environments and the types of problems students encounter in those settings, established framework of developmental knowledge construction are observable in the outdoor education classroom. Implications for teaching to developmentally different populations of students are discussed.

KEYWORDS: intellectual development, adolescents, emerging adults, ill-structured problems, adult education

Distinct differences in learning abilities and processes are observable in students as they grow older (Carey, 1985; Kuhn, 2001; Merriam & Caffarella, 1999). These developmental learning differences in students are not only a product of cumulative knowledge acquired through structured educational processes. Learning frameworks are also cognitive and social experiences in which students are engaging. Therefore, an awareness and understanding of developmental learning frameworks can inform the practice of educators and impact educational experiences for students. As most participants in outdoor education programs, and more specifically at the National Outdoor Leadership School (NOLS), are adolescent or college-age (Gookin, 2006), an appreciation of the intellectual processes and transitions within and between these ages is particularly relevant. Perry (1999) was one of the major researchers to outline the experience of learning among college-age students. Using his model, along with other supporting literature including Kitchener and King's model (1990) and adult learning theory (Mezirow, 1995), the researchers were able to build a trajectory of student learning from adolescence into young adulthood, including the college years. However, these models were developed based on evidence from traditional educational settings. Therefore, outdoor educators must consider and investigate the relevance of these frameworks for outdoor education programs as the components of the educational setting and teaching styles have some distinct differences from the traditional educational opportunities to which students are more frequently exposed to.

Models of Intellectual Development

Perry's conceptualization of Intellectual and Ethical Development (1999) is one of the dominant models of college student intellectual development. He conducted a series of year-end interviews over a 4-year period in the 1950s and 1960s with both Harvard and Radcliffe students to assess their intellectual development throughout their college careers. Incorporating the work of Piaget (1977) and Kohlberg (1958), Perry focused on college students during the adolescent to adult transition.

Specifically, Perry's (1999) model summarized the frameworks, or positions, college students used to view the world. His model was clearly based on a set of *positions* ("locus of central tendency") (p. 48) rather than *stages*. He argued that the idea of stages suggests certain durations of time an individual spends engaged in the processes or conceptions of those stages. In contrast, Perry's (1999) notion of *positionality* holds that distinctions between positions are based on a fixed level of intellectual development (Perry, 1999, p. 53), with no presuppositions regarding how long a person should or does spend wrestling with the specific ideas representative of each position. Further, he suggested that growth is encouraged by both academic and social environments and occurs during transitions between positions, not in the static positions themselves. Perry's positions, then, are more akin to intellectual milestones and less tied to developmental life stages. While these two ideas share parallel growth progressions, they are definitionally distinct (See Figure 1).

Perry (1999) identified nine positions, five related to intellectual development and four related to ethical development. This paper focuses on intellectual development frameworks, and how positions of intellectual development can be connected with students' self-reported learning mechanisms through their interpretations of how students understand knowledge construction. The ethical positions of Perry's framework discuss various commitments to ways of thinking and how students make decisions in a contextual world. These positions are viewed as ethical positions instead of intellectual positions as they do not involve changes in cognitive structures (Evans, Forney, Guido, Patton, & Renn, 2010). While Perry's (1999) positions were written as a developmental whole, the ethical positions will not be discussed in this paper as questions of ethic

and decision making were not involved in this study. The intellectual development positions developed by Perry and discussed in this paper include *Dualism*, *Multiplicity Pre-Legitimate*, *Multiplicity Subordinate*, *Multiplicity Correlate*, and *Relativism*.

Students in the Dualistic position view answers to problems as dichotomous: good and bad, right and wrong, or black and white. Knowledge acquisition, then, is considered a quantitative endeavor that is directed and distributed by authorities (e.g., teachers, textbooks, etc.) (Perry, 1999). These students typically identify instructors as experts and as the only individuals who hold knowledge on their given subject. For students in this position, problems must be resolved by a single solution or single right answer.

