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Coaching the Coaches: Using Design-Based Research to Improve the Instructional Skills of Canadian Air Traffic Control On-the-Job Instructors Through Professional Learning

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Coaching the Coaches:

Using Design-Based Research to Improve the Instructional Skills of Canadian Air Traffic

Control On-the-Job Instructors Through Professional Learning

by

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Abstract

Coaching in air traffic control on-the-job training is challenging and instructor quality can affect outcomes. This qualitative study explored the phenomenon of how instructional coaching can be used as a means of professional learning to help air traffic control on-the-job instructors (OJIs) identify and implement improvements to their instructional practices. The study focused on using coaching to build the capacity of OJIs to provide trainees with effective formative feedback. A three-phase design-based research (DBR) methodology was used to (a) prepare, design, and evaluate a usable professional learning coaching protocol, and (b) contribute theoretical understanding through the development of design principles.

Three main findings emerged from this study. First, through iterative testing of the designed coaching protocol, eight key components were identified, including: four process components (learning culture, coaching conversation, adaptable framework, logistical feasibility), and four content components (clarity of expectations, reinforce positives, targeted progression, actionable priorities). These key coaching protocol components formed the basis of a reflective process used to identify a set of theoretical design principles intended as a starting point for others undertaking design studies in similar contexts. Second, the training culture within the unit will either foster or inhibit the OJIs' engagement with professional learning opportunities and willingness to adopt the coaching protocol. This highlights the necessity for effective leadership and change management in implementing new professional learning initiatives. Third, OJIs must receive adequate training to use the coaching protocol, following professional learning best practices, to effectively influence instructional capacity.

The findings of this study have implications for policy and practice. First, a plan should be established to further develop a training culture that supports effective workplace learning for

OJIs. Second, OJIs should be provided with initial training and ongoing support on effective use of the coaching protocol. Third, members of the training team should receive ample preparation as instructional coaches to effectively support ongoing OJI development and professional learning. The results of this study will be of interest to those involved in air traffic control training, both in Canada and internationally, as well as to those in other safety-critical industries relying on on-the-job training.

Keywords: coaching, instructional coaching, professional learning, air traffic control, on-the-job training, workplace learning, design-based research

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CHAPTER ONE: INTRODUCTION

Air traffic control is highly complex work involving higher-order thinking and time-sensitive decision making based on imperfect information and changing conditions (Owen, 2009). Prior to obtaining an air traffic control licence and working independently, Canadian Aviation Regulations (CARs, 2017) require trainees to demonstrate the ability to proficiently complete the necessary tasks and skills for the job while working under the direct supervision of a qualified air traffic controller. This requires trainees to enter a period of on-the-job training (OJT) and necessitates experienced air traffic controllers to serve as on-the-job instructors (OJIs) in the workplace. A large part of workplace knowledge and skill acquisition is constructed while engaged in the job itself (Jacobs & Jaseem Bu-Rahmah, 2012), nonetheless, it continues to be challenging for organizations to ensure that an effective OJT program is implemented, despite its value in "developing…highly skilled employees" (Cho, 2009, p. 445).

A structured approach to OJT, including a systematic process for training development and delivery, is typically more effective than an unstructured approach (Cho, 2009; Johnson & Leach, 2001). In Canada, a structured approach to OJT is supported within air traffic control training; however, the practical implications of a dynamic operational environment prevent the necessary predictability for the consistent delivery of effective structured learning. Additionally, OJIs are experienced air traffic controllers and not necessarily teaching and learning professionals (Cho, 2009); therefore, they may not possess the needed instructional skills to skillfully guide a trainee (Johnson & Leach, 2001) to a successful training outcome. Cho (2009) noted that while OJIs are an important part of the training system, little attention in the literature has been given to the outcomes associated with their actions and suggested that opportunities

exist for growth and development. This perspective has also been expressed by Canadian air traffic control OJIs requesting learning opportunities to improve their instructional skills.

