

Helping Coaches Engage in Learning:
A Mixed-Methods Exploration of NCCP Participation and Certification Rates

by

BENJAMIN CHADDOCK

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Victoria, British Columbia, Canada

Supervisor: Dr. RUSS WILDE
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COMMITTEE APPROVAL

The members of Benjamin Chaddock's Thesis Committee certify that they have read the thesis titled: Helping Coaches Engage in Learning: A Mixed-Methods Exploration of NCCP Participation and Certification Rates, and recommend that it be accepted as fulfilling the thesis requirements for the Degree of Master of Arts in Learning and Technology:

Dr. Russ Wilde [signature on file]

Dr. Karl Storchmann [signature on file]

Final approval and acceptance of this thesis is contingent upon submission of the final copy of the thesis to Royal Roads University. The thesis supervisor confirms to have read this thesis and recommends that it be accepted as fulfilling the thesis requirements:

Dr. Russ Wilde [signature on file]

Abstract

This explanatory mixed-methods case study research explores impacts of learning blends, consumer behaviour, and personality traits on coach education participation and certification rates in Canada's National Coaches Certification Program. The research builds upon previous literature to further identify and quantify factors such that future revisions to coach education learning materials and program design can decrease participation barriers and increase certification rates. Using a mixed-methods approach, data was collected from 67 active coaches, coach developers, and instructional designers from eleven Canadian sports and analyzed using both regression and thematic methods. The findings reveal correlations between higher household incomes, incentives, certain personality traits, and learning preferences impact the likelihood of achieving NCCP-trained and certified status. These results contribute to the field of coach education by highlighting the importance of accessible, clear, and relevant content, flexible evaluation methods, and deliberate mentorship to better support diverse learning preferences and personality types. Implications for practice and future research include greater emphasis on learner-centred approaches, exploring sport-specific policies to better understand barriers and incentives, and expanding the sample size to further isolate the effect of predictive variables.

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Chapter 1: Introduction

Why do we play sports? For the opportunity to experience the thrill of moving our bodies? To connect with others in a shared task? To overcome assumed barriers and manifest an excitement for future capabilities? Or to facilitate such experiences for others? To participate in a story that helps us remember how to act in the world? Or just because it is fun and makes us feel good?

Canada is one of the largest nations by land mass in the world, covering over 9 million square kilometres and bridging peoples from three coastlines. The games played on these lands have ebbed and flowed throughout history as the tides themselves, changing with the seasons, the generations, and cultures that have called this place home. As an allegory for the challenges of the future, games have allowed communities to pass down the most critical aspects of a task or ability to its most vulnerable citizens, in controlled environments that allow for productive errors and corrections. Whether for hunting, gathering, protection, or connection, games are foundational to the human experience. Facilitating such games successfully requires a keen eye, relevant experience, and the careful balance between safety and fun. And like the vastness of the Canadian landscape, everyone's experience of learning and playing games has been and will continue to be different. Everyone's success will be unique, and everyone's teacher will have different strengths and weaknesses. No one's experience will be the same, albeit by design or chance. And upon this canvas of sport, we are invited to seek common ground through dialogue and discover the meta structure that resides within our shared experience of playing and facilitating games, rather than any one game itself. And through such discourse, we can learn or simply remember how to facilitate our traditions elegantly.

The refinement of these traditional activities into what we today call "sport," and how we teach sport, is thus an extension of our cultures' drive to relay information through a story that promotes maximal learning with minimal risk. Adult recreational leagues, elite competition experiences, and youth development programs manifest as the most distinct and common levels across sport today. As a result,

sport provides opportunities for people of all ages to embody humility, pursue excellence, and build teams that are greater than the sum of their parts. Guiding such a theatre of learning requires a delicate yet deliberate balance of structure and autonomy. This is why sports governing bodies and coach education associations exist, to facilitate optimal degrees of freedom and play, while maintaining expectations for the safety and security of both athletes and coaches.

Canadian sport currently includes sixty-five nationally recognized sports. Each sport is governed by a national sport organization (NSO) that focuses on elite performance, whereas development, club, and recreational programs are facilitated in concert by provincial/territorial sport organizations (PTSO) and local sport organizations (LSO), commonly known as clubs. Minimum coaching standards are designed and assessed by the Coaches Association of Canada's (CAC) National Coaches Certification Program (NCCP), awarding trained and certified status as leaders complete numerous modules and competency-based evaluations. However, individuals and organizations face multiple challenges, and certification compliance between sports and performance levels varies (Edwards, 2019).

Providing sports experiences that encourage people to exercise and pursue healthy lifestyles requires positive role models, knowledgeable leaders, and caring individuals (High Five, n.d.). But according Hagger et al. (2020), changing people's behaviour is challenging in the long run, especially in the presence of social norms (Sparkman & Walton, 2017). In 2003, the NCCP recognized a variety of challenges within the existing model and chose to shift towards a competency-based education and training (CBET) method (Demers, 2003). Over the following decade, each sport updated coach education materials with a greater reliance on constructivist learning principles, hoping to more effectively guide, moderate, and develop optimal coach behaviours (Demers, 2003; Erickson et al., 2008).

Exploring the learning experience and variables affecting participation and completion rates in Canadian sports coach education is a vast topic. This master's thesis research explores the lowest level of education where certification is universally available, the club or competition-introduction level, and

explores why so few coaches achieve certification. As an increasing number of Canadian sports integrate digital learning environments into coach education via blending learning and learning management systems, opportunities are available to revise content and systems to better support learning and certification. This study aims to inform stakeholders with insights from active coaches and to encourage changes to program design and resources that address the most significant barriers to achieving competition-introduction certification for club sport coaches. Although balancing administrative and learning needs is challenging, optimizing digital learning tools for learning facilitators and coaches rather than administrators may be a principal factor in participation and engagement rates moving forward. The following section provides a background of the NCCP, existing challenges, the risks associated with non-action, and how this research builds upon previous study.

Background

The CAC is responsible for education, research, and advocacy programs that develop and celebrate the skills and stature of coaches across all levels of sport in Canada (CACa, n.d.). First created in 1974, the NCCP is a unifying structure within the Canadian sport system, designed to build towards a shared vision of coach excellence (CACa, n.d.), illustrated in Figure 1. Since 2003, the program has offered three education streams: community, competition, and instruction (CACb, n.d.), as well as numerous education contexts, most popularly community-initiation, competition-introduction, and competition-development. Each NSO works with their CAC representative to select and develop their preferred education stream (e.g., Competition) and contexts (e.g., Competition-Introduction). As illustrated in Table 1, some sports do provide coach education in all three streams.

Across all streams and contexts, NCCP learning experiences focus on developing five core competencies: valuing, critical thinking, problem-solving, interacting, and leading (CACc, n.d.; Demers, 2003). These competencies help coaches uphold their responsibilities and, depending on their chosen context, to meet seven coaching outcomes: **planning** a practice, **designing** and **managing** a sports

program, **supporting the training and competitive experience, analyzing performance, and making ethical decisions** (CACd, n.d.). Each sport's NSO then decides to use either multi-sport modules, created and facilitated by the CAC, or sport-specific modules adopted, facilitated, and maintained by each sport, with CAC approval (CACb, n.d.). Although the NCCP is a uniform, competency-based coach education and development experience across Canada, variation among sports, coaching streams, and jurisdictional levels heightens the complexity of program facilitation.

Understanding the current NCCP program requires appreciation for previous challenges. Between 1974 and 2003, modules focused on relaying information, programs culminated with an evaluation, and professional development or maintenance of certification was not officially recognized or monitored. Programs were also sequential, requiring all coaches, regardless of their experience or interest level, to start with Level 1 (grassroots) education modules and certification, before advancing to Level 2 (Club), 3 (Provincial), and 4 (Olympic) programs. However, the need for higher-quality evaluation standards, on-going professional development, and streamlined pathways for Olympic athletes-turned-coaches necessitated large-scale transformations. Therefore, program design shifted away from sequential levels towards descriptive contexts that, in theory, helped new coaches to pursue their preferred context without pre-requisites. Logistical challenges and liability concerns with old level 1 evaluations prompted many sports to remove certification evaluations for the community level altogether (CACi, 2019). As a result, community coaches can only achieve trained status, valid in perpetuity, which is concerning given these coaches often work with a sport's most impressionable participants, most often those under 12 years old, where basic motor movements are patterned. In contrast, the Competition Pathway provides certified status to coaches who not only complete each module but successfully pass a written and in-person evaluation (CACi, 2019). Valid for five years, coaches must accumulate professional development points to maintain their certification (CACi, 2019). Unfortunately, few organizations use membership-based coach management systems, making it difficult

to support and enforce coach certification standards and policies; as of 2022, known exceptions include Alpine Canada, Triathlon Canada, and Cycling BC.

Role-modelling the lifelong learner mentality, the CAC continues to conduct coach education research to better understand the effectiveness of NCCP educational design and content (CACa, n.d.). Most pertinent to this thesis research, Edwards (2019) used qualitative methods to identify factors that Canadian coaches commonly consider barriers to NCCP training and certification, including: time, cost, value, and geographic and logistical challenges. Whereas Edwards et al. (2020) conducted a literature review to inform the implementation of learning blends during Covid-19 and found learning facilitators should: be well-trained for digital environments, use andragogical principles when teaching, and employ flipped learning strategies to best engage active learning even in the absence of in-person opportunities. Yet, these findings may benefit from validation through future quantitative analysis.

Problem Areas

Although earlier research showed that education participants valued their NCCP training and certification experience, more recent research indicates otherwise. For example, Danylchuk and Misener (2007) conducted a qualitative analysis in which 95% of respondents said their NCCP experience met or exceeded their expectations, and 54% said their perceived value of NCCP education increased after participating. Banack and Bloom (2009) also determined community coach modules effectively conveyed long-term athlete development principles, namely the importance of physical literacy, social bonding, and positive sports experiences for participants under the age of twelve. Yet, as the digital and social media age has democratized information, numerous competing education modules and organizations in sport have appeared, including the Professional Mountain Bike Instructor Association (PMBIA), Training Peaks University, HIIT Science, INSCYD, and the International Coaches Federation's (ICF) affiliated Canada Coach Academy. In addition, apps like Coaches Eye and insights from thousands of YouTube content creators consistently bring multi-modal learning materials to users of all skill and

experience levels. Furthermore, these private entities can act quickly, listen to their constituents, and modify content to maximize learning and perceived value. In that context, recent studies of NCCP education found only 58% and 55% of respondents intend to achieve trained and certified status, respectively (Baker et al., 2021). Common factors that dampen the perception of the NCCP training and certification include: unnecessary and/or overlapping content, poor implementation associated with low facilitator quality and evaluator access, time, cost, logistical barriers, and unclear certification maintenance pathways (Baker et al., 2021; Gurgis & Callary, 2022).

Although NCCP certification remains valid and relevant (Edwards, 2019), it needs to broaden its scope from a youth-only focus, create engaging and on-going development experiences, and provide relevant content that encourages participation. Kerr et al. (2018) suggest streamlining the certification process, as well as including incentives and conveying stories encouraging coach and coach developer participation. But, again, these qualitative findings may benefit from future research that quantifies the impact of each factor. Failure to adopt revisions in time may compromise the integrity of the Canadian sport system. If revisions are inadequate and the NCCP fails to match learner needs and maintain brand value, alternative accreditation systems will develop and fracture the coach education paradigm. This is already occurring in sports like Cycling and Triathlon where instructor or physiology-focused programs are pulling new coaches away from NCCP participation. When the coach education space becomes more diluted, sports organizations will need to either build partnerships to recognize the validity of such alternative programs or improve NCCP program design, content, or ease of use to uphold brand value and market competitiveness. Whether content or policy revisions are undertaken, staff dedicated to coach education will be necessary to navigate and implement updates. If done adequately, Canadian sports organizations will be better positioned to uphold policies that support safe and positive sport experiences for all ages and across time.

The competition-introduction context, which maps over two impressionable stages of development, is especially important for supporting the cultural integrity of sport experiences. First launched in 2004 (Culver et al., 2019), the Comp-Intro context is designed for coaches working with club level athletes who have 1-6 years of sport experience and are learning how to begin structured training and try competition. This includes the two Sport for Life (S4L) phases of development: Learn-to-Train (pre-growth spurt) and Train-to-Train (during growth spurt) (Higgs et al., 2006). In the former, coaches should help athletes develop mobility, unloaded speed, and sport-specific basic skills, while engendering an appreciation for improvement through consistent practice. In the latter, coaches must help athletes work through the challenges of adolescence, when additional risks appear associated with advanced skill learning, the onset of physical training, and the sensitivities of building social connection among teammates. Therefore, it is important that people leading practices and building club cultures be qualified regardless of their volunteer or part-time status. However, the publication and enforcement of coach education and certification requirements across the various levels of Canadian sport remains inconsistent, with significant barriers to completing programs and achieving certification.

Framework and Methods

As previously discussed, the CAC initiated changes to their coach education program in 2003 by adopting competency-based methods and a learner-centred approach. Since these two educational methods are built upon the two theoretical frameworks – constructivist learning theory and the andragogical principles of adult learning (CACH, 2021). Therefore, this research paper also adopts these frameworks and thereby aims to embody an appreciation for the experiences of learners, the importance of validating such experiences, and for fostering discourse among participants and researchers to support the formulation of new knowledge. A detailed exploration of the research's theoretical frameworks is discussed in the following chapter.

This research study also uses mixed methods to quantify factors affecting participation and completion rates, with an appreciation for blended learning, consumer behaviour, and personality trait expression. Building upon the theoretical frameworks of constructivism and andragogy, case-study methodology is used to account for the investigative nature of the survey and interviews, while also using regression analysis to explore the quantification of factors contributing to certification. More specifically, the research explored participation and certification factors impacting NCCP Competition-Introduction coach education in Canada since 2014. Finally, this research dataset illustrates changes in participation and certification rates before and after the onset of emergency blended learning in 2020 because of the Covid-19 pandemic.

Research Questions

The primary research question is: (1) in what ways might various factors impact NCCP Competition-Introduction (Club) participation and certification rates since 2014? Secondary research questions include: (2) How might blended learning delivery methods support coaches pursuing certification? (3) In what ways are the impacts of consumer behaviour considered in the NCCP learning design? And, (4) How might Five-Factor Model (FFM) personality traits forecast coach participation and certification rates?

Key Definitions

Andragogy proposes that adults and children learn differently due to self-concept, motivation, and life experience across five characteristics (Knowles, 1980, 1984; Merriam, 2001).

Constructivism builds upon the rationalist view that knowledge develops through reasoning and associating meaning with experience (Ertmer & Newby, 2013; Piaget, 1952; L. Vygotsky, 1934).

Blended Learning (BL) is a delivery model that uses a collection of sequenced and trackable digital content blocks to transcend the constraints of time and place and match students with the most

helpful content, including face-to-face (f2f), synchronous online facilitated video calls, and asynchronous on-demand eLearning modules (Hofmann, 2018). Teachers can employ these learning modalities in multitude of combinations, referred more generally as learning blends.

Consumer Behaviour investigates how emotional, mental, and behavioural responses to information impact an individual's preferred collection of goods and services (Kardes et al., 2011).

Personality is a "dynamic and organized set of characteristics of a person that uniquely influences their cognitions, motivations, and behaviours in various situations" (Ryckman, 2008, p. 4).

The Five-Factor Model (FFM) of Personality is a factor-analysis method that compares trait expression against population averages (Cattell, 1966; Costa & McCrae, 1976; Norman & Goldberg, 1966; Soto & Jackson, 2013; Tupes & Christal, 1961).

Chapter 2: Literature Review

This research adopts andragogy and constructivism as its theoretical frameworks to mirror the conceptual pillars of the NCCP. This chapter therefore explores each framework and the major themes of this thesis: coach education, blended learning, consumer behaviour, and personality traits.

Andragogy

Andragogy is a pragmatic and humanist concept that articulates the theoretical and practical needs of adult learners (Knowles, 1984). Rooted in the self-actualization philosophies of Maslow's humanism (Knowles, 1990), and Dewey and Lindeman's pragmatic emphasis on building knowledge through experience, rather than from authority (Merriam & Brockett, 1997), Knowles et al. (1998) articulates "andragogy as a transactional model of adult learning that is designed to transcend specific applications and situations" (p. 143). As such, adult learning is but one environment where the principles of andragogy may be applied (Knowles et al., 1998). Further, Knowles (1980; 1984) identified five characteristics of andragogy, accommodating for the unique attributes of most adult learners compared to children. These include self-concept, or an adult's ability and preference for autonomy and to self-

direct; experience, where previous moments of learning should be recognized and incorporated; readiness, where the individual acknowledges their reason to learn; orientation, or how applicable the content is to the problem at hand; and motivation, recognizing how intrinsic factors become more prevalent as we age (Knowles, 1980; 1984). Moreover, Brookfield (1986) argues andragogy is an individual and transactional model for learning whereby the learner and their environment interact in a dynamic and reciprocal fashion, impacting one another, rather than a critical theory associated with social change.

The term, andragogy was first referenced by Alexander Kapp in 1833 (Loeng, 2017). However, Kapp's andragogy differs from Knowles' more practical interpretation. Confronting the challenges of his time, Kapp explores more intangible competencies like character development across all ages, and one's ability to make effective decisions for the good of both the individual and the community (Loeng, 2017). This emphasis on critical theory and social change in the context of adult learning environments was debated between 1926 and 1948, with "one side holding that this goal [for adult education] should be the improvement of individuals, and the other holding that it should be the improvement of society" (Knowles, 1990, p. 44). For example, Lindeman (1926) argues the methods of andragogy are not limited to specific ages or abilities but rather to maturity levels. Whereas Krech and Crutchfield (1948) hold that in the pursuit of interpreting human behaviour and understanding social issues, theoretically sound social psychology is valid and immediately useful, and it is not necessary to "keep two sets of readers in mind" (p. 6). In compromise, Darkenwald and Merriam (1982) suggest andragogy can help both child and adult learners achieve success in adulthood because it aims to increase competencies that create versatile and fulfilled individuals who can solve personal and communal problems (Darkenwald & Merriam, 1982; Smith, 2019).

Andragogy is relevant to the proposed research because it is a foundational concept of the NCCP, explicitly cited in coach developer training materials and evidenced by a focus on facilitation

rather than instruction (CACH, 2021). The work of Darkenwald and Merriam (1982) heavily influences sections of the coach developer textbook, most aptly summarized by the final of eight principles whereby “LFs (Learning Facilitators) must provide specific and positive feedback related to individual participation in the group activities, the group’s ability to take responsibility for its own learning, interactions among coaches, the quality of discussions, and the ability of the group to think critically” (CACf, 2016, p. 12). This is more tangibly evidenced by the NCCP’s focus on role modeling deliberate mixes of questioning and instruction, with appreciation for everyone’s experience. Since coach education programs are most often designed for leaders who support adult coaches and, in turn, youth participants preparing for adulthood, andragogy is therefore a relevant mode of discovery in this context.

Constructivism

Constructivism builds upon the rationalist view that knowledge develops through reasoning and associating meaning with experience (Ertmer & Newby, 2013). Formulated by Piaget, Vygotsky, and Dewey, constructivist learning theory focuses on the process of learning rather than the impact of learning environments and specific stimuli (behaviourism) or one’s incentives for learning (humanism) (Brau, 2021). Piaget (1952) explores knowledge development by observing children at play, suggesting individuals either assimilate information into old frames of understanding, or experience disequilibrium and must accommodate or reframe their understanding upon exposure to challenges beyond their current mental capacities. Rather, Vygotsky (1934) explores how inner dialogue, oral speech, and cultural norms impact learning. Despite numerous scholarly critiques that argue mistranslations of his original works cause confusion (Cazden, 1996; Gredler, 2012; Newman, 2018; van der Veer & Valsiner, 1993; Zhang, 2013), Vygotsky remains the inspiration behind social constructivism, whereby dialogue heightens learning (Vygotsky, 1987). On the other hand, Dewey recognizes the cognitive aspects of Piaget and the cultural impacts of Vygotsky. He recommends that learning should occur outside the

classroom (Mayer, 2009, as cited by Brau, 2020) and focus on helping students understand how they think (Dewey, 1933). Applying this method in an education setting shifts a teacher's actions from instruction to facilitation (Cobb and Bauersfeld, 1995) and encourages questioning or discussion to help learners assimilate or accommodate new knowledge based on previous experience (Harlow et al., 2007). Both such concepts match the tenets of the NCCP discussed earlier.

However, the subjective nature of this learner-centred approach causes challenges. Bruning et al. (2004) explain that "some constructivists characterize mental structures as reflective of external realities, while others consider that no independent reality even exists outside the mental world of the individual itself" (as cited by Harlow et al., 2007, p. 195). Glasersfeld (1974) even claims Piaget's work constitutes that of radical constructivism, whereby knowledge is entirely subjective and invented, not discovered. However, in conversation Bringuier (1980), Piaget clarifies that knowledge is "quite contrary to a copy of the world ... [rather] it's a reconstitution of reality by the concepts of the subject who, progressively and with all kinds of experimental probes, approaches the object world without ever attaining it in itself" (as cited by Harlow et al., 2007, p. 64). The latter illustrates Piaget's connection to Kant (Soerfjord, 2015), including Kant's (1785) second formulation of the categorical imperative. Hakim (2015) explains that "an end in itself is an objective end, meaning that it can be held by all rational beings because it is determined by reason alone ... [and that] Kant ultimately identifies the end of moral principles, or the end in itself, to be humanity ... or good will" (p. 2). Therefore, Piagetian constructivism posits that a learner's mental world is subjective only to the extent to which it can successfully integrate and compliment the mental worlds of other community members. Harlow et al. (2007) illustrates similarities between Piaget's thoughts and Popper's (1972, 1982, 1994) Three Worlds theory, summarizing their commonly held position that independent reality exists outside the learner's mental world, as identifiable through critical thinking inquiry, testing, and revisability.

Constructivism is relevant to this research because the NCCP is also formulated on constructivist learning and aims to develop humility, curiosity, and the lifelong-learner mentality among coaches (CACH, 2021). One example of how the NCCP incorporates constructivism into coach education is through the presence and role of learning facilitators (LF). The role of an NCCP LF is primarily to guide participants through reflective and contextual activities that rely upon previous life experiences, and then to moderate discussions among participants. Finally, and only if needed, does an LF instruct and fill knowledge gaps (CACH, 2021). More specifically, written activities help students categorize their experiences and formulate knowledge so they can successfully coach athletes through complex situations and new environments. Therefore, facilitating NCCP modules as they are designed requires a comprehensive appreciation of andragogy and constructivist principles. Although NCCP delivery traditionally occurs in a group setting, due to financial and logistical constraints it more recently occurs by online video call, on-demand eLearning, or home study facilitation. Yet, Ruey (2010) reminds us that constructivist learning optimally stems from a mutual learning relationship among all participants, and therefore the primary task of a learning facilitator is to avoid rushing, instead cultivating curiosity and excitement for what hopefully develops into a lifelong passion for learning and self-actualization. Thus, regardless of setting, it is paramount in constructivist learning to provide adequate time and attention, as well as frameworks, activities, and resources that accommodate the learning environment and encourage reflection and discussion among students.

Coach Education Research

The sports coach education literature includes two main discussion points: what type of knowledge coaches need (Maclean & Lorimer, 2016), and which learning environments develop each knowledge type (Werthner & Trudel, 2006).

Coach Knowledge Types

According to teaching and learning research, the knowledge triad promotes the professional expertise necessary for fulfilling the role of educator (Collinson, 1996; as cited by Waeffler, 2018). Collinson (1996) articulates three forms of coach knowledge: professional, interpersonal, and intrapersonal. Professional knowledge includes sports-specific competencies (Collinson, 1996) like physical training and sports science, tactical awareness and decision-making, and mental and emotional skills to up-regulate anxiety and optimize performance. Whereas interpersonal knowledge pertains to communication methods between coaches and athletes, parents, sport organizations and stakeholders (Collinson, 1996). Finally, intrapersonal knowledge accounts for a coach's ability to reflect, and role-model or develop this ability in their athletes (Collinson, 1996). Since first published, Collinson's (1996) knowledge triad has now been adopted as the primary foundation of coach education (Waeffler, 2018). In fact, Côté and Gilbert (2009) build upon the framework and suggest that sound coach competencies, including sport knowledge, communication skills, and reflective abilities, are critical to developing athlete outcomes (competence, confidence, connection, and character) across different sport levels (recreation, youth development, high performance). Since 2012, Collinson's work has been adopted by the International Sport Coaching Framework as the global standard (ICCE & ASOIF, 2012).

More recently, the knowledge triad has helped identify gaps in the literature and promote further study. Trudel and Gilbert (2006) show that a greater volume of research has focused on professional (hard skills) rather than personal (soft skills) knowledge. So, it was no surprise when Laker and Powell (2011) called for a more robust training model for soft skill knowledge among sports coaches. Lefebvre et al. (2016) discovered that over 90% of 285 coach education studies focused on professional knowledge, whereas only 18 and 6 studies explored inter and intra-personal knowledge development, respectively. Despite this discrepancy, research findings on soft skill development have been consistent over time, promoting the importance of reflective practice (Irwin et al., 2004),

knowledge of self and personal philosophy (Lara-Bercial et al., 2017) and experience (Lefebvre et al., 2021). Interestingly, a thematic analysis by Lefebvre et al. (2021) suggests coaches develop both professional and personal knowledge through their vast and complex relationships with stakeholders (coaches, athletes, families) and that interactions with these stakeholders continuously guide a coach's development. This also matches Swettenham and Whitehead (2021), who share how think aloud (TA) reflective practices can develop all three forms of knowledge. In that light, the three forms of coach knowledge are shown to be distinct in nature, yet interconnected in development, leading us to the next discussion, exploring how coaches develop such abilities.

Coach Education Methods

The meta-analysis by Trudel and Gilbert (2006) outlines the history of coach education between 1970 and 2001, organizing coach education methods by Sfard's (1998) two metaphors of learning: acquisition, and participation. This literary analysis categorizes coach education programs as either large-scale (L-S) knowledge acquisition programs or experience-based participatory programs (Trudel & Gilbert, 2006). Large-scale programs assume coaches progress along a novice-to-expert continuum and acquire knowledge by working through increasingly complex modules (Trudel & Gilbert, 2006). Such modules include universal coaching theory, sport-specific skills, and tactics, and teaching what coaches should know and do (Trudel & Gilbert, 2006). All standardized coach education programs currently available, including the NCCP, incorporate a large-scale program. Conversely, participation-based education aligns with situated learning theory (Brown et al., 1989; Lave & Wenger, 1991) whereby the learner is interested in participating in specific activities rather than accumulating specific knowledge, referred to as private possessions (Sfard, 1998, as cited by Trudel & Gilbert, 2006). Such a perspective acknowledges the importance of both reflection and social learning, whereby individuals develop behaviours through life experience, and reflection upon such experiences to develop valuable leadership

behaviours (Trudel & Gilbert, 2006). However, it has been traditionally challenging for large-scale programs to acknowledge coaches who have learned through experience. To shift away from this dichotomy between large-scale and experience-based programs, Nelson et al. (2006) conducted a holistic and conceptual review of coach education literature using Coombs and Ahmed (1974) analytical framework of informal, non-formal, and formal learning environments.

Formal Learning Environments.

According to Trudel and Gilbert (2006), formal education programs first appeared in the United Kingdom and the United States of America, and are designed to mitigate moral and legal issues, increase coach competence, and protect athletes (Conn & Razor, 1989; Mills & Dunlevy, 1997). However, the rise of constructivism, problem-based learning (Savard, 1997), and appreciation for modular design, reflection, and time (Moon, 2001), encouraged formal programmers like the NCCP to shift away from traditionalist **what coaches should know** to competency-based **what coaches can do** models. Cushion et al. (2003) support this transition and call for greater appreciation of lived experiences, encouraging administrators to acknowledge mentorship in professional development accreditation. Likewise, Trudel and Gilbert (2006) suggest that large-scale programs can improve by encouraging coaches to share knowledge through communities of practice. This builds upon Barab and Duffy's (2000) work that learners benefit when teachers take the time to design context-rich activities and evaluation tasks. Such concepts align with Schon (1983), who earlier claims learning through participatory or real-world scenarios helps coaches recognize complex or historical problems and demonstrate social competencies (as cited by Gilbert & Trudel, 2001). Indeed, the positive impact of evaluating coaches in the field and through mentorship continues to gain ground (Callary et al., 2014; McQuade & Nash, 2015), showing that incorporating mentorship and social skill development into formal environments is possible and desired, but still challenging.

Informal Learning Environments.

Informal coach education takes place outside of organized structures (Reade & Rodgers, 2009) and may include passive observation of or casual mentorship with a coaching peer. Gould et al. (1990) argues that informal environments are essential for coaches wishing to pattern new ways of being. Moreover, Samella et al. (1994) claims that learning a sport's technical aspects occurs best when new coaches watch and listen, rather than engage in abstract classroom discussion. Informal settings are effective because the autonomy of the individual is maximized, and learning is driven by observation, reflection, and discussion (Garner et al., 2020; Nelson et al., 2006). Numerous studies indicate coaches prefer informal settings (Cassidy et al., 2008; Cushion, 2007; Cushion et al., 2003; Erickson et al., 2008; Gilbert & Trudel, 2001; Nelson et al., 2006; Trudel & Gilbert, 2006).

Moreover, Gilbert et al. (2006) illustrate that coaches participate in one hundred hours of informal coach education for every one hour of formal education. Although informal education is not always accidental, it should be encouraged due to learner preference (Werthner & Trudel, 2006). In fact, Maclean and Lorimer (2016) show that coaches often prefer informal environments and Myhre and Moen (2017) demonstrate that experiential learning outperforms traditional coach education programs. This may include partnering new coaches with certified coach mentors at major sports projects to add real world context, and mentorship that builds upon theoretical concepts covered in formal modules (Myhre & Moen, 2017). Therefore, the social element of informal learning should be acknowledged as a significant and positive factor for development (Culver & Trudel, 2006; Garner & Hill, 2017). As opposed to the hard skills of professional knowledge, the soft social and cultural skills of great coaches, like all artists, is best learned through practice and in real-world experiences. Indeed, competency-based critics including Collins et al. (2016), recommend a mentorship-based model whereby decision-making and professional judgment is the focus and, according to Garner et al. (2020), problem-solving is paramount. Fortunately, digital tools are now available to help organizations facilitate connections and discussions

among coaches through communities of practice (Culver & Trudel, 2006), whereby they can learn from one another on an on-going and informal manner. Yet, cataloguing and valuing these experiences remains open to interpretation.

Non-Formal Learning Environments.

Non-Formal education is a structured, systematic, educational experience, but does not result in certification and commonly focuses on a sub-group of students (Coombs & Ahmed, 1974; as cited by Nelson et al., 2006). Examples include professional development clinics and conferences (Nelson et al., 2006), with research indicating such activities contribute to high participation rates (Bloom & Salmela, 2000; Fleurance & Cotteaux, 1999; Schempp et al., 1999). However, these types of opportunities are not as common as we think (Maclean & Lorimer, 2016). To be effective, these types of educational experiences need to be interactive, collaborative, and include practice time (Desimone, 2011; Griffiths et al., 2016). Moreover, Bernstein (2000) claims professional development must distribute legitimate and relevant information, and despite its place outside of the certification pathway, be facilitated or monitored by qualified individuals to ensure content remains on-message. Griffiths et al. (2016) argue that non-formal education can help communicate a clear, comprehensive, and relevant message to individuals, and accommodate learner preferences, but needs to be delivered by qualified facilitators who actively engage with the learners. Currently, non-formal learning scenarios are acknowledged by the NCCP's maintenance of certification points system, however, each NSO may choose if and how to value and appoint credits for such organized events.

Coach Education Summary

In 2012, the International Council for Coaching Excellence incorporated these major themes of coach education literature into the International Sports Coaching Framework. This document remains the leading framework for the council and informs the actions of the twenty-eight member nations,

including the CAC. The published framework not only consolidates concepts of long-term athlete development, various sports contexts, and key coaching competencies, but also reframes the previously discussed coach education conceptual frameworks. Introduced earlier, the framework builds upon Moon (2004) and uses the presence of an expert coach or learning facilitator to differentiate between mediated and unmediated learning situations. The framework also incorporates the definitions of formal and non-formal learning environments by Coombs and Ahmed (1974), and visually acknowledges the significance of learning through working as a coach and reflection upon their experiences. This framework also incorporates the work of Knowles et al. (1998), demonstrating that coach education across the world adopts an andragogical lens. These concepts remain foundational in the current publications of the International Council for Coaching Excellence (ICCE), and future researchers can reference these guides to review updates to the coach education literature.

Blended Learning

Blended learning and its use in the NCCP feature as the key educational theme of this research thesis. In recent years, blended learning is increasing in popularity and mediated formal coach education programs like the NCCP are using its principles to manage geographical and logistical constraints. As of 2022, 16 of 67 Canadian sports include learning blends in coach education pathways. However, consensus in the academic literature regarding its definition, strengths, and design frameworks remain in flux. As a technology-augmented style of teaching, blended learning has only surfaced as a major teaching and learning concept over the past twenty-five years and continues to develop over time. This literature review section explores the history and definitions of the blended learning approach, including recommendations for program design, and its impact in the context of andragogy, constructivism, completion rates, and personality traits.

Before diving deeper into the effectiveness of blended learning in coach education programs, it is important to establish a working definition. Most recently, Hofman (2018) defines blended learning as

a modality that incorporates trackable blocks of learning content and accommodates a student's need. Bozkurt and Sharma (2021) suggests it as an approach that minimizes the weaknesses and optimizes the strengths of both in-person and technology-mediated learning. However, blended learning reflects a wide variety of learning theories, and technology has helped change the definition, which is now cast as a natural evolution of sound teaching and learning practices whereby teachers deliberately employ available tools to support student comprehension and retention.

Setting the stage, Graham (2006) defines blended learning as "instruction based on a combination of two historically separate models of teaching and learning: traditional face-to-face learning systems and distributed learning systems" (as cited by Bozkurt, 2022, p. 5). In this context, distributed learning, or spaced learning, is defined as a method whereby information is learned over extended periods of time, helping students comprehend and assimilate knowledge (Kirkley, 2012). Conversely, massed learning more closely relates to traditional face-to-face learning experiences whereby information and knowledge are developed within specific and often shorter time periods (Kirkley, 2012). Understanding the foundations of distributed learning is important in the context of coach education because of the considerable time associated with mastering all three aspects of the coach knowledge triad and the moderate capacities of formal coach education to support interpersonal and intrapersonal knowledge as discussed previously. Distributed learning is "grounded on the assumption that long-term memory will be improved when there is more time between acquisition and retrieval of information" (Kirkley, 2012, p. 1020). To this effect, Litman and Davachi (2008) recommend that student evaluations take place following a break from learning to leverage the benefits of the spacing effect. First hypothesized by Ebbinghaus (1885) and summarized by Vlach and Sandhofer (2012), the spacing effect is "arguably the most replicable and robust finding from experimental psychology" that shows spacing learning events over time increases long-term memory (p. 1). Thus, spaced learning, distributed learning, and blended learning are all connected through the goal of optimizing student

memory and knowledge in the long run. Acknowledging the foundations of distributed learning is important since coach education programs often allow learning by home study, and the benefits of spaced learning are inherent given the extended time periods associated with achieving and maintaining coach certifications.

The concept of blended learning has also evolved with changes in technology in the recent past. According to Park and Shea (2020), early research focuses more heavily on distance education and the quality of asynchronous discussions (De Wever et al., 2006; Pena-Shaff & Nicholls, 2004; Schrire, 2006). Distance learning, previously known as correspondence courses, allow students to use self-paced learning to complete and submit work beyond traditional classroom settings and timelines. The advent of personal computers and the internet has made such modalities of teaching and learning much more accessible. For example, McGee and Reis (2012) used learner traits, grades, and engagement, and teacher satisfaction to assess the impact of technology-mediated distance learning, while Helms (2014) explores themes of retention, communication, and teamwork from the literature. Highlights during this time include calls for greater social presence between students (Richardson & Swan, 2003), and a greater teacher presence (Garrison & Cleveland-Innes, 2005). Mason (2002) identifies that even early adopters of on-demand eLearning modules recommend the inclusion of in-person or synchronous sessions (as cited by Macdonald, 2017). Indeed, shifts toward heightened connectivity started a few years earlier when Garrison et al. (2000) proposed the Community of Inquiry framework, equally emphasizing teaching, cognitive, and social presence. This framework quickly gained momentum and remains one of the most cited publications in the literature (as cited by Park & Shea, 2020). In the spirit of student autonomy and curiosity, Dutta et al. (2005) argue that referencing and building knowledge from multiple information sources is an essential aspect of learning (as cited by Kirkley, 2012) and by the mid-2000s, the advent of new internet websites and services referred to as WEB 2.0 changed how people used the internet and, in turn, how teachers could leverage digital tools to support learning. The

idea of leveraging online networks to encourage student curiosity and self-discovery contributed to the rise of a new learning theory, connectivism. Gonzalez (2004) hypothesizes that in the face of rapid technological innovation and the democratization of information across the online world, the half-life of knowledge continues to decrease. Building on this, Siemens (2005) suggests that by leveraging self-organization and personal networks, students can learn to develop essential skills for the knowledge economy. This includes the ability to distinguish between important and unimportant information, create connections between information sources, and develop personal processes for creating knowledge that helps them remain current in their field of expertise (Siemens, 2005). As a result, McGee and Reis (2012) posit that blended learning is a “transitional method that will enact connectivist applications, situated in social networks mediated with technology, as the learner participates in decision-making and explores current understandings and knowledge while accessing information and relating knowledge across people, places, and cognitive originations” (p. 14). Prophetically, the launch of numerous social networking websites in the following years transformed the internet. YouTube launched in February 2005, Twitter in March 2006, and Facebook’s expansion to non-Ivy-league schools occurred in September 2006. Moreover, by 2006 the number of articles and total size of article text on the open-source encyclopedia website, Wikipedia increased dramatically (Hägström, 2024). As such, Siemens’ aspirations for greater interconnectivity were well timed and in the coming years, research shows that social learning facilitated by WEB 2.0 tools and social networks positively supports student discussions and the problem-solving processes (Conole & Alevizou, 2010; as cited by Helms, 2014). Moreover, Boyd (2010) argues networked public online spaces help teachers and students access online materials and collaborate within the time available, providing students with the freedom to complete tasks at their own pace. Thus, Laumakis et al. (2009) defines blended learning as an “environment that combines face-to-face instruction with technology-mediated instruction” but notes that “the

relationship between those two anchoring modalities [onsite and online] do not appear to be as straightforward as originally thought” (as cited by Bozkurt, 2022, p. 75).

The conceptual evolution of blended learning also incorporates changing perspectives on learning mode, namely the high-value initially placed on text-based learning (Stacey et al., 2009; as cited by McGee & Reis, 2012). Despite reports that millennial learners were less likely to read and are instead more visually oriented (Oblinger & Oblinger, 2005; Sweeney, 2006), NEA reports in 2004 and 2007 show recent innovations in technology were *increasing* reading rates (as cited by McGee & Reis, 2012). Nonetheless, momentum for creating education resources that are highly accessible and better leverage multi-modal concepts continued through the following decade. Multi-model learning builds upon the semiotic reasonings of Goodwin (2000), whereby humans communicate through a combination of speech, gestures, images, and eye contact or lack thereof, and encourages teachers to provide resources and facilitate activities that engage all a student’s senses. Examples include using subtitles on narrated video resources, or in some other way engage a combination of more than one sense to optimize information retention over time. Picciano (2009) proposes a new blended learning model that deliberately incorporates multi-model concepts, matching learning outcomes with learning modes and in appreciation of personality traits, learner preferences, and generational cohorts. Picciano’s model paired pedagogical objectives with the most appropriate setting and digital tools. This includes pairing social and emotional learning with classroom settings and pairing higher-order thinking and synthesis with writing projects (Picciano, 2009). This model also acknowledges the needs of extraverted learners to engage in ‘active’ rather than passive learning (Jung, 1921; as cited by Picciano, 2009). Active learning principles include a situation-based, complex, and purposeful environment, whereby students participate and learn through doing (Barnes, 1989). Such a kinesthetic way of teaching and learning is highly prevalent in sports coach education, evidenced by the higher rates of extraversion among successful coaches (Kao et al., 2023). Thus, developing learning resources and environments with

appreciation for multi-modal learning needs appear a valid and integral part of successful coach education experiences.