Multiplicity follows Dualism in Perry's model and includes three sub-positions: Pre-Legitimate Multiplicity, Multiplicity Legitimate, and Multiplicity Correlate. At face value, the Multiplicity sub-positions may suggest an "anything goes" mentality, but, in actuality, they involve the increasingly nuanced ability to consider multiple solutions to a problem before a definitive answer is known. Within these sub-positions, students become progressively more receptive to differing ideas and opinions, even those not generated by "experts," and improve their analytical thinking. Pre-Legitimate Multiplicity is a marker of the transition between the Dualistic and Multiplicity positions, and acknowledges multiple mechanisms through which learning is interpreted with a strong reliance on the authority knower for right and wrong answers. For students in this sub-position, there may be multiple solutions to a problem, but there is still only one that is right. In the next sub-position, Multiplicity Subordinate, students begin to identify that the multiple solutions to a problem could come from multiple sources, not solely derived from authority knowers. However, students in this position still perceive only one of those potential solutions as being ultimately right, and become confused in the process of sorting out the one correct solution. Lastly, Multiplicity Correlate is the sub-position that marks the transition between Multiplicity and Relativism. Here, students make the transition to seeing multiple viewpoints as a liberating possibility rather than a confusing quagmire.

After Multiplicity, students move on to the position of Relativism. Perry (1999) articulates this position as the stage where students start to recognize that not all opinions and ideas are as valid as others. Students begin to acknowledge the different values and levels of legitimacy of the ideas with which they interact. They also gain a working understanding of how reasonable people can reasonably disagree on some subjects. During this position, knowledge is viewed as having a more qualitative nature and becomes based on evidence and supporting arguments rather than dissemination from an authority.

While Perry's model adequately addresses college-age learners (Evans et al., 2010), it needs expansion to provide a better picture of intellectual differentiation among adolescents. The Reflective Judgment model, developed by Kitchener and King (1990), also addresses how knowledge is acquired and contextualized for learners across the lifespan. They argue that Piaget's (1977) formal operations insufficiently accounts for differences in individuals' epistemic assumptions. Kitchener and King's (1990) model explores the process of knowing across a large range of ages (16-33), and over seven independent samples (Brabeck & Wood, 1990; Kitchener, King, Wood, & Davidson, 1989; Schmidt, 1985; Welfel & Davidson, 1983). Their more age-based trends in intellectual development over time support Perry's findings, but also allow a more elaborate understanding of the positions that precede Perry's Dualistic Position. Kitchener and King's studies show that between the ages of 17 and 19, students are usually making the transition from a stage three (Perry's Dualistic Position) to a stage four (Perry's Multiplicity Position). They also suggest that students younger than age 17 are approaching stage three.

The Reflective Judgment model, which precedes Perry's Dualistic position, adds to this discussion an additional position where knowledge is absolute and static. The Reflective Judg-

ment Model's stages one through three state that knowledge is still based on absolutes, but adds acknowledgment of the setting in which learning occurs. Given this support from Kitchener and King (1990) regarding pre-collegiate students, the researchers added an additional position to Perry's model that represents the intellectual positionality of the adolescent age group for the purposes of this study. This *Pre-Dualism* position distinguishes itself from Perry's standard Dualism in that learners' styles indicate strict adherence to traditional learning mechanisms. In this Pre-Dualistic position, learners recognize knowledge as coming from authority sources (instructors), and only in authority settings (classrooms). Thus, Kitchener and King's (1990) model can account for the intellectual positioning of learners preceding Perry's (1999) initial stages. Literature from adult education, then, can inform our understanding of the intellectual positioning of the students who follow Perry's positions.

Most authors in adult education (e.g., Knowles, Holton, & Swanson, 1998; Mezirow, 1995; Thompson, 2009) agree that adult learners need educational experiences to be relevant. Adult learning is mostly nurtured through an educational context that is both student-centered and life-centered. Throughout their educational careers, adult learners have developed strategies that aid in their development of knowledge, and they learn best when they are in a position to leverage these strategies toward a new task (Mezirow, 1995). In addition, adult learners have often developed a level of expertise in one or many fields where they can apply the learning process. The extent to which knowledge is and needs to be applied to practical contexts is developed as a part of the learning process leading up to young adulthood. This becomes one of the distinguishing characteristics of learning approaches exhibited and preferred by young adult learners. These self-identified contexts make young adult learners fundamentally different from younger learners, such as adolescents or college-age students, as younger learners are still developing the contexts in which they will later apply their learning.

Combining these models and the literature creates a broader model with coherent markers of intellectual development positionality for adolescent through adult students (see Figure 1). These models are considered among the dominant models in college student development literature regarding cognitive milestones critical to this age group. However, past development and testing of these models has been limited to traditional classroom settings, and outdoor education programs are not traditional in a number of ways. These differences in educational settings may affect how students learn.