My study explored the phenomenon of how instructional coaching can be used as a means of professional learning to help air traffic control OJIs identify and implement improvements to their instructional practices. The dual purpose of this qualitative design-based research (DBR) study was to (a) design a usable professional learning coaching protocol for OJIs as a practical solution for their complex training problem, and (b) contribute to the development of theoretical understanding pertaining to instructional practices in this unique educational setting. The study focused on the use of coaching as a means to build the capacity of OJIs to provide effective formative feedback to trainees during the challenging phase of on-the-job training. It is intended that improvements in OJI instructional skills will contribute to a long-term increase in training success and improved qualification rates for air traffic control trainees.

Statement of the Problem

The training of Canadian civil air traffic controllers requires a significant investment in time, money, and resources from the employer which is not realized when a trainee is unsuccessful in completing the required training to attain an air traffic control licence. The training program can be physically, mentally, and emotionally demanding for trainees, on-the-job instructors, and training supervisors. Additionally, an unsuccessful trainee is no longer able to maintain their probationary employment status and the organization is unable to attain desired staffing levels, which can impact organizational health and service delivery. A lack of training success results in a substantial financial impact for the organization, as well as significant personal costs for the unsuccessful trainee and potential training exhaustion or disengagement for the instructor. Negative effects may also impact the organizational culture and manifest beyond

training in areas such as sick time, level of willingness to adopt new technology, or relationships with managers.

The majority of trainees successfully complete the initial phase of classroom and simulation training. However, only a small portion successfully complete the subsequent on-the-job training phase and achieve full qualification to work independently as licenced air traffic controllers. While there are many anecdotal opinions related to both the overall success rate in general and the lack of training success in specific individuals, it remains unclear what differentiates trainees with similar basic training to arrive at such disparate outcomes. Some OJIs have identified limited initial training and a lack of ongoing professional development in their instructor role as contributing factors; however, uncertainty exists on what actions can be implemented to better support OJIs in transforming their current instructional practices during on-the-job training.

The nature of a safety-critical operational environment presents a unique and challenging educational context for both trainees and OJIs. Successful training outcomes in air traffic control are dependent on the quality of the instructor (Oprins, Bruggraaff, & Roe, 2012) necessitating a requirement to ensure OJIs are adequately trained to effectively fulfill the trainer role. Currently, air traffic controllers interested in assuming an instructor role receive a five-day classroom-based training course to become certified as OJIs. A basic quality assurance plan is implemented during the OJIs' first experience working with a trainee to provide some monitoring and oversight. In 2018, a two-day classroom-based professional development workshop with a focus on coaching skills was implemented for all OJIs currently working with a trainee. While both the initial certification course and the professional development workshop include classroom application exercises, neither offer opportunities for situated learning, briefly defined as

"enabling experiences in authentic…contexts" (Choi & Hannafin, 1995, p. 53), nor include formal ongoing coaching for OJI skill development.

From my review of the literature, there is little information available on the design and implementation of processes for the provision of ongoing instructor development in this unique training environment. Thus, the aim of my research was to provide structured coaching to OJIs as a form of professional learning with the intent of improving their instructional skills when working with a trainee in the on-the-job training environment. Coaching in this context involved "a process that enables learning and development to occur and thus performance to improve" (Parsloe, 1999, p. 8). It used a dialogical approach to facilitate "self-directed learning…through questioning, active listening, and appropriate challenge in a supportive and encouraging climate" (van Nieuwerburgh, 2012, p. 17). The intent was to "enhance or grow the potential of the individual instructor" (Lock, 2018, p. 310) thereby creating value (Lock, 2018) for the instructor being coached, the trainee, and the organization. Therefore, the overarching question that guided this study was: How can instructional coaching be used as a means of professional learning to help OJIs identify and implement improvements to their instructional practices?

Context of the Study

In 2015 the International Civil Aviation Organization (ICAO) determined, there was an increased growth of 6.4% in the global aviation industry with approximately 3.5 billion people using air travel as a form of transportation (ICAO, 2015). This growth reflected a yearly trend in the industry with air transportation playing a "major role in world economic activity" (ICAO, 2016, p. 2). North America has the world's largest domestic market and experienced increases in both international and domestic air traffic during 2015 (ICAO, 2016). In 2001, it was predicted that ongoing growth in worldwide air travel would increase the requirement for air traffic

services (Galster et al., 2001). The impact of this increase became evident in August 2017 when a shortage of air traffic controllers at Toronto Pearson International Airport, combined with adverse weather, led to the cancellation of multiple flights affecting hundreds of passengers (Campion-Smith, 2017). Similarly, in May 2018, Montréal-Trudeau International Airport restricted the arrival of general aviation aircraft for a four-hour period due to a lack of available air traffic controllers (Forrest, 2018). Despite the recent drop in air travel due to pandemic-related travel restrictions, air traffic control is essential to the national infrastructure and the air navigation service provider (ANSP) is obligated to provide service (Campion-Smith, 2020), thus requiring air traffic control units to be adequately staffed.