Beyond the layering and pairing of learning outcomes and modes, the ratio of face-to-face and online learning is also important for learning blends. Although Laurillard (2002) warns that for effective outcomes, technology-mediated learning should not account for more than 50% of the learning experience (as cited by Macdonald, 2017), both Allen and Seaman (2010) and Dziuban and Moskal (2011) argue a specific percentage of class time must be facilitated online to warrant classification as a blend. A consensus now appears that if 30-79% of learning hours occur outside of face-to-face classroom settings, the experience constitutes a blend (Müller & Mildemberger, 2021). Most recently, Asghar et al. (2022) investigates optimal combinations of blends in vocational teacher training programs, whose learning competencies closely mirror the coach knowledge triad. The results suggest optimal learning blends include a learning split of 62% in-person face-to-face, 20% facilitated online (video calls) and 17% offline self-study (includes eLearning modules) (Asghar et al., 2022). Table 3 compares the findings of Asghar et al. (2022) against the eleven NCCP programs included in this thesis research. Conversely, Strayer (2012) stresses the importance of focusing on the quality and process of learning, rather than just modifying the amount of time used to introduce new information to students through readings or lecture. As such, McGee and Reis (2012) proposes that the definition of blended learning should not rely on the technological framework, but rather how well learning activities smoothly transition between face-to-face and online learning. Helms (2014) suggests blended courses must include student-teacher and student-student interactions in both online and face-to-face environments. And Macdonald (2017) warns that regularly scheduled contact between students and their advisor is essential to mitigate feelings of isolation, especially in distance education environments. Therefore, quality time for social connection, rather than an absolute value or percentage of class time, is an important ingredient for successful blends.

The order of face-to-face and online learning experiences is also relevant to the concept of blended learning. Contrary to traditional teaching methods in which class time is used to introduce new information, followed by individual tasks (homework) for information retention and knowledge creation, technology-mediated blended learning can more easily use flipped learning strategies. First coined by Nechkina (1984), developed by King (1993), Mazur (1997), Lage et al. (2000), and popularized by Salmon Khan (Thompson, 2011), the flipped classroom is “a pedagogical approach in which basic concepts are provided to students ... [before class] so that class time can ... build upon those basic concepts” (Persky & McLaughlin, 2017, p. 1). Also known as inverse, reverse, or backwards design, this approach is common in blended learning spaces as it encourages teachers to provide students with online resources that match their needs and help them understand new ideas, and then use active learning strategies in class to support comprehension and retention. Active learning is a classroom method whereby learners engage in activities that help them think through concepts, make associations (Bonwell & Eison, 1991), and acknowledge what they know and do not know, therefore activating metacognition (McGee & Reis, 2012). This can involve group work, listening/reading and reflecting/writing, as well as problem-solving and role-playing (McGee & Reis, 2012), all activities commonly recommended to NCCP LFs. Dietz-Uhler and Bishop-Clark (2001) show that face-to-face discussions were of higher quality when preceded by an online discussion (as cited by Helms, 2014), supporting the call to include synchronous online theory modules (video calls) in coach education pathways. More recently, meta-analysis by Schmid et al. (2023) suggests that flipped learning is more effective than online-only learning, but not as effective as the more broadly defined, blended learning. Therefore, the definition of blended learning acknowledges the deliberate ordering of content blocks but provides more flexibility than the more concrete concept of flipped learning.

Thus, the definition of blended learning and its derivatives can vary by combinations of learning order, environment, mode, technology, and spacing. Indeed, Garrison and Vaughan (2013) suggest it is

more productive to adopt an inclusive rather than restrictive definition. Moskal et al. (2013) argue the instructional designer is in fact the most important success factor, stating blended learning methods “must be operationalized in a manner that resonates with the context of the institution and aligns with its goal and objectives while at the same time maintaining consistency with organizational capacity” (p. 23). This matches earlier definitions, when Garrison and Kanuka (2004) define blended learning as a “thoughtful integration of classroom face-to-face learning experiences with online learning experiences” (p. 96), and more recent definitions when Bozkurt and Sharma (2021) explain it as a combination that blends the strengths and neutralizes the weaknesses of online and offline learning spaces to provide necessary flexibility for students, teachers, and organizations. Therefore, the theme of using digital tools and spaces deliberately and in the service of learning exists as a foundational attribute of the blended learning approach.

Comparing in-person classroom instruction to learning blends in university studies and health studies respectively, Bernard et al. (2014) and Vallée et al. (2020) show blended approaches yield better outcomes. Müller and Mildemberger (2021) also show that blends are “not associated with poorer learning outcomes... [and] are equivalent to conventional classroom instruction,” adding, however, that it is “not yet possible to say in which disciplines or for which specific competencies a blended learning format is particularly suitable” (p. 12). Rasheed et al. (2020) show that student self-regulation, procrastination, and isolation are better in blended learning environments compared to online-only environments, and Ashraf et al. (2021) demonstrate blended learning “can enhance students’ self-regulation toward learning, satisfaction, and engagement” (p. 1538). Yet, Ma’arop and Embi (2016) warn that teachers do not necessarily receive the necessary tools, attention, and training to effectively use digital tools when organizations transition from traditional to blended learning environments (as cited by Rasheed et al., 2020).

Earlier research by Dziuban and Moskal (2011) indicates that student satisfaction surveys are insufficiently designed to differentiate between the impacts of classroom, blended, and online-only learning. In that study, the alpha reliability coefficients across the three learning modes were similar and approached a value of 1 (classroom = 0.93, blended = 0.92, and online-only = .91) so it appears “students pay much more attention to the overall educational experience and less attention to the individual aspects of a course,” and the more effective predictor for completing a blended course is previous academic performance (Dziuban & Moskal, 2011, p. 239). Likewise, Owston et al. (2013) show a high correlation between student perceptions and academic performance, indicating high-performing students found learning blends convenient, more engaging, and better for information retention compared to face-to-face setting. However, this study also shows that low-performing students may not be able to cope with technology-based challenges of learning blends and thus it may be best to offer students a choice between blends and face-to-face environments when feasible (Owston et al., 2013). For example, Chekour et al. (2018) reminds us that the mere presence of computers does not improve student learning unless used carefully and that quality is essential in any mode of instruction. Therefore, Hofman (2018) suggests organizations conduct a needs-assessment to ensure they have the technological capacity to successfully adopt learning blends, especially when evaluation is required.

Blending-learning research on adult learners also illustrates the need for purposeful, interactive, and flexible designs. Initially viewed with great optimism because of its accessibility for students with jobs, hobbies, and families (Shea, 2007; Vaughan, 2007, as cited by Deschacht & Goeman, 2015), and flexibility in the time and place of learning (Decelle, 2016; Diep et al., 2017; Jones & Blankenship, 2017; as cited by van der Stap et al., 2024), blended learning programs still present challenges for adult learners. Park (2007) illustrates that drop-out rates are higher in blends compared to traditional classroom instruction, yet the factors contributing to drop-out change through the program. For example, before and during the learning experience, student age, gender, education level, and

employment status contribute to withdrawal, whereas logistics, finances, health, and managerial support are most important during the program (Park, 2007). Lack of teacher interaction and support during online activities also negatively impact student withdrawal (Cho et al., 2017; D. W. Johnson & Johnson, 2018; Kuo & Belland, 2016) and decrease learning outcomes (Cuesta Medina, 2018; McKenna et al., 2019; Serrano et al., 2019; as cited by van der Stap et al., 2024). According to Owston and York (2018), adult withdrawal rates may be specific to their preference for traditional classroom instruction because online activities are viewed as ancillary, rather than primary to their learning experience. Deschacht and Goeman (2015) caution that higher test scores often occur because of higher drop-out rates. Therefore, when evaluating the effectiveness of learning blends with adults, pass rates, discussion participation, course work, and exam scores should all be considered (Deschacht & Goeman, 2015). Ilgaz (2019) explores the impacts of mandatory participation in group discussions and time restrictions on assignments, finding one size does not fit all and therefore the utmost care during in the design phase is necessary to promote flexibility and attendance (Ilgaz, 2019). This echoes earlier work showing time restrictions increase participation rates and the quality of student discussion, as well as course completion rates, but at the expense of some students' needs (Lim et al., 2016; Rhode, 2009). Most recently, the work of McKenna et al. (2019) calls for a greater emphasis on interaction and proposes a design matrix that helps instructional designers match learning goals with activities. Moreover, van der Stap et al. (2024) show that when activities are relevant and meaningful to the students, adult learners in blended environments will complete assignments, including collaborative group activities that promote deep learning, but a greater logistical burden is born by the students. Thus, activity selection and sequencing can help teachers of adult learners avoid repeating content, use face-to-face sessions to encourage deep learning, and provide feedback to online assignments in a timely manner so all activities on the syllabus are equally valued (van der Stap et al., 2024). Biggs (2003) modified-3P model offers a constructive framework for the appreciation of adult learners and implementation of andragogical

principles that have stood the test of time. Like the Picciano (2009) model, the modified-3P model matches learning products (i.e., written documents, new knowledge) with learning processes (i.e., deep learning) (van der Stap et al., 2024). However, the model also proposes the concept of learning presage, whereby the unique combination of a learner's characteristics and needs are assessed against the available learning environment. As a result, the affective state of adult learners, their need for social presence, and the digital tools or learning design available to teachers can be considered. This appreciation for the learner also helps identify challenges including adults' desire for autonomy and self-directed learning, and need for deep learning through collaborative and meaningful activities, which support a positive convergence or seamless transition between online and face-to-face learning. Thus, blended learning can support adult learners and the principles of andragogy when careful attention to the experience of students and teachers are incorporated into design and implementation.

The literature also provides insights for transitioning and revising content for blended learning environments, which Canadian sport coach educators may consider for the future. McGee and Reis (2012) argue designers should be intentional with the blend type, differentiating between: enabling blends, which promote flexibility and access to opportunity; enhancing blends, which focus on deliberate improvements; and transformational blends, wherein radical changes occur, and learners receive information and construct knowledge much differently than before. Consideration should also be given to the purpose of the course and the end-product (McGee & Reis, 2012). For example, learning content may be: process-driven, which works toward a formative in-person coach observation; product-oriented, which works toward an end-product like written coach portfolios; or project-oriented, like a multi-day camp that helps incorporate more abstract competencies into the evaluation rubric. In addition, consideration should be made for what type of digital tools and spaces the students and teachers can access and use competently (McGee & Reis, 2012). Finally, learning objectives must be clearly written from the student's perspective, matching their learning needs, and optimally sequenced

to pair content with the learning environment (McGee & Reis, 2012). This may include clear expectations for student-student and student-teacher connectivity (McGee & Reis, 2012), use of in-person classroom settings to support community-building (Helms, 2014), and using communities of practice to encourage student autonomy (Yukawa, 2010). Thus, by designing education modules with the student in mind, designers can more effectively avoid creating a “course and a half” (McGee & Reis, 2012, p. 11) and best role-model an appreciation for what needs to be learned in a structured environment and what can be learned through experience.

Blended Learning in Coach Education

In the context of blended learning in sports coach education, peer-reviewed research is limited. Cushion and Townsend (2019) explore blended learning methods in the United Kingdom to show blends using digital resources are considered an “enabling tool” and help coaches access information and contextually specific challenges. However, echoing Chekour’s earlier caution that the way education technology is used is more important than any one type of technology, Cushion and Townsend (2019) find that harmony between learners, learning outcomes, and available teaching tools is paramount. Wang and Cope (2023) review fifteen research papers exploring coach education practices and identify three key themes: learning facilitator education, learning design, and course content. Interestingly, discussions around learning blends did not surface as a key theme. Rather, the emphasis was on shifting towards discussion-based and practical approaches that address participant needs, as well as learning-facilitator training and pedagogical expertise. This aligns with recent studies that indicate programs are indeed shifting to focus more on coach’s needs (Cope et al., 2021), and considerable progress has been made since the authoritarian styles of the 1980’s (Chapman et al., 2020). Cope et al. (2024) use a qualitative analysis of Saudi Arabian sports coaches and show learning format (online vs. blended) does not appear significant; rather, understanding the cultural climate is most important when fostering question-based learning experiences to promote deep learning through follow-up discussion. Wang and

Cope (2023) postulate that the amount of peer-reviewed literature on coach education learning design is limited because national organizations tend to keep program review and revision documentation private. Therefore, they recommend sports organizations engage more deliberately with academic researchers and democratize information about coach education challenges so helpful resolutions can be discovered.

In summary, the blended learning literature is extensive and multi-faceted and provides an opportunity to explore the history of education. Most evidently, the literature agrees that no single technology can supplant the role of teaching, and a teacher's responsibility is to carefully and deliberately select environments and resources that ensure learners come first.

As an aside, the concept of multi-modal learning resources and semiotic reasoning introduced earlier is an important aspect of this research due to existing narratives within the sports coaching culture. As recently as 2020, the concept of learning styles was included in official NCCP education materials and, as such, this original research survey asked respondents if they identify with the VARK model. Originally hypothesized by Fleming and Mills (1992) and Dunn (1990) and despite strong critiques in recent decades (Howard-Jones, 2014; Newton, 2015; Newton & Miah, 2017; Newton & Salvi, 2020), a vast percentage of educators still propagate the concept (Newton et al., 2021, as cited by Patil & Newton, 2023). Rather Willingham (2005a, 2005b) suggests the concept of learning modalities may help teach specific topics, but individual preferences or styles reflect individual learning abilities. Coffield (2013) explains the VARK model includes theoretically incoherent and conceptually confused literature, incongruent and context-poor questionnaires, and insufficient evidence that tailoring lessons to student preferences enhances learning. Moreover, Pashler et al. (2008) and Hattie (2012) show student assessments for learning using the VARK model exhibit weak relationships with success, as opposed to Wiliam (2011), who recommends more evidence-based approaches (as cited by Coffield, 2013). Finally, Coffield (2013) warns that "most practicing teachers and senior leaders become steadily more and more

remote from the research literature as they get further away from initial teacher education” and thus professional development of NCCP coaches needs to address discrepancies between past education models and current models of efficacy (p. 2). Most concerningly, NCCP coach developer resources have replaced the VARK model with Gardner’s (1983, 1993, 2011) theory of multiple intelligences (CACH, 2021) that equally lacks sufficient evidence as an educational model (Howard-Jones, 2014; Waterhouse, 2023). However, NCCP professional development experiences can constructively reframe the perspectives of coaches who identify with either Fleming’s or Gardner’s work by emphasizing the importance of simple verbal instructions, clear demonstrations, opportunities to practice motor-movements in closed and progressively open environments (more variables), and reflective exercises that support cognition when coaching athletes.

Consumer Behaviour

Consumer behaviour explores the factors that encourage people to make purchases or to continue a process towards an end goal. Simon’s (1955) theory of bounded rationality argues that uninformed consumers cannot perform subtle estimates of product value. This may lead to biased purchasing decisions (Bettman & Park, 1980). When under-informed, consumers make intuitive judgments and may fall subject to framing and anchoring effects (Shan et al., 2019). Thus, message framing is a communication strategy that can highlight the benefits gained or consequences avoided by purchasing a product (Levin et al., 1998). Although the literature does not demonstrate whether positive or negative frames are more convincing (Chen, 2016; S. Moon et al., 2016; van de Velde et al., 2010), framing impacts consumer attitudes and actions (Block & Keller, 2018; Zhu et al., 2009). Therefore, coach education learning and promotional materials need to be clear, concise, and compelling.

In the context of coach education program design and its impact on value and completion rates, patterns surface in the literature. Misener and Danylchuk (2007) show that although 95% of respondents reflected positively on their NCCP experience, only 54% agree their perceived value of the

NCCP increased after participating. More recently, Baker et al. (2021) found that 58% and 55% of NCCP participants intend to achieve trained and certified status. Yet, outside of Canada, Vargas-Tonsing (2007) indicates more positive perceptions of coach education programs and suggests education and certification should be mandatory. Vargas-Tonsing (2007) posit if coach education programs are already held in high regard, the perceived value will rise as programs develop a greater focus on interpersonal and intrapersonal knowledge (to support athlete communication skills and character). Yet, in Canada, content overlap, poor facilitation, limited evaluator access, time, cost, logistical barriers, and unclear education pathways are negatively affecting the NCCP's perceived value (Baker et al., 2021; Gurgis & Callary, 2022). Of these factors, Horgan and Daly (2015) suggest the individual traits and abilities of the coach developer may indeed carry the greatest impact for coaches-in-training (as cited by Culver et al., 2019). Most recently, qualitative analysis by Kerr et al. (2018) suggests NCCP certification rates may increase if the following attributes are developed: articulate the benefits of certification, streamline the process and use of online tools, and incentivize and reward certification – all of which are closely associated with informing and framing concepts of consumer behaviour. Furthermore, Kerr et al. (2018) suggests evaluators need to be more accessible.

Given the competing education programs now available on the market, NCCP program design may benefit from a greater appreciation for consumer behaviour, and the aforementioned research shows that learner-centred evaluation criteria and experiences are further examples of putting the customer first.

Personality Traits

As this research project explores the impact of personality traits on NCCP certification rates, this section explores the relevant literature. Ryckman (2008) defines personality as a "dynamic and organized set of characteristics of a person that uniquely influences their cognitions, motivations, and behaviours in various situations" (p. 4). The Five-Factor Model of Personality Traits (FFM) is considered

the preeminent model (Tovmasyan & Kaye, 2023; Baruth & Cohen, 2023; Digman, 1990; Goldberg, 1993; Quigley et al., 2022), and includes five dimensions and ten sub-dimensions (Cattell, 1966; Costa & McCrae, 1976; Norman & Goldberg, 1966; Soto & Jackson, 2013; Tupes & Christal, 1961). Factors include openness to experience (intellect & openness), conscientiousness (orderliness & industriousness), extraversion (enthusiasm & assertiveness), agreeableness (compassion & politeness), and neuroticism (withdrawal & volatility). Most interestingly, the big five traits also capture the impact to two meta-traits (Liu & Campbell 2017) linked to two important neurotransmitters, dopamine, and serotonin. According to DeYoung et al. (2002), plasticity encompasses the traits extraversion and openness, and is associated with dopamine, a neurotransmitter that facilitates exploration, learning, and cognitive flexibility, and controls sensitivity to rewards and potential rewards. Opposing the pleasure-seeking attributes of plasticity are the pain avoidant attributes of the second meta-trait, stability (DeYoung et al., 2002). Characterized by trait conscientiousness, agreeableness, and neuroticism, the neurotransmitter serotonin facilitates pain avoidance by stabilizing information, disrupting impulses, and increasing focus (DeYoung et al., 2002). Thus, a pain-avoidant person may exhibit combinations of low neuroticism (emotional stability), high conscientiousness (motivational stability) and high agreeableness (social stability), whereas a pleasure-seeking individual may constitute high degrees of both extraversion and openness, or interest in new or changeable conditions (DeYoung et al., 2002). The model helps individuals compare trait expression against population averages using a normal distribution. For example, someone expressing 51st percentile trait-conscientiousness is more industrious and orderly than half the population. Although numerous researchers suggest personality trait expression is equally influenced by genetic heritability and environmental conditions (Jang et al., 1996, 1998; Loehlin et al., 1998; Riemann et al., 1997; Yamagata et al., 2006) understanding how traits express differently over time remains in study. According to Soto & John (2012), traits conscientiousness and agreeableness tend to increase with age while neuroticism, extraversion, and openness generally decline. However, Seifert

et al. (2023), shows mixed evidence for changes in conscientiousness and agreeableness, but confirms trait neuroticism decreases with age, improving emotional stability. Indeed, personality trait expression research is a complex and on-going area of study, encouraging researchers to exercise caution when designing research and interpreting results.

Although personality trait expression is not a common topic discussed in coach education research, significant research has taken place in academic settings. Of the five traits, conscientiousness is universally considered a significant and positive predictor of academic success (Chamorro-Premuzic & Furnham, 2003; Duff et al., 2004; Lounsbury et al., 2003; Nguyen et al., 2005; Nofle & Robins, 2007; Paunonen & Ashton, 2001; Poropat, 2009; Rosander et al., 2011). The remaining four traits appear less universally significant, but hypothetically valid in specific student groups and learning environments (O'Connor & Paunonen, 2007). For example, Chamorro-Premuzic & Furnham (2003) report students high in trait conscientiousness and low in trait neuroticism (emotionally stable) do best in post-secondary exams. Rosander et al. (2011) find this is indeed the case in sports studies, but that success in language and practical studies correlate with higher degrees of trait neuroticism, or emotional instability, perhaps due to altered study habits. While one would expect trait openness, associated with lexical intellect (J. A. Johnson, 1994; Saucier, 1992) to contribute to success, many studies have not demonstrated significant correlations (Lounsbury et al., 2003; Nofle & Robins, 2007; O'Connor & Paunonen, 2007; Paunonen & Ashton, 2001). Nguyen et al. (2005) demonstrate differences between male and female learners, whereby intellect and emotional stability positively impact male academic performance, but neither trait expression significantly impacts female success. Therefore, in traditional learning environments, educators may consider trait conscientiousness as a strong predicting factor for success, but additional traits may only provide insight for specific learners and environments.

Conversely, personality trait research on blended delivery environments has received increased attention in recent years, building upon Deschacht and Goeman's (2015) recommendations that student

personality types be considered when designing blends. Lin et al. (2005) suggests that personality traits should deliberately inform the use of 'active learning' strategies, especially with learners high in trait extraversion. Informed by the works of Karl Jung (1921), Picciano's (2009) model reminds us that:

the extrovert may prefer active, highly collaborative environments while the introvert [may] prefer less interaction and less collaboration. This suggests that instruction should be designed to allow both types of individuals—the outgoing social organizer as well as the introspective reflective observer—to thrive (p. 13).

This idea is supported in the literature with trait extraversion positively predicting preferences for classroom instruction compared to blends (Tovmasyan & Kaye, 2023), and blends compared to online-only (Keshavarz & Hulus, 2019), due to student desires for social interaction. Abe (2020) demonstrates students high in the extraversion sub-trait enthusiasm, are successful in both interactive and face-to-face learning environments because excited students write more and experience higher cognitive learning through reflective activities. Whereas Lv and Li (2024) shows when a student's performance expectations, effort expectations, and hedonic motivations align and they feel confident tasks can be completed (self-efficacy), blended learning environments improve participation and comprehension. Thus, Keshavarz and Hulus (2019) suggest that teachers consider student motivation when designing blends. As defined, hedonic motivation is the impact of a person's pleasure and pain receptors on their movement towards a goal or away from a threat (Kaczmarek, 2017), which corresponds with the dichotomy between the Big-Two meta-traits, plasticity and stability, and their respective neurotransmitters, dopamine and serotonin. This recent research on self-efficacy in learning blends was preceded by Alkış and Temizel (2018), who explored differences between blends and online-only environments. Interestingly in blends, only trait conscientiousness predicts exam performance, whereas neither personality traits nor self-efficacy predicted learning management system (LMS) use (Alkış & Temizel, 2018). A student's perception of a learning task's value and their anxiety of exam

performance best predicted success (Alkiş & Temizel, 2018), demonstrating the impact of motivations and self-efficacy compared to the use of specific digital resources. Anxiety is also associated with trait neuroticism, or low emotional stability. Finally, Tovmasyan and Kaye (2023) show United Kingdom university students high in trait neuroticism prefer blended learning rather than classroom instruction because social interactions decrease and learning autonomy increases. Thus, acknowledging the impact of personality traits may be helpful when designing blends, although the academic literature is more comprehensive in online-only spaces.

In online-only spaces, the academic community has made considerable progress recently, culminating in learning design recommendations that match trait expression with various learning modalities. Previous phenomenological research showed the high expression of trait conscientiousness and trait openness predicted happier and better performing students (Cohen & Baruth, 2017; Keller & Karau, 2013). According to Alkiş and Temizel (2018) trait conscientious and self-efficacy predicts use of an LMS, demonstrating that students who are proficient with digital resources or industrious and organized enough to learn, will do better in online spaces. This study confirmed that trait conscientiousness and LMS use predicts learning performance in both blended and online-only environments (Alkiş & Temizel, 2018). Recent research also confirms the impact of trait conscientiousness on predicting online engagement (Quigley et al., 2022) and preferences for online learning resources (Baruth & Cohen, 2023). However, Roos and Kazemi (2022) caution that generational cohorts may impact these rates, showing trait conscientiousness significantly predicted information-seeking internet use in people born between 1965 and 1999, but trait openness and extraversion predicted internet use for information seeking in people born between 1946 and 1964. Thus, engaging with digital tools and quizzes can create varying levels of anxiety for students. According to Horan et al. (2020), hindrance-challenge stress scores first proposed by Cavanaugh et al. (2000) and later supported by Lepine et al. (2004), are now “widely accepted both among academic and practitioner audiences”

with the implication that “hindrance stressors will interfere with performance or goals, while challenge stressors contribute to performance opportunities” (p. 1). Quigley et al. (2022) show that challenge-stressors (e.g., assignment difficulty) do not significantly predict performance, yet hindrance-stressors (e.g. logistical difficulties) do significantly and negatively predict performance. Therefore, online-only environment can incorporate difficult activities but need to ensure students can use digital tools competently. Quigley et al. (2022) also shows positive correlations between trait extraversion with participation and performance, mirrored by the work of Baruth and Cohen (2023) that suggests cohorts high in trait extraversion and openness enjoy all types of group activities. To further complicate the matter, Blumer & Döring (2012) previously show traits can express differently due to the learning setting. For example, learners may express more emotional stability while learning online compared to in-class environments (Blumer and Döring, 2012). More generally, Quigley et al. (2022) show trait neuroticism inversely predicts participation rates but positively associates with a desire to learn and the ability to study regularly. This means students who are emotionally unstable want to learn and do their homework but are not always present during class. Interestingly, Baruth and Cohen (2023) found students high in trait neuroticism did not express interest in any of the proposed learning modalities. Thus, they suggest teachers focus on other traits to identify optimal learning modalities and focus on mitigating the challenges faced by highly neurotic learners rather than redesigning the experience for all. The result of this innovative research illustrates significant correlations between personality trait expression and various learning modalities, encouraging teachers to conduct personality assessments on student groups before finalizing learning designs (Baruth & Cohen, 2023). Thus, to match personality trait-based preferences with learning modality and reduce challenge-hindrance stressors for highly neurotic students, learning management systems, exams, and online resources found in coach education like the NCCP, should feature clear, sequential, and easy-to-use instructions, resources, and technologies so learning remains centred on the topic of interest rather than the challenge of navigating

digital tools. Providing pertinent resources to aid learning and performance, including lecture notes, matches previous literature (Biktimirov & Klassen, 2008; Weisbord et al., 2003; Wilson, 2003), and well-designed learning management systems may positively influence student confidence and motivation for learning (Coates et al., 2005). The comprehensive nature of this research literature regarding personality traits in online-only spaces can help teachers design the digital experience of learning blends while the academic literature specific to blends continues to develop.

Literature Review Summary

In review of the academic literature regarding coach education research, blended learning, consumer behaviour, and personality trait expression impacting coach participation and certification rates, several factors surface. Collinson's (1996) knowledge triad guides our understanding of how to use different learning environments to develop specific coach competencies. Formal learning environments most often excel at developing professional sport-specific skills, yet acknowledging and encouraging informal learning scenarios can help develop inter- and intra-personal knowledge (Cushion et al., 2003; Gilbert & Trudel, 2001). Although blended delivery methods have not been shown to statistically improve learning, multi-modal digital resources can support sound pedagogical practice (Chekour et al., 2018; Cushion & Townsend, 2019). Creating valuable and sought-after learning experiences requires an appreciation for meeting the customer's needs, matching personality type with learning environment, and recognizing the impact of logistical barriers, or hindrance-stress factors (Baker et al., 2021; Gurgis & Callary, 2022; Kerr et al., 2018; Quigley et al., 2022). And finally, the Five Factor Model of personality is considered a descriptive rather than a predictive and comprehensive theory of personality and does not provide causal reasoning for human behaviour (John & Srivastava, 1999). On that note, Möttus et al. (2020) argue explanatory, predictive, and descriptive research of personality vary in method and goals, and should not strive for homogeneity and accept that they are not entirely isolated from one another. Thus, this research aims to build upon the existing literature to

quantify the impact of learning blends, consumer behaviour, and personality traits on NCCP participation and certification rates across numerous Canadian sports.

Chapter 3: Research Methodology

Explanatory Case Study Methodology

This research project used a correlational case study methodology to explore coach education methods in Canadian sport. Tisdell and Merriam (2016) explained that compared to other forms of inquiry, unit of analysis in a case study is the case itself. Yin (2003) defines case study as “an empirical inquiry that investigates a contemporary phenomenon (the ‘case’) within its real-life context” and is helpful when the behavior of participants cannot be manipulated (p. 13). Moreover, Tisdell and Merriam (2016) suggest case study methodologies when it is challenging to separate influential variables from the given context. Moreover, this correlational research uses a specific dataset to explore a snapshot in time to identify statistical associations between factors, rather than an extended study whereby variables are altered to discover causation. According to Yin (2003), data collection methods for case study can include the analysis of archive records, artifacts (including policy and protocols), and interviews. Direct participant observations and field studies are also common (Yin, 2003), but this thesis research did not use such methods due to time and capacity constraints. Therefore, case study researchers focus on describing and exploring a particular phenomenon using organized observations, data collection and analysis to study individuals or bounded groups (Yin, 2003). In this case, an original research survey collected data from eleven Canadian sports and sixty-seven NCCP Competition-Introduction (club) coaches who participated in education modules between 2014 and 2023. The dataset collected economic, academic, and personality trait information about each user as well as specific feedback regarding their coach education experience. Establishing the bounds of this research is a key aspect of case study research, yet factors impacting NCCP certification rates undoubtedly exist beyond the bounds of this research and such factors will contribute to the regression analysis error term. Using a case study

methodology, however, permits the researcher to explore such immeasurable aspects through interview discussion and analysis to develop context and acknowledge externalities. Therefore, follow-up interviews took place with coaches outside of the sport of cycling to develop context and identify emerging themes.

As opposed to exploratory or descriptive case study, this explanatory research used an original survey to quantify factors contributing to coach certification rates as well as identify an interview sample for follow-up qualitative analysis. Previous literature suggested the existence of factors affecting NCCP completion and certification rates (Kerr et al., 2018), yet such factors were not measured. This research aimed to quantify the impact of these hypothesized variables using quantitative logistic regression analysis, as well as explore new factors specific to personality trait expression and learning blends. The research also used a thematic analysis of follow-up interviews to identify naturally occurring patterns that may not be present in the quantitative data. Based on the researcher's professional experience as an NCCP-certified NCCP Master Coach Developer and provincial sport administrator for nearly a decade, hypotheses of naturally occurring patterns impacting the pursuit of coach education and certification may include acting on their goodwill (they retired from sport early yet wish to remain involved and give back regardless of their personality trait expression or impacts of consumer behavior) or conversely, technical or logistical challenges (coaches who live in areas with poor internet connectivity and require face-to-face instruction). Fortunately, this project garnered the support of four national sports organizations and participants from eleven nationally recognized sports, thus a comparative analysis of each coach education pathway occurred during the investigative phase. However, the research sample was too small to adopt a more comprehensive multi-case or comparative case study paradigm. Yet, as per Miles et al. (2014), subunits or subcases did appear in the data. To account for variations among these groups – specifically in-training, trained, and certified coaches – the

analysis incorporated a comprehensive descriptive statistics section. As such, the research project attempted to identify new and quantify hypothesized factors in an explanatory spirit.

Explanatory case study is appropriate because its philosophical underpinnings match the theoretical framework of the thesis research, constructivism (Stake, 1995; Yin, 2003). Constructivists argue truth is dependent upon an individual's perspective yet does not reject the notion of objectivity (Baxter & Jack, 2008). This "circular dynamic of tension between [...] subject[s] and object[s]" (Crabtree & Miller, 1999), facilitates a pluralism that acknowledges a socially constructed notion of reality (Searle, 1995), encourages participants to meaningfully convey their perspective (Crabtree & Miller, 1999, p. 10), and help researchers better understand their actions (Lather, 2009; Robottom & Hart, 1993; as cited by Baxter & Jack, 2008). More particularly, explanatory case study can help us discover presumed links of real-life interventions that are too complex for survey or randomized experimentation (Baxter & Jack, 2008). The impact of blended learning delivery, consumer behaviors, and personality traits on coach certification rates is indeed complex, and true randomization of future cohorts of coaches in-training is difficult. Rather, grouping historical data by in-training (at least one module completed), trained (all modules complete), or certified (observed and evaluated) status helped quantify factors affecting completion and certification rates. Historical data and interview analysis helped explain the measurable and immeasurable factors impacting coach certification rates.

Mixed Methods Research

Quantitative, qualitative, and mixed-methods research each offer a unique way of generalizing observations across differently sized groups (Polit & Beck, 2010). Quantitative research is used to identify numerical patterns and understand relationships between independent and dependent variables, the quality of which hinges upon the data's ability to accurately forecast relationships beyond the research sample size (Kerlinger & Lee, 2000; Polit & Beck, 2008; as cited by Polit & Beck, 2010). Qualitative research instead focuses on providing a deep and contextualized understanding of human

experience through non-numerical analysis and discussion (Polit & Beck, 2010). Bolstered by the work of Glaser and Strauss (1967) and Guba (1978), qualitative analysis is now a common research form (Tisdell & Merriam, 2016) that helps elevate marginalized groups (Bogdan & Biklen, 2007) and allows for inductive analysis of naturalistic, or real-world settings. However, qualitative study limits the researcher's ability to modify variables and extrapolate findings to populations beyond the sample size (Tisdell & Merriam, 2016). Mixed methods research (MMR) instead provides opportunities to combine the strengths of both methods.

Development and acceptance of mixed-methods research methods has developed over the past sixty years (Tisdell & Merriam, 2016). Combining the objective and deductive quantitative perspective, with the inductive and constructivist qualitative perspective, the history of mixed methods research includes four periods. The 1970's formative period featured the addition of interviews to quantitative research, followed by the 1980's debate period that explored the epistemological differences discussed above. The 1990's procedural period developed the most common MMR research approaches and was followed by the advocacy and expansion period of the 2000's whereby research policy changes occurred, most notably when the National Institutes of Health (NIH) started to call specifically for MMR proposals. A turning point occurred in 2003 when the National Science Foundation touted the benefits of a mixed methods approach (Creswell & Plano Clark, 2011), impacting the type of research proposed and funded (Tisdell & Merriam, 2016).

Differences across the three types of mixed-methods research centre upon the order research is conducted and analyzed. Exploratory design uses qualitative analysis to explore the contextual aspects of a new topic, with findings then helping establish parameters necessary for successful quantitative analysis (Creswell, 2015). Explanatory design instead collects quantitative data first, followed by a qualitative analysis that further explains relationships between variables (Creswell, 2015). Convergent design occurs when researchers explore two different research questions, using qualitative analysis to

explore one question, and quantitative analysis to explore the second (Creswell, 2015). This research used explanatory design and collected detailed survey data from a wide range of active and retired coaches, followed by interviews with non-cycling coaches. Due to the researcher's significant degree of responsibility, influence, and power in the NCCP cycling program, great lengths were taken to ensure research participants were anonymized. Thus, the process included a voluntary online survey that collected anonymous demographic data and only non-cycling coaches were permitted to engage in the interview process.

Data Collection Overview

To uphold the tenets of explanatory mixed methods research, the process occurred as follows. The original research survey was facilitated by the online platform, Monkey Survey between January 21st and February 23rd, 2023. A total of 112 people started the survey and seventy-seven people finished the survey; however, only 60% (67 coaches) answered the survey completely, averaging 48 minutes in duration. Thus, the low survey completion rate negatively impacted the data collection process and sample size. Participants were invited through email communication from viaSport, numerous NSOs, and a 30-day social media campaign on LinkedIn and Instagram, and there were no financial incentives for participating. To ensure only non-cycling respondents were asked to volunteer for an interview and disclose their contact information, survey logic was implemented to ensure all cycling coaches were automatically skipped ahead to the next section and avoid any possibility of identifying themselves. The researcher disclosed details of how information would be stored, handled, and later destroyed in the research invitation letter, in the online survey introduction, and repeated verbally before interviews took place. This information also reinforced a participant's right to decline, pause, or cancel their participation in the research at any time. The survey was designed in four parts. First, respondents disclosed demographic data including age, gender, education, household income, citizenship, province

of residence, and NCCP coach status. Second, questions explored their experience with the learning design and resources available through their coach education experience, including learning preferences and experiences with learning blends. The third phase of the survey explored attributes of consumer behaviour, namely the impact of total hours, costs, and the number of transactions on their continued participation, whereas the fourth and final phase used the BFI-44 inventory to estimate personality trait profiles for each participant. Short-answer questions were included for all respondents, including cycling coaches, to identify strengths and weaknesses of their experience with the learning design (impact of blends), the program design (consumer behaviour) and inform the interview selection process. Non-cycling respondents participated in follow-up interviews; however, initial analysis of the quantitative data did not indicate the presence of large outliers. Therefore, interview participants were identified to achieve an equitable balance between NCCP status, gender, coach type, and geographic area. However, when only six of the ten identified respondents confirmed and attended their interview, selection criteria for interviews were reduced and eventually 24 of 26 non-cycling coaches were invited, culminating in a total of nine interviews between July 1st and September 1st, 2023. Interviews occurred by phone call or video call (via Zoom) as per the participant's preference, and averaged 35 minutes in duration, with the longest interview extending to 80 minutes. The interview recordings and notes were compiled and transcribed between August and October 2023 and analyzed using a thematic framework in January and February 2024. The comprehensive analysis of the quantitative data then occurred between March and May 2024. Finally, the Coaches of Association of Canada encouraged four nationally recognized sports (Athletics Canada, Nordic (cross-country) Canada, Ringette Canada, and Cycling Canada) to share participation and certification totals between 2014 and 2023 (Table 2). Unfortunately, the researcher was unable to procure the proposed demographic data including age, gender, province, birth year, and time stamps of education participation and certification due to privacy agreements between the CAC and the Government of Canada. Nevertheless, this data helped establish context.

Thus, explanatory mixed methods research was used in this research, and the following sections further explain the quasi-experimental quantitative analysis and thematic qualitative analysis process.

Quasi-Experimental Quantitative Regression Analysis

Quasi-experimental (Qe) research is used to assess correlations between predictor variables when randomization is logistically or ethically (Harris et al., 2006). More specifically, Qe is a helpful when sample sizes are smaller, randomizing location and subjects is challenging, and ethical considerations factor into data collection (Harris et al., 2006). Based on the research timeline and total time available, quasi-experimental design can occur with or without control groups and pre-tests or may use an interrupted time-series to illustrate when an intervention occurred, the latter of which often improves causality (Harris et al., 2006).

The Qe design was appropriate for this research study because of the limited time available, small data sets, and challenges randomizing the data against control groups. Randomization across sport and geographic boundaries would have also been counter-productive because the research explored the impacts of sport-specific design and implementation practices as well as the impact of blended learning and access to digital and internet tools. The short duration of this research project does however provide a snapshot in time by comparing participant attributes with current certification status. Future research may consider tracking coaches over time to assess how changes across the numerous variables impact certification status. Since the NCCP program and learning delivery methods are established and undergo revisions on a quintennial cycle (CACi, 2019), if such a study were to look instead at learning design (blend) changes, lengthy time horizons would be required, however Qe design could still be used. This study also adopted a quasi-experimental analysis because although previous factors were identified (Edwards, 2019), the researcher required flexibility when conducting the regression analysis to accommodate for bias in the sample data and permit experimental modeling of previously unidentified or confounding variables.