Learning Settings

Classrooms across the nation are changing every year in light of new knowledge about what environments are most conducive for student learning (Litkey, 2004; Wurdinger, 2005). However, most of the students who are currently in college are products of classrooms that were influenced by *No Child Left Behind* and high-stakes testing that impacted the classroom environments and curriculum structures. When outdoor educators consider this as the primary learning environment that current college students were exposed to, the outdoor education classroom has some distinct differences that are worth investigating.

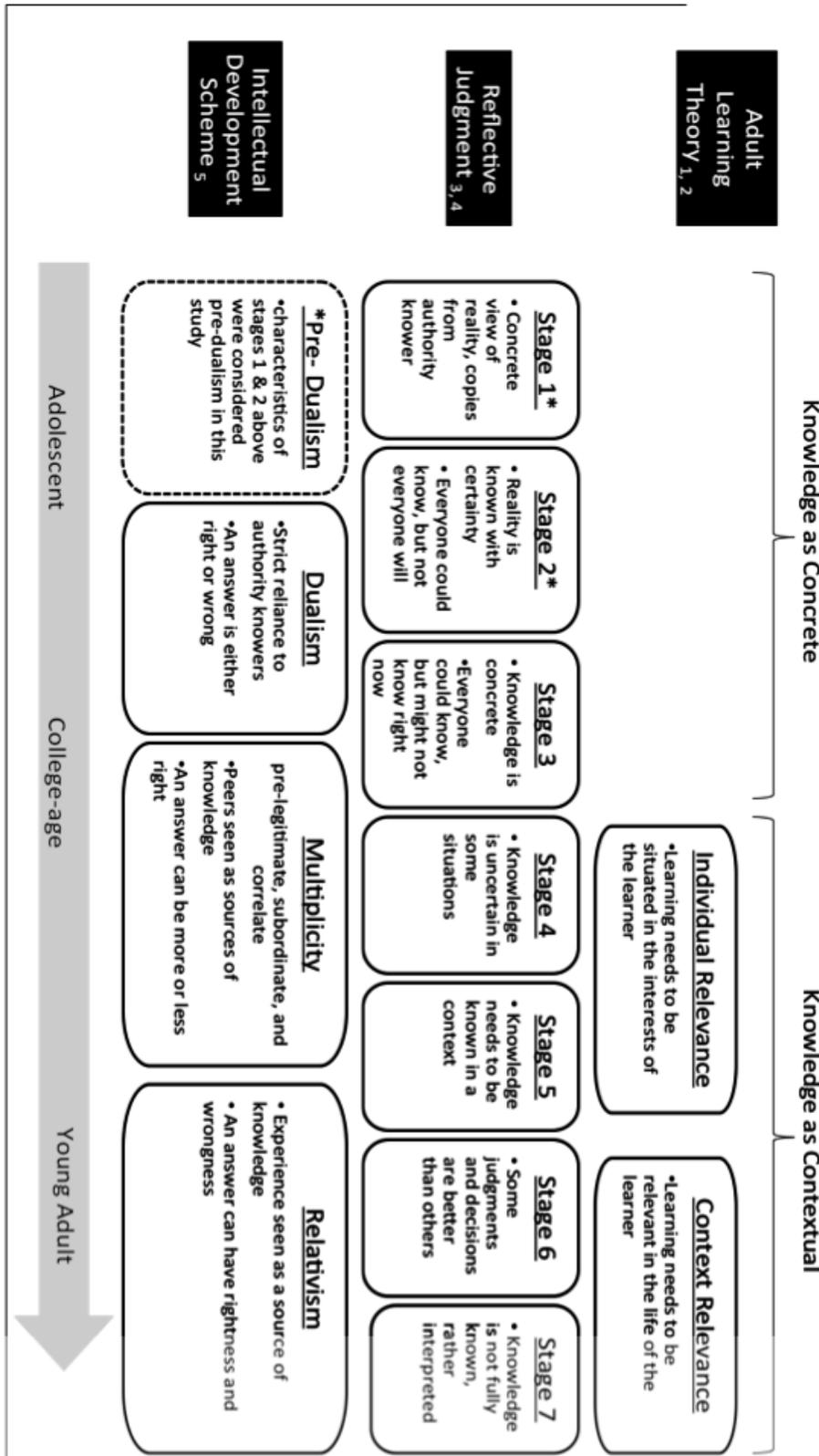


Figure 1. Developmental learning models. Life stages or intellectual positions. 1. Mezirow, J. (1995); 2. Knowles (1998); 3. Kitchener & King. (1990); 4. Fisher, K. (1980); 5. Perry, W. (1999).