Kelley (2012) recognized that within the USA's Federal Aviation Administration (FAA) the "problem of air traffic controller staffing shortages has been well documented" (p. 10). Additionally, it was noted that there continues to be a "serious shortage of well-trained Air Traffic Controllers" (Salden, Paas, & van Merrienboer, 2006, p. 350) in the aviation industry as a whole. Although delays due to staffing shortages are uncommon (Campion-Smith, 2017; Forrest, 2018), the recent situations in Toronto and Montreal demonstrate that the potential exists for the Canadian aviation industry to be affected by these concerns. As a result, Canada's ANSP is training at maximum capacity (Forrest, 2018) and continues to allocate significant resources for recruiting and training new air traffic controllers to meet current traffic levels. Nonetheless, a two-year training program combined with attrition, retirements, and a low training success rate can make it difficult to realize significant staffing gains (Campion-Smith, 2017). Unfortunately, many trainees do not successfully qualify as a result of their first on-the-job training experience and some never reach the required safety standard to work independently even after subsequent on-the-job training opportunities.

This lack of training success contributes to the ongoing air traffic controller staffing shortage and results in a substantial financial impact on the organization as well as a significant personal cost to the unsuccessful trainee. Repetitive unsuccessful training outcomes can also lead to exhaustion and trainer burnout for on-the-job instructors who then become unable or unwilling to assist in training future trainees. Moreover, when a trainee is successful in achieving full qualification, it is frequently attributed to some unknown innate talent (Owen, 2009) rather than enacted training strategies. This belief can make it challenging for OJIs to recognize that their actions impact learning and that improvements to their instructional strategies could positively affect training outcomes.

The ANSP has engaged a variety of strategies to address the increased need for air traffic controllers, including new recruitment programs, hiring experienced foreign controllers, designing a comprehensive curriculum, and developing new classroom and simulation courses. There is also a recognition that OJIs must be trained, developed, and supported in their instructional role, resulting in the rise of new strategies for OJI professional development. As success rates begin to slowly improve, an openness to new ways of training and coaching, and an acceptance of the benefit of ongoing professional development, has begun to emerge among members of the training team thus providing an ideal context to explore solutions to this practical problem.

Rationale for the Study

Air traffic control is a "highly complex job that requires specialized skills and expertise" (Koskela & Palukka, 2011, p. 294). The work occurs in a socio-technical environment requiring the use of complex technologies and social interactions to make time-sensitive, complex cognitive decisions, frequently based on limited information and changing situations (Koskela &

Palukka, 2011; Owen, 2009). Safety is essential in the provision of services with the need for "perfect and consistent performance" (p. 297) however there is also a need for efficiency (Koskela & Palukka, 2011) to avoid significant air traffic delays. For a trainee, OJT can be the most difficult and challenging phase of training. Learning opportunities typically cannot be planned or structured in advance (Oprins et al., 2012) to allow for sequential and progressive learning. Skill acquisition is complex with multiple tasks being trained concurrently (Oprins et al., 2012) and no opportunity exists to pause the work to provide coaching (Owen, 2009).

The live operational environment does not provide a conducive atmosphere for learning and instructors must be particularly skilled to deliver effective coaching while maintaining responsibility for the operational work. Research on workplace learning recognizes the importance of the instructor in facilitating learning during on-the-job training and identifies the need to provide adequate training for the role (Ahadi & Jacobs, 2017; Johnson & Leach, 2001; Oprins et al., 2012; Virkkula & Kunwar, 2017). The necessity for effective instructor training is especially applicable for OJIs in a complex learning environment such as air traffic control where "learning is strongly dependent on the quality of the coaches" (Oprins et al., 2012, p. 32) and instructors are constrained by strict safety parameters.