During recent NCCP revision cycles, at least sixteen of the 67 officially recognized sports in Canada adopted blended delivery methods, providing an opportunity to assess the impact of blends on trained and certified status. However, national data shared by the partnering NSOs did not partition coach training and certification totals by year, only in summary since 2014. Therefore, survey data could not be partitioned to compare certification success before and after the introduction of learning blends or the on-set of emergency-online learning due to Covid-19 in early 2020. Fortunately, the survey sample was large enough to illustrate some patterns in certification rates before and after 2020 which are discussed in Appendix 2: Figures. Qe design does permit researchers to group subjects optimally and non-randomly, compared to purely experimental research. Therefore, the researcher did group survey data by factors of interest including certification status. Since the research was time-bound and it was not possible to establish a control group, this research does not qualify as purely experimental. However, the implementation of blended learning strategies in and around 2020 did serve as a natural experiment (Ahmed, 2021). As such, the introduction of emergency online learning in 2020 helped mimic the effect of randomization and accommodate for small sample sizes. Thus, learning blends and the other variables captured in the survey can be classified as an instrumental variable, whereby they may correlate with NCCP status but not with the regression error term. Therefore, quasi-experimental design best suited the research.

Quantitative Data Collection

As mentioned earlier, survey data was collected using the online tool, Monkey Survey in early 2023 and compiled for analysis in the following months. The data was also cross-checked for errors by comparing respondent's answers against published policy documents. Examples include discrepancies between the number of modules respondents claim to have participated versus the number of modules included in that sport's competition-introduction pathway. As discussed in Chapter 4, such variables were dropped from analysis. The remainder of the survey data was downloaded to Excel for cleanup

before being uploaded into Stata software for analysis. Personality trait expression data was collected using a 5-point Likert scale, ranging from 1 Strongly disagree to 5 Strongly agree. The personality trait responses were then further processed before uploading to Stata. For example, absolute mean scores and age-adjusted percentiles for each of the five traits were calculated against the John and Srivastava (1999) dataset which are further discussed in Chapter 4.

Quantitative Data Analysis

Quantitative data analysis incorporated descriptive statistics, a correlation matrix, binomial, and multi-variate logistic regression. Due to initial difficulties interpreting the data using regression, a detailed descriptive statistics process took place. As a result, the researcher identified bias in the sample, most notably the lack of respondents with good internet connectivity and patterns of personality traits that infer the sample included highly conscientious, agreeable, open, extraverted, and emotionally stable individuals. However, after consultation with the second advisor, Dr. Karl Storchmann, the researcher was able to better utilize Stata software and calculate regression models. By early April 2024, three models were developed and showed statistically significant correlations between independent variables and three certification sub-groups, in-training, trained, and certified NCCP status. Correlation matrix analysis in May 2024 further illustrated patterns that explain how and why certain variables negatively or unexpectedly impacted regression results. As a result, the three models were modified and improved, and are discussed in Chapter 4.

Binomial logistic regression can be used to predict the probability of a binary outcome in a dependent variable (i.e., certified status) based on one or more continuous or categorical independent (predictor) variables. Logistic regression can also be used when independent variables are not normally distributed, multi-collinearity is absent (i.e., independent variables are not correlated), and no strong outliers exist in the data (Stoltzfus, 2011). Logistic regression also assumes observations are independent (no duplication in data), and a linear relationship exists between the independent variables

and the log-odds of the dependant variable. The core of binomial logistic regression is the Sigmoid or Logistic Function that produces a coefficient (β_1) or odds-ratio probability (e^{β_1}) that predicts how much a one-unit increase in X_1 (independent predictor variables) predicts the likelihood of the binary outcome (i.e., certified status), or in this research, correlates with odds of membership in that category.

$$P(y = 1 | x) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n)}}$$

Where:

- $P(y = 1 | x)$ is the probability of the outcome being 1 (success) given the predictors x ,
- β^0 is the intercept
- $\beta^1, \beta^2, \dots, \beta^n$ are the coefficients for the independent variables

Model quality is evaluated by various tests, including a confusion matrix (compares actual and predicted outcomes to identify true negatives and false positives), a receiver operating characteristic curve (compares the true positive rate (sensitivity) against the false positive rate (specificity)), a Hosmer-Lemeshow test (compares the observed rates against predicted probability for random sub-groups), and the Akaike Information Criterion which penalizes model quality when too many predictor variables are included. Logistic model goodness-of-fit values are calculated differently than linear regression models and use McFadden's R-squared calculation in which values between 0.2 and 0.4 represent good fits.

$$R^2 = 1 - \frac{\log L_{model}}{\log L_{null}}$$

where:

- $\log L_{model}$ is the log-likelihood of the fitted model,
- $\log L_{null}$ is the log-likelihood of the null model (a model with no predictors).

This research project partitioned survey data into two sub-groups to design the logistic regression models. Model 1 used a subgroup of twenty-six non-certified coaches to explore relationships

between predictor variables and the likelihood of achieving trained status. Model 2 used a subgroup of fifty-eight survey respondents that identify as either trained or certified to explore relationships impacting the achievement of certification, most notably the completion of written documentation and/or on-site observations as opposed to participating in education models. The results of the two logistic regression models are discussed in Chapter 4.

Multi-nominal logistic regression can be used when the dependant (outcome) variable is categorical and features three or more mutually exclusive categories (i.e., in-training, trained, certified status). The output includes coefficients and odds ratios for each variable relative to a reference category to estimate how each predictor variables influences membership in each category. As such, the model calculates the log-odds of each class relative to a reference, or baseline category, and a similar set of evaluations are used to test the validity of the model. When a model includes K categories, the log-odds of each category k relative to the reference category is modeled as:

$$\log\left(\frac{P(y = k)}{P(y = reference)}\right) = e\beta^{0k} + e\beta^{1k}X_1 + e\beta^{2k}X_2 + \dots + e\beta^{nk}X_n$$

where:

- $k = 1, 2, \dots, K-1$, and each class has its own set of coefficients β_k

Since this research project explored the factors impacting a coach's status as a certified, trained, or in-training coach, multi-nominal logistics regression was used in Model 3. Since the data was partitioned and groups established, each group is mutually exclusive to one another for the purposes of the regression model. As a result, Model 3 used a similar set of predictor variables from Models 1 and 2 and explored patterns between the predictor variables and the likelihood of a coach holding classification as either a coach in-training, trained, or certified. The results of the multinomial logistic regression model are discussed in Chapter 4.

Qualitative Thematic Analysis

Braun and Clarke (2006) defined thematic analysis as “a method for identifying, analyzing, and reporting patterns (themes) within data ... [that] minimally organizes and describes your data” and thus provides an “accessible and theoretically flexible approach to analyzing qualitative data.” Kriukow (2022) argued such a method is valid and recognized for data that is interpretable, but not exactly or explicitly detailed. However, Knafl and Breitmayer (1989) cautioned that especially in the context of case study methodology, adequate transcription coding and triangulating of themes is necessary to discover patterns of behaviour and perspectives, especially when seeking convergence and confirmation of ideas from small interview samples. Boyatzis (1998) described the flexibility of thematic analysis as a ‘translator’ for researchers, enabling them to use different methods to communicate with one another, as opposed to other methods like grounded theory, ethnography, or phenomenology that carry more comprehensive literature and frameworks for analysis. Braun and Clarke (2006) proposed a 6-part framework for the collection and analysis of qualitative data. This framework built upon previous claims that thematic analysis should be considered a stand-alone method (N. King, 2004; Leininger, 1992; Thorne, 2000), opposing claims that its processes are in fact used by many qualitative methods (Boyatzis, 1998; Holloway & Todres, 2003; Ryan & Bernard, 2000). The six-phase recursive model of Braun and Clarke’s (2006) encouraged researchers to “move back and forth as needed, throughout the phases” of analysis (p. 16). In the past 15 years, additional models have surfaced including Merriam’s (2009) three-step inductive and comparative process to manage the complex process of shifting between concrete descriptions and abstract interpretations; Creswell’s (2013) four-step non-linear spiral procedure whereby researchers move in analytical circles; and Miles et al. (2014) four-part concurrent nodes of activity design whereby researchers can chunk ideas and return to them at a later stage of analysis. Finally, Nowell et al. (2017) suggested contextual recommendations like code manuals, discussions to reduce bias, storytelling when theme labeling, quoting key words, and adding identifiers

to all quotes. In summary, the six critical steps of thematic analysis include familiarization and transcription of interviews, coding by color or numerical value, generating initial themes, reviewing themes to match the research initiatives, naming and defining the themes to establish boundaries for content discussed in the written report (Braun & Clarke, 2006).

Both case study methodology and thematic analysis acknowledge the unique context of each participating research subject. Alhojailan (2012) stated that such models help researchers collect, code, and generalize the opinions of interview participants and discover common themes and agreed-upon definitions. Moreover, successful data analysis of case study research requires purposeful sampling strategies, clearly written and substantiated questions, and systematic collection (Baxter & Jack, 2008; Russell et al., 2005). Time permitting, these models can also encourage researchers to conduct interviews over a greater time span rather than one definitive encounter, strengthening the quality of the case study findings by permitting respondents to reflect, and provide additional insights after their initial interview (Baxter & Jack, 2008). Likewise, double coding, whereby the research returns to assess interview transcripts a second time, may provide additional insights if time allows (Krefting, 1991). Although the research was successful in speaking with a mix of trained and certified NCCP coaches and provided opportunities for follow-up conversation, no additional conversations (verbal or written) took place with interview participants. The interview process did however allow the researcher to explore the insights of these experienced stakeholders in the unique context of Canadian sports coaching in the spirit of case study methodology. As such, the qualitative data collection and analysis process of this research used an inductive and latent thematic analysis further discussed below.

Qualitative Data Collection

Introduced earlier, a total of 9 of 26 non-cycling coaches were interviewed and invited on their balance of NCCP status, open-ended survey responses, as well as gender, sport, and province. Despite these attempts, a high percentage of interview participants were experienced and certified coaches. For

example, only one trained coach participated in the interviews (8 certified) and six of eight certified coaches completed their education and certification before the onset of emergency blended learning in 2020. Nevertheless, eight active coaches, three learning facilitators (2 active), two national administrators (1 active), and one instructional designer (retired) were included in the interview sample, illustrating the educational and experiential depth of the sample.

An inductive approach was used to guide the interview and analysis process. Since only non-cycling coaches could participate in the interview process, and the researcher's knowledge of each sport's education program was limited to published documentation, each interview was a process of discovery, and focused on building rapport before discussing the research questions. Fereday and Muir-Cochrane (2006) explained since no categories or themes were chosen a priori (deductive approach), and themes were able to emerge through the interview process, this aligns with an inductive approach. Moreover, interview structured used Thiagaran's (1992) debrief framework as it is incorporated into the NCCP program and "can be used with any experientially rich, emotionally intense, [and] cognitively complex learning activity" (p. 1). Interestingly, all but one interviewee shared openly and in detail right from the beginning of the call, illustrating the cohort's excitement and interest in sharing their experience. In the case of the initially reserved participant, once the researcher explained more about the research and its intention to provide positive recommendations for future iterations of the NCCP, rather than a critique, the length and depth of the respondent's answers shifted, and many valuable insights were shared. Patton (2015) explained that researchers cannot observe feelings, thoughts, and intentions through numerical data and Krefting (1991) believed an appreciation for and understanding of the situational context is vital to understand the decision-making process of interviewees. Therefore, Tisdell and Merriam (2016) recommend a semi-structured form as it helps researchers discover specific information about participants and respond effectively to new ideas or perspectives shared during interviews. Indeed, Patton (2015) recommended case study researchers include and exclude specific

interview questions, using experiential, emotional, and knowledge-based questions rather than why, yes/no, and leading questions. Therefore, an inductive approach helped frame the interview structure and questions and encouraged the researcher to facilitate the emergence of new themes throughout the process.

Qualitative Data Analysis

An inductive process was also used for the thematic analysis as themes and codes emerged from the data that more closely aligned with the theoretical frameworks of the NCCP and this research study, andragogy, and constructivism, rather than the specific research topics of blended learning, consumer behaviour, and personality traits. As a result, interview transcript coding used a latent rather than semantic analysis. Although seven of the nine interviews were captured verbatim and transcribed as such, two interviews were captured using interviewer note-taking, to which the interview notes were validated by follow-up email to check accuracy and credibility. Moreover, the semi-structured nature of the interview created, at times, sporadic jumps of thought and emotional answers that were not always expressed in complete sentences. Therefore, latent level analysis provided the researcher with the ability to extrapolate and discover larger meanings. Conversely, future studies that utilize detailed written reflections may discover different insights through semantic analysis.

The inductive and latent analysis utilized elements from both the frameworks of Braun and Clarke (2006), and Miles et al. (2014), as summarized by Peel (2020). The concurrent node model and simplified analysis framework of Miles et al. (2014) best matches the interview process. Under this model, the discussion points of the interview can shift across diverse topics and return to previous topics later in the interview (Peel, 2020). For example, in cases when the interviewee shared personally sensitive insights, the researcher was able to acknowledge and accommodate the structure of the interview, and only if appropriate, revisit previously explored topics with reframed questions to better understand the participant's view. Moreover, the Miles et al. (2014) model used a more clear and

concise description of the analysis steps. This framework involved coding transcripts and, when appropriate, adding analytical memos before categorizing the data so themes can develop rather than emerge during analysis. Indeed, each transcript was reviewed for important quotes, which were highlighted and later transcribed, and in some cases paraphrased, into a summary document. However, the analysis also incorporated the framework of Braun and Clarke (2006) whereby the researcher manually transcribed interview audio recordings, noting initial observations, and engaged with the data deeply such that six months was needed to mentally process the information shared by the interview participants before drafting the analysis. To support the formal analysis, transcripts were printed, hand-coded, and hand-cut and sorted to best allow themes to emerge without concern for managing a digital platform. A total of eighty-two quotes were identified and coded, informing the development of key themes. As per the sixth and final step of Braun and Clarke's (2006) framework, weaving the analytical narrative occurred in numerous steps and the researcher returned to the data extracts during analysis. For example, the initial writing process in early 2024 helped further simplify the prominent themes, whereas revisions in late 2024 exhibited attributes of double-coding whereby some codes and sub-themes were shifted and combined to better articulate the nature of the quotes. However, as a novice of thematic analysis, the clear and concise description of the Miles et al. (2014) framework helped the researcher condense the data, generate categories, and assemble tables and figures that supported the development of key themes.

Limitations and Constraints

Research limitations are associated with the nature of the research method and are beyond the researcher's control. This research is limited in scope and analysis due to factors associated with time and access to information. The CAC upholds strict privacy policies (CACj, 2019) and access to demographic data was limited. Compared to the ratios of in-training, trained, and certified coaches in the general coach population (see in Table 2), the survey sample featured a disproportionately high

number of trained and certified coaches. Moreover, self-identified NCCP status could not be verified by the researcher. Selection bias is also present in the sample due to the modest advertising campaign as well as the grouping of survey data by unverified NCCP status. As per the quasi-experimental approach, Harris et al. (2006) explained that such use of non-randomized groups will negatively impact the research findings and validity of causation. Shadish et al. (2002) also claimed nine validity concerns for quasi-experimental studies, including the impact of confounding variables, ambiguous temporal precedence (if the intervention occurred before the outcome), and regression to the mean (Bland & Altman, 1994). Therefore, articulating, identifying, and measuring independent variables that uniquely impact dependant variables (i.e., NCCP status) is important, and descriptive statistics were used to identify sample skewness, kurtosis, and correlation matrices for confounding variables. This research's exploration of impacts and changes to learning blends was also limited by the design of the original survey, that could be improved in future research to better identify how learning blends impacted coaches in-training. According to Hodkinson and Hodkinson (2001), case study and thematic analysis are limited by the quantity of data and the challenge of numerically representing the findings. Therefore, objectivity, or the lack thereof, commonly limits the validity of findings and the generalizability of such research (Hodkinson & Hodkinson, 2001). To help establish research constraints, limit scope, and strengthen findings, Stake (1995) suggested concrete time boundaries, whereas Miles et al. (2014) recommended clear and concise definitions and context. Therefore, acknowledging the limitations of this research design is important and is further discussed in chapters 4 and 5 respectively.

Ethics

Articulating and abiding by ethical research standards is also important, often complicated by mixed methods. Cain (2020) explained that mixed-method research may incorporate heightened ethics challenges because the risks of both quantitative and qualitative research combine to form more significant issues. Moreover, Poth (2020) suggested concerns increase under more intensive collection

methods (short data collection periods), and when participant expectations vary widely. Evans et al. (2011) and Macfarlane (2010) also hypothesized that the growing popularity of mixed-methods research would contribute to the development of new ethical concerns beyond those associated with chosen quantitative and qualitative methods (as cited by Cain, 2020). Thus, mixed methods exhibit heightened and unknown risk.

Common ethics concerns associated with quantitative design include obtaining permission, protecting anonymity, clearly communicating research purpose (Caruth, 2013), and analyzing and reporting data with integrity and respect for all (American Statistical Association, n.d.). Conversely, common ethical concerns associated with qualitative analysis include clear communication, respect for respondents (including awareness and response to potential power imbalances), integrity, and confidentiality. According to Creswell (2012), these issues are also mixed method research issues.

As a result, the research acknowledged these familiar challenges and made accommodations accordingly. For example, the researcher prepared to manage interviews with participants from a wide range of experiences, including negative experiences with the NCCP coach education program. Acknowledgement and active listening, without passing judgment, as well as integrity, confidentiality, and awareness of social justice issues and bias were important for this preparation. As a CAC Chartered Professional Coach and NCCP-certified Master Coach Developer, the researcher had completed a comprehensive array of ethics training including the Royal Roads TCPS ethics module. Interviews were also scheduled during a low stress time of year (August) since most sports coaches have adequate time and energy to reflect in a positive and comprehensive manner during this time of the calendar year.

In general, this study posed only minimal risk to participants, and the researcher took steps to ensure compliance with Royal Roads University's ethical research practices. All coaches were required to review and sign an informed consent form prior to starting the anonymous online survey and only non-cycling coaches were invited to self-identify for follow-up interview scheduling. Moreover, participants

were informed on numerous occasions that they could withdraw from the research at any time without any consequence. All identifying metrics (email) collected during the survey and interview follow-up remained confidential through the project. As stated in the consent form, all data was de-identified and records allowing identification of participants were destroyed. The only exception includes several interview participants who expressed great interest in being notified by email when the final version of the research project is published as they wished to review the findings. Finally, the researcher obtained formal approval from the Royal Roads University Ethics Board before initiating the data collection process.

Chapter 4: Quantitative Regression Analysis

This chapter explores the quantitative analysis performed on the survey sample, including a descriptive analysis of the data set, a correlation matrix analysis to explore patterns that preface the regression model, and the results of the binary logistic and multinominal regression models.

Descriptive Statistics

Descriptive statistics analysis helps visualize the data so researchers can explore patterns, identify bias, and postulate models. In summary, the sample includes sixty-seven respondents from ten sports, with a balance of men and women, as well as different education levels, coach types, preferred and experienced learning methods, textbook formats, program costs, and total number of hours. Conversely, the sample is bias towards certified coaches, higher household incomes, self-identified visual learners, emotionally stable and highly open, extraverted, agreeable, and conscientious coaches. Moreover, one hundred percent of respondents disclosed they can access the internet and attend internet-based learning experiences illustrating inherent bias due to the nature of the online survey. Additionally, more than half of the sample represents coaches from the sport of cycling. View Figure 2 to Figure 36 in Appendix 2: Figures to review the data set descriptive statistics in detail.

Correlation Matrix

Correlation matrix analysis identifies patterns between predictive variables, with strong values approaching positive or negative one, and weak values approaching zero. Researchers seek highly positive correlations between independent (predictor) variables (e.g. trait neuroticism) and dependant (outcome) variables (e.g. NCCP status), whereas low correlation values between independent variables is preferred. When two independent variables are correlated and included in a regression model, multicollinearity occurs. In this case, although the model's goodness-of-fit or r-squared value improves, the significance (p value) and effect size (coefficient) of each variable decrease (Ozili, 2022). As a quasi-experimental project, correlation matrix analysis is a crucial step that helps identify bias and patterns in the data, choose representative independent variables, and drop correlated independent variables. Indeed, correlations do appear in the dataset and impacts which variables best suit the regression model. For example, gender is correlated with preferences for printed resources and certification year, and education and household income were also strongly correlated and based on the model, only one variable should be included, respectively. Correlations between learning methods experienced and preferred, as well as learning style exist, thus only one variable should be included in regression modeling. Similarly, trait extraversion and neuroticism both exhibit normal distributions and correlation with NCCP status, but coach type and trait conscientiousness are correlated, encouraging the use of coach type rather than trait conscientiousness in the model. View Table 4 to Table 26 in the Appendix 3: Tables to review the correlation matrix analysis.

Model Specification

This research uses three different regression models to explore the significance of independent (predictor) variables on NCCP coach status. Models 1 and 2 use a subset of the data sample and binary logistic regressions to explore how variables predict the probability of achieving NCCP trained and

certified status, respectively. As a result, sample sizes are smaller, 26 and 57 observations respectively, negatively impacting Wald test scores. However, both models use a consistent set of predictor variables and produce moderate McFadden's R-squared (R^2) values, statistically significant predictor variables, and strong Hosmer-Lemeshow and AUC values, demonstrating both model's goodness of fit. Conversely, Model 3 uses a multinomial logistic regression model and the entire data set (67 observations) to explore the impact of predictor variables against the ordinal variable, NCCP status, including in-training, trained, and certified status. Model 3 uses a similar set of predictor variables compared to Models 1 and 2; however, as per the correlation matrix, coach type and preferences for kinesthetic learning are added. This larger model indicates statistical significance for numerous predictor variables and strong goodness-of-fit metrics including McFadden's R^2 values, correlation matrix values, Wald test scores, and ROC values. As discussed in Appendix 3: Tables, several independent variables are correlated in the dataset and serve as proxies; notably, coach full-time status is a proxy for trait conscientiousness, and education status is correlated with household income. In the spirit of experimentation and with the goal of isolating a common set of predictor variables for all three models given the available data, many specifications were tested. As an example, Model 1 uses the predictive variable, income, whereas Models 2 and 3 use the predictive variable, education, to achieve the best McFadden's R^2 values. Conversely, the ordinal variable, coach type (volunteer, part-time, full-time) best serves the multinomial regression model 3, whereas in models 1 and 2 use a dummy variable (coach-full-time status) to achieve best goodness-of-fit values.

Model specification was also tested to confirm the validity of the results. Binary regression models 1 and 2 use a classification statistics table and confusion matrix to assess goodness-of-fit. This information summarizes the performance of the logistic regression by illustrating the number of true positives, true negatives, false positives, and false positives. As a result, measures such as accuracy, precision, recall (sensitivity), specificity, F1 score, and ROC and AUC values can be calculated to illustrate

the probability that the model, given a random variable, will rank the positive higher than the negative. The Hosmer-Lemeshow test also confirms the model's predictions are significantly different from the actual outcomes. In this case, high Hosmer-Lemeshow p-values (>0.05) indicate the null hypothesis cannot be rejected, so the model fits the data well and no significant difference exists between the observed and expected outcomes. The Wald test also confirms model specification when sample size is adequate and coefficients are not large (which negatively affects and increases standard error size), otherwise inflated and non-significant Wald test scores appear. More specifically, the Wald test assesses the significance of predictive variable odds-ratios (i.e., co-efficient) and tests whether each coefficient is significantly different from zero. Therefore, models that exhibit poor Wald scores should be considered with caution because it is not evident that the effect size of the predictor variable is different from zero. Increasing sample size and transforming variables to reduce standard error of predictor variables are ways model specification and Wald scores can be improved (Asiamah et al., 2017; Greenaway & Russ, 2016). Although transformed variables, including the normal log of age were tested in the latter phases of model specification, these variables did not significantly improve any of the models. A final test for goodness-of-fit includes the Receiver Operating Characteristic (ROC) that compiles the results of all available confusion matrices and illustrates the best probability threshold value for each model. For example, as model specification improves, the area under the curve (AUC) compared to the random estimator (0.5) increases. More specifically, the AUC represents the discriminatory power of the logistic regression model and the probability it will rank a randomly chosen positive instance higher than a randomly chosen negative instance. Testing goodness-of-fit values for multinomial logistic regressions like Model 3 includes the assessment of a covariance matrix in which values should be close to zero, followed by Wald tests and ROC/AUC plots. This following section examines the design of each model and the regression results including excerpts from Stata software tools.

Model 1: Binary Logistic Regression (Trained vs. In-Training)

A binomial logistic regression was conducted to assess the effects of age, gender, income, trait neuroticism, trait extraversion, and full-time coach status on the likelihood of achieving NCCP trained status within a non-certified sample. As a result, only twenty-six of the sixty-seven observations were included in the analysis. The specification of model 1 is illustrated in Equation 1 below:

Equation 1: Likelihood of Trained Status vs. In-Training Status

Equation 1: Likelihood of Trained Status vs. In-Training Status

$$y = e\beta^{\wedge}_0 + e\beta^{\wedge}_1 \cdot \text{age} + e\beta^{\wedge}_2 \cdot \text{gender} + e\beta^{\wedge}_3 \cdot \text{income} + e\beta^{\wedge}_4 \cdot \text{neuroticism} + e\beta^{\wedge}_5 \cdot \text{extraversion} + e\beta^{\wedge}_6 \cdot \text{d_coach full-time}$$

- Where y is a binary variable, with the value of 1 for trained coaches, and 0 for in-training coaches.
- Age is a continuous variable, based on the coach's age as of March 1st, 2023.
- Gender is a binary variable, with a value of 1 for men, and 0 for women.
- Income is an ordinal variable by household annual income, with a value of 1 for <\$20,000, and 7 for >\$150,000/yr.
- Neuroticism is a continuous variable calculated by the BFI44 Inventory
- Extraversion is a continuous variable calculated by the BFI44 Inventory
- d_Coach Full-Time is vector of Coach Type to capture Coach Full-Time fixed effects.

As illustrated in Figure 37, the model demonstrated a good fit with a McFadden's R^2 value of 0.42. However, only a small number of predictor variables indicated significant correlations. The model estimates for every one-unit increase in household income (as per the brackets used in the survey), the odds of holding trained status as opposed to in-training status increase by a factor of 3.27, holding all other variables constant ($p=0.042$). Compared to other equations in this research, model 1 isolated the

fixed effects of full-time coaches, rather than using the ordinal variable, coach type (volunteer, part-time, full-time), because in the unique context of the sample data, using a fixed effect improved the statistical significance of income. The model constraint value (y-intercept) was also statistically significant ($p=0.032$) and exceedingly small ($e^{\beta^0_0} = 0.00000146$). This indicates that if all predictor variables are equal to zero, the log-odds of the outcome occurring (i.e., trained status) are meaningful and not due to random chance. Of course, this makes sense because the model used a bias set of observations, including 65% trained coaches ($n=17$) and 35% in-training coaches ($n=9$). However, since it is unrealistic for the predictor variables to be zero (age, income, neuroticism, extraversion), the extremely small odds-ratio of the constraint does not carry practical significance because it reflects how the model poorly handles unrealistic predictor values. In future, a larger sample with an equal distribution of trained and in-training coaches may impact these values. One weak correlation to note for future research is the impact of trait neuroticism. According to model 1, for every one-unit increase in trait neuroticism (1-5 Likert Scale), the odds of holding trained status increased by a factor of 6.32, but only with near significance ($p=0.088$). This indicates a small correlation between trained coaches and those who expresses higher degrees of neuroticism. Finally, the Hosmer-Lemeshow test produced a non-significant result ($p = 0.07$), indicating no significant deviation between predicted and observed values, further supporting the model's fit (see Figure 38).

The model specification also performed well with an accuracy value of 84.6%, illustrated in Figure 39. Calculated by a threshold value of 0.05, sensitivity (recall) and precision are both 88.2%, illustrating a balance of false positives and negatives by the model. The area under the ROC curve (AUC) was 0.88, indicating strong discriminatory power between trained and in-training individuals. However, due to the limited sample size, the Wald test yielded a non-significant result ($p = 0.36$), meaning we cannot reject the null hypothesis that the log-odds of each predictor variable differ significantly from zero (see Figure 40). Moreover, pairwise Pearson correlation coefficients were used to assess the

likelihood of multi-collinearity in the model and a significant correlation between income and age (+0.31) exists, as illustrated in Table 27.

In summary, the model suggests that higher household income significantly increases the likelihood of achieving trained status compared to in-training status, with the odds more than tripling for each income bracket increase. Future studies should include larger sample sizes to allow for stronger statistical validation and potential rejection of the Wald test's null hypothesis, thereby confirming the significance of model coefficients. For additional information and Stata readouts, review Figure 37 - Figure 44 in the Appendix 2: Figures.

Model 2: Binary Logistic Regression (Certified vs. Trained)

A binomial logistic regression was conducted to assess the effects of age, gender, education, trait neuroticism, trait extraversion, coach type, and the presence of incentives on the likelihood of achieving NCCP certified status among trained and certified coaches. Since the nine in-training coaches were dropped from this model, only fifty-eight of the sixty-seven observations were included in the analysis. The specification of model 2 is illustrated in Equation 2 below:

Equation 2: Likelihood of Certified Status vs. Trained Status

Equation 2: Likelihood of Certified Status vs. Trained Status

$$y = \beta_0 + \beta_1 \cdot \text{age} + \beta_2 \cdot \text{gender} + \beta_3 \cdot \text{education} + \beta_4 \cdot \text{neuroticism} + \beta_5 \cdot \text{extraversion} + \beta_6 \cdot \text{coachtype} + \beta_7 \cdot \text{incentives}$$

- Where y is a binary variable, with the value of 1 for certified coaches, and 0 for trained coaches.
- Age is a continuous variable, based on the coach's age as of March 1st, 2023.
- Gender is a binary variable, with a value of 1 for men, and 0 for women.
- Education is an ordinal variable by academic completion, with a value of 1 for no high-school degree, and 6 for graduate degree (master's or PH. D)

- Neuroticism is a continuous variable calculated by the BFI44 Inventory
- Extraversion is a continuous variable calculated by the BFI44 Inventory
- Coach Type is an ordinal variable, with a value of 1 for volunteers, 2 for part-time, and 3 for full-time.
- Incentives is a binary variable, with a value of 1 for incentives present, 0 for no incentives.

Illustrated in Figure 45, the model demonstrated a good fit with a McFadden's R^2 value of 0.36 and several predictors were statistically significant. The model estimates for every one-unit increase in coach type (volunteer, part-time, full-time) the odds of holding certified status as opposed to trained status increase by a factor of 3.85, holding all other variables constant ($p=0.035$). The model also shows that when coaches identify the presence of incentives for certification, the log-odds of holding certified status increases by a factor of 5.22, holding all other variables constant ($p=0.039$). Conversely, Likert scale values of trait neuroticism and extraversion as per the BFI44 Inventory resulted in negative relationships with certified status. A one-unit increase in trait neuroticism (less emotional stability) decreased the odds of holding certified status by 79%, holding all other variables constant ($p=0.028$). Moreover, a one-unit increase in trait extraversion also decreased the odds of certified status by 87%, holding all other variables constant ($p=0.039$). These results suggest that certified coaches tend to exhibit higher emotional stability and lower extraversion (i.e., more introverted tendencies). Although, age, gender, and education did not express statistical significance, the model constraint value (γ -intercept) was significant ($p=0.038$) and large ($e\beta^0 = 4808$). Like model 1, this indicates that if all predictor variables are equal to zero, the log-odds of the outcome occurring (certified status) are meaningful and not due to random chance. Of course, this makes sense because the model used the default threshold value of 0.5, and the sample includes 70% certified coaches ($n=41$) and 30% trained coaches ($n=17$). The extremely large coefficient of the constraint does not carry practical significance because it reflects how the model poorly handles unrealistic predictor values, as is the case with ordinal

variables like education (1-6), neuroticism and extraversion (1-5), and coach type (1-3) are included in the model.

Regarding the model's overall fit, the Hosmer-Lemeshow test yielded a non-significant result ($p = 0.51$), indicating no significant deviation between predicted and observed values (see Figure 46). Comparatively, the confusion matrix illustrated in Figure 47, indicates high sensitivity (87.5%) and precision (83.7%) values, but low specificity (58.2%) and negative predictive (66.7%) values. Nonetheless, area under the ROC curve values were high ($AUC=0.86$), suggesting the model's strong discriminatory power between certified and trained coaches. Yet, like model 1, the Wald test returned a non-significant result ($p = 0.09$) due to the small sample size, meaning we cannot reject the null hypothesis that the log-odds of predictor variables differ significantly from zero (see Figure 48). Moreover, pairwise Pearson correlation coefficients were used to assess the likelihood of multicollinearity in the model and a significant correlation between education and age (+0.24) exists, as illustrated in Table 28.

In summary, the model suggests that the presence of incentives, higher emotional stability, introversion, and holding a part-time or full-time coaching position rather than a volunteer role all increase the likelihood of certification. Future studies with larger sample sizes are needed to validate these findings and to reject the Wald test's null hypothesis, confirming the significance of the log-odds of each predictor. Nevertheless, this analysis identifies patterns that distinguish coaches who achieve certified status from those who remain trained. For additional information and Stata readouts, review Figure 45 - Figure 52 in the Appendix 2: Figures.

Model 3: Multinomial Logistics Regression (Ordinal Variable: NCCP Status)

A multinomial logistic regression was conducted to analyze the ordinal variable NCCP coach status and assess which predictor variables affect the likelihood of belonging to each status group: in-

training, trained, and certified. The model included all sixty-seven observations and examined the effects of age, gender, education, trait neuroticism, trait extraversion, coach type, incentives, and self-identified kinesthetic learning preferences. The specification of model 3 is illustrated in Equation 3 below:

Equation 3: Likelihood of NCCP Status

Equation 3: Likelihood of NCCP Status

$$y = \beta_0 + \beta_1 \cdot \text{age} + \beta_2 \cdot \text{gender} + \beta_3 \cdot \text{education} + \beta_4 \cdot \text{neuroticism} + \beta_5 \cdot \text{extraversion} + \beta_6 \cdot \text{coachtype} + \beta_7 \cdot \text{incentives} + \beta_8 \cdot \text{d_Prefer Kinesthetic}$$

- Where y is the ordinal variable NCCP status, with a value of 1 for in-training, 2 for trained, and 3 for certified coaches.
- Age is a continuous variable, based on the coach's age as of March 1st, 2023.
- Gender is a binary variable, with a value of 1 for men, and 0 for women.
- Education is an ordinal variable by academic completion, with a value of 1 for not finishing high-school, and 6 for graduate degree (master's or PH. D)
- Neuroticism is a continuous variable calculated by the BFI44 Inventory
- Extraversion is a continuous variable calculated by the BFI44 Inventory
- Coach Type is an ordinal variable, with a value of 1 for volunteers, 2 for part-time, and 3 for full-time.
- Incentives is a binary variable, with a value of 1 for incentives present, 0 for no incentives.
- d_Prefer Kinesthetic is vector of Preferred Learning Style to capture Kinesthetic fixed effects.

Illustrated in Figure 53, the model demonstrated a moderate McFadden's R^2 (0.19), and five of eight predictor variables exhibited statistical significance. For example, a one-unit increase in gender (female = 0, male = 1), increased the odds of holding a subsequent NCCP status (in-training, trained,

certified) by a factor of 3.69, holding all other variables constant ($p=0.024$). This makes sense because although the sample includes a balance distribution of men and women, the sample does include a disproportional number of certified men and in-training and trained women, as discussed in the Appendix 2: Figures. The model also indicates that a one-unit increase in education (academic certificates and degrees) increased the odds of holding a higher NCCP status by a factor of 1.74, holding all other variables constant ($p=0.037$). Although trait neuroticism did not appear significant in this model, trait extraversion did demonstrate significance. According to the model, a one-unit increase in trait extraversion (1-5 Likert scale) decreased the odds of higher NCCP status by 68%. Such correlations may indicate NCCP education programs are not meeting the needs of extraverted coaches. Moreover, a one-unit increase in kinesthetic learning preferences, as opposed to all other preferences, decreased the odds of higher NCCP status by 74%, holding all other variables constant ($p=0.043$). This is also surprising and cautions against the use of online-only programs for certain learners. Interestingly, coach type also exhibited statistical significance. A one-unit increase in coach type (volunteer, part-time, full-time) increased the odds of more complete NCCP credentials by a factor of 2.22, holding all other variables constant ($p=0.054$). As discussed earlier in this chapter, the impact of coach full-time status was greater than the impact of trait conscientiousness, since the sample demonstrates high correlations between volunteer-status and trait conscientiousness. Therefore, although the sample indicates NCCP status is not correlated with trait conscientiousness, a coach's position as a full-time, part-time, or volunteer does indeed correlate with higher degrees of NCCP status. This is most interesting and is associated with the incentives of policies and procedure for full-time coaches at the club and provincial level, as opposed to the expectations and thus incentives for volunteers to complete higher levels of NCCP education. The results of this model are encouraging and demonstrate patterns in the sample data with NCCP status.

Compared to earlier models, the higher number of observations improved the model specification. Illustrated in Figure 54, the Wald test yielded a significant result ($p = 0.02$), rejecting the

null hypothesis that the coefficients are not significantly different from zero. The Akaike (AIC) and Bayesian Information Criteria (BIC) were also the lowest for this specification of model 3 (AIC = 119, BIC = 141) (see Figure 55). Compared to previous versions used during the quasi-experimental stage of this regression analysis, these lower AIC and BIC values indicate the specification fits the data well and avoids artificially inflating McFadden's R^2 values by over-fitting the model with too many parameters (predictive variables). Note, each of the three models in this research use a different subset of the observed sample and therefore AIC and BIC values of Model 3 cannot be compared to Model 1 (see Figure 37) and Model 2 (Figure 45). Moreover, pairwise Pearson correlation coefficients show a significant correlation between education and age (+0.24) exists, as well as NCCP status and Gender (0.302) previously discussed in the descriptive statistics and later illustrated in Table 29.

In summary, the model suggests that coach type, education, and gender-male is positively correlated with the likelihood of holding a higher NCCP status. Conversely, extraverted coaches and those with a self-identified preference for kinesthetic learning have a lower likelihood of holding a higher NCCP status. Unfortunately, the predictor variables used in model 3 subsumed the impact of less significant variables associated with blended learning.

Quantitative Summary

This research uses three regression models to analyze the effect of various learning, customer, and personality factors associated with achieving NCCP trained and certified status. Model 1 suggests higher household incomes positively impact the likelihood of achieving trained status, thus future research may explore reducing the cost of education modules or acknowledge the impact of opportunity costs for some income brackets. Model 2 suggests the presence of incentives, receiving financial compensation for coaching, and emotionally stable and introverted personality traits positively impacts the likelihood of achieving certified status. Thus, future research may explore how evaluation can better suit a wider range of personality types, and how administrators can establish incentives for completing

accreditations. Finally, model 3 illustrates self-identified kinesthetic learners are underserved by the current methods of the NCCP program. Both models 2 and 3 also indicate a coach's academic education level strongly contributes to the likelihood of success in achieving certified status, thus administrators or researchers can explore how to improve the program for different education levels or offer further accommodations. Future research should also leverage a larger sample size to reduce bias, as well as isolate more articulate measures for analyzing how blended learning preferences and experiences correlate with NCCP status.