Many traditional classroom environments provide a highly structured framework in which students learn (Dewey, 1938; Wurdinger, 2005). These settings involve preset classrooms with a teacher or text as the definitive source of knowledge. Learning in these traditional classrooms is bound by restrictions of time and space, which in turn limit the interactions of the peer group in the learning experience. These settings are also highly structured in terms of subject matter, duration of learning experience, and interaction between students and instructors. Students in these settings are often presented with “well-structured problems” (Kitchener & King, 1990) that have definitive answers and do not change over time and context. The presentation of learning opportunities as well-structured problems is, most likely, an artifact of the need to quantify knowledge in a measurable way to meet standards of the formal educational system. Perry’s (1999) model was developed and tested using students who have been mostly educated through traditional classrooms, and, up to this point, has only been applied to students’ educational experiences in these settings.

The outdoor education classroom varies from a traditional classroom in several specific ways. The first difference is mostly in how learning experiences are constructed, as outdoor education settings engage students in learning experiences that are shorter in overall length than the traditional school year or semester. Second, outdoor education settings provide an experience where the students and instructors live and travel together. Clearly, living life daily with your teachers and course-mates, while also learning, creates a unique experience with its own advantages and challenges. Outdoor education settings allow students to wrestle with course content, but also with group dynamics, objective and subjective hazards, and the tasks of living in a novel environment (Ewert & McAvoy, 2000; Hattie, Marsh, Neill, & Richards, 1997; Walsh & Golins, 1976). Also, the outdoor classroom is typically full of ill-structured problems as the primary mode of facilitating learning. Such problems do not have definitive answers, and may need to be defined and redefined multiple times for students to understand their full complexity. Ill-structured problems are different in that students cannot leverage only strictly right and wrong answers but, instead, must navigate between gradients of better or worse answers to determine a resolution (Kitchener & King, 1990).

Research Question

Perry’s (1999) model has been shown to hold across many settings and populations (Baxter Magolda, 1992; King & Kitchener, 1994), and is still being implemented to improve student experiences in the traditional classroom environment (Gallagher, 1998; Kloss, 1994; Thoma, 1993). However, this framework has not been examined in terms of learning in outdoor education. The purpose of this study is to determine whether Perry’s model of intellectual development, as expanded here, fits the context of the outdoor education classroom. If Perry’s characterizations of student thinking hold in this setting, an instructor or educator would expect to see adolescent students exhibit learning positions that resemble the earliest stages of the model regardless of classroom type. Also, young adult learners in the outdoor classroom should exhibit learning mechanisms equivalent with the latter positions in Perry’s intellectual development model.

For ease of data analysis, though not in full congruity with Perry’s (1999) conceptualization of positionality, the researchers consider students in terms of age ranges. This paper contextualizes adolescents between the ages of 13 and 17. These individuals, typically still living with their families of origin, are members of an ordered educational system that is moderated by larger structures beyond the individual community (Tanner, 2005). Once individuals leave this life stage, they move into the developmental positions often demonstrated by college-age students, defined in this paper as the ages between 18 and 22. These individuals are moving from their family of origin into transitory roles that will eventually lead to them forming families and iden-

tities of their own. This life stage is marked by investigational decision making, experimenting with various adult roles, and subconscious grappling with what it means to have knowledge, and what it means to be a learner (Tanner, Arnett & Leis, 2008). As individuals leave this stage, they transition into more permanent adult roles that are markers of young adulthood. Adults have left the transitory roles of their intellectual development and are responsible for their own decisions. They should show the highest levels of independence of any of the groups discussed here with respect to their development and acquisition of knowledge. Therefore, for the models proposed above to be applied to the outdoor education setting, the researchers would hope that students who have engaged this type of educational experience would respond about their learning experiences in such a way that is reflective of developmental expectations articulated in these models.

Method

Students included in this study were from NOLS which was founded in 1965 and uses wilderness education courses to teach a variety of objectives that most universally include leadership, risk management, technical skills, ecology, and environmental ethics. NOLS courses range from adolescent specific courses (ages 14-16), college student courses, courses for individuals over 25 years of age, and courses specifically for those looking to become outdoor educators themselves. Courses range in length from 8 to 135 days (Gookin, 2006).