Based on an intentional desire to improve the success rates in air traffic control training, the ANSP undertook an evaluation of current approaches and re-examined the values and beliefs guiding training. These findings are now reflected in the organization's operational training philosophy which emphasizes the use of sound learning theory (e.g., value of social learning, progressive learning), a systems approach to training (e.g., analysis, design, validation), and a student-centered/coach-driven model of training delivery. This has entailed a move away from the traditional directive, evaluative, and inflexible approach under which many of the instructors

learned the job to a more facilitative, questioning, and self-directed approach familiar to the current generation of trainees.

There is recognition that a significant amount of learning is situated in the operational environment during the on-the-job training phase with the instructor acting as a facilitator and coach. The ANSP recognizes good coaching as an essential factor in trainee success and aims to ensure instructors possess the necessary knowledge and skills required to effectively facilitate trainee learning through appropriate coaching. The ANSP has undertaken a review of the instructional technology courses provided to prepare and train air traffic controllers to assume an instructional role. This has resulted in the design of a new competency-based professional instructor development program that values a multi-faceted approach to instructor training, including foundational training, focused recurrent workshops, and ongoing professional development, delivered within the context of a quality assurance program. The program also recognizes the need to provide instructors with ongoing support and guidance in their coaching role.

Under the current system of instructor training, new and experienced OJIs participate in basic quality assurance activities but do not have an individualized professional development plan. This study explored one approach to address this identified gap in the ongoing development of OJIs' coaching skills. By using professional learning as a reform-based approach to professional development, OJIs received instructional coaching, and feedback in the context of their regular coaching environment. This provided a clear connection to authentic practice and aligns with the ANSP's focus on "coaching the coaches". Additionally, the use of job-embedded coaching eliminated the significant challenge of removing the instructor from operational work to attend professional development activities.

Significance of the Study

"Training interventions are a salient but neglected part of air traffic control training" (Koskela & Palukka, 2011, p. 310). Gaining a deeper understanding of the effects of coaching as a form of professional learning for air traffic control OJIs offered both theoretical and practical contributions. The theoretical understanding, in the form of design principles, evolved from the research but contributes to a wider body of knowledge that may be used in a variety of settings (McKenney & Reeves, 2012) external to this context. The practical contributions came from designing the coaching protocol and testing implementation through the instructional coaching intervention as a solution to a problem in practice with the intent of yielding both immediate and longer-term effects.

From a theoretical perspective, the development of a coaching protocol for air traffic control OJIs addressed an identified gap in the literature pertaining to on-the-job instructing and coaching in a dynamic, safety-critical environment. It is intended that the study findings will contribute beyond the immediate context through the development of theory and a deeper understanding of on-the-job training, professional learning, and instructional coaching in both the air traffic control environment as well as other instructional settings. Additionally, research on workplace learning frequently focuses on the learner (Billett, 2003; Owen, 2009) while this study made a contribution to understanding through a focus on the instructor and their coaching role.

From a practical perspective, a legitimate problem of practice in a real-world setting was considered and a solution was identified and empirically tested. At the local level, practical significance exists for the trainee, the OJI, and the organization. On-the-job training is typically a difficult and stressful phase of training for the trainee. Working with an OJI who possesses the

required knowledge and skills to effectively coach the trainee in an operational environment can facilitate the learning process and improve the training experience. It is intended that, by applying the findings of this study, OJIs will develop improved instructional skills leading to a higher quality instructor capable of delivering improved training opportunities resulting in an ultimate increase in successful training outcomes. An improved success rate is of further significance to the instructor as it has the potential to reduce OJI disengagement and decrease burnout by creating a more rewarding training environment. For the organization, increased successful qualifications offset attrition, assist in addressing staffing shortages, and provide the organization with a beneficial return on the resources invested in training. Adequate air traffic control staffing contributes to safety, decreased potential for air travel delays, and promotes an overall healthier work environment.

The practical significance for the organization moves beyond the immediate context of instructional outcomes in on-the-job training to offer potential contributions with long term implications for positive cultural change in training delivery. Improved trainee performance linked to the enactment of better instructional practices may contribute to offsetting the belief that successful trainees have an innate talent for air traffic control (Owen, 2009) and establish a view that the coaching capacity of the OJI is capable of making a difference in training outcomes. This may also have an impact into the future as trainees observe coaching being modelled effectively and imitate it themselves when working as OJIs post qualification with future trainees.