Chapter 5: Thematic Analysis

Using survey and interview data from the research participants, several noteworthy findings emerged regarding impacts of NCCP content, design, and tools on certification rates. This chapter includes the research's thematic analysis of all open-ended survey questions and follow-up interviews with non-cycling coaches to explore these findings. Although the analysis indicates consistent strengths of the NCCP program, the analysis also highlights numerous themes that may be considered during future revisions. These themes are associated with maintaining or improving the relevance of the program by updating the learning design and resources with a learner-centred approach.

Framing and preparing for the interview process, the researcher first analyzed the results of the open-ended survey answers to ensure both cycling and non-cycling coaches shared valuable context. These responses were de-identified, coded for brevity and helped the researcher frame follow-up interview questions. When asked how the NCCP can be updated with a greater appreciation for the learner, 14% requested updated materials, 14% suggested mentorship, 14% believe learner needs are not being met, and 16% believe learner preferences are not being matched (Figure 59). When asked how the NCCP can be revised to match their consumer needs, 12% requested clearer pathways and information, 11% more simplicity, 9% more incentives, 9% better customer service, among other requests (Figure 60). Similarly, 60% of respondents recommended revisions across both the learning and

customer experience. As a result, the interview script included questions about both the learning and customer experience, as well as how new digital resources and tools (including personality trait assessments) may impact the likelihood of coaches pursuing and achieving certification.

It is important to note the interview sample included a more bias distribution of certified coaches compared to the online survey. Although the online survey itself featured a high percentage of certified coaches (61% compared to the population average of 8%), the interview sample (n=9) contained 8 certified coaches and only 1 trained coach. However, of those 8 certified coaches, 3 also identified as coach developers, either as learning facilitators (LFs, who delivers education modules), coach evaluators (CEs, who conduct portfolio and in-person evaluations), or master coach developers (MCDs, who train, mentor, and evaluate LFs and CEs). Of these three coach developers, one actively serves as a learning facilitator, and the other two represent one active and one retired national administrator, both of whom fulfilled the master coach developer and instructional designer role. Therefore, the interview sample does exhibit a great depth of life and coaching experience through the NCCP program. Although only one trained coach was interviewed, the participating coach developers provided valuable insight regarding common challenges for trained coaches in the pursuit of certification. So, although it is important to note that the interview analysis only represents 13% of the survey sample (n=9/67), those participating do represent eight of the ten non-cycling participating sports and live in four different provinces across Canada. Thus, the interview sample provides valid insights from a wide array of sports, sport leaders, and geographic areas.

Centred upon the three pre-determined aspects of this research: learning design, program design, and personality traits, the themes and subthemes most prevalent in the analysis are illustrated in Figure 61 and outlined in Figure 62. As a result, the research has identified one theme for each aspect of the research, with several subthemes that help link the themes. For example, in the context of learning design including blends, resources, and modalities, participants expressed a common desire for

learning formats to be optimized for the goal of the module, albeit in-person or online. Whereas, meeting the needs of the coaches emerged as a prominent theme in the context of their customer experience. Finally, discussions about personality traits led to the identification of universal and context-specific coaching traits, but participants were clear that such concepts must be framed as tools. The remainder of this chapter provides evidence for the emergence of these themes by referencing interview quotes and paraphrasing, giving reference to coaches (C1-C6) and coach developers (D7-D9).

1.0 – The Learning Format is Optimized for the Learning Goal

Optimizing the learning format for the goals and outcomes of the NCCP's Competition-Introduction pathway emerged as the over-arching theme associated with the learning experience. Common challenges include a disconnect between learning materials and evaluation documents, lack of mentorship opportunities, and mismatching of learning outcome and format, resulting in experiences that lack clarity and relevance.

1.1 Clarity and Relevance

Coach Interviewee (C6) shared a common sentiment from the interview sample in that the NCCP does provide a good foundation for prospective coaches who do not have a sport background. For example, C1 shared that their sport's NCCP program provides a satisfactory education base for club coaches by using three synchronous-online multi-sport modules and one face-to-face weekend course. As introduced in Chapter 1, each sport decides whether to include multi-sport or sport-specific modules in the education pathway, but when multi-sport modules are used, it can be challenging for learning facilitators to ensure content is clear and relevant learners include coaches from different sports, experiences, and interests. Whereas sport-specific modules bundle coaches by experience and sport, and in theory, should help instructional designers create relevant and clear content; however, information overload often remains a challenge. C6 shared "the trick is to not overwhelm, because in my

experience with adult learners, they want to know the five key things they need to know, not the other 20 things that should come in time.” Thus, identifying required versus ancillary learning outcomes for each module may help establish clarity and relevance for learners, and bridge gaps between instructional designers and learning facilitators.

Coach Developer interviewee (D8) agreed, stating in quote “each module needs a clear goal.” In addition, D8 stressed how important it is for all coach developers (including evaluators) to acknowledge that many students are going to be volunteers. And according to D8, it is imperative that “must learn” as opposed to “learn in time” knowledge and competencies are identified by instructional designers and upheld by learning facilitators.

One example of how materials can provide clarity, relevance, and meet the needs of adult learners is matching learning materials with evaluation activities. Although many evaluation portfolio templates used in Canadian coach education prominently include open-ended answers, there are specific activities that require the use of templates. However, C4 shared that the templates provided, in quote, “were so confusing that we never use them.” Moreover, coach developer (D7) shared that “one of the things that we did in our last revision was built in time so we could explicitly talk about the portfolio,” and continued that:

the mental focus plan was an area where coaches were really struggling to connect, or even remember the content covered in the multi-sport module, so they didn’t understand how to complete the portfolio activity ... so, the multi-sport module wasn’t helping. (D7)

Indeed, creating clear and relevant templates is crucial to meeting the needs of learners. Moreover, C4 believes that if specific templates are necessary for evaluation purposes, learning facilitators should incorporate these templates into the learning experience so students learn how to use and modify templates for their needs and context. To support this process, instructional designers

and administrators may consider identifying not only the minimum required competencies but how such competencies need to be evaluated.

With a greater focus on clarity and relevance, instructional designers may choose to align and scaffold competencies by different stages of athlete development. Coach interviewee (C1) suggested that all texts be simplified or categorized by a specific stage of development and that information specific to Train-to-Train athletes are not covered in Learn-to-Train or FUNdamentals modules. This would further help categorize coach knowledge and skills into a must-learn versus learn-in-time framework. For example, instructional designers could add colour-coded icons in textbook margins to identify stage-specific information to avoid creating too many separate documents. Moreover, C1 believes that national sports organizations, not learning facilitators, are responsible for articulating these differences between required and ancillary knowledge. Indeed, many NCCP programs do already match coach context with specific stages of development; however, greater specificity emerged as an improvement.

Providing clarity and relevance for learners surfaced as a key theme and matches the principles of andragogy introduced in Chapter 2. Also introduced earlier, the coaching knowledge triad and the many types of learning blends are associated with the next prevailing learning theme, matching learning outcomes with methods.

1.2 Match Learning Outcomes with Methods

When discussing how to optimize learning and match methods, the coach knowledge triad often surfaced as a helpful framework. In summary, the coach knowledge triad differentiates between professional knowledge (sport-specific skills), interpersonal skills (ability to communicate with others), and intrapersonal skills (ability to reflect). In some cases, this strengthened the call for eLearning resources, and in others, stressed the importance of mentorship and in-person learning experiences.

Support for the use of eLearning and other on-demand information resources prevailed across the interview sample. Coach interviewee (C4) shared that such resources help teach tactical and technical skills to new coaches. Coach Developer (D8) agreed that eLearning is also helpful for introducing theoretical concepts and provides adequate time for coaches to absorb concepts before applying them during face-to-face follow-up sessions. Moreover, D7 shared eLearning resources help “check a lot of boxes” by making the information accessible, easily translatable, and can accommodate those with learning challenges compared to a regular textbook.

To further optimize eLearning experiences however, themes of clarity, relevance, and matching continued to surface. Coach Developer (D7) shared that “we created short video resources to help Learning Facilitators cover the technical aspects of the sport during [synchronous] online theory modules, and the video resources are a game changer especially if the LF can use them well.” However, D7 also stressed the importance of creating connections between coaches and such video resources. For example, D8 recommended that technique-focused instructional videos should use athlete models that match the age and stage of the pathway. Coach Developer (D8) further explained that when older or experienced athletes with refined technique are used as beginner models, the resources can still be helpful if the Learning Facilitator is well-trained and uses a script to accentuate the important points. Building upon the call for greater connection to the material, C4 suggested video resources are at minimum narrated, and better yet learning facilitators can “speak to the video” and answer questions thoroughly.

In addition, the interview sample indicated that specific types of professional knowledge are missing from their NCCP pathway, and the eLearning resources can help fill this gap. C4 suggested that club coaches should be required to complete an official’s module to ensure coaches understand the sporting regulations. Moreover, coach developer (D8) shared that women’s health and especially information about the growth spurt need to be included. For example, D8 shared the effect of femur

elongation and Gluteus Medius weakness, leading to “knee collapse” in adolescent girls is not covered in the material but could help coaches working with those age groups proactively identify, manage, or delegate such challenges to professional consultants. By sharing such theoretical and technical knowledge through multi-modal digital resources before meeting in-person, not only is information packaged into clear, relevant, and stage-appropriate bits, but a set of common language and understanding can promote in-person discussions.

Shifting away from the highly technical aspects of the professional knowledge triad and towards the human-centred aspects of inter-personal knowledge, the interview sample suggested different ways we can use video resources. C4 suggested that even highly technical videos, if well-designed, can role-model social and emotional competencies. For example, C4 suggests that a video of coaches explaining and demonstrating a skill to a group of athletes could state that athletes can move freely in the background of the group during the introduction but also use validating questions to ensure all athletes understand the activity. C4 shared that such examples can help coaches experience ways of engaging with athletes with learning challenges before they start working in the field. Conversely, C2 shared their experience of attending a funded athlete and coach development camp with the National Team. During this in-person experience, C2 watched the master Olympic coach observe, intervene, and provide feedback, when necessary, but also stick to the basics, keep it simple, and incorporate play into practice. However, role-playing activities do not heavily feature in coach education modules, and instead, are reserved for coach developer modules. In this spirit, well-designed video resources that illustrate how to modify explanations for learning challenges, when to intervene, and where to incorporate play, can help introduce interpersonal competencies in online environments.

Rather, instructional designers could leverage the coach knowledge triad to distinguish which competencies are best developed in-person. In fact, the interview cohort shared strong support of their blended learning experience. Coach Developer D8 warned “I don’t think we should focus on one mode

of delivery” and that rather, we need to focus on the entire pathway and how it compliments the learning outcomes. Moreover, C5 believes that “the blended learning model is a strength, not a weakness.” This connects to the work of McGee and Reis (2012) and Helms (2014) that encourage complimentary transition between learning formats and emphasis on teacher/student interactions, respectively. Indeed, when blended learning experiences were discussed with the interviewees, sub-themes associated with matching interpersonal and professional knowledge outcomes with certain learning formats emerge.

Learning professional knowledge through the act of practice-coaching is one of the strengths of the NCCP’s constructivist model and helps match outcomes with methods. For example, during face-to-face modules, coaches are often tasked with teaching a sport-specific skill to a group of coaches in-training, who then pretend to be athletes of a certain age and stage of development. These activities are designed to help coaches find their coaching voice and grant lots of creative freedom in their lesson plan and teaching cues. However, C6 shared that “we need to make sure the practices are valuable.” One way to provide value, as well as relevance and clarity, is to ensure coaches improve their own technique while attending an education module. Coach Developer (D8) shared that “we train them technically; they get a personal coaching session.” D8 further explained that helping coaches learn to teach even basic technical skills should be in-person and one of the more engaging ways to do this is to personally coach the new coaches and improve their skills. For example, C4 explained that “I am a very visual learner ... I need to be on the ice to learn” so having a learning facilitator or mentor watch a real practice and provide immediate feedback is crucial. From a safety perspective, in-person learning is also particularly important for coach and athlete safety. C6 stressed just how important it is to learn how correct teaching techniques for high-risk skills. C6 shared that:

developing strong technical expertise is required, because I mean you can really hurt people if you do it badly, [and] if we do it wrong, then when the athletes move down the pipeline,

someone's going to have to undo that work and correct it ... so, trying to get it right the first time is hugely important for the sport. (C6)

Therefore, professional knowledge of a sport can be introduced through high-quality video or eLearning resources but acquiring and consolidating those competencies need to be developed and refined in-person.

Developing interpersonal and intrapersonal knowledge also emerged as competencies that are important and should be developed by matching outcomes and methods. C2 expressed the significance of expert learning facilitators who can effectively role-model how to interact with and lead coaches in-training. C2 stressed "connection is everything." Similarly, C5 shared that participating in multi-sport modules helps one develop their soft skills and learn from coaches in other sports, because "you gotta see other perspectives." However, C5 does believe that if an ability is best learned through role-play, such activities should be in-person rather than online. In the context of intrapersonal knowledge, the NCCP introduces and develops reflective competencies in several ways. These include small group activities referred to as liberating structures, as well as individual activities like the Stop-Light-Reflection included in textbooks and online facilitation. Coach developer D9 shared that they commonly explained that the NCCP is "not going to teach you about soccer, [it's] going to teach you about how to coach or how to teach soccer, [and] there's a whole differentiation between that." In fact, the interview sample expressed consistent support for the NCCP's ability to role-model and develop inter and intrapersonal competencies. More specifically, coach developer D7 shared coaches who achieve certification often develop a strong reflective ability associated with a mix of increased confidence in their abilities and humility for areas for growth.

Nonetheless, the experience of working through past athletic experiences or developing the confidence to coach requires many different methods and time periods. So, although on-demand eLearning, facilitated online seminars, and in-person learning all serve important roles in developing

coach knowledge, matching the outcome with the method emerged as a theme in the interview sample. Conversely, competencies that require additional time can be served through mentorship.

1.3 Deliberate Mentorship

Coaches undergoing NCCP certification are evaluated against an established set of outcomes and criteria articulated in the written portfolio document. To achieve certification, coaches must achieve the minimum standard in all outcomes. However, evaluation documents also articulate exceeding criteria for each outcome, which can be leveraged to create mentorship programs and professional development rubrics. Indeed, the call for deliberate mentorship emerged as an important theme for the interviewees. As introduced earlier, mentorship is often classified as an informal learning method and provides additional freedom to both the mentee and the mentor. Thus, mentorship may help match learning and knowledge needs.

According to C3, a mentor is defined as “someone who is a higher-level, someone who can check-in on you, either in-person or online”, and either understands the sport’s context or previously knows the mentee. However, C3 cautioned that mentorship experiences should not be a required aspect of the NCCP pathway, rather an organized and optional program would be most valuable. Moreover, C5 shared that because of the logistical constraints of face-to-face mentorship, making mentorship required would negatively impact rural coaches.

Incorporating mentorship experiences as a pre-requisite for evaluation emerged as an interesting topic in the interview cohort. For example, C3 suggested that pathways could include a work-experience aspect whereby coaches run several practices with either a mentor present or available to debrief over the phone but stressed “I need this to be in-person so it might be different in my context.” Indeed, accommodating such individual needs would be challenging if mentorship were a formal pre-requisite for evaluation. Conversely, C6 also believes mentorship should be a required element of

certification, whereas D7 suggests a more holistic perspective that evaluation and mentorship should work in tandem.

Thus, if mentorship is used as a tool for post-evaluation professional development and certification maintenance, it can provide greater flexibility. Coach Developer D7 shared that “something I have tried very hard to do is push the idea that evaluation is more about the experience of the coach, the comments, the interaction with their evaluator, that it is about the evaluation results themselves.” As a result, D7 shared that providing high-quality modeling is a learning facilitator’s most vital role. Moreover, D7 suggested that evaluators and mentors should be the same person, and coaches be paired with this individual for 6-12 months, rather than just a one-hour evaluation call. This would constitute a significant shift away towards a role-modeling approach; however, a sport requires competent mentors and available funds to facilitate such a program.

Indeed, post-certification mentorship experiences emerged as a popular request across the interview cohort. In fact, the NCCP program already features several modules that are sequenced and designed for certified coaches. For example, coach developer modules like the learning facilitator core training modules develop both interpersonal and intrapersonal knowledge by introducing topics such as stages of group development, different theories of learning and facilitator roles, and prompts students to reflect on their experiences as a certified coach with those from other sports. Moreover, coach evaluator training incorporates role-play and a detailed focus on how to assess learning outcomes and competences. Finally, master coach developer training challenges leaders to explore the power of story and the act of questioning versus telling, to motivate curiosity by appreciating time frames necessary for personal growth and cultural change. In addition, mentorship programs would provide flexibility for coaches to develop professional knowledge by completing skill instructional modules, or higher-education programs in physiology, psychology, or cultural development and change management. More tangibly, D7 claims that sports need to ask better questions like “is there something we can do as an

organization to help you achieve your professional development goals?" In this context, the NCCP's exceeding evaluation criteria may provide clear and relevant guidance, or such discussions may illuminate areas where the exceeding criteria miss a key competency for club coaches in the real world.

Understanding the barriers that coaches face in their professional development journey can inform the design of such post-certification mentorship programs. C2 shared that their sport nominates club coaches to attend a fully funded five-day camp with the national team and Olympic coaches each year. C2 also stated that all club coaches are invited to attend monthly calls for professional development, where the largest takeaway is often just how similar everyone's challenges are across the country. D7 shared that in many sports, informal mentorships are already in place, however, they are not recognized. Furthermore, D7 believes that identifying ways to accredit such experiences will help create more opportunities and incentives for experienced coaches to talk with and support new coaches, most often by regularly scheduled one-on-one phone calls. Yet, C2 shared that to make such programs effective, the experience needs to be at least 8 weeks or an intensive 5-10 days.

Thus, deliberate mentorship structures, incentives, and experiences can provide accessible opportunities for coaches to achieve exceeding abilities in the years following certification, and match learning preferences, competencies, and methods.

By acknowledging the coach knowledge triad, and deliberately matching NCCP competencies and learning environments, coaches may engage more actively in their development. According to coach developer D9, coach education needs to be valuable and transformative, so everyone is engaged and not "just being a warm body in a seat." Providing clear and relevant information, and digital resources that meet coach interests and abilities should be a focus during content revisions. Moreover, identifying what information can be classified as **must-learn** or stage-appropriate, rather than **learn-over-time** or learn-through-mentorship also demonstrates appreciation for the learner and healthy role-modeling.

Therefore, in the context of the learning experience of NCCP coaches participating in this research, the idea that learning formats should be optimized for their learning goals emerged as the primary theme.

2.0 – Meet the Customer’s Needs

Acknowledging coaches as customers and formatting education tools and structures to meet their needs emerged as the second over-arching theme from the interview cohort. An appreciation for economic and consumer behavior in this section of the analysis helps pair factors of andragogy associated with agency and autonomy. For example, adopting problem-based tasks, internal motivation strategies, and responsibility for and control over their learning are all pillars of andragogy that mirror the choices afforded to an informed customer in a free market. Thus, when coach’s consumer needs are met, their likelihood of engaging with the program longer and more completely increases. When discussing customer-centred NCCP revisions, sub-themes include creating high-quality experiences, using up-to-date resources that remain structurally consistent and acknowledge real-world challenges.

2.1 Valuable

Building and maintaining value is an intricate balance of consumer needs and administrative capacity. Since instructional designers review and revise NCCP programs on five-year cycles, opportunities to reflect upon recently adopted blended learning methods is fast approaching. However, perceptions of product value vary widely across consumers in a free market economy and such variability was evident in the interview cohort. Nonetheless, focusing on key tasks emerged as an important attribute of program quality.

Coach Interviewee C3 believes each coach education module should focus upon a central task. However, C3 also stated that coaches prefer to learn at their own pace. Therefore, building and maintaining perceptions of program quality for adult learners can focus attention on providing an array

of problem-based activities that equally develop a central learning outcome. For example, when learning to modify a skills practice with zero lead time, instructional designers can provide 3-5 different scenarios students can choose from and work together to solve the problem. However, such an activity should only occur after students have demonstrated proficiency in designing a practice and teaching a skill under known conditions. Yet, in the spirit of competency-based education, such learning can take place in the field rather than the classroom, since the goal of the new NCCP is to help coaches demonstrate their ability to do, rather than know things. Indeed, C3 concluded that the freedom to engage with theoretical information differently, so long as group discussions, in-person practice, and mentorship follow, strongly influences adult coach's perception of the NCCP's quality.

Perceptions of quality were also associated with continuities between education and experience. Coach interviewee C2, shared "I've seen coaches who get through the hoops but still do not have the practical experience." Indeed, balancing experience and education is a challenging task for administrators and instructional designers. If requirements are too strict, the number of non-certified coaches may increase, yet if requirements are too lenient, inexperienced yet certified coaches may negatively impact public perceptions of quality. The question is then, what is the purpose of achieving NCCP certification? For example, Coach Developer D8 shared recent changes to Nordic Canada's Learn-to-Train (L2T) pathway may negatively impact the number of certified club coaches because the pathway now includes hosting a logistically challenging multi-day overnight camp. In fact, D8 explained this requirement has been included in the sport's Train-to-Train (T2) pathway (both are under the Competition-Introduction context) for several years and no coaches have been able to recently achieve certification. By extending this requirement to the more elementary level, coach certification at the L2T pathway will potentially become equally as rare. D8 explained such requirements are beyond what is necessary for working with children at the club level, such competencies are more suited to performance pathways like the Competition-Development context focused on athletes close to or

beyond high school graduation. It will be interesting to understand how this structural change impacts perception of program quality and the number of non-certified coaches with significant levels of experience in the sport of cross-country skiing going forward.

When products change, it can take time for customers to adapt due to the impact of brand inertia (Solomon, 2005), and perceptions of quality may change over time (Wang et al., 2009). Therefore, the structural integrity of the NCCP program needs to be a principal factor when designing program revisions. C3 believes that although content should be updated, changes to the structure of the pathway including the names and order of the modules should be avoided. Moreover, Coach Developer D8 proposes that content updates should occur in a timely manner. For example, Coach Developer D7 explained that “the last thing we want is to have old versions of things lying around that are out of date and useless.” D7 further explained that when errors are discovered or content needs to be revised, their sport acts swiftly by updating and re-publishing all coach education documents on their website and learning management system, rather than waiting for the next revision cycle. According to D7, updated content is key to maintaining the NSO’s position of influence and reputation as content experts.

Conversely, when structural changes occur and customers become unclear about the product (i.e., NCCP content), low program integrity can negatively impact perceptions of value. Coach Developer D9 shared that “a lot of people ... don’t believe in the NCCP or what it can do for them.” Moreover, they explained that when done poorly, new people rather than new training are necessary. For example, after structural revisions, the sport required a brand-new cohort of coach evaluators because the legacy evaluators were vehemently opposed to the changes and left the community. Such discontent can also create microcosms of tribalism and a greater departure from the NCCP’s five core competencies. D9 explained “here in British Columbia, we [the clubs] fight more between ourselves than we do competing with other provinces” and it negatively affects the athlete’s sport experience. Thus, strong leadership

from governing bodies, which listens to and accommodates coach needs, while effectively conveying program design and revision processes can help improve customer confidence.

Discovering harmony between program clarity, relevance, integrity, quality and learner needs can surface through the use of backward design. This instructional technique focuses first on the central task coaches need to do to achieve certification, and build evaluation criteria, learning activities, and informational resources that meet those outcomes. For example, Coach Developer D7 shared how their sport uses a learning management system to not only publish educational resources but also upload and store all a coach's evaluation documents. As a result, the experience of evaluation extends beyond an email interaction between the coach and the evaluator, so the national administrator and the provincial coach developer can understand the coach's progress and optimize post-certification professional development experiences toward exceeding competencies.

Moreover, sentiment for pairing coaches with a learning facilitator they respect and can aim to emulate surfaced through analysis. For example, D7 shares that even though the LF role is to facilitate rather than instruct, it does not matter, and new coaches want to learn from someone they respect, someone they know, someone from their community. Of course, this can present logistical challenges associated with the size of coach developer teams across the country in each sport, especially when program structures create imbalances between certification level and years of experience. To help acknowledge coach experience in accordance with coach education, national organizations can visually pair different education contexts with years of experience. For example, the Community-Initiation context is for coaches with less than one year of coaching experience, whereas the Competition-Introduction context is for coaches with previous competitive experience or 2+ years of coaching experience. This mirrors the long-term athlete development phases, which pairs the T2T stage to children experiencing the growth spurt or athletes with 3-6 years of sport experience. If appreciation for the familiar is acknowledged when designing coach education pathways and revisions, clubs and

coaches can instead celebrate both years of experience and certification, so athletes do not have to decide between experience and education.

Thus, exploring ways to quantify and celebrate hours of coaching experience may support learners. Coach Developer D9 explained that although it is not a requirement, their sport recommends sixty work hours before pursuing competition-introduction certification. Conversely, the International Coach Federation (ICF), which is more focused on business and life coaching, does require a minimum number of work hours with detailed logs. However, as introduced earlier, C1 believes that such requirements would negatively impact rural coaches or smaller sports since it can be hard to accumulate hours.

Yet, listening to the current and prospective customers is a helpful way to build and maintain program quality. Coach Interviewee C2 explained that creating content for underserved groups like the Community-On-Going context can serve as a helpful reminder of how to meet customer needs and build value. They explained that creating modules for recreational adults would be an excellent gateway experience and would invite natural born leaders to build confidence first within their cohort before taking on a more official role as a club coach. Examples include Cycling BC's Ride Leader Training program that fulfills this niche and has contributed to people participating in the Comp-Intro pathway and succeeding as NCCP coach developers. Further, these introductory experiences can help demystify the NCCP program and positively impact perceptions of quality.

Coach Developer D8 also believes that when people associate their identity with coaching, an intrinsic motivation to remain in the community exists and builds perceptions of value for professional development and helping other coaches get started. D8 explains that "I identify as a coach, so I keep coaching, [because] ... having considered that this pathway takes many years, reaching a point of the pathway and then just quitting coaching ... [would] just [be] a waste of your resources."

2.2 Accessible

Accessibility emerged as another customer-centred sub-theme associated with meeting coach's needs. Within the interview cohort, this most often manifests as a request for simpler language, easier to use resources, and flexibility for accommodations when appropriate.

Coach Interviewee C1 explained that prospective coaches are often confused about how to start or complete their club coach pathway. Furthermore, C4 shared that coaches are even unsure if they need to or should begin with the Community pathway as opposed to the Club pathway. This most often stems from the change away from the former Level 1, 2, 3 system towards the descriptive system adopted more recently. Using simpler language can help mitigate these challenges and help customers feel the program is indeed accessible. Indeed, Packard and Berger (2021) demonstrate using more concrete language during customer interactions can significantly increase customer satisfaction and willingness to buy, the benefits of which are consistent across different communication methods (email vs. phone), contexts (different firms, customer requests, and issues), and scenarios (e.g., retail service encounters). Moreover, C1 suggests that national and provincial organizations should attempt to make their coach education webpages and documents so clear and concise that a frequently asked questions section is not necessary. Review of various Canadian sport coach education pathway infographics and introductory webpages indeed illustrates a lack of consensus or guidance from the CAC. This concept matches the work of Dixon and McKenna (2022) who recommend the JOLT method to reduce consumer indecision by reducing risk, limiting exploration, and offering recommendations. Thus, the CAC could standardize pathway illustrations for all sports as well as set concrete language that better informs prospective coaches. According to Iyer et al. (2020), consumer knowledge positively impacts buying behaviour and reduces impulse buying. In this context, impulse buying may express as uninformed yet excited prospective coaches starting an education pathway, only to later dropout since the program does not match their needs or interests. Such occurrences will undoubtedly increase drop-out rates and

negatively impact public perceptions of quality or accessibility. Indeed, Mason et al. (2023) illustrates a product's emotional value, its ability to evoke a positive emotional response, is the most influential predictor of consumer behavior. Thus, creating concrete, accessible, and positive customer experiences for prospective NCCP coaches is important and builds value.

An example of how simple and deliberate vocabulary can best support coach education includes the definition of an 'instructor' versus a 'coach.' Coach Developer D9 explained that these two words convey distinct roles and the NCCP should acknowledge these differences. D9 suggests that a sport's practice-to-competition ratio may better indicate if education programs should be labeled instructor training versus coach training. For example, sports leaders working in the Active Start, FUNdamentals, and Learn-to-Train athletes (all pre-growth spurt) stages do indeed fulfill the role of instructor who teaches foundational technical skills compared to club head coaches who manage the development of the athlete and club culture over an extended time.

According to coach interviewee C5, information about the evaluation process needs to be easy to find, and coach developer D9 argues that the maintenance of certification process also needs to be much clearer. Simple language throughout the coach education process can thus help coaches access the information they need to make informed consumer choices.

Ease of use also emerged as a common thread regarding accessibility. Coach Developer D7 shared that their sport's learning management system is exclusively used for evaluation rather than education. This way, coaches can track their progress using the established LOCKER platform yet have an easy-to-use platform for evaluation. Coach Interviewee C2 warned that when sports adopt pre-requisite modules into education pathways, it is important to "make the pre-requisites clear and easy to access." Commonly, eLearning modules are hosted on the LOCKER platform, yet some sports are now including private third-party modules, or a mix of nationally and provincially-organized courses which complicate where to register for modules. D7 explained that eLearning pre-requisites can work well "as long as we

have a very clear list of what needs to be complete” and a place coaches can go to track their progress. Indeed, many sports have recently created standalone Learning Management Systems at great expense because updates to the LOCKER system have not occurred in a timely manner.

Despite the multitude of online resources and websites now associated with NCCP education and certification, the shift towards digital resources has improved ease-of-use in many ways. D7 shared “as we shifted to paperless resources, it allowed us to make the information available to the public, even if they aren’t taking the course,” democratizing valuable information. Such a free exchange of information is a stark contrast from pre-Covid policies when textbooks were printed and coveted as private property.

Across the Canadian sport landscape, different administrative practices and policies also exist related to accessibility and ease-of-use. D7 explained that provincial organizations have the autonomy to schedule, administrate, and teach all NCCP Competition-Introduction modules. However, the sport of cycling uses a different approach, and provincial organizations are not permitted to facilitate theory modules, only practical skill modules in-person (Cycling Canada, 2024). D7 explained that it is important to have flexible policy, because “some provinces are like, let us do it, and other provinces are like, no, you do it. So, it is a collaboration.” Either way, vertical alignment between provincial and national organizations and accessible resources or easy-to-use systems are important to ensuring coaches perceive education programs as accessible.

One example of such accessibility and ease-of-use is the availability of synchronous experiences with professional learning facilitators and coach evaluators. Coach Interviewee C5 explained that “it’s borderline impossible to get certified” because there are not enough facilitators, not enough modules, and coach education is not prioritized in the sport’s culture. In fact, C5 claims that in British Columbia the only club-level speedskating coaches with certification are those who were grandfathered in through the old system. C5 continues “I got to the evaluator after bugging [my national federation] quite a bit,

and then once I was assigned an evaluator, I sent my portfolio except I heard nothing... so my strategy was to call his personal cell number I got from one of his former skaters and called him everyday for two weeks until he emailed me back, saying 'he's really busy, that he's got a lot of balls in the air ... but it should not take that level of persistence to get certified, right? Like they should be trying to make it easy for coaches!' Indeed, this sport is experiencing significant challenges associated with coach evaluator availability.

Conversely, online asynchronous, and synchronous education modules are helping overcome the logistical and geographic challenges of coach education in Canada. For example, Speedskating BC adopted an innovative approach and aligned synchronous learning with the pre-competitive phase of the annual calendar. As a result, online modules are facilitated between May and December, followed by in-person learning from September to December. This aligns with feedback from the interview cohort. C6 suggests that scheduling should consider the target audience, including their age and daily/weekly availability. Moreover, C1 states that in-person courses need to be available more than once a year. Coach interview C4 explained that due to the low availability of coach developers, in-person modules are now only available in large urban areas like Vancouver, creating unsurmountable challenges for rural coaches across the province.

Thus, to ensure the NCCP program is accessible, a large investment in coach developers is now necessary. C1 claims that their sport needs more learning facilitators, and multi-sport modules need to be more often available and easier to find online. C5 claims that their sport needs more coach evaluators so a coach undergoing evaluation receives adequate support and follow-up. Undoubtedly, these structural limitations require time to solve, and, in the meantime, the interview cohort expressed greater desire for accommodations. Thus, accommodations emerged as a common sub-theme associated with accessibility.

Although synchronous online meetings along with asynchronous eLearning content and activities have reduced the need to travel to in-person theory modules, adopting further accommodations can help inform NCCP revisions from a customer-centred approach that promotes accessibility. C5 shared that “we need to make things accessible for people in the north” and we can do that by providing printed materials at no added cost and in some cases, video resources on thumb-drive. Such accommodations can help overcome areas with low internet connectivity or learners with limited access to or abilities with digital tools. Moreover, C5 believes that webinars should be recorded and available on-demand, with access to a mentor or facilitator for follow-up questions.

Another accommodation that is commonly requested yet poorly facilitated is the use of video submissions, much in the spirit of distance education programs from the past. In such a case, coaches would submit a video that illustrates their ability to teach a skill or facilitate a practice. Indeed, D9 believes that evaluation by video is a good option when instructions are clear and specific so that submissions are well done and helpful to both the coach and the evaluator. However, most sports do not include detailed instructions for such submissions, and according to the interviewees, such accommodations are rarely fulfilled. Nonetheless, C4 argues that the discovering accommodations that work for both coaches and administrators is important because otherwise “we just can’t recruit the necessary volunteers.” Therefore, meeting the needs of coaches, even in the case of special accommodations, does not decrease the quality of the experience per say, rather, it demands greater focus on the program’s core competencies and learning outcomes.

2.3 Incentivized

The presence of incentives emerged as the final sub-theme associated with revising the NCCP program with a greater emphasis on the customer experience. Prices and regulations constituted the two most common drivers associated with incentives for achieving certification.

Like how each sport illustrates their education pathway differently, regulations for coach training and certification vary across sport and context. Coach Interviewee C1 stated that when sports do not publish expectations or regulations for coach education, the only incentive to achieve certification is self-recognition and personal development. Indeed, such regulations would have to balance the logistical constraints of accessing education with the ethical standards set by either the CAC and NSO funders like Own the Podium, or even the Canadian Government. Rather, PSOs are graded by their Provincial/Territorial Coaching Representative (PTCR), like viaSport in British Columbia on the comprehensive nature of available coach education and impact funding for community and club level coach education. Conversely, coach interviewee C4 explained that their national sports organization mandates a certified female coach be present on the bench during all practices and games. As a result, parents are encouraged to pursue coach certification so their children can play, even if they are brand new to the sport. C4 shared that “I’m not a strong skater and I never coached in my life before ... [but later] I was asked to coach BC Winter Games because I was the only certified woman in the north.” So, despite the challenges associated with policy enforcement, parent coaches are incentivized to achieve certification, especially when they are rewarded. C4 continued:

So, I found that the incentive was if there was nobody to be there, my daughter could not play, so I think that was a huge incentive to begin with. The incentive to go further in my education was BC Games... and then now continuing to coach even though my children are not in ringette anymore. Now I think the incentive is it... it's rewarding for me. (C4)

The success of this national policy is illustrated in Table 2, whereby the sport of Ringette features the highest participation and certification rates in this research sample.

Conversely, regulations poorly formulated or adopted may exasperate existing challenges and penalize, rather than incentivize coach certification. C6 explained that there is always a small number of people who will do most of the work, so we need to make sure we do not burn them out and we should

remove as many impediments as possible. And although C6 suggests certification be necessary to coach the provincial team or attend national championships, it would rather be helpful if NSOs specify the minimum standard for leading versus supporting a club practice. C6 continues “essentially, [the coach developers] need to see how you are in-person, and make sure you’re safe” because after all, in volunteer sports we need to make it easy for people to get involved. Therefore, policy makers should carefully consider administrative capacity and the quality of their education program before initiating and enforcing coach certification requirements.

Coach certification policies are often used by PSOs to accredit affiliated clubs and activate liability insurance for coaches. Coach Developer D9 explained that certification is indeed a requirement for insurance because they facilitate a contact sport, yet enforcing the policy:

was a painful kind of struggle, ... but it had to be done, and I think that it has improved [coach] quality, ... and I think as a result we're seeing better results at the high end, at worlds and big high-level tournaments. We are seeing much better results. (D9)

Conversely, D7 explained that because of the high turnover of coaches from year-to-year, where clubs often hire a former club athlete returning from university to lead summer camps, NCCP certification in their non-contact sport is not required for insurance purposes. Therefore, future research could explore patterns between certification regulations and sport-specific factors to better understand the impact of incentives for NCCP certification.

Pricing also emerged as a common thread regarding incentives for certification. According to the interview participants, sports can use pricing to incentivize certification by considering who pays, when do they pay, and how evaluation fees are collected. Both C3 and D8 shared it is culturally accepted that clubs often cover the costs of coach education. Whereas D9 shared that such an arrangement often occurs when coaches make a short to medium-term commitment to the club. More specifically, C5 claimed that clubs often expect such a coach to achieve the required credentials over a three-to-four-

year period, but further leniency is common when provincial guidelines are lacking. Therefore, at a minimum, national or provincial sports policy can help ensure club coaches achieve a given standard in a timely manner.

The effects of pricing and, in turn, household income on certification rates was also explored in the Chapter 4 quantitative analysis. In fact, counter to the researcher's presuppositions, the interviewees share preferences for micro-purchases throughout their education experience. Coach Developer D7 explained "we wanted to offer one payment for the whole program so it would be easier for people but ZERO people signed up, they would rather move through each module piece by piece when time allowed." These preferences were also evident in the descriptive statistics of this research sample and other interview participants. Therefore, the number of transactions is not a driving factor and indeed uncorrelated with the impact of total program price.

Conversely, the interview cohort did call for the use of pricing discounts and other financial accommodations. For example, C6 suggests that financial subsidies could be reserved for exceptional cases, like special projects or out-of-province opportunities. In addition, some sports subsume the costs of evaluation into the training costs. However, D8 shared that in their sport, evaluation requires a separate transaction which makes sense because often it takes many years to prepare. Moreover, D7 explained that separate transactions for evaluation also helps ensure coach evaluators are more adequately paid. Alternatively, C5 shared that coaches do not pay for evaluation and instead those costs are collected in theory during the education modules.

Perhaps a better question to ask is how vertically aligned national and provincial organizations and what is the national budget for and emphasis on the importance of coach education. One could argue coach education is one of, if not the primary product that sports organizations offer to customers and thus should take precedent. Thus, centering NCCP revisions upon customer experiences can help illuminate the importance of incentives, accessibility, and providing value.

3.0 – Personality trait knowledge is framed as a tool

When discussing the costs and benefits of incorporating knowledge of personality traits into coach education programs, the interview cohort expressed a mix of support and concern. Although participants showed support for discussing traits and behaviours with coaches to build their confidence or discuss opportunities for growth, concern was raised over the need to frame such information as tools. An example of this tool-focused approach surfaced through the way the researcher discussed personality trait scores with the interviewees, initiating discussions about the traits, behaviours, and skills important for different coaches. As a result, two sub-themes emerged whereby a universal set of coaching traits appear evident, followed by a more contextual set of traits that for example, differentiate between leaders who work in club versus high-performance environments.

3.1 Universal coach personality traits

As introduced in Chapter 2, this research leverages the work of John and Srivastava (1999) and assessed survey respondents across the Big Five personality traits: openness, conscientiousness, extraversion, openness, and neuroticism. The researcher's understanding of these traits helped identify patterns within interviewee responses and guide interviews accordingly. As such, universal traits including high emotional stability and balanced degrees of agreeableness emerged during this analysis. However, these attributes first surfaced through a more tangible theme, what is the coach's role?