Of the over 3,000 students who completed NOLS courses between June of 2005 and February of 2007, 689 were included in this study. The researchers initially delimited study participants to those in the age segments described previously: adolescence (14-17), college-age (18-22), and young adults (23-34). The mean age for participants in this study was 19 years, with a mode of 18 years. Thus, the analysis included 136 adolescent students, 386 college-age students, and 167 young adult students. The researchers also removed responses from atypical NOLS courses (e.g., custom courses for the Naval Academy). Questions from this study were a part of the larger NOLS Course Quality Survey (CQS). The specific questions used in this study were (Q1), "Which of the six NOLS curricular objectives (Leadership, Outdoor Skills, Environmental Ethics, Risk Management, Expedition Behavior, or Communication) did you learn the most about?" and (Q2), "How did you learn about the outcome you selected above?" The researchers focused on students who reported learning the most about either Outdoor Skills (n=431), or Leadership (n=258), as these outcomes were of primary interest to NOLS and represented the largest response categories. The open ended responses from Q2 were subsequently used to identify learning mechanisms and determine intellectual positionality for each student. All student responses were stripped of any additional information (i.e., age, sex, course type, etc.) and were only identified by a unique number. After all responses were coded into positions, they were re-connected with the student's ages using the unique identifier to assess relative magnitude of positions within each age group.

In developing a coding scheme for student responses, analysis based on positionality becomes an important concept to recognize. Because students are in outdoor classroom settings for a limited period of time, a purely developmental perspective is difficult to fully assess. For this reason, the researchers intentionally evaluated students' positionality within the model as a snapshot of how students process knowledge at the time of their courses. Using each student's entire response as the unit of analysis, data regarding how students reported that they learned were enumerated into one of five positions: Pre-Dualism, Dualism, Pre-Legitimate Multiplicity, Multiplicity (including Multiplicity Subordinate and Multiplicity Correlate), or Relativism. To code students' responses into these categories, researchers looked for words that identified a learning mechanism that was representative of a position. For example, students who noted that they

learned from an instructor during a class were categorized as Pre-Dualist thinkers because they showed dependence not only on instructors for learning, but also on instructors in a clearly defined instructional setting (such as a class). Students who noted that they learned just from “the experience of being out here” were categorized as Relativist thinkers because the student’s ability to learn from an experience that wasn’t explicitly defined as educational. (Additional examples of student responses can be found in Table 1.) Coding each student’s response into only one category allows for comparison of relative magnitude of responses.

Table 1

Examples of Student Responses

| Position | Skill Learned | Student Response | Rule |
|--------------------------------|----------------------|--|--|
| Pre-Dualism | Leadership | "Classes on different leadership techniques and styles" | Responses states a dependence on instructors in a specific instructional setting |
| | Outdoor Skills | "Classes taught by instructors" | |
| Dualism | Leadership | [instructor]'s leadership exercise" | Responses articulate a dependence on instructors, but learning is not limited to a specific setting |
| | Outdoor Skills | "The instructors taught me everything from stove use to tenting" | |
| Multiplicity Pre-Legitimate | Leadership | "Watching and imitating instructors" | Responses show an interaction of student and instructor, where student is an active role in experience |
| | Outdoor Skills | "The instructors guidance, trial and error" | |
| Multiplicity | Leadership | "Being leader of the day because it gave you a chance to practice your skills" | Responses to not mention an instructor influence, but rather students learning from practice |
| | Outdoor Skills | "Our daily practice with our new skills" | |
| Relativism | Leadership | "Making decisions on my own, and being responsible for myself" | Responses articulate a learning process that is internal and reflective in nature |
| | Outdoor Skills | "Being in the wilderness for a while" | |

Results

Consistent with Perry’s model, analysis of student responses in the Outdoor Skills category shows that knowledge construction trends in the outdoor classroom are consistent with the trends observed in the traditional classroom (see Figure 2 for visual representations of relative magnitude of student responses in intellectual position by developmental group). Adolescent students tended to report learning from “classes taught by instructors” and “instructors [guiding] me

through it,” which are indicative of Pre-Dualistic and Dualistic learning positions, respectively, as they are strictly dependent on the formal mechanisms of knowledge transmission and acquisition. For college-age students, the most common position was Multiplicity, responding that they learned from “practice” and “learning from other students’ tricks they know.” These students view learning as coming from sources other than the instructors in the lecture-style class. Higher order positions are more frequently reported among young adult students, as is demonstrated by the increasing presence of Relativism when learning Outdoor Skills. Young adult students stated that “hands on experience” and “failing and having to regroup and try again” were the best learning experiences for them. College-age students commonly responded that they learned best through “practically applied classes” and “practice [of] the skills so that I feel comfortable applying them on my own.” These answers are typical of a Pre-Legitimate Multiplicity position, as they noted a formal knowledge transmission mechanism (classes) and an informal application (practice).