The findings of this research will be of interest within the ANSP's operational training department as they are particularly applicable to the development of curriculum for the initial and ongoing training of OJIs. It will also be of interest to those involved in the delivery of on-

the-job training, including the OJIs, training supervisors, and members of the training teams supporting OJI development. Due to the shortage of qualified air traffic controllers in the aviation industry as a whole, the research findings should also prove of interest to other ANSPs around the world grappling with similar issues and looking to implement improved coaching for trainees. Finally, this research will be of interest to other industries that use OJIs as a means of providing training for personnel operating in a safety-critical environment, such as nuclear power plants or rail transportation.

Definition of Key Terms

The following key terms are defined within the context of this study and informed by the literature.

- **Coaching** – One-on-one form of collaborative professional learning (Denton & Hasbrouck, 2009; Desimone & Pak, 2017; Lofthouse, 2019) that provides OJIs with "opportunities to discuss and reflect…practice the application of new ideas and receive feedback from an expert, and to observe modeling" (Lockwood, McCombs, & Marsh, 2010, p. 374).

- **On-the-job training (OJT)** – Formal one-on-one workplace learning in an operational air traffic control unit for the purpose of attaining full unit qualification as endorsed by Transport Canada.

- **On-the-job instructor (OJI)** – A fully licenced air traffic controller assigned to provide one-on-one instructing, coaching, and training to an unqualified trainee in a designated operational unit or specialty. The OJI maintains full responsibility for the operational position while the trainee is working and is certified as an instructor through completion of an initial OJI Skills Course.

- **Trainee** – A student learning the skills of air traffic control in on-the-job training and assigned to work under the direct supervision of a licenced air traffic controller.

- **Professional development** – Encompasses "a wide variety of specialized training, formal education, or advanced professional learning intended to help [OJIs]…improve their professional knowledge, competence, skill, and effectiveness" (Great Schools Partnership, 2013). Within this study, professional development was research-based and used a reform-based approach.

- **Professional learning** – Involves a social constructivist and situated approach (Sentance & Humphreys, 2018) aimed at developing an OJI's instructional capacity to better serve the learning needs of trainees. It is considered as both an "intellectual and personal endeavor" (Girvan, Conneely, & Tangney, 2016, p. 130), enacted by way of an ongoing coaching process, as instructors critically self-evaluate, construct meaning through dialogue and reflection, and integrate or adapt learnings to their specific context (General Teaching Council for Scotland, n.d.; Ontario College of Teachers, 2016).

- **Formative feedback** – Verbal or written information that is communicated to the OJI regarding aspects of their instructional and coaching performance. It has the intent of modifying behaviour by providing knowledge, developing skills, or forming particular attitudes for the purpose of improving the OJI's instructional practice and skills. (Adapted from Hattie & Timperley, 2007; Shute, 2008). Formative feedback also occurs from the OJI to the trainee.

- **Workplace learning** – Involves the individual development—in a specific organizational context—of novel cognitive processes in conjunction with skill acquisition through the

assimilation of new knowledge, skills, and values (Adapted from Garavan, Morley, Gunnigle, & McGuire, 2002). It includes both formal and informal learning experiences.

Organization of the Dissertation

This chapter outlined the aim of the research study to explore the use of coaching as a means of professional learning for air traffic control on-the-job instructors by describing the study's problem and providing the context, rationale, and significance. Chapter Two reviews the literature on OJT within the context of workplace learning. Current themes in professional development are explored in relation to the OJI and the constructs that underpin the study, including instructional coaching as a form of professional learning and formative feedback as an essential instructional skill. Chapter Three provides details of the research design, including a delineation of the research questions that guided the study and the population and sampling. The three phases of the DBR methodology are carefully described in conjunction with the associated methods of data collection and analysis. Integrity of the study is provided in consideration of trustworthiness within this qualitative research. Chapter Four presents the themes that emerged from the findings of the research from all three phases of data collection used to prepare, design, and evaluate the professional learning coaching protocol. Included are the design requirements and design propositions that, in conjunction with the literature, formed the foundation of the coaching protocol tool. Chapter Five discusses the findings of the study and responds to the research questions by providing the key components of a professional learning coaching protocol and the associated design principles. The opportunities and challenges of the protocol are discussed and the impact on instructional capacity is considered. The dissertation concludes with Chapter Six, which provides an overview of the study, the implications of the findings, and suggestions for future research.