Coach Interviewee C6 summarized the all-compassing nature of the many traits involved in a coach's role by sharing:

I want to be a leader... [but] it's not just being the boss and getting the paycheck, it's actually performing a function of inspiring and developing and controlling and ... sometimes cattle prodding people to achieve that particular end that the organization wants. So, if you are not willing to be in that larger-than-life role [and have] that 'will' to step outside yourself, then you

are not going to be a very good leader. Same thing with coaching... you must make yourself vulnerable to stand up there and say here I am, and you should be able to expect to have any question thrown at you and be expected to respond to it.

This quote demonstrates the complex mix of traits embodied by coaches, ranging from emotional capital, or agreeableness, to sense of self, including both higher degrees of extraversion and emotional stability. And although C6 also stated that every coach will have their own style, that the coaching role is not for everyone.

Equally, coach interviewee C3 believes that coaches need to be able to differentiate and balance both the needs of the individual and those of the group. This sentiment most closely aligns with leaders who express moderate degrees of agreeableness (i.e., 50th percentile) and higher degrees of openness (i.e., >50th percentile). As such, leaders would have the capacity for high order thinking and appreciation for new ideas, yet, disagreeable enough to make leadership decisions. Such higher degrees of trait openness may also be associated with the life-longer learner mentality encouraged by the NCCP program. For example, C3 believes that well-trained coaches acknowledge they will have to work hard to achieve certification, and that once achieved, they will by no means always be correct in the future. Such sentiment conveys the need for industrious and humble coaches who can adapt to changing sport cultures, technology, and athlete needs. Therefore, combinations of stability, curiosity, and productivity encapsulated within the definition of a coach's role emerged during the interview process and analysis. This not only illustrates why coaches are so special but also why their attributes and abilities are difficult to articulate.

The interview cohort also demonstrated universal interest in and support for life-long learning, an expression of higher degrees of trait openness. Coach interviewee C6 shared "when the new courses came out ten years ago, I was the president of the club, and I wanted to take those courses, because I'll learn something." Whereas C2 explained that "there are coaches like me who will go out and take a

course, but I'm there to learn, rather than checkboxes." C2 continues "You need to keep learning, and you need to keep getting mentored and you need to spend time with people that know more than you do, right?" Interest in learning from other coaches and the ability to try new things or think critically about past actions aligns with higher degrees of trait openness. Conversely, C5 explained that coaches lower in trait openness may often express as a less democratic coaching style or lower interest in peer-coach feedback. Further research can explore patterns between trait openness and preferences for instructor versus coach education programs. Yet, the ability to identify patterns, and think creatively also aligns with the initial phases of an important NCCP coaching outcome, making ethical decisions. This includes establishing the facts and identifying all actions and consequences. Thus, higher degrees of trait openness appear a universal trait for all Canadian coaches, as evidenced by the interview cohort and the activities included in the existing NCCP program.

Emotional stability also surfaced as a common trait for all types of coaches. C6 suggests that regardless of the context, coaches should not be prone to negative emotion and express a minimum standard of stability. Indeed, emotional stability is critical when working with impressionable youth athletes, as well as during higher-risk and more competitive environments at the club and performance level. However, it can be easy to confound aspects of agreeableness with emotional stability as was evident during the interview process. Thus, defining and working with personality trait information and tools would be a necessary activity during coach education if these concepts are to be useful to the population. Coach Interview C6 shared that emotional stability is a critical competency that coaches need to make decisions and manage consequences. In fact, this ability features as the final action of the NCCP Making Ethical Decisions (MED) framework. Thus, instructional designers may consider leveraging the MED framework as an example to introduce and illustrate how personality traits or the expression of which, through learned skills and behaviours, can manifest as different and important coaching actions.

Trait agreeableness, or emotional capital, also surfaced as a universal coaching trait according to the interview cohort. For example, the ability to act politely and compassionately also aligns with the middle stages of the NCCP Making Ethical Decisions framework, whereby coaches must evaluate the pros and cons of all actions, as well as the final stage whereby coaches must manage the consequences of their decision. Coach interview C5 recommends that coaches exhibit a degree of agreeableness that matches their participants because “you need empathy and compassion, but at the same time, sometimes you have to push your athletes.” Coach Developer C7 explains “the coach’s job is to be the one who can steer the athlete when their own tendencies are taking them off track ... this is one example of how a coach doesn’t necessarily need be too agreeable.” Thus, personality trait assessment may help new coaches understand if their traits or behaviours express low, moderate, or high in trait agreeableness. In fact, C5 proposes a more descriptive approach:

I think of emotional capital, where it is like... OK, if I am gonna say no, if I am going to disagree with this, I cannot do that every time. You gotta pick your battles and you need to build trust before you do that ... so, there is some strategy involved, and if you know how agreeable you are ... [it can help you know] where to apply it. (C5)

Therefore, helping coaches acknowledge expressions of trait agreeableness can help identify areas for professional development, and learning skills or patterning behaviours that create more versatility may help coaches achieve exceeding competencies during ethical decision-making. Thus, the interview process indicates the emergence of universal coaching traits, associated with matching expressions of openness, emotional stability, and emotional capital with athlete needs.

3.2 Contextual coach personality traits

Yet, themes of context-specific coach personality traits also emerged during this analysis, associated with coach tasks, and athlete age and stage of development. As a result, recommendations of

how and when such personality trait information and tools can be productively added into coach education surfaced during the research.

Discussed previously, balanced expressions of trait agreeableness appear important for sports coaching. However, comparisons between the coach interviewees and coach developer interviewees illustrated interesting patterns. For example, coach developers exhibit lower degrees of agreeableness and trait openness compared to the average and median values for coaches interviewed. In fact, coach developer D9 enthusiastically shared “I have always questioned things ... my favourite saying is ‘underestimate me’ – that will be fun.” Such sentiment may constitute an expression of low agreeableness or higher degrees of assertiveness, which is a sub-trait of extraversion. However, based on the personality profile of this research participant, the former trait is associated with agreeableness as they also ranked lowest in trait extraversion across the interview cohort. Yet, distinctions between coaches and developers seem logical, like differences between coaches and officials. For example, coach developers are often involved with evaluations and enforcing sport policy, so individuals with lower expressions of agreeableness may be attracted to or excel in such roles.

Likewise, coach developer D7 cautioned “there is a lot of push to get high-performance athletes to become coaches... [but] I don’t think that is your best bet for building your best athletes.” This push is associated with the new descriptive levels used by the NCCP over the past decade, whereby national team athletes can now bypass levels one and two and jump straight into coaching high-performance athletes. Such program design, however, can help match coach traits with the needs of the sport context and particular athlete cohorts. For example, according to Fong et al. (2020), competitiveness is best predicted by combinations of low trait agreeableness and high degrees of assertiveness (a sub-trait of extraversion). However, Seifert et al. (2023) illustrates trait extraversion remains stable over time, and trait agreeableness and conscientiousness may change, whereas emotional stability increases with age. Therefore, placing competitive coaches in high performance environments may suit the trait expression

in the short run if they are emotionally stable. D7 shared that some elite athletes retire and start coaching, only to realize they are too competitive, their drive towards excellence is greater than that of their athletes and it creates sub-optimal group environments, which does not help the retired athlete conclude their own sport journey positively. Therefore, understanding a coach's personality trait expression and how it may change over time can help prospective coaches fulfill a coaching role that matches their level of competitiveness and optimally support their sport community.

Similarly, acknowledging degrees of trait conscientiousness may help coach developers employ strategies associated with self-directed learning for coaches in-training. Coach interview C6 believes that coaches pursue certification out of sense of duty, including self-actualization, ego, or entrepreneurial interests, or a sense of obligation specific to accreditation requirements. Furthermore, C6 shared they personally achieved certification at an early age, and over the past forty years consistently participated in professional development, as well as fulfilled administrative and leadership roles at their club. This is a good example of intrinsic motivation. To help coaches pursue such a life-long pursuit of development, acknowledging trait conscientiousness, in harmony with motivating factors can help coach developers accurately pair coach education with different self-directed learning phases. Chapter 6 explores this hypothesis further.

In the context of club coaches, higher degrees of extraversion emerged as a common theme in the cohort. Club certified coach, C3 shared "I enjoyed hanging out with people, talking to people... [but] I focus on big ideas, so sometimes it is hard to articulate my ideas." And C3 believes there are personality traits that compliment the coaching role. For example, C3 shared that although recently retired athletes are often strong with a sport's technical elements, it does not mean they have the mental competencies to excel at every coaching level. Similarly, coach developer D7 has witnessed situations where high-performing athletes are in fact so extraverted and generous with their time that it detracts from their own training and performance. D7 clarifies that in such a case, the athlete may better serve the sport

community as a club coach rather than a performance athlete. In reflection, D7 hypothesized that club coaches are higher in openness and extraversion, whereas recreational and community coaches who work with younger participants are more agreeable. Such patterns also appear in the quantitative aspects of this research, with trait extraversion surfacing as a significant predictor in achieving trained status as a club coach.

Further examples of context-specific personality traits emerged when discussing changes over time. Coach interview C3 explained “in my youth, I was a doormat ... [but] my competitive nature changed dramatically as I became an adult.” C3 shared that in their twenty’s, they changed sports and started working with a “supportive and positive” master coach who altered their perception of and interest in competitive sport. C3 explained that after meeting this coach, “I loved racing - that is why I competed in Athens (Olympics 2004) ... in fact, I didn't even know I was competitive, and did not consider myself an athlete [before starting that new sport], ... “because as a child I thought sport was about getting yelled at.” Of course, this sentiment further supports the importance of coach education and the power of role-modeling, but also explores how personality trait expression can alter over time. Conversely, coach developer D7 shared they have seen “coaches often undergo a decided shift when they begin working with high-performance athletes, they become more focused, more tight ...however, there is no reason to be less friendly.” Thus, one may argue that when behaviour changes occur in the short run, environmental and cultural factors may outweigh those of established personality traits. And according to D7, the freedom provided by the descriptive rather than sequential structure of NCCP contexts helps coaches choose the pathway that is right for them.

Finally, when discussing how to incorporate knowledge of personality traits into coach education, the cohort shared such information would be helpful for new coaches, but the intention and delivery of such content must frame the information as a supplemental and optional tool. Coach interview C5 explained that personality tests “can help you understand your strengths and weaknesses.”

However, coach developer D8 warned “my fear is that people feel like they don't fit the model, and so they [feel that they] shouldn't be coaches.” D8 continued that instead we must convey that “we all have a side of us that contributes” to the sport community and as a result, we can help people identify as a coach and increase the number of years they contribute to the community. Therefore, coach developer D9 suggested that introductions to personality trait information should occur in a group setting to de-escalate any misconceptions, like how the concept of group development stages is introduced in Learning Facilitator core training as an icebreaker activity. This is an example of how personality traits information may help develop interpersonal and intrapersonal knowledge.

Given this context, it is important to adopt the motif of “traits not fates” to further associate this knowledge as a professional development tool that helps coaches identify strengths and opportunities for growth. For example, coach developer D9 shared “I have been coaching everything all these years, but it is all an act, yes, it is a performance ... I am very introverted... so you are not gonna meet me out and about [because] I prefer to stay home.” In this case, the coach’s traits mismatch the performance or environment and although they can learn skills and pattern behaviours that help them demonstrate exceeding competencies, it may take more mental energy than it would otherwise. Moreover, D8 shared “I coach with a guy that is, personality-wise, very opposite to me... he is very introverted, he is extremely deliberate, he is not spontaneous at all. And he is an amazing coach. The kids respond well to him, and he is the opposite of the stereotypical [kids coach] shouting and inventing fun games on the spot. And you know, if I had to choose a coach between him and me, I would choose him!” Thus, athletes often enjoy and need a coaching team that features mixed attributes, and in some cases, leaders may coach differently than how they wish to learn!

Qualitative Summary

The thematic analysis of interview participants thus provides further context of the statistical models, identifying learner and customer needs that may improve the likelihood of achieving NCCP

certification. As illustrated in Figure 61 and Figure 62, updating the learning experience with deliberate mentorship, matching learning outcomes with teaching methods, and ensuring content is clear and relevant surfaced as the key themes. Incentivizing certification, making the program accessible, and building value through consistency and acknowledgement of work experience are important themes to support the customer experience. Conversely, discussing personality traits contributed to the identification of universal and context-specific coach traits, encouraging the addition of this knowledge into NCCP programs yet framing the information as optional tools rather than requirements for success.

Chapter 6: Research Implications

As an explanatory case study mixed methods project, this research identifies several recommendations for instructional designers, learning facilitators, and administrators of coach education, specifically Canada's NCCP program. The findings suggest greater emphasis on learner-centred approaches, by using high-quality and evidence-based learning resources and streamlined program design to improve both the learning and customer experience. As a result, this research illustrates interesting patterns specific to learning blends, consumer behaviour, and personality traits that may impact NCCP certification rates.

Discussion

The research indicates the learning experience can be supported by using clear and evidence-based information that matches learner needs and academic prowess. First, the quantitative analysis indicates that a relationship exists between academic accomplishment and coach certification status. Thus, the effectiveness of learning theories and education resources used by coach developers may be improved by considering the cognitive development and academic abilities of coaches in-training. For example, when teaching younger coaches or those with less academic experience, resources and facilitation styles that illustrate best practices, provide strong positive feedback, and promote the instructor role can help such learners acquire and consolidate basic coach competencies, rather than

focus on more cognitive and theoretical topics. The tenets of behaviourism may better assist these types of learners compared to constructivism as hypothesized by Grow (1991). Behaviourism is a learning theory associated with the empirical view that knowledge develops from experience and teachers can use various stimuli to help students acquire new patterns of behaviour (Ertmer & Newby, 2013; Schunk, 1991; Skinner, 1938). Of course, as coaches develop, textbook resources and facilitation strategies may include more advanced coach theory and adopt constructivist principles. For example, leaders ready to evolve from instructors to coaches can experience active learning techniques and liberating structure activities to reflect upon their previous experience and unpack the NCCP core values and coaching outcomes, now empowered with a few seasons of personal experience. Under such a model, coaches who are ready to curiously expand their knowledge base can do so when it matches their needs and abilities, without penalizing new coaches who rather seek clear, concise, and evidence-based best practices to get started. Currently, NCCP streams and contexts are organized by athlete type, and altering the structure towards coach type would require transformational change. In the context of learning blends, modifying textbooks and pathways to champion a 'quick-start' instructor-style program followed by constructivist coach education would indeed constitute a transformational blend such that learning may occur differently than in the past (McGee & Reis, 2012). However, considering the democratization of coach education resources available online, growing calls for personalized and mobile-based eLearning now in development at the CAC, and the insights from this research's interview sample, providing more clear, concise, and high-quality information is paramount to maintaining the NCCP's value.

Second, qualitative themes calling for the matching of learning outcomes with teaching methods correspond with the quantitative findings that extraverted and neurotic coaches are participating in modules but not achieving NCCP certification. Although built upon the concepts of andragogy and constructivism to encourage coach developers to role model a spirit of curiosity, help coaches reflect on

their own sport experience, and develop knowledge through discourse and practice, this research indicates incongruencies between the training and evaluation experience. For example, NCCP evaluations heavy in written assignments, email correspondence, and online quizzes exhibit a disconnect between the interpersonal and intrapersonal-focused experiences of NCCP education modules. Thus, it makes sense when this research indicates coaches prone to negative emotion and who prefer group environments engage with educational modules but struggle to pursue evaluation. This may be associated with a lack of face-to-face interactions during evaluation, or written assignments that either include poorly articulated evaluation criteria, instructions, or connections to reference material, or were not covered during educational modules. When the evaluation experience differs from the education experience, it creates discontinuity and anxiety for learners and, according to this research, significantly impacts extraverted and neurotic learners. Therefore, coach certification rates may improve by incorporating more in-person, face-to-face online, or group activities into the evaluation process, perhaps allowing the coach evaluator to better role-model Thiagararan's (1992) stages of debrief, a tenet of NCCP evaluation theory. To match learning outcomes with teaching methods, instructional designers may consider leveraging existing evaluative criteria to redistribute what coaches must demonstrate during evaluation and what they need to develop over greater periods of time through professional development programs. For example, the NCCP already articulates minimum and exceeding competencies which can be used to design such maintenance of certification experiences. Shifting the NCCP certification towards the minimum necessary professional coach competencies can also help inform the format and outcomes of educational modules and the evaluation experience, whereas the complex interpersonal and intrapersonal competencies can be emphasized and refined during post-certification mentorship-based professional development experiences. NCCP certification could then adopt a more summative approach, and mentorships programs could use a formative approach. In practice, this would include providing clear instructor-style expectations for coaches to demonstrate

during in-person, technique-focused and group-based educational modules that contribute to their evaluation card, and written assignments that are preceded by high-quality flipped resources, as well as group work that accommodates andragogical principles. Such a lens may be described as the distinction between coach education and coach development whereby the minimum and exceeding standards are achieved respectively. This concept is already practiced by the Canadian Ski Instructor's Association, which has shifted away from a one-and-done evaluation experience, and towards a more iterative evaluation that includes group work, micro-evaluations, and on-going supervision (CSIAa, 2024; CSIAb, 2024).

Finally, coach education content for learners needs to be current and evidence-based. Although the quantitative analysis of Model 3 illustrates coaches who self-identify as kinesthetic learners are less likely to complete the NCCP program, over 80% of the entire research sample identified as uni-modal, indicating a wide-spread belief in the out-dated VARK concept. This matches the findings of Howard-Jones (2014) and Newton et al. (2021), whereby a large portion of educators still believe in the validity of such concepts, referred to as neuromyths. Thus, content revisions and professional development should provide more current and evidence-based literature associated with teaching and learning, including the impact of the spacing effect (Ebbinghaus, 1885; Vlach & Sandhofer, 2012) and the importance of learning by thinking, both of which feature within prevailing evidence-based learning theories including behaviorism, cognitivism, constructivism, and connectivism, not to mention experiential and humanistic learning. As a result, coaches can learn tangible technical competencies quickly and, over time, can master the more complex competencies of facilitating the mental development of club athletes and the social cultures of club sports.

In the context of blended learning, this research struggled to identify concrete quantitative findings due to poor survey question design. This is due to a combination of factors including a small sample size, poorly designed survey questions specific to the learning blends, and multi-collinearity

between the measured factors whereby markers for learning blends were subsumed by more significant factors in the regression models. Future research thus requires greater partnership with each national sports organization's coach education department to identify how blended learning is incorporated into the learning experience, how flipped learning resources are being used to develop professional competencies and how active learning strategies (e.g., mentorship or formative evaluation) are used to support inter and intra-personal competencies, thus capturing a more representative sample size. However, the qualitative analysis provided insights that NCCP instructional designers may consider when designing future learning blends. Specifically, the curation of clear and concise flipped learning resources, although costly and time-intensive to develop, can accommodate the needs of new coaches seeking instructor-style information and encourage curiosity and discourse during group sessions, thus abiding by the concepts of andragogy, constructivism, and active learning theory for coaches with greater levels of experience. As a result, instructional designers can avoid overwhelming new students by articulating a clear goal for each module, teach to the evaluative criteria, and match coach and athlete type with the method of teaching and learning.

Given the recent democratization of sports education information available online, and the growing influence of privateer platforms, failure to accommodate the needs of Canadian coaches may negatively impact participation in the NCCP program and the sport experiences of athletes in future decades. Thus, adopting a learner-centred approach with inspiration from blended learning principles can help the NCCP maintain its relevance as Canada's paramount coach education program.

This mixed-methods research also indicates the consumer experience of coaches in-training can be supported by altering prices, and using framing effects and incentives to simplify, inform, and encourage coaches to begin and complete their education pathway. For example, regression model 1 suggests higher household incomes positively impact the likelihood of achieving trained status. Thus, program administrators may explore shifting prices paid by coaches away from education modules

towards evaluation or may incorporate some costs into the price of annual coach memberships. In the latter option, access to coach education and development can become a complimentary value-add, despite nominal increases to annual coach membership prices. In addition, regression model 2 suggests that incentives could increase coach education participation and help part-time or full-time coaches achieve certified status. The thematic analysis revealed the development of themes including the need for valuable, task-based information that helps coaches fulfill a specific role, and policies that incentivize certification. In addition, using simple language to frame the benefits and steps of the program, such that the program appears structurally consistent over time, can help customers comprehend the nature of coach education experiences (Solomon, 2005), and thus maintain strong perceived value over time (Wang et al., 2009). After all, customers rarely purchase what they do not understand. Thus, standardized pathway infographics endorsed by the Coaches Association of Canada may help limit consumer confusion, and given the challenges associated with the descriptive context labels, consideration should be given to using the former lexicon, levels 1-2-3. Future research in this area can explore sport-specific policy to better understand barriers and incentives, and surveys can include logic so researchers can confirm how many modules in a coaching context are being completed.

Finally, both the quantitative and qualitative findings indicate personality trait expression exhibits patterns of interest according to the survey and interview analysis. The thematic analysis identified universal and context-specific coach traits, and the regression analysis showed extraverted and neurotic coaches are disadvantaged by the existing NCCP program. Personality trait testing may therefore help educators modify their facilitation to accommodate student needs, such as by ensuring portfolio discrepancies are discussed over the phone or on a video call, or evaluating skills teaching in person at the conclusion of the training session. Personality trait testing may help new coaches understand how their own competitive drive compares with others and how it may express during coaching sessions. For example, awareness of such combinations of sub-trait assertiveness and trait

agreeableness may help match coaches with an appropriate athlete development stage. That said, incorporating another topic into the NCCP program requires a tool-focused and problem-solving approach, like how learning facilitators animate and role-model concepts of group development and debriefing strategies through in-person facilitation and group ice-breaker activities.

New Ideas

In reflection, researching and articulating the narrative of this thesis project helped the researcher formulate a greater appreciation for teaching and learning principles that correspond with a decade of NCCP coach developer experience. Given the synthesis of these research findings and these personal field experiences, the researcher suggests the NCCP can maintain its constructivist and andragogical roots while leveraging blended learning strategies to better serve new coaches by expanding upon the theories of Grow (1991). Built upon Knowles' (1975) research hypothesizing an adult learner's experiences and maturity impacts their motivation to learn and self-direct their learning, Grow (1991) introduces the Staged Self-Directed learning (SSDL) model, pairing instructional methods with student attributes. As a precursor to self-regulation learning strategies supported by recent language learning research (Nakata, 2010; Oxford, 2013; Oxford, 2016; Hawkins, 2018), appreciation for frameworks that match teaching methods with student maturity, experience, and motivation may also support coach education.

Thus, a new learning model – call it the Sport-Harmonized Action Plan for Education (SHAPE) – could be built upon a four-step learning matrix that considers the attributes of Learner Coaches, and Coach Developers, as well as the Complexity of the Learning Environment, and the appropriate Learning Theory. The SHAPE model follows the first three steps of Grow's work, which shows students with low levels of experience or maturity are highly dependent and need a controlled learning environment with immediate and positive feedback that is directive and pedagogical in nature (Grow, 1991). With such

students, educators would take on the role of teacher or instructor and leverage greater inspiration from behaviourism learning theory. Indeed, Grow (1991) states “many students at this stage expect discipline and direction, so provide it” and concludes “many well-established behavioural teaching methods work well in the S1 stage” (p. 130). In a second stage, as students develop maturity, experience, and the cognitive ability to abstractly connect theoretical concepts, educators can adopt the role of motivator or coach and leverage greater inspiration from cognitivist and social cognitivist learning theory. And in the third stage, as learners achieve sufficient experiences and maturity to reflect upon their experiences and engage in a reflective dialogue most closely associated with constructivist learning theory, educators can fulfill the role of discussion moderator or skill refinement facilitator with a question-based approach. These three stages can be seen to support the NCCP’s minimum standard for coach competencies, providing instructor pathways for younger coaches or those working with athletes in the earlier stages of athlete development, yet maintain the problem-solving method common across NCCP programs. However, Grow (1991) also articulates a fourth stage, accommodating learners who exhibit sufficient maturity, experience, and motivation to self-direct their learning. This stage aligns well with the mentorship-based professional development themes that surfaced in this thesis research, indicating a point at which educators could adopt the role of delegator, advisor, or mentor, and leverage connectivist learning theory to empower coaches to seek, filter, and compose new knowledge through consultation with their personal social networks and available technologies to achieve a higher levels of coach competency. Table 30, in Appendix 3, illustrates the SHAPE learning model, setting out the stages and relevant competencies, while acknowledging the impact of safety and time-constraints commonly associated with the sports learning environment. It also notes the learning theories that other academics – and this research – demonstrate to be relevant. By organizing coach training in a way that match learning needs with evidence-based learning theory, the SHAPE model may help encourage approaches that support both long-term athlete and coach development.

Conclusion

Identifying and quantifying the various factors impacting NCCP Competition-Introduction (Club) participation and certification rates in Canadian coaching is a vast and on-going project. This case study research shows that even with a modest sample size, patterns emerge that coaches, coach developers, and administrators can use to make coach education more accessible and achievable. Future research could benefit from larger sample sizes to overcome bias associated with NCCP status and education level that affected this research. Narrowing the cohort by studying only coaches within each revision cycle could also account for gender bias that was unavoidable in this research sample, and could address on-going innovations in digital learning and education methods. Future researchers could also reference ICCE guides to review updates to the coach education literature and guiding principles of sports coaching. Although the factors specific to blended learning often confounded with other factors in this research, this project serves as a good reminder that those creating digital learning networks and communities should adopt a learner-centred approach that role-models the NCCP values of life-long learning and develops all three aspects of the coach knowledge triad. As internet services and digital resources further evolve to meet the needs of prospective and legacy Canadian sport coaches, the NCCP has an immense opportunity and responsibility to adapt and grow swiftly. Maintaining great emphasis on the quality of face-to-face experiences, that work in harmony with clear and effective preparatory and professional development content can help the sixty-five registered sports meet this future need. This way, Canadians can continue to play and teach one another games that instill the values we hold dear as stewards of this land.

Appendix 1: Survey Design

Page 1 - Consent Form	
Consent	y/n
Sport (Primarily coach ...)	Cycling ... (If selected, survey skips to page 3) Alpine Skiing Rowing Track and Field Running XC-Skiing
Page 2 – Contact Information	
Email Address (for interview invitation)	Email format
Page 3 - Demographics	
Birth Year	yyyy
Gender	Male, Female, Other (please specify)
City – Current Residence	
City – During Childhood & Adolescence	
Education Level	
Income	
LTD phase	U13, U17, +17, +35 Competitor, +35 Recreational
Coach Employment Status	Volunteer Part-Time Full-Time
Text Box explaining how participants can verify their status and complete the following questions accurately.	
NCCP Competition Introduction Context Status	In-Training (taken at least 1 module) Trained Certified Expired
Number of modules completed?	## (1-10)
Certification Year (optional)	yyyy
Page 3 - Learning Delivery Method	
Did you complete on-demand eLearning modules?	y/n

Did you attend online-facilitated theory modules (zoom, etc.)?	y/n
Did you attend in-person theory modules?	y/n
Did you attend in-person outdoor modules?	y/n
How do you prefer to learn theoretical coaching information?	on-demand eLearning
	online facilitated
	in-person
Do you have access to a consistently stable internet connection, making streaming/ZOOM easy?	yes - streaming/zoom works well
	no - video calls are a challenge
Do you require printed copies of theory information?	yes, and they were provided at no extra fee
	yes, but I had to print them myself
	yes, but I couldn't get a print-friendly copy
	no, I am comfortable using digital resources like PDFs
Do you prefer to learn a certain way?	Visual (see it)
	Auditory (hear it)
	Kinesthetic (feel it)
If you were able to update your sports NCCP Comp-Intro pathway for the purposes of teaching and learning, what would you change? What would you keep? (To be more accommodating, to remove common barriers, etc.)	Short-Answer
Not Included in Survey:	
Comp-Intro Pathway information collected from public website or partnering orgs	
Number of modules included in pathway	# ...collected using public website
Number of multi-sport modules	# ...collected using public website
Number of sport-specific modules	# ...collected using public website

Page 4 - Consumer Behaviour	
How many transactions should be involved in pursuing NCCP Comp-Intro certification?	1 - single payment with 365 days to pursue certification
	<5 - bundle content into sport-specific modules to reduce the number of transactions
	>5 - keep it as it is, one transaction per module

How many hours of guided learning should be involved in pursuing certification?	20 hours
	40 hours
	60 hours
	80 hours
How much should the entire process cost?	<\$200
<i>(by comparison: 20 hr first aid is ~\$350, 40hr ~\$650, 80hr ~\$999)</i>	<\$400
	<\$600
	<\$800
Does your sports organization incentivize the pursuit of NCCP Certification?	y/n ... short answer
Does your sports organization showcase certified coaches using a public registry or newsletter?	y/n
Does your sport organization recognize a PayScale that increases your pay upon certification?	y/n
If you were able to update your sports NCCP Comp-Intro pathway with greater appreciation for you as a customer, what would you change? What would you keep? (To be more accommodating, to remove common barriers, etc.)	Short answer
Not Included in Survey:	
Comp-Intro Pathway information collected from public website or partnering orgs	
Number of hours to achieve certification	# - collected using public website
Number of hours completed	Inferred by number of modules completed
Total cost to achieve certification	# - collected using public website

Page 5 – BFI Inventory	
1. Talks a lot	1 = strongly disagree 2 = somewhat disagree 3 = neutral 4 = somewhat agree 5 = strongly agree
2. Notices other people's weak points	
3. Does things carefully and completely	
4. Is sad, depressed	
5. Is original, comes up with new ideas	
6. Keeps their thoughts to themselves	
7. Is helpful and not selfish with others	
8. Can be kind of careless	

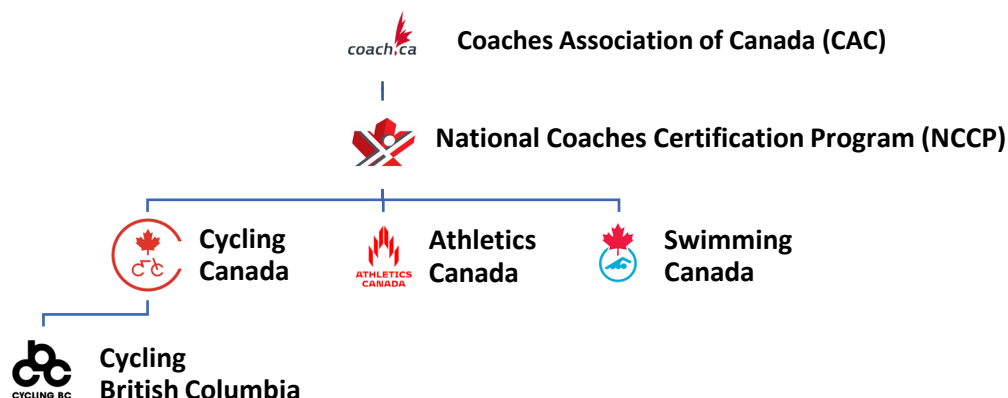
9.	Is relaxed, handles stress well	
10.	Is curious about lots of different things	
11.	Has a lot of energy	
12.	Starts arguments with others	
13.	Is a good, hard worker	
14.	Can be tense; not always easy going	
15.	Clever; thinks a lot	
16.	Makes things exciting	
17.	Forgives others easily	
18.	Isn't very organized	
19.	Worries a lot	
20.	Has a good, active imagination	
21.	Tends to be quiet	
22.	Usually trusts people	
23.	Tends to be lazy	
24.	Doesn't get upset easily; steady	
25.	Is creative and inventive	
26.	Has a good, strong personality	
27.	Can be cold and distant with others	
28.	Keeps working until things are done	
29.	Can be moody	
30.	Likes artistic and creative experiences	
31.	Is kind of shy	
32.	Kind and considerate to almost everyone	
33.	Does things quickly and carefully	
34.	Stays calm in difficult situations	
35.	Likes work that is the same every time	
36.	Is outgoing; likes to be with people	
37.	Is sometimes rude to others	
38.	Makes plans and sticks to them	
39.	Get nervous easily	
40.	Likes to think and play with ideas	
41.	Doesn't like artistic things (plays, music)	
42.	Likes to cooperate; goes along with others	
43.	Has trouble paying attention	
44.	Knows a lot about art, music, and books	
Calculate BFI44 Inventory scores by finding the mean value for each of the follow questions:		
Openness		5, 10, 15, 20, 25, 30, -35, 40, -41, 44
Conscientiousness		3, -8, 13, -18, 23, 28, 33, 38, -43
Extraversion		1, -6, 11, 16, -21, 26, -31, 36
Agreeableness		-2, 7, -12, 17, 22, -27, 32, -37, 42
Neuroticism		4, -9, 14, 19, -24, 29, -34, 39

Note: Minus symbol (-) indicates the 1-5 Likert scale value is inverted. For example, is a user selects 4/5, the answer is inverted to 2/5.

Appendix 2: Figures

Figure 1

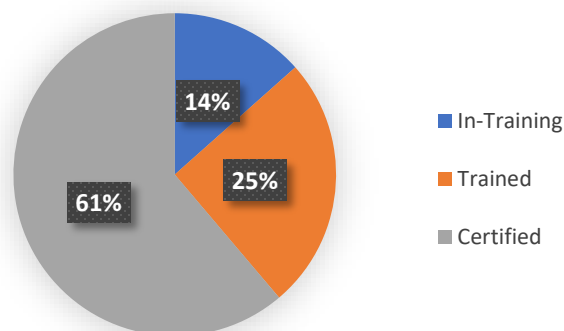
Canadian Sport Hierarchy Example



Note: The Coaches Association of Canada (CAC) facilitates and oversees the delivery of the National Coaches Certification Program (NCCP) in partnership with a variety of stakeholders, including the Government of Canada, National Sports Organizations (NSOs) (i.e., Cycling Canada), provincial sports organizations (PSOs) (i.e., Cycling BC), and provincial/territorial coaching representatives (PTCR) like British Columbia's viaSport, and partnering organizations like the Canadian Sport Institute (CSI).

Figure 2

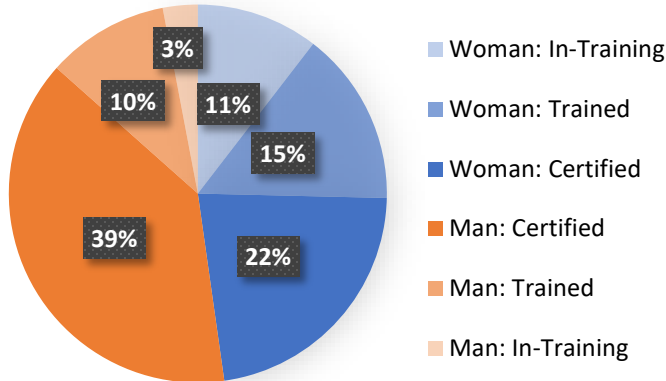
Certification Status in Sample



Note: A total of sixty-seven respondents completed the online survey, representing eleven of the sixty-five national sports. An additional forty-seven respondents started or incompletely finished the survey and were not included in the analysis. Of the sixty-seven respondents, forty-one coaches self-identified as NCCP-certified coaches (61% of the sample). An additional seventeen coaches identified as NCCP-trained coaches (25%), and nine coaches identified as coaches in-training (14%). Due to confidentiality concerns, NCCP status could not be verified by the researcher so errors may exist in the data set.

Figure 3

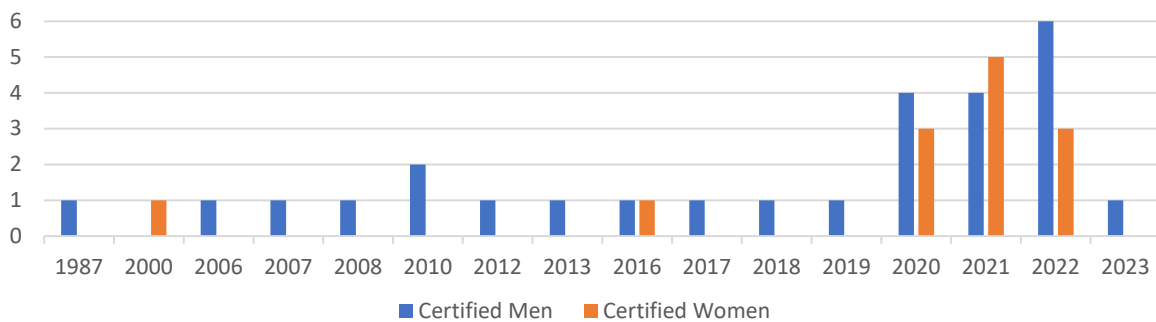
Gender Pie Chart by Certification Status



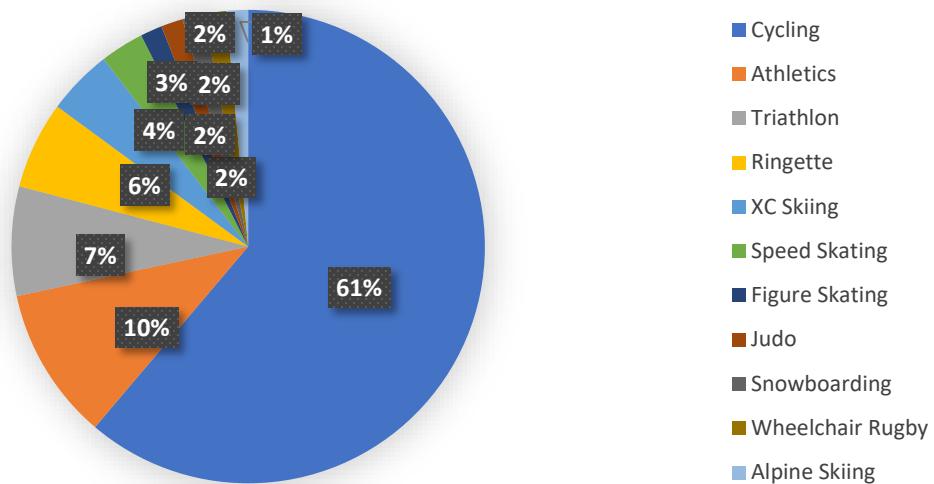
Note: The sample includes a balanced mix of both coaches who identify as men and women. Of the sixty-seven respondents, thirty-five men (52%) and thirty-two women (48%) participated. Although data from the CAC of Canada and participating NSOs to confirm gender ratios in the general coach population was unavailable, historical records Cycling BC since 2014 indicate 63% men and 38% women split across 1500 members. Therefore, the survey constitutes a greater degree of gender parity compared to existing programs. This parity is helpful when exploring statistical relationships in the data. However, analyzing certification status and certification year by gender does introduce imbalances in the dataset.