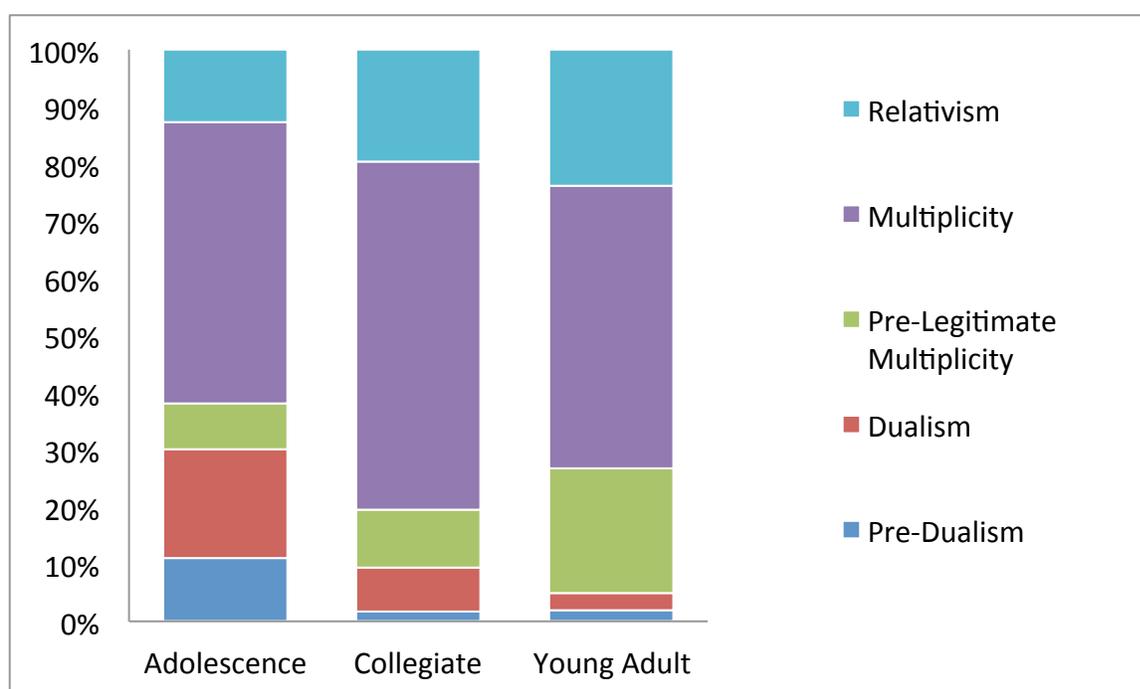


Figure 2. Outdoor skills positions. Relative magnitude of student responses in each intellectual position by developmental group.

Likewise, analysis of students’ responses in the category of Leadership Skills shows that learning positionality in the outdoor education classroom is also consistent with Perry’s framework (see Figure 3). The data suggest less frequent presence of lower order positions among older students. For example, regarding Leadership, Pre-Dualistic learning was less common for college-age than adolescent students, and was absent for young adult students. In writing about Leadership, Pre-Dualistic adolescents reported that “the instructors explained leadership well” or “classes helped me remember new information.” In contrast, college-age and young adult students responded with “being leader on a solo day and putting skills to the test” or “being in a leadership position and making mistakes.” Older students seem able to recognize that the actual practice of leadership and the mistakes made can be valuable sources of learning.