Figure 4

NCCP Certification Year in Sample



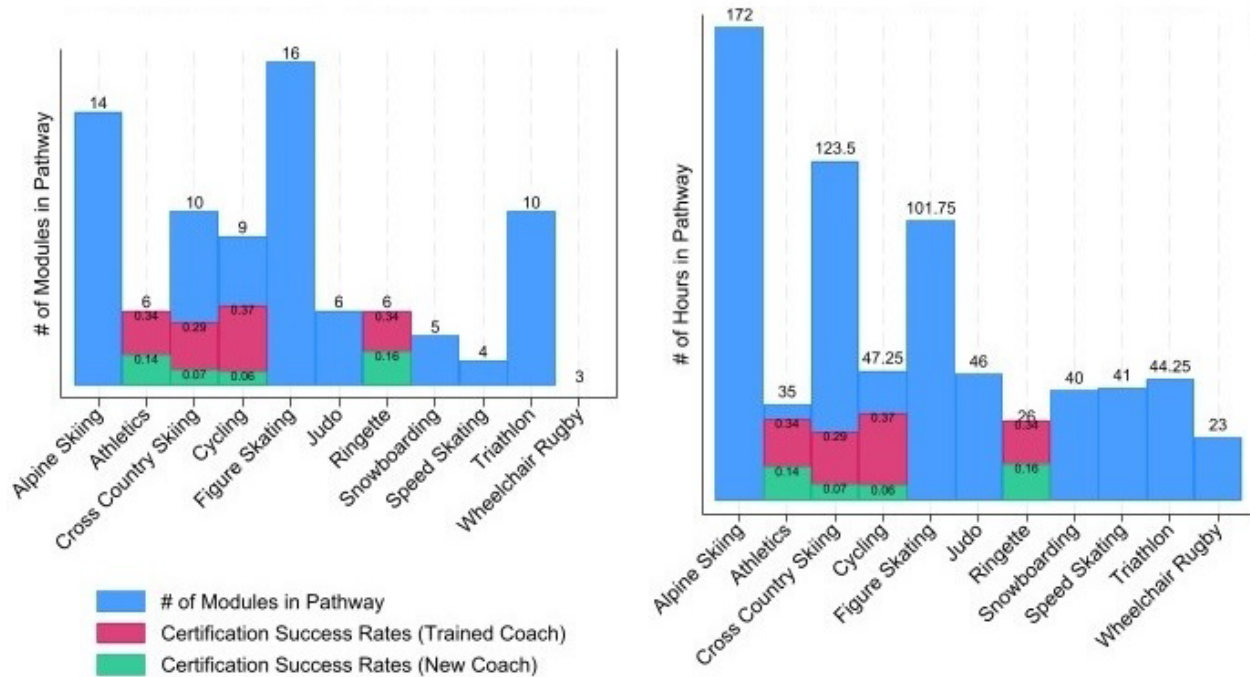
Note: The survey includes a bias distribution of certified men and women before and after the onset of blended learning. For example, the sample includes only two certified women before 2020, who achieved certification in 2000 and 2016. Conversely, twelve men achieved certified between 1987 and 2019. However, the sample exhibits good gender parity with an equal number of twelve certified men and women between 2020 and 2023. Note, only thirty-eight certified coaches disclosed a certification year. As a result, the effect of gender (man) may be inflated in the regression model.

Figure 5*Sport Representation in Sample*

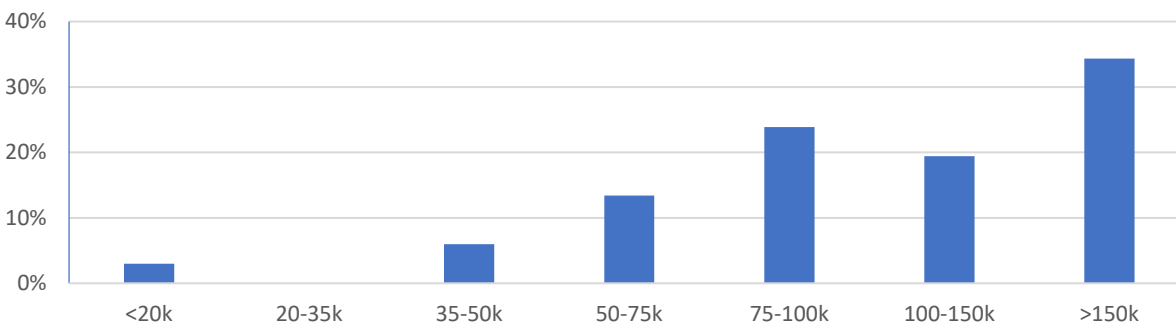
Note: The sample represents ten sports, but 62% of the sample (41 of 67) are cycling coaches. The sample also includes seven athletics coaches (11%), five triathlon coaches (8%), four ringette coaches (6%), and three cross-country (Nordic) skiing coaches (5%). Fortunately, of these top five sports represented in the sample, four NSO's partnered with the researcher and shared summative data of coach education since 2014.

Figure 6

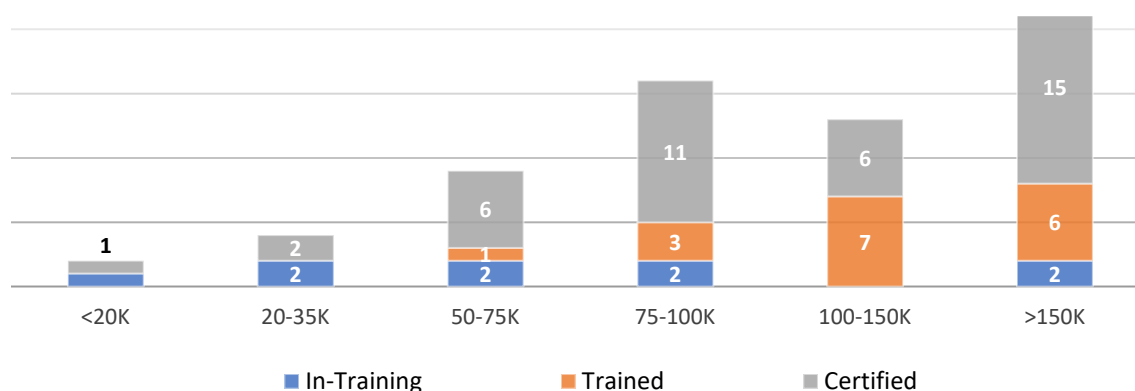
Program Length in Number of Modules and Hourly Duration



Note: This illustration depicts the number of modules in a sport's pathway (blue), and certification success rates. When comparing certification rates by the number of modules and hours in each sport's pathway, patterns surface between athletics and ringette, compared to cycling and cross-country skiing. For example, certification rates from start to finish in athletics and ringette range from 14-15% respectively and the pathway includes six modules and 26-35 hours of education. Conversely, cycling, and cross-country skiing certification rates range between 5-6% and includes 9-10 modules over 47-123 hours of education. Due to the probability of errors associated with this variable in this research, the number of modules and hours per sport should not be included in the regression model. However, it is interesting that a slight increase in certification rates appear in sports with a lower number of modules and total hours.

Figure 7*Household Income*

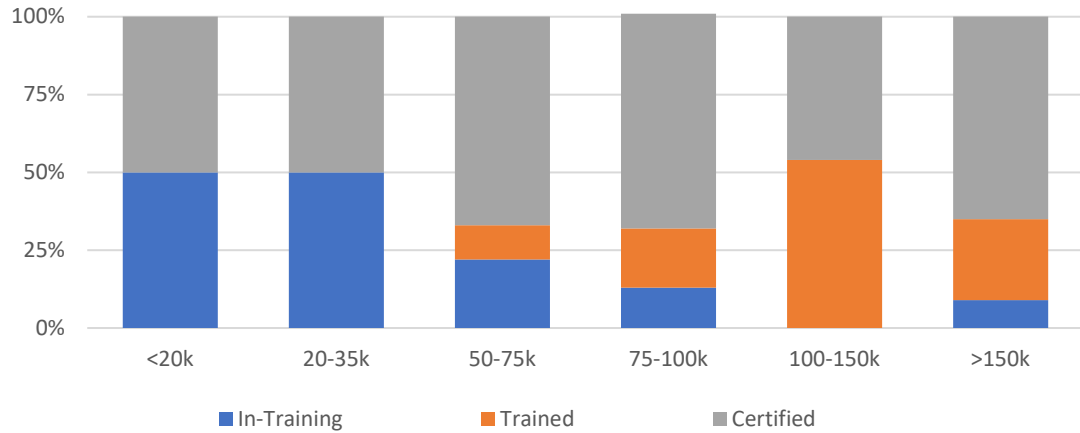
Note: To access a coach's opportunity cost associated with pursuing certification, as well as financial barriers associated with participating in learning experiences, survey respondents disclosed household income values. Opportunity cost is the value a coach forgoes when choosing to participate in NCCP learning experiences compared to alternative sources of education or activities that further their goals, including monetary compensation. For example, coaches who earn average household incomes may experience high opportunity costs associated with participating in lengthy and ineffective coach education experiences and may elect to spend their time pursuing their primary vocation. However, coaches who earn above average household incomes may be participating as volunteer coaches and therefore the opportunity cost is not associated with future monetary compensation as a coach. According to Stats Canada, the average household income in Canada was \$73,700-\$70,500.00 in 2020 and 2022 (Statistics Canada, 2022). As per above, 78% of the sample earns more than the national average.

Figure 8*Certification Status by Income*

Note: When further analyzed by NCCP status, the sample includes a higher proportion of certified coaches at higher income levels. For example, 11 of 15 coaches in the \$75,000-\$100,000 income bracket hold NCCP certification, and 15 of 23 coaches in the >\$150,000 bracket hold NCCP certification.

Figure 9

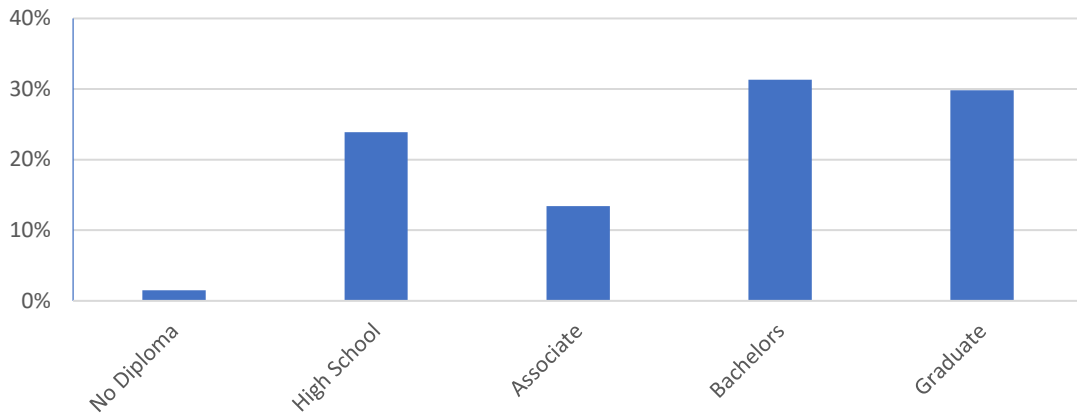
Certification by Income Quantiles



Note: Using a quantile analysis, each income bracket features a near 50% split between certified and non-certified respondents. Therefore, household income may support the regression model.

Figure 10

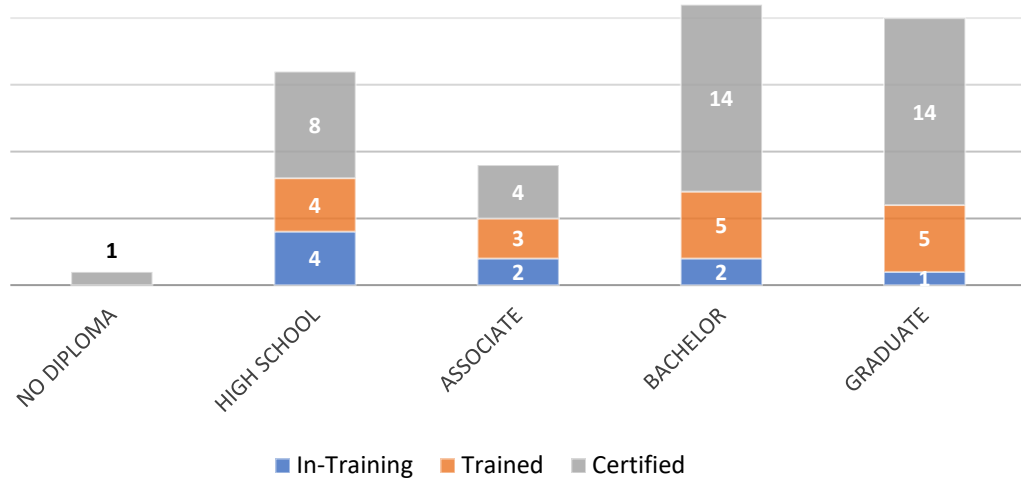
Education Quantile Sample Distribution



Note: The survey also explored education levels, ranging between high-school, post-secondary associate certificates, bachelor’s degrees, and graduate degrees (Masters or PH. D). In fact, most of the survey (61%) holds a post-secondary degree (Bachelors or Graduate). Conversely, 13% and 24% hold an associate degree and high school diploma respectively. As a result, the sample is skewed towards coaches with higher education accreditation.

Figure 11

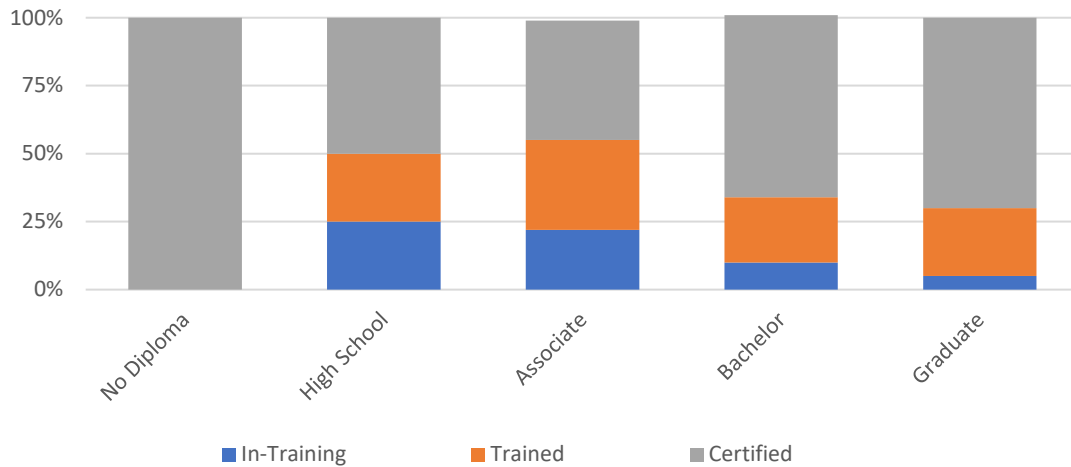
Certification by Education



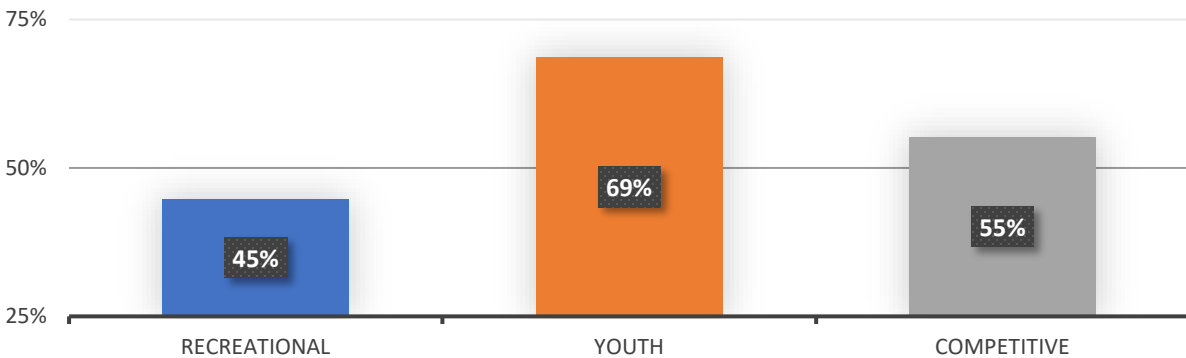
Note: When illustrated by NCCP status, each education bracket includes 3-5 trained coaches. However, the sample includes a disproportionately high number of certified coaches (14) in both the bachelor’s and graduate education brackets.

Figure 12

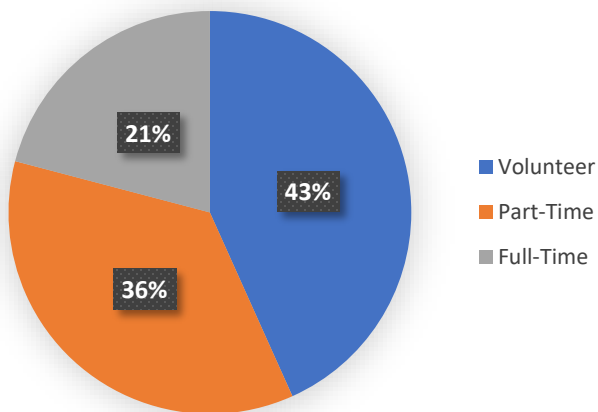
Certification by Education Quantiles



Note: Quantiles illustrate 25% of each education bracket hold NCCP trained status. Moreover, as education increases, in-training status decreases and certified status increases. Therefore, regression analysis may explore the relationship between education level and the likelihood of achieving NCCP certification.

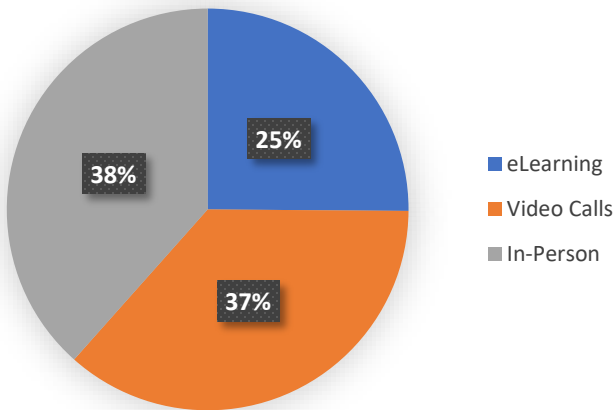
Figure 13*Athlete Type*

Note: Of the sixty-seven survey participants, most coaches in our research sample work with youth athletes (69%), creating bias in the sample. However, the sample exhibits a balance of coaches who work with competitive athletes (55%) and those who support recreational athletes (45%). Therefore, analysis of athlete type between competitive and recreational athletes can be included in the regression model.

Figure 14*Coach Type*

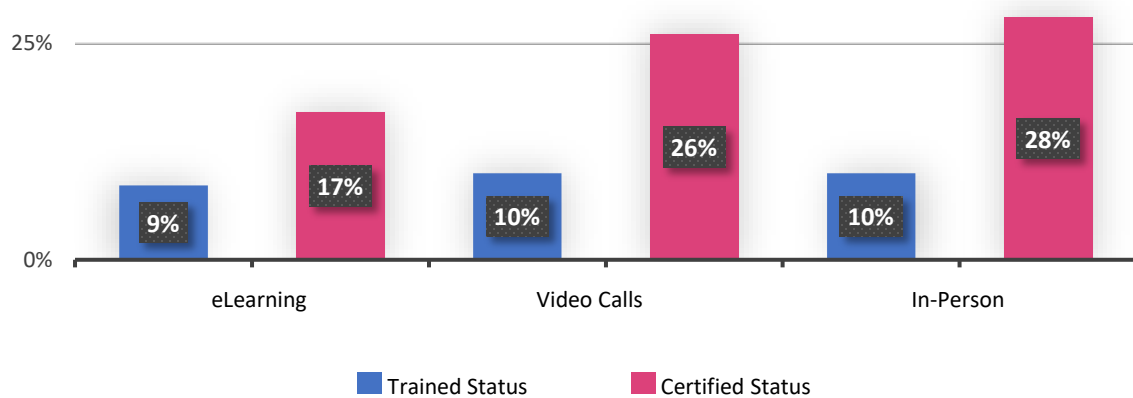
Note: The sample also includes a moderate balance between volunteer coaches (43%), part-time coaches (36%) and full-time coaches (21%), providing opportunities to use this variable in the regression model, albeit the data is slightly skewed towards volunteer coaches.

Figure 15

Preferred Learning Method

Note: The survey also explored patterns between preferred learning methods and the methods that coaches experienced, as well as textbook formats and learning styles. The sample includes a balanced representation of coaches who, if they had to choose only one learning format, preferred on-demand eLearning modules (25%), synchronous online video calls (37%), and in-person modules (38%). Since these distributions are equally distributed, this variable may be helpful as a regression model variable.

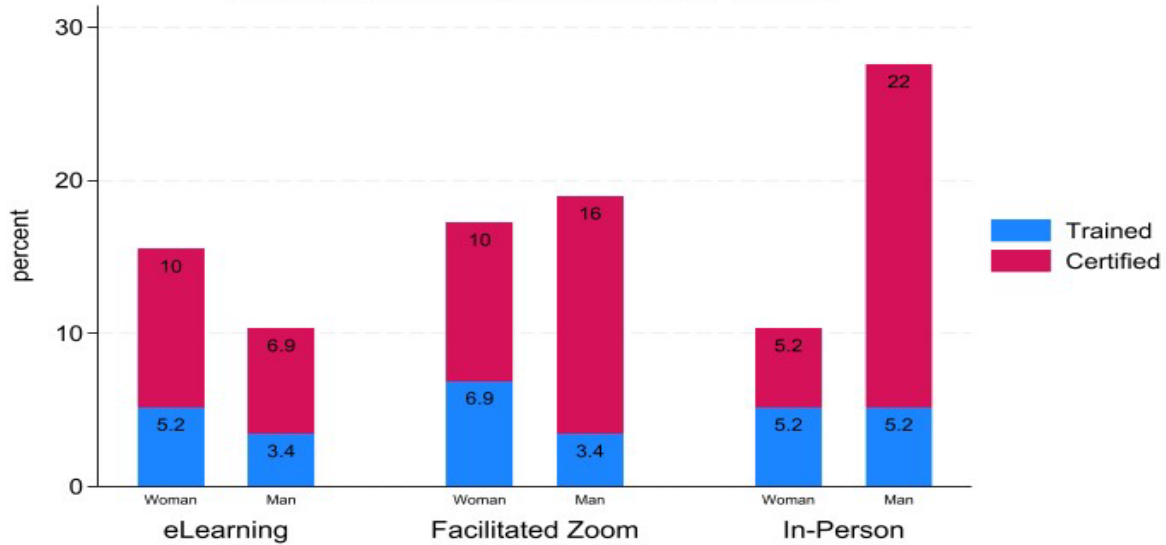
Figure 16

Preferred Learning Method by Certification Status

Note: When further analyzed by certified or trained status, the sample includes a consistent 8-10% of trained coaches across each of the three preferred learning methods. Alternatively, a greater number of certified coaches in the sample participated in synchronous deliveries, either video calls or in-person.

Figure 17

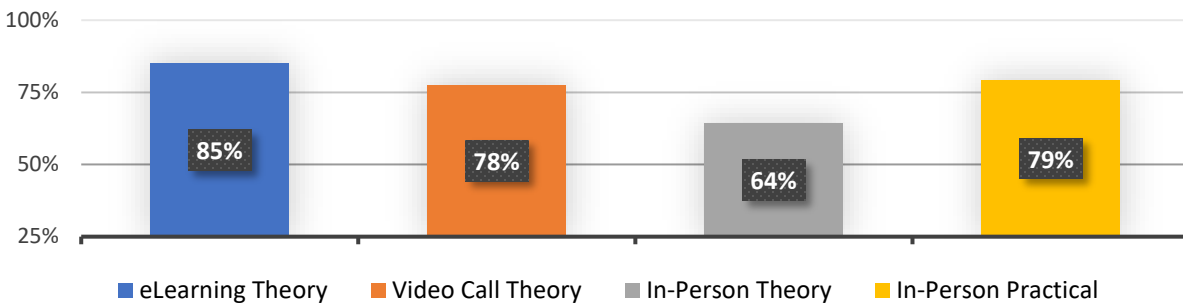
Preferred Learning Method by Certification and Gender Percentages



Note: When preferred learning method is analyzed by NCCP status and gender, the sample includes a small representation of women who prefer in-person modules. Rather, the sample includes a high-proportion of men who prefer in-person learning, exceedingly so for men with NCCP-certified. Therefore, regression analysis should not include both gender and learning method preferences due to multicollinearity.

Figure 18

Learning Method Experienced

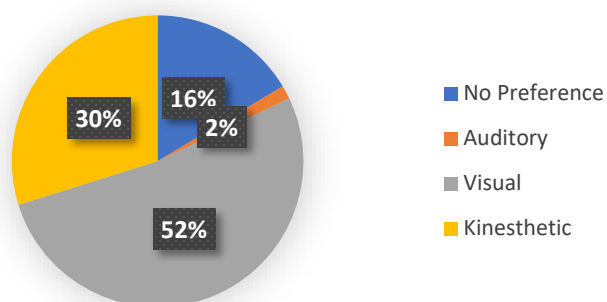


Note: Regardless of a coach’s preferred learning method, the survey indicates most respondents experienced each of the four different learning methods. For example, 85% of the respondents completed an asynchronous eLearning module, showcasing the prevalence of this modality since 2014. Moreover, 78% participated in synchronous online (ZOOM) theory modules compared to 64% who completed theory modules in face-to-face classroom settings. This 14% discrepancy, coupled with the 15% who did not complete an eLearning module, indicates that 14-15% of the sample represents insights from coaches

trained before the use of blended learning since 2014. Conversely, 79% of the sample includes respondents who participated in practical training face-to-face. Although in-person practical training is paramount in the NCCP program, the 21% of coaches who did not experience this learning method may have instead challenged their pathway, completed a Covid-19-augmented online-only program, or submitted videos demonstrating practical coaching competencies. Nonetheless, with each of the learning methods commonly experienced by respondents, these variables may be helpful during further analysis.

Figure 19

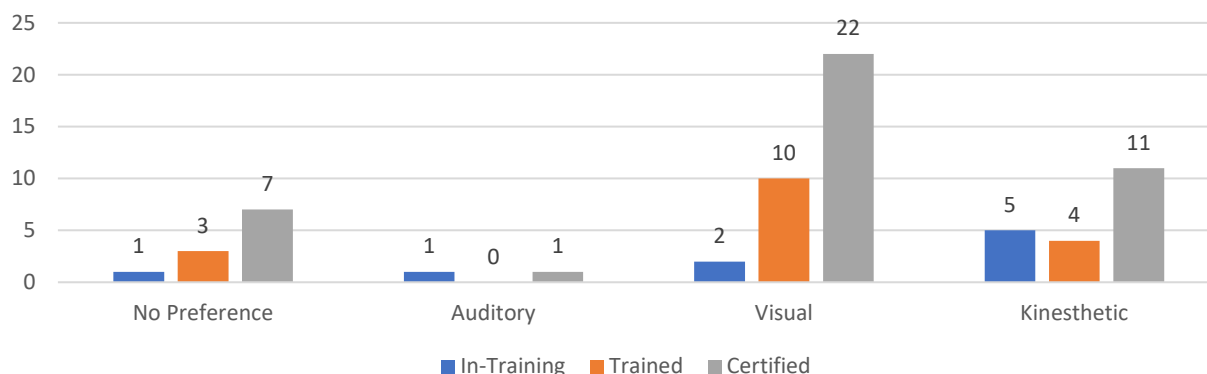
Preferred Learning Style



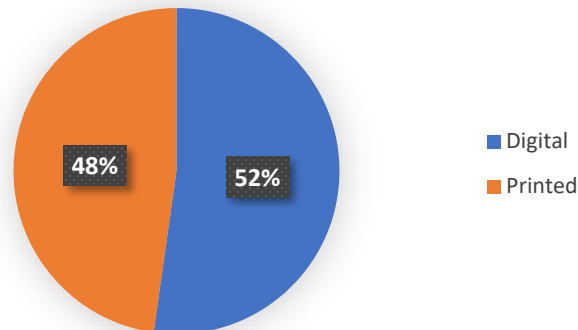
Note: 16% of the sample indicated no preferred learning style, whereas 2% identified as auditory learners, and 52% of the sample identified as visual learners. Since 30% identified as kinesthetic learners, which most closely matches a quarter of the sample, kinesthetic preferences may be helpful in the regression. Interestingly, the 16% distribution of no-preferred-style matches the work of (Prithishkumar & Michael, 2014) that showed 14% of students identify as tri-modal (VAK).

Figure 20

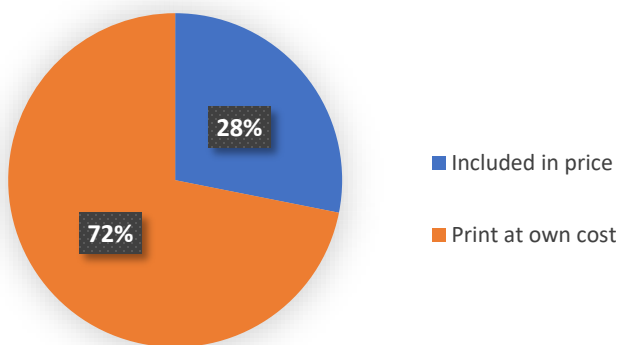
Learning Style by Status



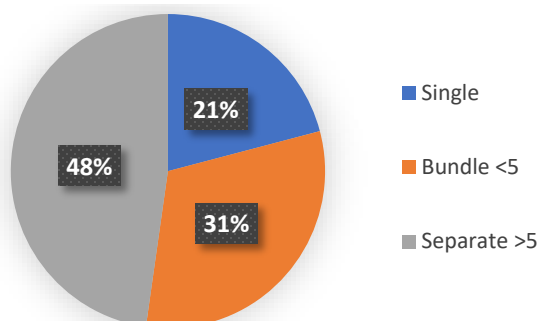
Note: When distributed by certification status, certified coaches across kinesthetic, visual, and no-preference groups are consistently twice as prevalent in the sample. Therefore, learning style can be explored in the regression model.

Figure 21*Preferred Textbook Format*

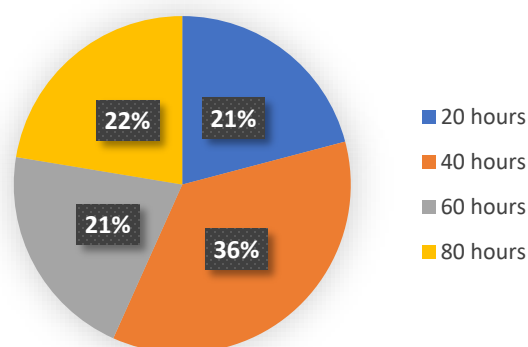
Note: Despite the prevalence of internet access in the sample (100%), a balanced preference for digital and printed textbooks exists in the sample. Thirty-five (52%) respondents prefer digital resources, whereas thirty-two (48%) prefer printed textbooks. As a result of this even split, textbook format may be considered for the regression model.

Figure 22*Preferred Textbook Availability*

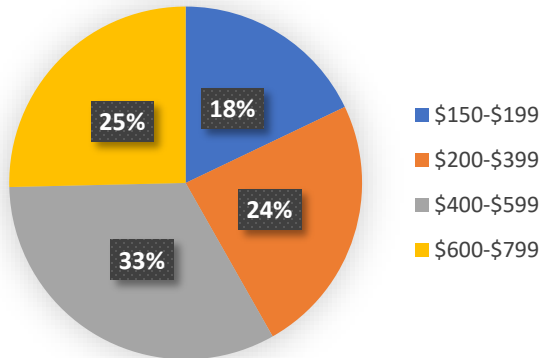
Note: As a segway to the economic factors of the research, the sample also includes an imbalanced distribution of coaches who prefer printed resources yet had to pay out-of-pocket to print the textbooks. Nine respondents (28%) received printed resources included in the course registration price, a common occurrence before 2020, whereas twenty-three (72%) of respondents received digital textbooks that they printed at home or through a printing company at their own expense to help optimize their learning experience. The effect of this additional administrative step may constitute a financial or logistical barrier for some coaches and may constitute further study.

Figure 23*Preferred Number of Transactions*

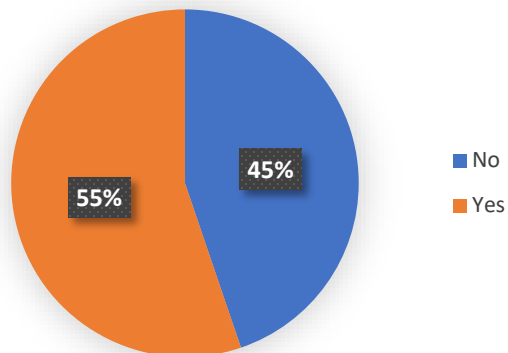
Note: The survey also explored numerous factors of the NCCP program design, including the preferred number of hours, costs, transactions. Thirty-one coaches (48%) prefer to “keep it as it is, one transaction per module, even if that means greater than 5 transactions”, and only fourteen coaches (21%) “prefer a single payment with 365 days to pursue certification.” The remainder of respondents (31%) prefer to bundle the content into sport-specific modules and reduce the number of transactions to five or less. These results were unexpected and counter the researcher’s hypothesis that the volume of transactions is a barrier to education and certification. The qualitative analysis further explores this concept and appears to be associated with the anxiety caused by an upfront payment and a looming deadline rather than the inconvenience of making transactions.

Figure 24*Preferred Hours*

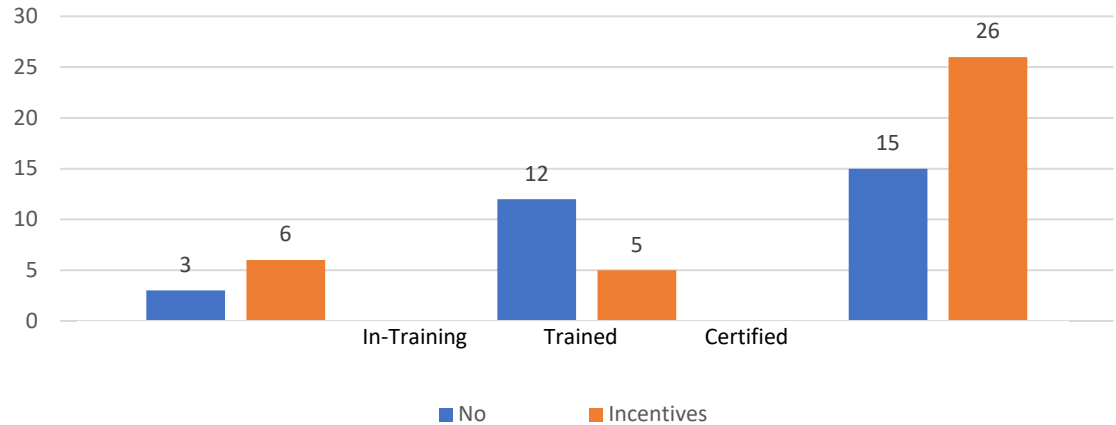
Note: Preferences for program duration were more uniformly distributed across the four survey answers. Most respondents (36%) prefer a 40-hour program length, with the remaining respondents equally split between 20 hours (21%), 60 hours (21%) and 80 hours (22%).

Figure 25*Preferred cost*

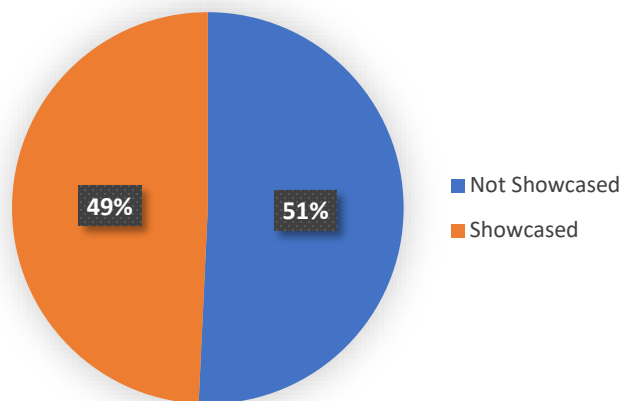
Note: Similarly, most respondents prefer a total cost of \$400-\$599. Since these values are evenly distributed across the four survey answers, this variable may be considered for regression analysis.

Figure 26*Presence of Incentives*

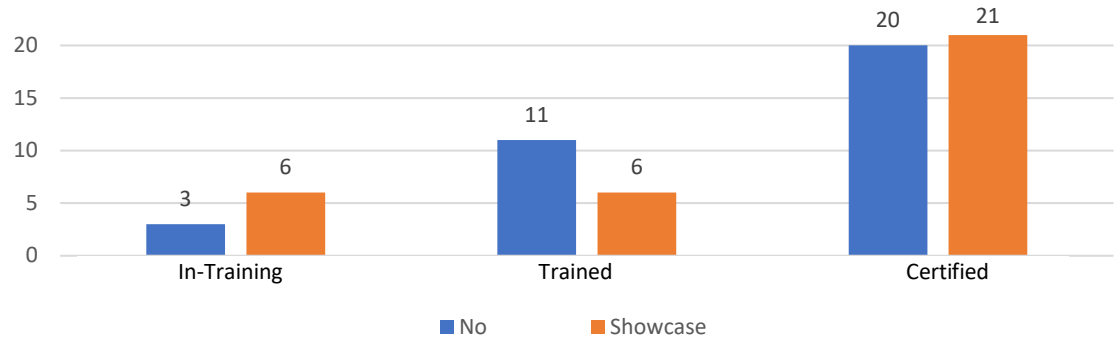
Note: The survey explored the presence of incentives, including advertising certified coaches, and a published pay scale. The survey includes an equal distribution of thirty-seven coaches (55%) who identify the presence of incentives for achieving certification exist, whereas thirty coaches (45%) responded no. Therefore, this variable may be considered for regression modeling.

Figure 27*Incentives by Certification Status*

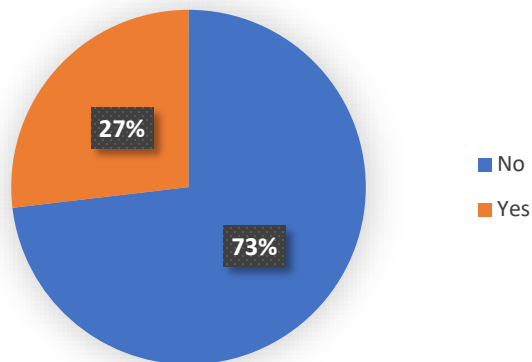
Note: When grouped by certification status, an inversion appears in the data whereby trained coaches more often disclose a lack of incentives, compared to both in-training and certified coaches. Therefore, the presence of incentives appears to be a strong variable for regression analysis.

Figure 28*Certified Coaches Showcased*

Note: To explore what coaches perceive as an incentive, the survey also asked if their sports organizations actively showcase NCCP-certified coaches on webpages, newsletters, or social media campaigns. Like before, the sample exhibits a balanced split, with 34 (49%) coaches agreeing that showcasing occurs, whereas 33 (51%) disagreed. Therefore, this variable may be used in the regression model.

Figure 29*Presence of Showcasing by Certification Status*

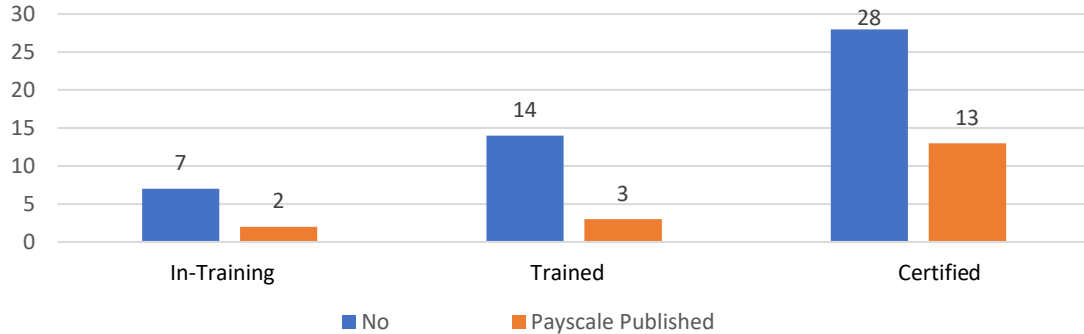
Note: When distributed by certification status, showcasing does appear to have a relationship with certified status (21) compared to in-training (6) and trained (6) status. Moreover, twice as many trained coaches indicates no showcasing (11 of 17). However, the certified sample shared an equal distribution of showcasing (21) and no showcasing (20). Therefore, it is unlikely that this variable will be helpful in the regression model given the research sample.

Figure 30*Presence of a Published Pay Scale Published*

Note: The research survey also included another proposed incentive, a published pay scale that encourages NCCP certification. A total of eighteen coaches (27%) indicated their sport published a pay scale that encourages NCCP certification, compared to forty-nine coaches (73%) that answered no. As a result, this variable is not evenly distributed and may introduce bias into the regression model if included.