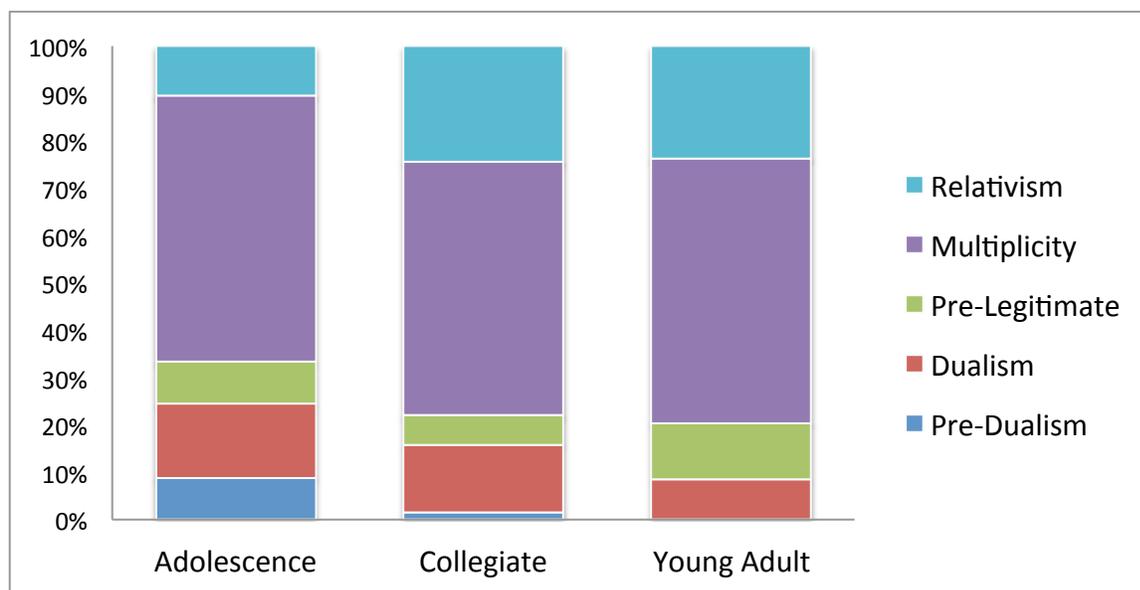


Figure 3. Leadership positions. Relative magnitude of student responses in each intellectual position by developmental group.

Discussion

The purpose of this study was to assess the fit of Perry's (1999) model of intellectual development in the context of the outdoor education classroom. Results support that the positions of learning present among different age groups in the outdoor classroom do parallel those observed in the well-structured, traditional classroom. This suggests that application of this model to the outdoor classroom may be useful in understanding processes of student learning.

The researchers acknowledge that teaching and learning are inextricably related processes. However, the purpose of this study was to investigate how students understand their own learning. Outdoor education instructors may teach differently from each other and the teaching style and techniques of each instructor may be affected by his/her own intellectual development. However, this study did not include instructors' perceptions of their students' intellectual development, or instructors' assessment of how students learned. Rather, this analysis is based on how students perceive their own learning of a particular set of skills.

Therefore, when outdoor educators talk about student learning, there is real value in knowing students as individuals, and the researchers' goal is not to deny that students are individuals with unique educational needs. However, this study highlights a body of literature holding that students who are in particular developmental positions show similarities in how they contextualize knowledge across classroom environments. These similarities allow outdoor educators to apply these developmental frameworks to a population broader than the individual. Instructors in outdoor education programs see hundreds of students each year and for a limited amount of time. While taking the time to identify and cater to the unique educational needs of each student would be ideal, it is not always practical. An understanding of developmental models, then, can be extremely useful for instructors: outdoor educators and researchers need to recognize that students' ages suggest frameworks through which they can ingest and process the knowledge and skill outcomes that the outdoor classroom seeks to facilitate.

Outdoor education, fraught with ill-structured problems, relies on a process of discovery and evaluation for knowledge development and skill acquisition. For example, NOLS defines wilderness as “a place where nature is dominant and situations and their consequences are real” and outdoor educational settings as places where “people learn by accepting and meeting real challenges” (Gookin, 2006, p. 4). This is intentional, or at least beneficial, as the skills outdoor educators teach (leadership, decision making, problem solving, etc.) cannot be bound or defined by either purely right or wrong answers. Leadership skills are, by their very nature, ill-structured problems. Leadership is highly contextual. While there are methods to leadership, the application of leadership is such that it requires students to think diversely about potential outcomes and scenarios. The same applies to Outdoor Skills, as well. These skills encompass things such as navigation, risk management, etc. The very nature of most of these problems is that they do not have single right and wrong answers, which requires students to reach outside of Dualistic learning mechanisms for resolution.