Figure 31

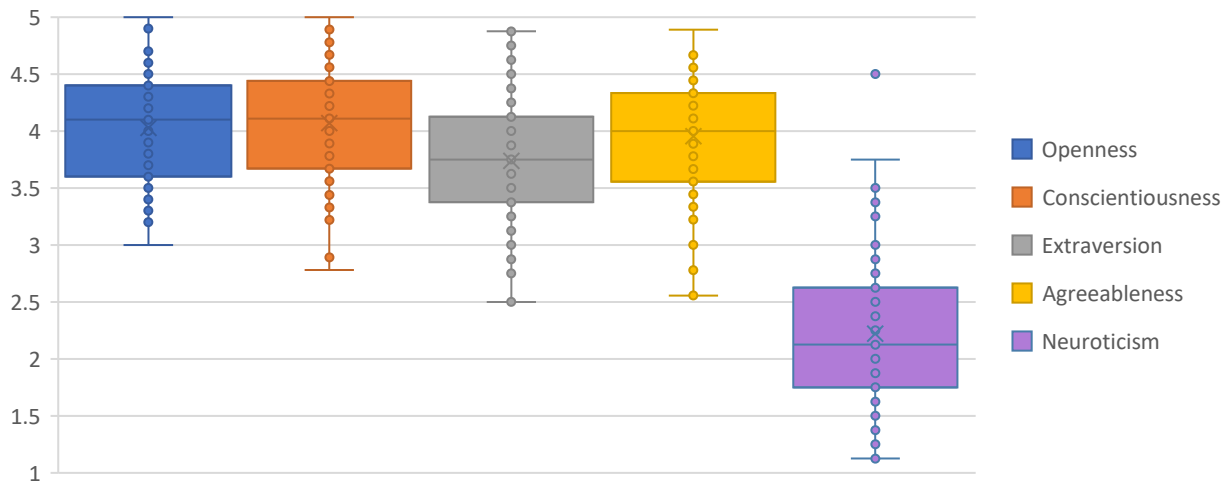
Pay Scale by Certification Status



Note: When analyzed by certification type, although published pay scales were more prevalent among certified coaches (13/18), many certified coaches indicated no published pay scale (28 of 41). Therefore, is unlikely this variable will be helpful in the regression model given this specific research sample.

Figure 32

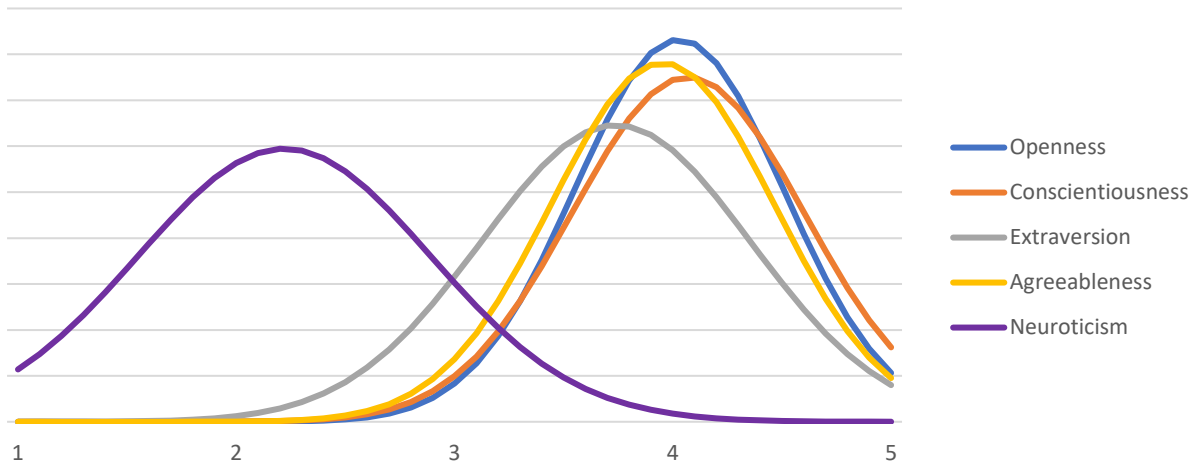
Personality Traits in Sample by Box Plot



Note: A box plot is a graphical representation that displays the distribution of a dataset through its quartiles and highlights key aspects like the median, quartiles, and potential outliers. The length of the box indicates the interquartile range (IQR), showing the variability of the middle 50% of the data, while the whiskers represent the range excluding outliers. The positions and lengths of these elements help quickly identify central tendencies, spreads, and any outliers in the data. The results of the BFI44 inventory 1-5 Likert scale results indicate the sample includes a high proportion of emotionally stable (low neuroticism) coaches, as well as higher degrees of openness, conscientiousness, extraversion, and agreeableness. This box plot indicates the range of outliers in the dataset, notably one highly neurotic coach.

Figure 33

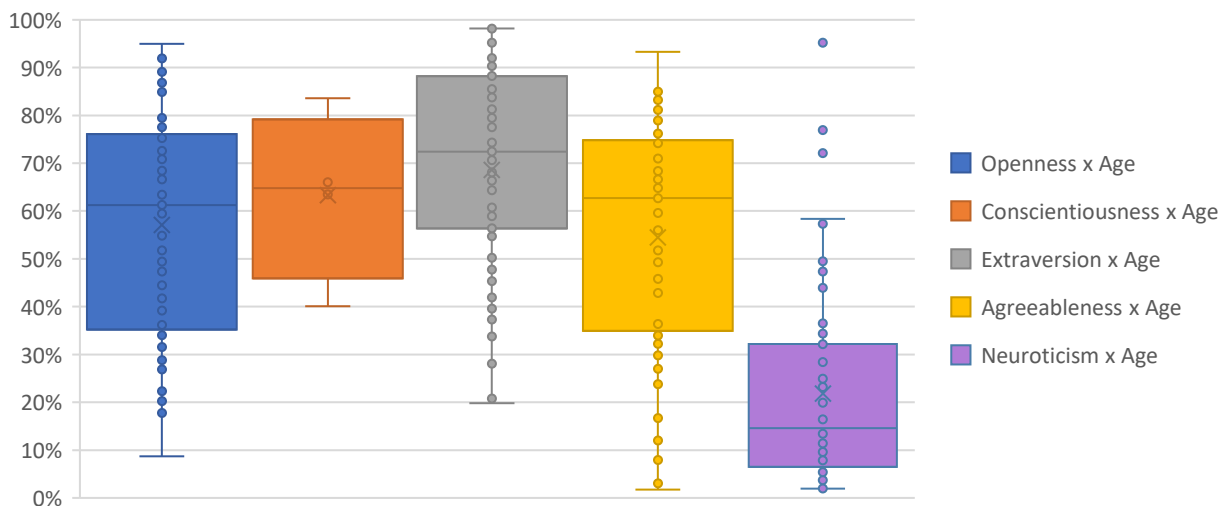
Comparison of Sample Personality Traits by Normal Distribution



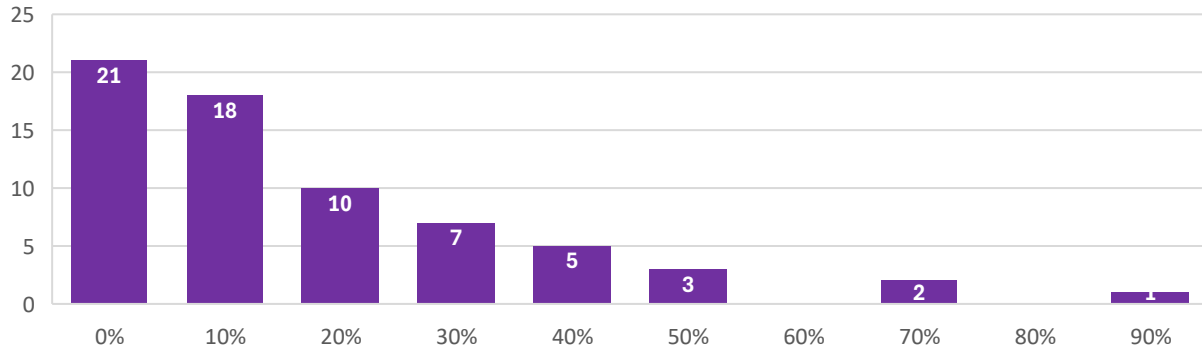
Note: Due to the normal distributions of trait extraversion and neuroticism, no transformations are recommended when using these variables in regression analysis, however, it is difficult to know if transformations may be necessary for the remaining traits.

Figure 34

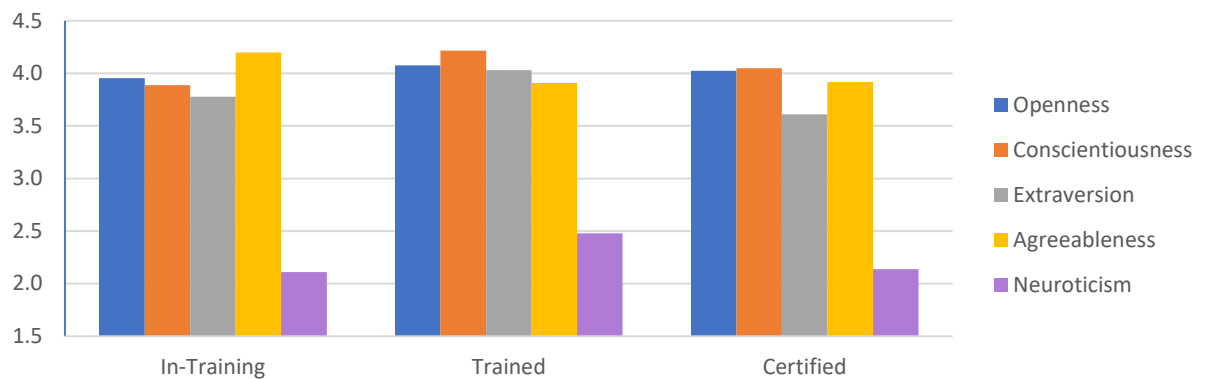
Age-Adjusted Personality Traits Percentiles in Sample by Box Plot



Note: When age-adjusted personality trait scores are calculated, the sample includes coaches higher in openness, conscientiousness, extraversion, and agreeableness compared to other adults their age. The box plot also confirms the sample includes emotionally stable coaches, albeit three respondents are highly neurotic for their age.

Figure 35*Age-Adjusted Trait Neuroticism Quantiles*

Note: Further analysis of age-adjusted trait neuroticism values indicates greater bias in the sample's age-adjusted values. For example, 39 of 67 coaches exhibit high emotional stability (1st to 19th percentile) yet three coaches express higher than the 90th percentile. Therefore, age-adjusted traits may create bias in the regression model. Rather, the regression model can use transformations or the absolute trait values for extraversion and neuroticism, as discussed earlier, because of their normal distribution.

Figure 36*Personality Trait Means by Certification Status*

Note: Matching personality trait mean scores by certification status is also a helpful way of visualizing the dataset before we move into our correlation matrix analysis. In absolute terms, trait openness, conscientiousness, extraversion, and neuroticism are greater in trained coaches compared to those in-training. This makes intuitive sense as one would expect coaches who are open to new experiences, willing to put in the work, and enjoy being around others will attend all the required education modules. However, both trait openness and conscientiousness expressed lower in certified compared to trained coaches. This is counter to the literature, whereby elevated levels of trait openness (including fluid intellect) and trait conscientiousness best forecast long-term success in household income (Vella, 2024). If these values express lower in certified coaches, it may indicate factors are present that dissuade even

the most determined and curious coaches from completing the certification process. Interestingly, trait extraversion and neuroticism both decreased in certified compared to trained coaches. This may indicate that sports are using evaluation formats do not accommodate for the extraverted nature of the coach population, or perceptions of the evaluation process are such that those who are prone to negative emotion decide to avoid evaluation altogether and remain a trained coach. As this study uses three different regression models to compare individuals in each group, this figure provides a helpful reminder that factors beyond personality may impact the pursuit of NCCP training and certification.

Figure 37

Model 1 Regression Model: NCCP Trained and In-Trained Status

Effect	Odds Ratio	SE	95% CI		p
			LL	UL	
Age	1.00	0.06	0.89	1.13	0.91
Gender ^a	5.03	8.88	0.15	160.04	0.36
Household Income ^b	3.27	1.91	1.04	10.31	0.04
Neuroticism ^c	6.32	6.85	0.75	52.83	0.08
Extraversion ^c	2.44	2.78	0.26	22.73	0.43
Full-Time Coach ^d	0.61	0.11	0.00	2.36	0.13

Note. N = 26. This binary regression model explores the effect of predictors when comparing coaches with NCCP Trained status rather than In-Training status. McFadden's R-squared = 0.4222. CI = confidence interval; LL = lower limit; UL = upper limit. ^a 1 = man, 0 = woman. ^b Self-Reported. ^c BFI44 Inventory. ^d 0 = no, 1 = yes.

Figure 38

Model 1 Post-Evaluation: Hosmer-Lemeshow Test

```

Goodness-of-fit test after logistic model
Variable: NCCP_Trained

Number of observations =    26
Number of groups =       10
Hosmer-Lemeshow chi2(8) =  14.31
Prob > chi2 = 0.0741

```

Note: The Hosmer-Lemeshow Test assesses the goodness-of-fit for logistic regression models by comparing observed and expected outcomes, with a p-value greater than 0.05 indicating that the model's predictions align well with the actual data. Equation 1 satisfies the Hosmer-Lemeshow test with a probability value of 0.0741.

Figure 39*Model 1 Post-Estimation: Confusion Matrix*

Logistic model for NCCP_Trained

Classified	True		Total
	D	~D	
+	15	2	17
-	2	7	9
Total	17	9	26

Classified + if predicted $\Pr(D) \geq .5$
 True D defined as NCCP_Trained $\neq 0$

Sensitivity	$\Pr(+ D)$	88.24%
Specificity	$\Pr(- \sim D)$	77.78%
Positive predictive value	$\Pr(D +)$	88.24%
Negative predictive value	$\Pr(\sim D -)$	77.78%
False + rate for true ~D	$\Pr(+ \sim D)$	22.22%
False - rate for true D	$\Pr(- D)$	11.76%
False + rate for classified +	$\Pr(\sim D +)$	11.76%
False - rate for classified -	$\Pr(D -)$	22.22%
Correctly classified		84.62%

Note: A confusion matrix displays actual versus predicted classifications (True Positives, False Positives, True Negatives, and False Negatives) and helps calculate post-estimation metrics including accuracy, precision, recall, and F1 score. Analysis of equation 1 indicates good model specification with an overall accuracy of 84.6%. The model correctly estimates both false positives (sensitivity/recall) and false negatives 88% of the time.

Figure 40*Model 1 Post-Estimation: Wald Test*

```
test age gender income neuroticism extraversion coach_fulltime

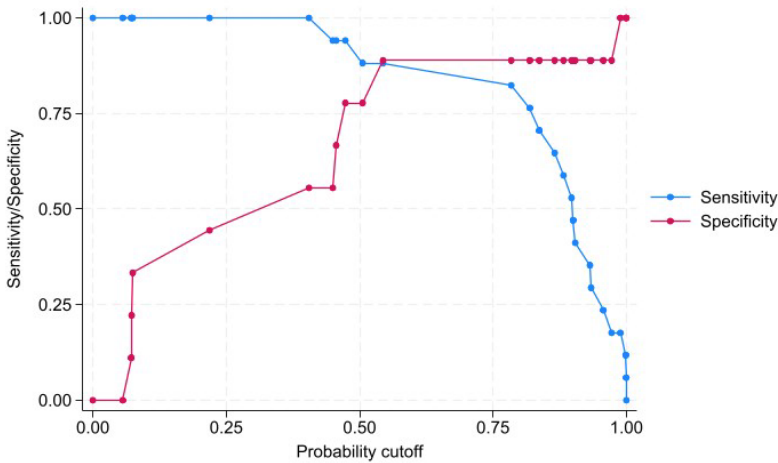
( 1) [NCCP_Trained]age = 0
( 2) [NCCP_Trained]gender = 0
( 3) [NCCP_Trained]income = 0
( 4) [NCCP_Trained]neuroticism = 0
( 5) [NCCP_Trained]extraversion = 0
( 6) [NCCP_Trained]coach_fulltime = 0

      chi2( 6) =    6.57
      Prob > chi2 =   0.3623
```


includes twice as many women (66%) as men (34%) and a mean household income is above \$100,000. Mean values of trait neuroticism and extraversion are 2.35 and 3.94, respectively. Surprisingly, the sample for equation 1 only includes two full-time coaches, thus a majority of this sample (92%) are either volunteer or part-time coaches.

Figure 43

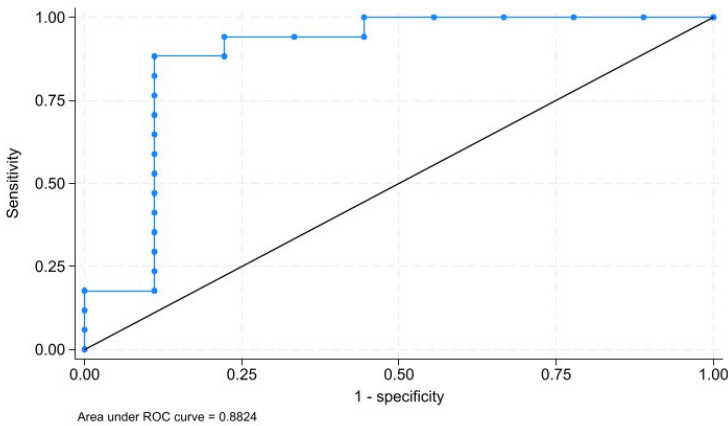
Model 1 Post-Estimation: Sensitivity vs. Specificity Graph



Note: A Sensitivity vs. Specificity Graph, or ROC curve, helps visualize the performance of a binary classifier by plotting sensitivity (true positive rate) against 1 - specificity (false positive rate) across various threshold values, where the ideal cutoff point maximizes both sensitivity and specificity, typically found near the top-left corner of the graph. The optimal cut-off point for Equation 1 is near 0.5.

Figure 44

Model 1 Post-Estimation: ROC and AUC Graph



Note: The Receiver Operating Characteristic (ROC) plots sensitivity (true positive rate) against 1 - specificity (false positive rate) at various threshold levels, where a curve closer to the top-left corner

indicates better performance. The Area Under the Curve (AUC) illustrates the discriminatory power of the equation to differentiate between the dependent variable's two classes. The AUC value for Equation 1 is 0.88, indicating strong discriminatory power to distinguish between trained and in-training individuals.

Figure 45

Model 2 Regression Model: NCCP Certified and Trained Status

Effect	Odds Ratio	SE	95% CI		p
			LL	UL	
Age	0.96	0.03	0.89	1.04	0.346
Gender ^a	2.30	1.76	0.51	10.36	0.275
Education ^b	1.62	0.60	0.78	3.37	0.189
Neuroticism ^c	0.21	0.15	0.05	0.84	0.028
Extraversion ^c	0.13	0.10	0.02	0.61	0.010
Coach Type ^d	3.85	2.46	1.09	13.51	0.035
Incentives ^e	5.22	4.18	1.08	25.08	0.039

Note. This binary regression model explores the effect of predictors when comparing coaches with NCCP Certified status rather than Trained status. N = 58. McFadden's R-squared = 0.3554.

CI = confidence interval; LL = lower limit; UL = upper limit. ^a 1 = man, 0 = woman. ^b 0 = no high school, 1 = high school diploma, 2 = associate diploma, 3 = bachelor's degree, 4 = graduate degree. ^c BFI44 Inventory. ^d 1 = volunteer, 2 = part-time coach, 3 = full-time coach. ^e 0 = no incentives present, 1 = incentives present.

Figure 46

Model 2 Post-Evaluation: Hosmer-Lemeshow Test

Goodness-of-fit test after logistic model

Variable: **NCCP_Certified**

Number of observations = **58**
 Number of groups = **10**
 Hosmer-Lemeshow chi2(8) = **7.25**
 Prob > chi2 = **0.5104**

Note: The Hosmer-Lemeshow Test assesses the goodness-of-fit for logistic regression models by comparing observed and expected outcomes, with a p-value greater than 0.05 indicating that the model's predictions align well with the actual data. Equation 2 satisfies the Hosmer-Lemeshow test with a probability value of 0.5104.

Figure 47*Model 2 Post-Estimation: Confusion Matrix*

Logistic model for NCCP_Certified

Classified	True		Total
	D	~D	
+	36	7	43
-	5	10	15
Total	41	17	58

Classified + if predicted $\Pr(D) \geq .5$
 True D defined as NCCP_Certified $\neq 0$

Sensitivity	$\Pr(+ D)$	87.80%
Specificity	$\Pr(- \sim D)$	58.82%
Positive predictive value	$\Pr(D +)$	83.72%
Negative predictive value	$\Pr(\sim D -)$	66.67%
False + rate for true ~D	$\Pr(+ \sim D)$	41.18%
False - rate for true D	$\Pr(- D)$	12.20%
False + rate for classified +	$\Pr(\sim D +)$	16.28%
False - rate for classified -	$\Pr(D -)$	33.33%
Correctly classified		79.31%

Note: Post-estimation analysis of Equation 2 indicates high sensitivity (87.5%) and precision (83.7%) values, but low specificity (58.2%) and negative predictive values (66.7%).

Figure 48*Model 2 Post-Estimation: Wald Test*

```
test age gender education neuroticism extraversion coachtype incentives
```

```
( 1) [NCCP_Certified]age = 0
( 2) [NCCP_Certified]gender = 0
( 3) [NCCP_Certified]education = 0
( 4) [NCCP_Certified]neuroticism = 0
( 5) [NCCP_Certified]extraversion = 0
( 6) [NCCP_Certified]coachtype = 0
( 7) [NCCP_Certified]incentives = 0
```

```
chi2( 7) = 12.17
Prob > chi2 = 0.0950
```

Note: Wald test returned a non-significant result ($p = 0.09$) due to the small sample size, meaning we cannot reject the null hypothesis that the log-odds of predictor variables differ significantly from zero.

Figure 51

Model 2 Post-Estimation: Sensitivity vs. Specificity Graph

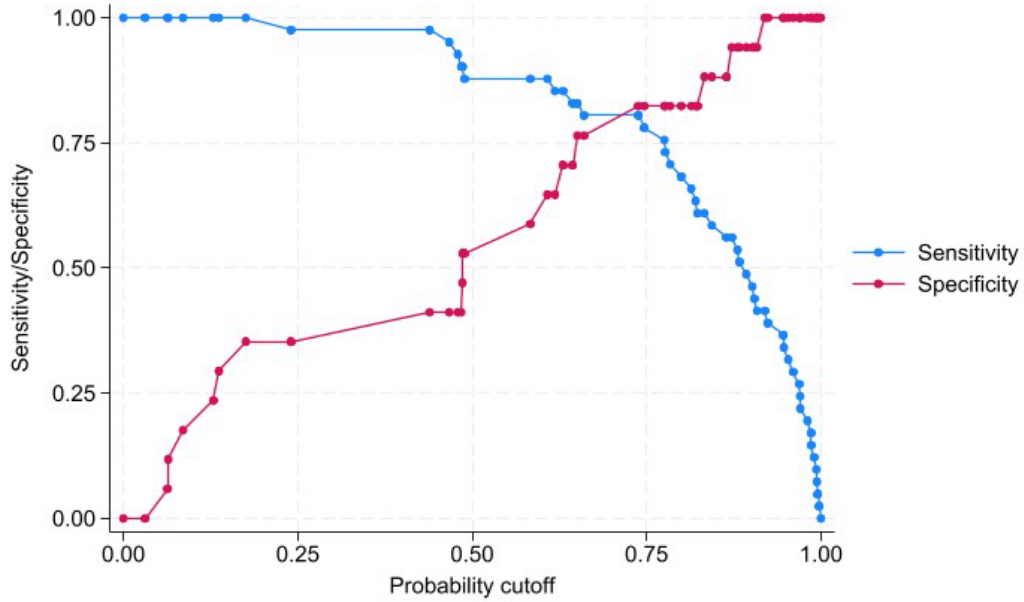
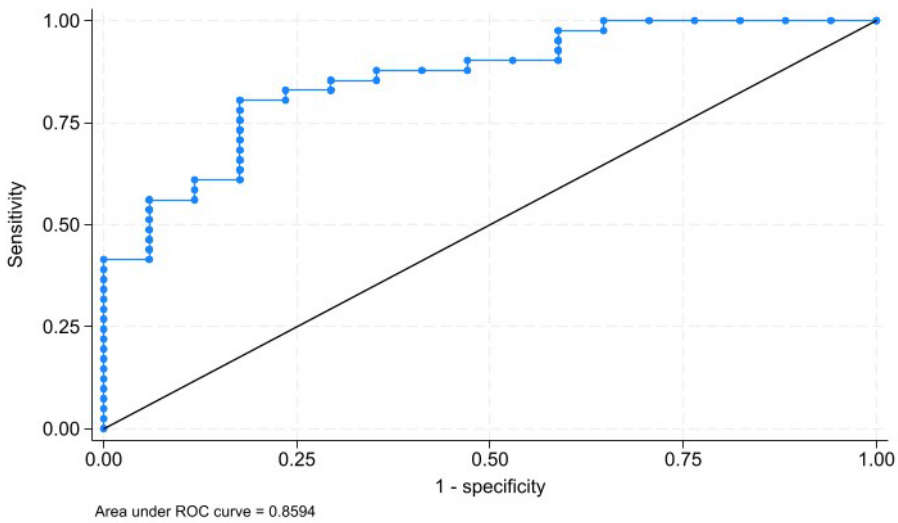


Figure 52

Model 2 Post-Estimation: ROC and AUC Graph



Note: The AUC value for Equation 2 is 0.8594, indicating strong discriminatory power to distinguish between certified and trained individuals.

Figure 53

Model 3 Regression Model: NCCP Certified, Trained, and In-Training Status

<i>Effect</i>	<i>Odds Ratio</i>	<i>SE</i>	<i>95% CI</i>		<i>p</i>
			<i>LL</i>	<i>UL</i>	
Age	1.01	0.02	0.96	1.06	0.620
Gender ^a	3.69	2.13	1.19	2.95	0.024
Education ^b	1.74	0.46	1.03	2.95	0.037
Neuroticism ^c	0.60	0.25	0.26	1.36	0.223
Extraversion ^c	0.32	0.16	0.12	0.87	0.026
Coach Type ^d	2.22	0.92	0.98	5.00	0.054
Incentives ^e	1.55	0.92	0.48	5.00	0.458
Prefer Kinesthetic Learning ^f	0.26	0.17	0.07	0.95	0.043

Note. This multi-nominal logistic regression model explores the effect of predictors when comparing coaches with NCCP Certified status, Trained status, and In-Training status. N = 67. McFadden's R-squared = 0.1950

CI = confidence interval; LL = lower limit; UL = upper limit. ^a 1 = man, 0 = woman. ^b 0 = no high school, 1 = high school diploma, 2 = associate diploma, 3 = bachelor's degree, 4 = graduate degree. ^c BFI44 Inventory. ^d 1 = volunteer, 2 = part-time coach, 3 = full-time coach. ^e 0 = no incentives present, 1 = incentives present. ^f 0 = other, 1 = prefer kinesthetic learning.

Figure 54

Model 3 Post-Estimation: Wald Test

```
( 1) [NCCP_Status]age = 0
( 2) [NCCP_Status]gender = 0
( 3) [NCCP_Status]education = 0
( 4) [NCCP_Status]neuroticism = 0
( 5) [NCCP_Status]extraversion = 0
( 6) [NCCP_Status]coachtype = 0
( 7) [NCCP_Status]incentives = 0
( 8) [NCCP_Status]pref_kinesthetic = 0
```

```
chi2( 8) = 18.16
Prob > chi2 = 0.0200
```

Note: Due to a larger sample size, the Wald test returned a significant result ($p = 0.02$) due to a larger, rejecting the null hypothesis that the coefficients are not significantly different from zero.

Figure 57

Model 3 Post-Estimation: Margins

	Delta-method				[95% conf. interval]	
	Margin	std. err.	z	P> z		
_predict						
1	.1319913	.0366633	3.60	0.000	.0601325	.20385
2	.2472653	.0501255	4.93	0.000	.149021	.3455095
3	.6207435	.0501712	12.37	0.000	.5224097	.7190772

Figure 58

Model 3 Post-Estimation: Margins Plot

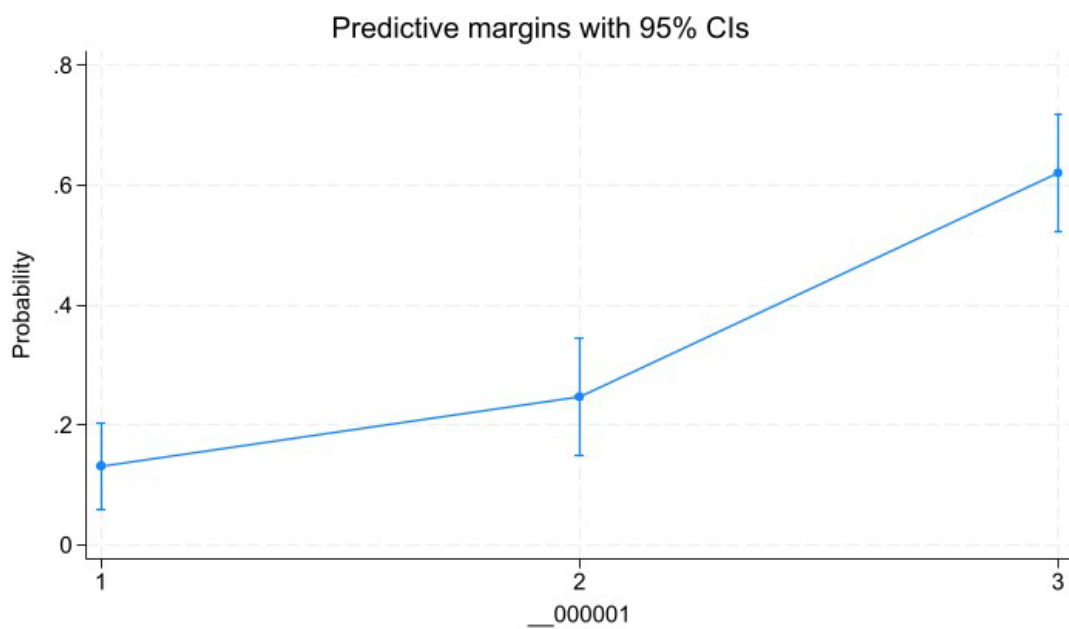
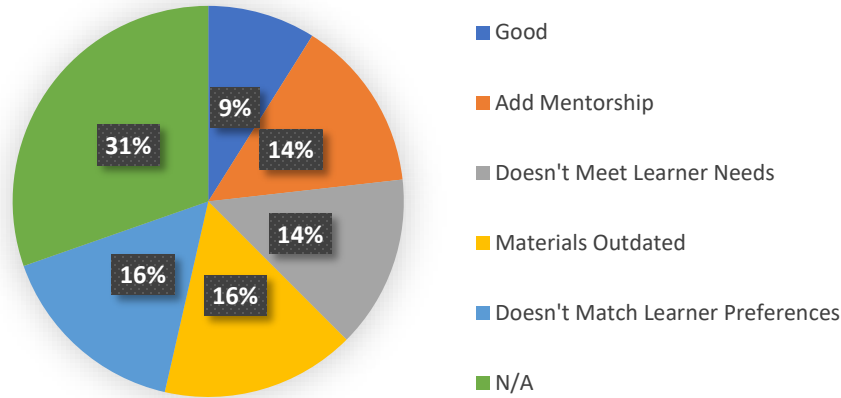


Figure 59

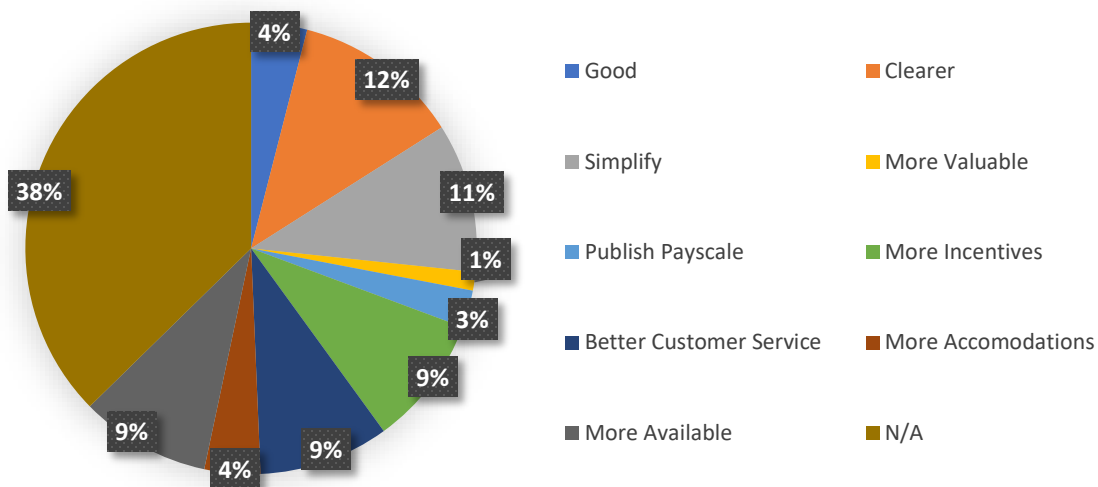
Appreciation for Coaches as a Learner – Pie Chart



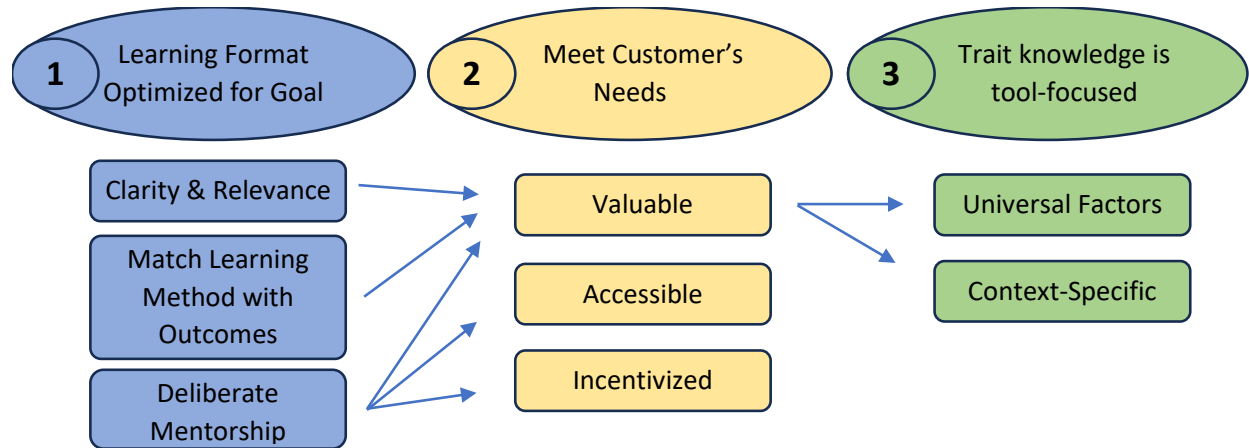
Note: When asked “what would you change if you could update your sport's NCCP Comp-Intro pathway with a greater appreciation for you as a learner? (to be more accommodating, to remove common barriers, etc.),” 31% did not respond and 9% indicated approval with the current design. However, 14% requested the addition of mentorship, 14% stated learner needs are not met, 16% stated learner preferences are not matched, and 14% called for updated materials.

Figure 60

Appreciation for Coaches as a Customer – Pie Chart



Note: When asked how the program can better match their needs as a customer, rather than a learner, answers were more diverse. Thirty-eight percent did not respond and 4% were happy with their experience. However, 12% requested clearer pathways and information, 11% requested simplicity, 9% more incentives, 9% better customer service, 9% more available, 4% more accommodations, 3% a published pay scale, and 1% more value.

Figure 61*Emerging Themes and Sub-Themes*

Note: The thematic analysis of interview participants took place over numerous steps, including initial coding by-hand, and further categorization during the writing and editing process. In summary, three key themes emerged for each distinct aspect of this research. As illustrated above, the interview discussions and analysis provide additional context to the quantitative results, identifying learner and customer needs that may improve the likelihood of achieving NCCP certification. For example, updating the learning experience with deliberate mentorship, matching learning outcomes with teaching methods, and ensuring content is clear and relevant surfaced as the key themes. Incentivizing certification, making the program accessible, and building value through consistency and acknowledgement of work experience are important themes to support the customer experience. Conversely, discussing personality traits contributed to the identification of universal and context-specific coach traits, encouraging the addition of this knowledge into NCCP programs yet framing the information as optional tools rather than requirements for success. The following figure illustrates the codes established during the writing process and finalized during editing, providing an outline of Chapter 5.

Figure 62

Summary of Thematic Analysis Themes & Sub-Themes

Themes & Subthemes	Codes
1.0 - Learning format optimized for goal	
1.1 - Clarity & Relevance	Program is Helpful Avoid Overwhelming Clear goal for each module Teach to exam templates Match LTAD phase
1.2 - Match Learning Outcomes with Methods	Benefits of eLearning & learning prep Professional Knowledge Interpersonal Knowledge Intrapersonal Knowledge High-Quality Resources Role-Modeling by Learning Facilitators
1.3 - Deliberate Mentorship	Leverage Existing Evaluation Criteria Required or optional? Barriers and Duration
2.0 - Needs of the coaches in-training are met	
2.1 - Valuable	Task/Problem-based Quality and Integrity Familiarity Quantifying Work Experience Building Value
2.2 - Accessible	Simple Language Ease of Use Accommodations
2.3 - Incentivized	Regulation and Policy Pricing
3.0 - Personality trait knowledge is framed as a tool	
3.1 - Universal factors of coach personality	What is a coach's role? Openness (Interest in Learning) Neuroticism (Sense of self) Agreeableness (Emotional Capital)
3.2 - Contextual differences in coach personality	Agreeableness Conscientious Extraversion Personality changes Tool-based Traits, not fates (professional development)

Appendix 3: Tables

Table 1

Example of Coach Education Streams by Sport

<i>Sport</i>	<i>Community</i>	<i>Competition</i>	<i>Instruction</i>
Alpine Skiing		√	√
Cycling	√	√	
Hockey	√	√	√

Note: Each sport may decide to develop two of three streams: community, competition, or instruction. Hockey is a unique sport in that it has developed educational programs for all three streams. Other sports develop streams by sport size, funding, and need.

Table 2

Completion rates by sport

<i>Sport</i>	<i># Coaches since 2014</i>	<i>Achieve Trained</i>	<i>Convert to Certified</i>	<i>Complete Pathway</i>	<i>% of Sample</i>	<i>% of Certified Pop.</i>
Athletics	2014	31%	34%	14%	11%	1.7%
XC Skiing - L2T	1312	12%	31%	5%	5%	2.7%
Cycling	1323	11%	37%	6%	62%	28.2%
Ringette	9740	35%	34%	15%	6%	0.1%

Note: Records from Athletics Canada, Nordic Canada, Cycling Canada, and Ringette Canada indicate 14,389 coaches have participated in coach education since 2014 and between 5-15% of coaches achieve certification. Although participation rates (i.e., achieving trained status) are higher, ranging from 11-36%, conversion rates from trained to certified status are interestingly similar, ranging from 31-36%. This may indicate universal challenges associated with achieving certified status, whereas more sport-specific factors may impact achieving trained. The table also illustrates the number of certified coaches in the sample compared to each sport's population of certified coaches. For example, of the forty-one cycling coaches participating in the research (62% of the sample), twenty-eight identify as certified. Since a total of eighty-five cycling coaches have achieved certified status since 2014, the research sample represents 28.2% of the recently certified population in cycling.

Table 3*Comparing Learning Environment Distribution by Hours*

Sports	F2F %	Online %	Offline %
Alpine Skiing	55%	42%	2%
Athletics	69%	0%	31%
Cross Country Skiing	79%	11%	11%
Cycling	34%	47%	20%
Figure Skating	8%	51%	10%
Judo	26%	61%	13%
Ringette	62%	0%	38%
Snowboard	60%	25%	15%
Speed Skating	5%	78%	17%
Triathlon	41%	53%	7%
Wheelchair Rugby	9%	87%	4%
Asghar et al. (2022) Recommendations	62%	20%	17%

Note: The total hours of each sports pathway were calculated and categorized as either face-to-face (F2), online (video calls), or offline (home-study or eLearning) using publicly available information. In comparison to the recommendations by Asghar et al. (2022), the sport of snowboarding features the closest ratio, with 60% F2F, 25% online, and 15% offline.

Table 4*Age Demographics in Sample*

	Mean	Std. Error	Std. Dev	Min	Max	N
Year of Birth	1975.33	1.46	11.97	1952	2004	67
Age	47.67	1.46	11.97	19	71	67
Age When certified	43.82	2.11	12.98	20	68	38
Certification Year	2017.13	1.22	7.54	1987	2023	38
Years Since Certification	5.87	1.22	7.54	0	36	38

Note: The survey sample includes coaches ranging from 19 to 71 years of age, with a sample mean of 47.7 years. This information supports the use of the adult learning theory by NCCP instructional designers. Of the forty-one self-identified certified coaches, thirty-eight disclosed a certification year. This variable helped the researcher determine coaches achieved certification between 20 to 68 years of age, with a sample mean of 43.8 years old. More broadly, the sample includes insights from coaches who achieved certification between 1987 to 2023, with a sample mean of 2017. Yet, as illustrated by Figure 4, the data

is skewed towards recently certified coaches, with 24 of 38 survey participants achieving certification between 2020 and 2023. Therefore, the data set provides insights from learners before and during the widespread implementation of blended learning during the covid-19 pandemic.

Table 5

Gender Totals by Certification Status

	<i>In-Training</i>	<i>Trained</i>	<i>Certified</i>	<i>Total</i>
Women	7	10	15	32
Men	2	7	26	35
Total	9	17	41	67

Note: The sample includes a greater number of women with in-training and trained status compared to a greater number of men with certified status. Therefore, the impact of gender on certification status is skewed towards men in the regression analysis. Figure 4 also illustrates this phenomenon.

Table 6

Summation of Certified Coaches in Sample by Gender and Pre-post

	<i>1987-2019</i>	<i>2020-2023</i>	<i>Total</i>
Women	3	12	14
Men	11	12	24

Note: The sample includes a significant difference between the number of women and men who achieved certification before the widespread adoption of blended learning in 2020. Of the thirty-eight certified coaches who disclosed a certification year, an equal number of men and women achieved certification between 2020-2023, but four times as many men achieved certification between 1987 and 2019. When exploring the effect of gender on certification rates, as well as the presence of confounding or proxy variables associated with learning preferences, resources, and program design, acknowledging this bias in the sample is important. According to Skelly et al. (2012), a proxy variable is a variable that itself is not directly relevant but serves in place of an unobserved or difficult to measure variable whereas, confounding variables are present if there is a moderate or high correlation between two independent variables. The latter is undesirable in a regression equation since the effect and significance of both variables will lead to inaccurate conclusions from the equation (Skelly et al., 2012). In the presence of confounding variables, it is best to drop the least representative variable from the equation and instead highlight its correlation in the discussion (Skelly et al., 2012).

Table 7*Program Duration by Sport*

<i>Variable</i>	<i>Mean</i>	<i>Std. Error</i>	<i>Std. Dev.</i>	<i>Min</i>	<i>Max</i>	<i>N</i>
# of Modules Complete	6.46	0.38	3.09	1	16	67
# of Modules per Sport	8.67	0.23	1.92	3	16	67
Total Hours by Sport	48.03	2.35	19.21	23	123.5	67

Note: Coaches self-identified as completing an average total of 6.5 modules against an average of 8.7 modules per pathway. Although this data cannot be verified due to privacy concerns, a support document was provided to survey participants to help clarify the number of modules currently in their education pathway. Nonetheless, 33% of the forty-one certified coaches claimed to complete a different number of modules than exist in their pathway, and on average this discrepancy amounted to completing only 47% of the actual number of modules in their sport's pathway. This indicates that the number of modules in the Comp-Intro pathway has increased in recent years, or participants are unclear about the number of modules on their sport's pathway. Therefore, future research should incorporate logic into survey questions whereby the number of modules in each sport changes according to the year in which training and certification occurred.

Table 8*Descriptive Statistics of Personality Traits in Sample*

<i>Variable</i>	<i>Mean</i>	<i>se(mean)</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>N</i>
Openness	4.03	0.06	0.48	3.00	5.00	67
Conscientiousness	4.07	0.06	0.53	2.78	5.00	67
Extraversion	3.74	0.08	0.62	2.50	4.88	67
Agreeableness	3.95	0.06	0.51	2.56	4.89	67
Neuroticism	2.22	0.08	0.67	1.13	4.50	67

Note: To control for the impacts of personality traits, survey participants completed the BFI44 inventory using a 1-5 Likert scale assessment. Mean scores ranged closely between 3.74-4.07 for most traits. The researcher expected such a relationship as one may hypothesize sports coaches working at the club level are more likely high in openness, conscientiousness, extraversion, and agreeableness compared to the general population. Similarly, mean scores for neuroticism (2.22) were also lower than the population average indicating a high degree of emotional stability in the sample. Similar patterns also appeared in the range of minimum and maximum scores. The sample includes a 2.0-2.3 range across all traits, with the range for trait neuroticism extending to 2.5 units, excluding one outlier. Trait extraversion and neuroticism most closely match a normal distribution, with standard deviations of 0.62 and 0.67 respectively, and can be used in the regression model. Conversely, trait openness, conscientiousness, and agreeableness exhibit more positive kurtosis, or leptokurtosis whereby standard deviations are 0.48, 0.53,

and 0.51, respectively. According to Westfall (2014), positive kurtosis is most often associated with outliers in the dataset.

Table 9

Descriptive Statistics of Age-Adjusted Personality Trait Percentiles in Sample

<i>Variable</i>	<i>Mean</i>	<i>se(mean)</i>	<i>SD</i>	<i>Min</i>	<i>Max</i>	<i>N</i>
Openness-Age-Adjusted	0.57	0.03	0.23	0.09	0.95	67
Conscientiousness Age Adjusted	0.63	0.03	0.24	0.15	0.95	67
Extraversion-Age-Adjusted	0.69	0.03	0.22	0.20	0.98	67
Agreeableness-Age-Adjusted	0.54	0.03	0.24	0.02	0.93	67
Neuroticism-Age-Adjusted	0.22	0.02	0.20	0.02	0.95	67

Note: Age-adjusted personality trait scores illustrate additional insights. For example, mean age-adjusted trait openness of the sample ranks in the 57th percentile, so on average, the sample includes coaches who are slightly more open than similarly aged individuals in the general population. Conversely, trait neuroticism and extraversion rank in the 22nd and 69th percentile respectively, indicating that our sample includes coaches who are more emotionally stable and positively extraverted compared to similarly aged individuals in the general population.

Table 10

Correlation Matix: NCCP Status by Numerous Predictive Variables

	<i>In-Training-D</i>	<i>Trained-D</i>	<i>Certified-D</i>
Gender	-0.237	-0.129	+0.28
Income	-0.315	+0.219	
Coach Competitive Athletes [Dummy]			+0.330
Coach Recreational Athletes [Dummy]	+0.349		
Coach Full-Time [Dummy]			+0.259
Printed Textbook Included [Dummy]			+0.411
Willingness to pay extra for printing [Dummy]		+0.361	
Prefer Cost (\$200-\$399) [Dummy]			+0.302
Incentives		-0.303	+0.207
Extraversion		+0.277	-0.264

Note: Correlation matrix analysis between NCCP status and various independent variables illustrate relationships that should be articulated and explored before building regression models. For example, in-training status (-0.237) and trained status (-0.129) is negatively correlated with gender, whereas certified status is positively correlated with gender (+0.28). This indicates most non-certified coaches in the dataset

are women and most certified coaches in the dataset are men, matching the previously discussed in Table 6. Therefore, including gender in the regression model may create bias in the findings. Moreover, in-training status is negatively correlated with household income (-0.315) whereas trained status is positively correlated (+0.219). Therefore, income may be considered for models comparing in-training and trained status. In-training status is also positively correlated with coaches who support recreational athletes (+0.349), whereas certified status is positively correlated with coaches who support competitive athletes (+0.330). This makes intuitive sense and indicates athlete type may be a relevant factor in certification status. Moreover, certified status is positively correlated with respondents who identify as full-time coaches (+0.259), as opposed to part-time or volunteer coaches. Therefore, variables that isolate full-time coaches may contribute to the quality of the regression model; however, as discussed later, this impacts the present of trait conscientiousness in the model. One variable that may be a proxy for the impacts of Covid-19 is the availability of printed resources at no extra fee. Certified status is positively correlated with those who received printed resources at no additional costs (+0.411), whereas trained status is positively correlated with those who prefer printed resources and were willing to pay extra for printing (+0.0361). With the rapid introduction of PDF textbooks between 2020 and 2023, this may indicate that learning preferences have indeed not changed recently, and coaches are willing to bear additional costs to access printed textbooks. Certified status is also positively correlated with preferences for total program costs of \$200-\$399 (+0.302), which differs from the most popular preferred program cost (Figure 25). This is interesting and indicates that those who have achieved certification recommend lower total fees compared to the average respondent in the dataset. And finally, certified status is positively correlated with self-identified presence of incentives (0.207) whereas trained status is negatively correlated with the presence of incentives (-0.303). This indicates that incentives may be a helpful metric in identifying factors that contribute to comparing coaches between trained and certified status; however, understanding what exactly constitutes an incentive requires further investigation. The dataset also includes ordinal variables, whereby respondents chose from several options.

Table 11

Correlation Matix: NCCP Status by Education

	<i>In-Training-D</i>	<i>Trained-D</i>	<i>Certified-D</i>
Education	-0.214	0.003	0.148
High School Diploma [Dummy]	0.190	-0.005	-0.129
Associate Certificate [Dummy]	0.102	0.072	-0.135
Bachelor's Degree [Dummy]	-0.077	-0.024	0.076
Graduate Degree [Dummy]	-0.161	-0.006	0.118

Note: To help understand patterns in the data and prepare for regression analysis, ordinal variables are often isolated as dummy variables, including education. The data exhibits mildly negative correlations between education and in-training status (-0.214), and mildly positive correlation with certified (+0.148), illustrating an effect. Moreover, in-training status is positively correlated with only finishing high-school (+0.19) and certified status is positively correlated with university education (bachelor's degree +0.076, and graduate degree +0.118) indicating education may be a helpful variable to include in the regression model.

Table 12*Correlation Matrix: NCCP Status by Education and Household Income*

	<i>In-Training-D</i>	<i>Trained-D</i>	<i>Certified-D</i>
Education	-0.214	0.003	0.148
Household Income	-0.315	0.219	0.025
\$20,000 - \$35,000 [Dummy]	0.188	-0.102	-0.040
\$35,000 - \$50,000 [Dummy]	0.270	-0.147	-0.058
\$50,000 - \$75,000 [Dummy]	0.101	-0.129	0.044
\$75,000 - \$100,000 [Dummy]	-0.015	-0.085	0.087
\$100,000 - \$150,000 [Dummy]	-0.193	0.321	-0.151
> \$150,000 [Dummy]	-0.100	0.012	0.059

Note: Correlation matrix analysis is important to avoid issues of multi-collinearity. Most notably, education level and household income are positively and strongly moderately correlated (+0.380). As a result, regression models should only include one of these variables. Like education, correlations exist between NCCP status and household income. In-training status negatively correlated (-0.315) with household income, and trained (0.219) and certified (0.025) status is positively correlated. Yet, correlations vary due to an anomaly in the data for households earning between \$100,000 and \$150,000 annually. For this group, certified status was negatively correlated (-0.151). This may indicate the presence of opportunity costs for this income bracket, whereby the time and energy required to achieve certified status and generate income as a sport coach is not a viable alternative compared to more traditional income sources. Interestingly, the dataset shows small but positive correlations between certified status and household incomes higher than \$150,000 a year, supporting a hypothesis that such households may engage in sports coaching for non-monetary reasons. Moreover, household income is most positively correlated with trained status (+0.219), rather than certified status (+0.025) as that of education (+0.148). As a result, patterns of correlation strength across the three certification levels differ between income and education. Therefore, based on the research sample, education may be the most representative variable to compare all NCCP status groups, whereas income may be representative when comparing in-training and trained status.

Table 13

Correlation Matrix: Education, Income, and Program Design

	<i>Education</i>	<i>Income</i>	<i>Preferred Hours</i>	<i>Pref. Transactions</i>	<i>Pref. Cost</i>
Education	1				
Income	0.380	1			
Preferred Hours	0.104	-0.079	1		
Preferred Transactions	0.217	0.128	0.252	1	
Preferred Cost	0.082	0.055	0.600	0.204	1

Note: An interesting pattern also surfaces between income, education, and preferred program costs, hours, and number of transactions. The aggregate ordinal variable, education, is positively correlated with all variables (0.082 to 0.380), and household income is positively correlated (0.055 to 0.600) except for preferred program duration in hours. In this one case, household income is negatively correlated (-0.079) with the preferred program duration. Further analysis of the preferred duration against the various income brackets did not show any consistent patterns. However, the strong and positive correlation between preferred hours and cost (0.600) demonstrate respondents acknowledge program costs should increase in accordance with program length. As a result of these positive correlations, regression models may best include only one of the discussed variables.

Table 14

Correlation Matrix: Education by Number of Preferred Transactions

	<i>Education</i>	<i>High School-D</i>	<i>Associate-D</i>	<i>Bachelor-D</i>	<i>Graduate-D</i>
Preferred Transactions	0.217	-0.102	-0.247	-0.026	0.276
Single [Dummy]		0.057	0.228	0.048	-0.255
Bundled (<5) [Dummy]		0.074	0.017	-0.040	-0.019
Separate (<10) [Dummy]		-0.115	-0.201	-0.002	0.225

Note: The correlation matrix analysis also provided more context regarding the preferred number of transactions across the survey respondents. Based on the use of single-transaction programs in successful alternative instructor and coach education programs, the researcher expected the respondents to prefer a lower number of transactions; however, responses varied widely. Yet, when compared against education level, patterns emerge that support the call for future research to use a more diversified and larger research sample. Although the aggregate correlation for education and the preferred number of transactions was positive (0.217), analysis of each education dummy variable indicates that in fact, for most survey respondents, education level and preferred transaction number is negatively correlated. Indeed, thirty percent of the research sample contains coaches with graduate degrees (master's or Ph.D.) and of those respondents, a strong and moderate positive correlation calls for a greater number of transactions. This effect impacts the correlation value of the aggregate. Discussed in Chapter 5, programs with a single transaction but a set time window (12-months) for certification completion was more

anxiety-producing than motivating, and separate transactions instead best helps club coaches work through the process at their own speed. Nonetheless, the exploration of this correlation conveys how patterns or bias in the dataset can surface when ordinal variables are further extrapolated and explored using a correlation matrix.

Table 15

Correlation Matrix: NCCP Status by Coach Type

	<i>In-Training-D</i>	<i>Trained-D</i>	<i>Certified-D</i>
Coach Type	-0.056	-0.232	0.246
Volunteer [Dummy]	0.009	0.183	-0.170
Part-Time [Dummy]	0.070	-0.006	-0.044
Full-Time [Dummy]	-0.095	-0.215	0.259
Athlete Type			
Recreational [Dummy]	0.34	0.09	?
Competitive [Dummy]	-0.35	-0.10	0.33

Note: Dummy variables for each coach type exhibit correlations with NCCP status. Full-time coaches are positively correlated with certified status (+0.259) whereas volunteer status positively correlates with trained status (+0.183) and part-time status correlates with in-training status (+0.070) respectively. Moreover, NCCP status is correlated with the types of athletes coached. Coaches supporting recreational athletes were positively correlated with in-training status (+0.34) and trained status (+0.09), whereas coaches working with competitive athletes were positively correlated with certified status (+0.33) and negatively correlated with trained status (-0.10) and in-training status (-0.35). This pattern of correlation between certification and status as a full-time competitive coach may be considered in the regression model.

Table 16

Correlation Matrix: Coach Type by Trait Conscientiousness

	<i>Coach Type</i>	<i>Volunteer-D</i>	<i>Part-Time-D</i>	<i>Full-Time-D</i>
Conscientiousness	-0.231	0.240	-0.125	-0.145
Conscientiousness x Age	-0.233	0.240	-0.122	-0.148
NCCP Status: Certified [Dummy]	0.246			

Note: Correlations also surfaced between NCCP status and trait conscientiousness in the sample. For example, volunteer status is positively correlated with trait conscientiousness (+0.24) and negatively correlated with part-time (-0.125) and full-time (-0.145) status. When adjusted for age, this pattern was consistent. For example, income is positively correlated with trait conscientiousness (+0.41) and the natural log of age (+0.41) (not pictured), indicating as expected, as both trait conscientiousness and age

increase, coach are more likely to fulfil a volunteer role at a sports club. Therefore, trait conscientiousness and coach type are correlated and only one of these variables are recommended for modeling.

Table 17

Correlation Matrix: Coach Type by Preferred Learning Style

	<i>Coach Type</i>	<i>Volunteer-D</i>	<i>Part-Time-D</i>	<i>Full-Time-D</i>
Preferred Learning Style	0.139			
No Preference [Dummy]		0.101	-0.079	-0.030
Prefer Auditory [Dummy]		0.141	-0.092	-0.063
Prefer Visual [Dummy]		-0.009	0.091	-0.097
Prefer Kinesthetic [Dummy]		-0.109	-0.011	0.146

Note: There are small correlations of interest between coach type and preferred learning style. For example, volunteers exhibit a mildly positive correlation with any preferred learning style (+0.1) and auditory preferences (+0.14), whereas part-time and full-time coaches positively correlate with preferences for visual (+0.09) and kinesthetic (0.146) learning, respectively. This pattern could provide additional insight into who becomes full-time coaches and the demographics of the existing coach base in the sample, lending to the idea kinesthetic learners more often participates in sport and as a result, may be more likely to become coaches over time. Moreover, models comparing trained and certified coach groups may isolate kinesthetic preferences as a variable in the regression model.

Table 18

Correlation Matrix: Preferred Learning Style by Certification Year

Preferred Learning Style	<i>1987-2019</i>	<i>2020-2023</i>
Visual [Dummy]	6 43 %	15 63 %
Kinesthetic [Dummy]	3 21 %	7 29 %
No Preference [Dummy]	5 36 %	2 8 %
Total	14	24

Note: When learning style preferences are sub-grouped by achieving certification before and after the onset of emergency blended learning in 2020, kinesthetic learners are most equally represented in the sample. As a result, using a dummy variable for kinesthetic learners may support the quality of the model as opposed to other preferences or an aggregate variable.

Table 19

Correlation Matrix: Preferred Learning Format by Experienced Learning Format

	<i>Prefer eLearning-D</i>	<i>Prefer Video Calls-D</i>	<i>Prefer In-Person-D</i>
Did eLearning [Dummy]	0.257	-0.171	-0.033
Did Video Calls [Dummy]	0.342	0.030	-0.290
Did In-Person Theory [Dummy]	-0.471	0.120	0.245
Did In-Person Practical [Dummy]	-0.540	0.185	0.236

Note: The survey data also shows patterns between the learning formats preferred by coaches and those they experienced. For example, coaches who prefer asynchronous on-demand eLearning modules and participated in such formats are positively correlated (+0.25). These coaches also often participated in synchronous video calls (+0.34) but did not participate in face-to-face theory (-0.47) or practical (-0.54) modules. Correlations between coaches who prefer synchronous video calls and participated in such formats are also positive (+0.03). Moreover, coaches also participated in face-to-face theory (+0.12) and practical modules (+0.18) but did not often participate in asynchronous learning (-0.17). Finally, coaches preferring and experiencing face-to-face experiences are positively correlated (+0.24) and negatively correlated with eLearning (-0.03) and video call (-0.29) formats. Although it is unclear why these correlations are present in the data, and qualitative analysis may provide more context. This relationship in the data may be associated with the year coaches participated in training, a variable that was not collected in the survey. Either way, the dataset illustrates many learners experienced formats that match their preference, supporting the concept that blended learning delivery formats create welcome opportunities for learners.

Table 20

Correlation Matrix: Experienced Learning Format by Preferred Learning Style

	<i>eLearning-D</i>	<i>Video Calls-D</i>	<i>F2F Theory-D</i>	<i>F2F Practical-D</i>
No Preference [Dummy]	-0.154	-0.149	-0.005	-0.070
Visual [Dummy]	0.103	0.0600	-0.029	-0.050
Kinesthetic [Dummy]	-0.001	0.0374	0.0792	0.099

Note: Although very mild, some correlations surfaced between preferred learning style and learning formats experienced. For example, the data set indicates those who prefer kinesthetic learning and experienced synchronous learning was positively correlated: video calls (+0.03), face-to-face theory (+0.07), and face-to-face practical (+0.09). In addition, visual learners more often participated in eLearning (+0.10) and video calls (+0.05) but less often in face-to-face learning (-0.029 to -0.050). Please note, the sample included only one respondent with preferences for auditory learning and was dropped from correlation analysis. Although these relationships are mild, in appreciation for the previously discussed correlations between preferred learning style, preferred learning format, and experienced learning format, the regression model should include only one such variable.

Table 21*Correlation Matrix: Certification Year by Learning Formats and Preferences*

	<i>Certification Year</i>
Did eLearning [Dummy]	0.729
Did Video Calls [Dummy]	0.765
Did In-Person Theory [Dummy]	-0.375
Did In-Person Practical [Dummy]	-0.011
No Preference [Dummy]	-0.409
Prefer Visual [Dummy]	0.165
Prefer Kinesthetic [Dummy]	0.174
Prefer Digital Textbooks [Dummy]	0.037
Prefer Printed Textbooks [Dummy]	-0.037
Printed Textbooks included [Dummy]	-0.762
Willing to Pay Extra for Printed [Dummy]	0.762

Note: The correlation matrix also illustrates patterns between certification year and participation in learning formats. For example, participation in eLearning (+0.72) and video calls (+0.76) is significantly positively correlated with certification year, and moderately negatively correlated with in-person theory (-0.37) and practical deliveries (-0.01), illustrating the shift towards blended learning models in recent years. Moreover, the advent of blended learning has changed the availability of printed resources for learners, also reflected in the correlation matrix. Although learner preferences for digital resources are only slightly positively correlated with certification year (+0.03), indicating a slow increasing comfort with digital PDF textbooks, certification year and willingness to pay extra for printed resources was highly correlated (+0.76), illustrating those who prefer printed textbooks will go out of their way to access resources in their preferred format. When comparing preferences for printed resources with certified coaches, access to printed resources that are included in the purchase price is positively correlated (+0.41). Conversely, those who prefer printed resources and were willing to pay extra to print the textbooks is negatively correlated (-0.41) with achieving certification. This indicates that for those who prefer printed resources, the way those resources are made available may effect certification rates. Moreover, certification year is negatively correlated (-0.76) with access to printed resources at no extra fee, illustrating policy changes across sports since 2020 whereby only digital PDFs are made available upon registration. The correlation matrix indicated positive correlations between women and preferences for printed resources, and most substantially correlations with a willingness to pay extra for printing. Since PDF resources have become much more popular in recent years, and a different number of women have achieved certification during the blended learning era, gender and textbook preferences are highly correlated (+0.47). Therefore, only one variable should be included in regression models. Moreover, age and printed resource preference is positively correlated (+0.13), indicating older coaches may have a higher preference for printed textbooks. Compared to printed textbooks, strong correlations exist in the sample between gender and preferences for digital textbooks. Since the gender variable is designed a women = 0 and male = 1, the positive correlation between gender and digital textbooks (+0.22) indicates

that men prefer digital textbooks and women dislike digital textbooks. However, gender was negatively correlated with willingness to pay extra for printed resources (-0.47), indicating that men are unwilling to pay extra, whereas women are willing to pay extra.

Table 22

Preferred Textbook Format by Gender

	<i>Prefer Print</i>	<i>Prefer Digital</i>	<i>Total</i>
Woman	19	13	32
Man	13	22	35
Total	32	35	67

Note: The sample indicates a preference for printed resources among women, and a preference for digital resources among men. However, when assessed on aggregate, the sample features a near 50/50 preference for print (32/67) and digital (35/67). Therefore, printed textbook preferences may negatively impact the significance of gender in the regression model and only one should be included. Future research may further explore why women exhibit a greater preference for printed resources compared to men.

Table 23

Willingness to Pay for Printing by Gender

	<i>No</i>	<i>Yes</i>	<i>Total</i>
Woman	2	17	19
Man	7	6	13
Total	9	23	32

Note: The sample was further isolated to explore printed resource preferences. Among the thirteen men, 50% of respondents indicated a willingness to pay extra costs for home-printing, whereas nearly all women respondents (89%) indicated willingness to pay extra. Further research may explore how offering printing resources and subsuming the cost of printing into the module cost impacts women participation in the NCCP.

In addition, the data set includes a moderately positive correlation between receiving printed resources included in the purchase price and the presence of incentives for certification (+0.42). As a result of these intercorrelations between gender, preferences for printed resources, willingness to pay extra for printed resources, and incentives, selecting proxy variables and including only select variables in the regression model may positively impact the model quality.

Table 24*Correlation Matrix: Preferred Duration (hours) by Preferred Cost*

	<i>Preferred Hours</i>	<i>20 hours-D</i>	<i>40 hours-D</i>	<i>60 hours-D</i>	<i>80 hours-D</i>
Preferred Cost	0.6				
\$150 - \$199 [Dummy]		0.526	-0.105	-0.24	-0.157
\$200 - \$399 [Dummy]		-0.03	0.166	0.143	-0.301
\$400 - \$599 [Dummy]		-0.125	0.207	-0.125	0.006
\$600 - \$799 [Dummy]		-0.3	-0.293	0.207	0.427

Note: The data set also indicated mild relationships between the number of modules in a pathway with NCCP status, as well as pathway hours and costs. Although very mild, the number of modules included in each sports pathway is negatively correlated with achieving trained status (-0.06) and certified status (-0.11) indicating that additional modules may decrease certification rates. Conversely, preferred program total cost is positively correlated with preferred pathway hours (+0.59). This indicates that respondents who prefer a longer duration coach education program are also more willing to pay. As a result, the sample data indicates coaches are willing to pay \$10/hour for formal coach education experiences. Of the four different cost brackets and duration brackets available in the survey, correlations were highest between preferences for less than 20 hours of education and paying under \$200 (+0.53) and preferences for 80 hours of education and paying up to \$80 (+0.43). In relation to coach type, moderate correlations exist between coach type and total cost (+0.23), indicating volunteers wish to pay less and full-time coaches are willing to pay more. Due to inter-correlations, coach type may serve as a proxy variable for preferred hours and costs in regression models.

Table 25*Correlation Matrix: NCCP Status & Incentives by other variables*

	<i>Incentives</i>	<i>In-Training-D</i>	<i>Trained-D</i>	<i>Certified-D</i>
Showcase Coaches	0.287			
Pay Scale Published	0.343			
Agreeableness	0.154			
Printed Textbooks Included [Dummy]	0.429			
Income 75,000 to \$99,999 [Dummy]	0.364	-0.015	-0.085	0.087

Note: Another motivating factor for achieving certification in this research is the presence of incentives. The research survey asked three questions to understand if the presence of incentives is impactful and hypothesized the presence of published pay scales or showcasing of certified coaches may be valid incentives. The correlation matrix indicates a strong positive correlation between the presence of incentives with certified status (+0.20) and a negative correlation with trained status (-0.30). This supports the use of incentives as a predictive variable in the regression model. However, incentives and showcasing

were also positively correlation (+0.287) and as well as positively correlated with pay scales (+0.343). As a result, only one of these three variables should be included in the regression model.

Interestingly, survey respondents who identified the presence of incentives were also positively correlated with trait agreeableness (+0.154), compared to negatively correlated with all other personality traits. This may indicate that respondents higher in agreeableness are more likely to agree that incentives are present.

Discussed earlier, another positively correlated variable with incentives is the availability of printed textbooks included in the purchase price (+0.429), illustrating the possibility that survey respondents perceive this added value as an incentive to pursue coach training and certification. Therefore, incentives can be included in the regression model to account for trait agreeableness and textbook format preferences.

Most interestingly, incomes between \$75,000-\$99,000 are positively correlated with the presence of incentives (+0.364) and certification (+0.087). Although this income bracket is positively correlated with certification, there are discrepancies in correlations between certification and incomes of \$100,000-\$150,000 (-0.151) and +\$150,000 (+0.059), dampening the overall correlation between income and incentives (-0.138). This can be attributed to the opportunity cost of pursuing coach education. As such, incentives may also serve as a proxy for the impacts of income in the regression model.

Table 26

Correlation Matrix: Age, Education, NCCP Status by Personality Traits

<i>Variable</i>	<i>Age</i>	<i>Education</i>	<i>In-Training-D</i>	<i>Trained-D</i>	<i>Certified-D</i>
Openness	0.329	0.069	-0.060	0.059	-0.010
Conscientiousness	0.251	-0.221	-0.135	0.161	-0.050
Extraversion	-0.165	0.101	0.025	0.277	-0.265
Agreeableness	0.279	0.237	0.190	-0.052	-0.086
Neuroticism	-0.153	0.305	-0.065	0.226	-0.156

Note: As discussed in the descriptive statistics figures, personality traits distributions in the sample are skewed. Interestingly however, correlations between age and personality traits matched the literature. For example, trait openness, conscientiousness, and agreeableness were positively correlated with age, and extraversion and neuroticism were negatively correlated with age, matching the work of John and Srivastava (1999). However, education levels in the sample did not correlate with personality traits as one would expect. Education was slightly positively correlated (+0.07) with trait openness and negatively correlated (-0.22) with trait conscientiousness. This is different than the literature that indicates conscientiousness positively predicts success in education (Poropat, 2009). Conversely, household income values in the sample were highly correlated with both conscientiousness (+0.41) and the natural log of age (+0.41), matching the expectations in the literature that trait conscientiousness predicts household income (Alderotti et al., 2023; Duckworth et al., 2012; Vella, 2024), and income increases with age (+0.31) (Statistics Canada, 2022). When comparing personality trait scores with NCCP status, the correlation matrix showed a mix of mild to moderate relationships. Trait openness is negatively correlated with in-

training status (-0.06) and positively correlated with trained status (+0.059), mildly illustrating those who are more open to experience continue taking modules. Trait conscientiousness is negatively correlated with in-training status (-0.135) and positively correlated with trained status (+0.161), moderately indicating those higher in conscientiousness participate in more modules. Trait extraversion is positively correlated with in-training status (+0.02) and trained status (+0.27), illustrating enthusiasm and assertiveness to participate in modules and achieve trained status. However, certified status is moderately negatively correlated with trait extraversion (-0.265), in fact, certified status exhibited negative correlations with all personality traits in the sample. Moreover, trait neuroticism is positively correlated with trained status (+0.226) and negatively correlated with certified status (-0.156). In summary, trait extraversion and trait neuroticism exhibit the strongest correlations between trained and certified status and as a result, these variables may support the regression model. These correlations may be associated with the concept that emotionally stable coaches are willing to undergo the evaluation process, and it is the training process rather than the evaluation process that best compliments the needs of extraverted coaches.

Table 27

Model 1 Post-Estimation: Pairwise Pearson Correlation Coefficients of Variables

	<i>Trained</i>	<i>Age</i>	<i>Gender</i>	<i>Income</i>	<i>Neuroticism</i>	<i>Extraversion</i>	<i>Coach Full-Time</i>
Age	0.301 (0.136)	1					
Gender	0.189 (0.354)	0.039 (0.754)	1				
Income	0.538* (0.004)	0.311* (0.010)	-0.046 (0.715)	1			
Neuroticism	0.214 (0.293)	-0.179 (0.146)	-0.049 (0.697)	-0.124 (0.319)	1		
Extraversion	0.208 (0.308)	0.021 (0.868)	-0.066 (0.594)	0.159 (0.197)	-0.152 (0.220)	1	
Coach Full-Time	-0.093 (0.650)	-0.014 (0.913)	0.124 (0.318)	0.047 (0.704)	-0.046 (0.712)	0.039 (0.752)	1

Note: Pairwise correlation measures the strength and direction of the linear relationship between two variables, calculated using Pearson's correlation coefficient. Values range from -1 (perfect negative correlation) to +1 (perfect positive correlation), with 0 indicating no linear relationship. A statistically significant p-value (typically <0.05) means that the correlation is unlikely due to random chance. Significant correlations between Income and Age (+0.31) and Trained Status and Income (+0.54).

Table 28*Post-Estimation: Pairwise Pearson Correlation Coefficients of Variables*

	<i>Certified</i>	<i>Age</i>	<i>Gender</i>	<i>Education</i>	<i>Neuro.</i>	<i>Extra.</i>	<i>Type</i>	<i>Incentives</i>
Age	0.059 (0.66)	1						
Gender	0.204 (0.124)	0.039 (0.754)	1					
Education	0.052 (0.698)	0.244* (0.047)	-0.172 (0.925)	1				
Neuroticism	-0.225 (0.089)	-0.179 (0.146)	-0.049 (0.697)	0.172 (0.165)	1			
Extraversion	-0.324* (0.013)	0.021 (0.868)	-0.066 (0.594)	0.062 (0.621)	-0.152 (0.220)	1		
Coach Type	0.265* (0.044)	-0.059 (0.637)	0.149 (0.229)	-0.203 (0.099)	-0.009 (0.940)	-0.021 (0.865)	1	
Incentives	0.310* (0.018)	-0.019 (0.873)	0.100 (0.419)	0.032 (0.798)	-0.057 (0.645)	-0.120 (0.331)	0.051 (0.687)	1

Note: Significant correlations exist between Education and Age (+0.24), as well as Extraversion, Coach Type and Incentives with Certified Status as explained earlier.

Table 29*Model 3 Post-Estimation: Pairwise Pearson Correlation of Coefficients of ologit model*

	NCCP Status	Age	Gender	Edu	Neuro.	Extra..	Type	Incent.	Pref Kin.
Age	0.216 (0.079)	1							
Gender	0.302* (0.013)	0.039 (0.754)	1						
Education	0.201 (0.102)	0.244* (0.047)	-0.012 (0.925)	1					
Neuroticism	-0.075 (0.544)	-0.179 (0.146)	-0.049 (0.697)	0.172 (0.165)	1				
Extraversion	-0.191 (0.122)	0.021 (0.868)	-0.066 (0.594)	0.0615 (0.621)	-0.152 (0.220)	1			
Coach Type	0.193 (0.117)	-0.059 (0.637)	0.149 (0.229)	-0.203 (0.099)	-0.009 (0.939)	-0.021 (0.865)	1		
Incentives	0.097 (0.435)	-0.019 (0.873)	0.100 (0.419)	0.032 (0.798)	-0.057 (0.645)	-0.121 (0.331)	0.050 (0.687)	1	
Pref Kin	-0.161 (0.193)	-0.152 (0.2188)	0.167 (0.178)	-0.106 (0.393)	0.066 (0.596)	-0.088 (0.479)	0.148 (0.234)	0.194 (0.116)	1

Note: The above information indicates a significant correlation between Education and Age (0.24). The correlation between NCCP status and Gender (0.302) was discussed earlier and illustrates bias in the dataset.

Table 30*Sport-Harmonized Action Plan for Education (SHAPE)*

Stage	Coach Attributes (Label)	Coach Developer Attributes (Label)	Complexity of the Learning Environment	Learning Theory (proposed)
1	Limited Maturity Limited Experience Limited Motivation (Dependant)	Expert/Authority (Teacher, Instructor)	Limited Safety Limited Time	Behaviourism
2	Moderate Maturity Moderate Experience Limited Motivation (Interested)	Motivator (Guide, Coach)	Sufficient Safety Limited Time	Cognitivism
3	Sufficient Maturity Sufficient Experience Moderate Motivation (Involved)	Facilitator (Mediator, Socratic Guide)	Sufficient Safety Sufficient Time	Constructivism
4	Exceeding Maturity Exceeding Experience Exceeding Motivation (Self-Directed)	Delegator (Advisor / Mentor)	Sufficient Safety Excessive Time	Connectivism

Note: The model builds upon the fundamental attributes of Grow's (1991) Staged Self-Directed Learning (SSDL) model and pairs each stage with a learning theory and sports learning environment. Grow (1991) addresses how teachers can adapt instructional methods to match a learner's stage of self-direction and postulates behavioral teaching methods are commonly effective for stage 1 (dependant) learners. The proposed SHAPE model pairs combinations of learner maturity, experience, and motivation with evidence-based learning theories beyond the NCCP's constructivist framework. As such, when athlete motor-skill development is limited such that safety is a risk factor in any environment other than a closed and variable-reduced space, or if time is limited, or if new coaches exhibit no understanding of basic pedagogical principles, coach developers and sports leaders can utilize behavioural learning theory as 'instructors' to control the learning environment, provide high-quality role-modeling (including explanations, demonstrations, activities, and reflections) and positive feedback to help learners acquire basic competencies and confidence. As athletes mature and can abstractly conceptualize how to further refine their technical skills or modify their tactical approach when faced with more random and variable environments, cognitivism and social cognitivism learning theories can be used by 'motivating' coaches. A sufficient degree of safety but limited time exists in such a sports learning environment. Finally, once students become sufficiently mature, experienced, and technically skilled that they can proficiently navigate random and open environments under pressure, leaders can use constructivist learning theory and fulfil a moderator role that encourages learner reflection and discussion. Whereas learners with either exceeding attributes of maturity, experience, motivation, and time can utilize connectivist learning methods under the guidance of a delegator or mentor to either achieve advanced athletic abilities or comprehensive and exceeding professional, interpersonal, and intrapersonal coach competencies.

Appendix 4: Stata Do-File Commands

Model 1: NCCP Trained vs. In-Training Status (26 observations)

```

logistic NCCP_Trained age gender income neuroticism extraversion coach_fulltime
estat classification          *Confusion Matrix*
estat gof, group(10)        *Hosmer-Lemeshow Test > 0.05*
test age gender income neuroticism extraversion coach_fulltime    *Wald test < 0.05*
estat ic                    *Akaike's information criterion and Bayesian information criterion*
estat summarize            *Descriptive Statistics*
lroc                        *Area Under the Curve*
lsens                       *Sensitivity vs. Specificity Graph: higher the better*
pwcorr NCCP_Trained age gender income neuroticism extraversion coach_fulltime, sig star(.05)
*Pairwise Pearson correlation coefficients between the specified variables*

```

Model 2: NCCP Certified vs. Trained Status (58 observations)

```

logistic NCCP_Certified age gender education neuroticism extraversion coachtype incentives
estat classification          *Confusion Matrix*
estat gof, group(10)        *Hosmer-Lemeshow Test > 0.05*
test age gender education neuroticism extraversion coachtype incentives *Wald test < 0.05*
estat ic                    *Akaike's information criterion and Bayesian information criterion*
estat summarize            *Descriptive Statistics*
lroc                        *Area Under the Curve*
lsens                       *Sensitivity vs. Specificity Graph: higher the better*
pwcorr NCCP_Certified age gender education neuroticism extraversion coachtype incentives, sig
star(.05) *Pairwise Pearson correlation coefficients between the specified variables*

```

Model 3: In-Training vs. Trained vs. Certified (67)

```

ologit NCCP_Status age gender education neuroticism extraversion coachtype incentives
pref_kinesthetic, or
estat ic
test age gender education neuroticism extraversion coachtype incentives pref_kinesthetic *Wald Test*
estat summarize            *Descriptive Statistics*
pwcorr NCCP_Status age gender education neuroticism extraversion coachtype incentives
pref_kinesthetic, sig star(.05) *Pairwise Pearson correlation coefficients between the specified
variables*

```

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