Adolescent Learners

Adolescent learners in this study show different learning characteristics and mechanisms than the others. Consistent with the literature, this study suggests that younger students are more likely to use Dualistic mechanisms to learn new knowledge and skills. They see their learning as having strict right and wrong answers, and they rely heavily on instructors to impart this knowledge to them. While this does not mean that adolescent students are not ready to tackle complex problems, it does mean that they will need more guidance as they start to explore broader sources and solutions to solve some them. Adolescent students do not necessarily see their peers as lacking value, or the experience as irrelevant, but these are not pre-identified sources of knowledge. Too often, educators ask adolescent learners to take on tasks that are beyond their developmental reach and may, in essence, set these students up to fail (Paisley & Powell, 2007). Instructors in the outdoor classroom need to be aware of these developmental characteristics to help relieve the stress that occurs when educational techniques are in conflict with students’ developmental capabilities. Instructors can also help frame or restructure learning initiatives in ways that are developmentally appropriate for that age group.

Results of this study suggest that adolescent students may still be in a position where they consider answers to problems as definitive, relying heavily on authority (instructors) to solve problems, and therefore unable to recognize that their peers or environment offer knowledge from which they can learn. The outdoor classroom may provide a place where adolescent students can practice ill-structured problem solving and begin to expand their repertoire of knowledge sources. Through this process, they may be able to build connections and context that will aid them in solving additional ill-structured problems both later on the course and, ideally, when they return home. Instructors who can introduce ill-structured problems to students as such, and then help adolescent students identify the variety of resources available for solving them, could aid in the intellectual development of these students.

College-Age Learners

College-age learners orient toward Multiplicity. It is critical that instructors use the coaching mechanisms of Pre-Legitimate Multiplicity to begin modeling higher level thinking and learning techniques so that students begin to incorporate learning into their own contexts. College-age students are capable of tackling ill-structured problems in a more exploratory sense. They may see that any one answer may not be either purely right or wrong, but potentially both

and they are in a position to understand the contextual usefulness of feedback from non-authority sources (e.g., peers, environment, etc.). The setting of the outdoor education classroom provides a venue for these college-age students to encounter ill-structured problems with the aid of both their peer communities and instructors.

Young Adult Learners

The developmental models discussed previously suggest that adult learners should exhibit learning mechanisms that are part of the Relativism positionality. The responses of older students in this study show that they are less reliant on instructors as the sources of their knowledge and are more open to learning from diverse sources and mechanisms. As a result of more exposure to education and a broader experience base, these students have encountered more complex problem-solving processes and have a wider variety of cognitive resources available to them. These students also exhibit a developing understanding of the contexts that they will need to determine the relevance for learning, both as a part of the immediate problem, and after the course experience. Young adult students who have achieved higher levels of intellectual positionality may have minds that are primed for working with diverse and complex sources of knowledge and potential solutions; they are not only ready for, but are asking about, the relative fit of a solution in varied contexts, or how it might transfer to other contexts.

Thus, young adult students have much to gain from the outdoor classroom. Most of the young adult students in this study are already operating in the higher levels of knowledge construction, so they have the cognitive capacity to take on ill-structured problems. The outdoor classroom gives them the opportunity to leverage their full cognitive potential in the resolution of a complex problem. Practicing this type of thinking may facilitate the development of even higher levels of knowledge construction.

Conclusion

How, then, do outdoor educators use ill-structured problems in our learning experiences with adolescent students who have not yet become skilled at thinking about learning this way? The researchers are not suggesting that the outdoor classroom is inappropriate for adolescent populations, but outdoor educators may need to adopt specific tactics to meet these students where they are developmentally. Within outdoor education, there is a belief among field instructors that the “mountains speak for themselves” (Bacon, 1987, p. 6), and that learning can happen for any student as a result of just being a part of that experience (i.e., Cain, Cummings, & Stanchfield, 2005; Gass & Stevens, 2007; Priest & Gass, 2005; Stremba, 2009). While this may be true for some students, what is known about developmental frameworks and contextualization of knowledge is that younger students may not understand that the experience itself is a source of knowledge and may be unable to make the direct connection from experience to learning. These students need formal classes, demonstrations, and other more didactic approaches to fully learn about a problem or skill they are seeking to understand or master. However, guiding students through these cognitive processes and encouraging recognition of the myriad contexts to which those skills may apply could facilitate students’ development of higher order knowledge construction as they move into young adulthood and beyond.

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