CHAPTER TWO: LITERATURE REVIEW

The aim of my research was to provide instructional coaching to on-the-job instructors (OJIs) as a form of professional learning with the intent of improving their own coaching and instructional skills when working with a trainee in on-the-job training (OJT). My research provided an opportunity for OJIs to observe and experience instructional coaching and formative feedback in their own professional learning and then implement those modelled behaviours when practicing new instructional skills in their own coaching practice with a trainee through the use of the designed coaching protocol.

This chapter provides the theoretical framework of the study using a social constructivist approach to coaching. This recognizes that the challenges associated with coaching in the air traffic control training context is a phenomenon partly "emanating from the sociocultural context from which it is situated" (Crippen & Brown, 2018). A review of the literature is provided to situate this problem of practice within the current discourse of on-the-job training, professional learning, coaching, and formative feedback. In keeping with design-based research's theoretical orientation, findings from the literature review then contributed to the development of the design propositions in the first phase of data collection. Lastly, by identifying a gap in the literature, I note the positioning of my study as a contribution to continuing the current discourse on coaching in this unique learning environment.

Theoretical Framework

"All research is interpretive: guided by a set of beliefs and feelings about the world and how it should be understood and studied" (Denzin & Lincoln, 2017, p. 19). Within qualitative research, the interpretive paradigm is based on the researcher's ascribed ontology, epistemology, and methodology. Exploring the phenomenon of providing instructional coaching to on-the-job

instructors as a means of professional learning necessitated the use of a social constructivist paradigm. This paradigm engaged with a relativist ontology acknowledging that there are multiple realities constructed through both ones lived experiences and social interactions (Lincoln, Lynham, & Guba, 2017). An acceptance of a relativist ontology was necessary for research within a facilitative coaching framework as "the learner is met and accepted wherever she is in her learning trajectory" (Aguilar, 2013, p. 6) and the coach's role is to facilitate meaning-making within the learner (Merriam, Caffarella, & Baumgartner, 2007). Thus, the researcher in the role of the coach participated actively in the research to ensure the generation of knowledge that both reflected and accepted the multiple realities of the on-the-job instructor (Lincoln et al., 2017).

This allowed for a subjectivist epistemology. As the researcher and the on-the-job instructor (OJI) worked collaboratively together, meaning was co-created through the coaching conversation, a dialogic process in which knowledge was "constructed when individuals engage socially in talk and activity about shared problems or tasks" (Driver, Asoko, Leach, Mortimer, & Scott, 1994, p. 7). Findings became the creation of the interaction between the researcher (coach), the participant (OJI), and the context in which we found ourselves; that being the safety-critical operational environment of air traffic control.

The constructivist paradigm assumes a naturalistic set of methodological procedures with the goal of understanding the phenomena so as to inform praxis (Denzin & Lincoln, 2017). This aligned with the use of design-based research as a methodology to design and develop a solution to address a real-world problem of practice while simultaneously contributing to theoretical understanding. McKenney and Reeves (2012) acknowledged that there is now a "rapidly growing appreciation of the notion that knowledge is uniquely constructed by the individual,

rather than transmitted; and instruction should therefore provide the conditions and materials to facilitate that construction" (p. 62).

Based on Brown's (1992) assertion that "real-life learning inevitably takes place in a social context" (p. 144), my study drew on social cognitive theory and situated learning as a framework for enacting coaching as a means of professional learning. The OJI and the coach worked collaboratively during the coaching session to incorporate the social cognitive concepts of observational learning and modelling. The OJI was provided with opportunities for observation as the coach modelled behaviours associated with effective coaching strategies. Furthermore, through social interaction the coach modelled effective formative feedback and the OJI developed self-efficacy through practice of the modelled coaching strategies. Situated cognition gives prominence to the context of learning, the associated activities, and the resulting social interactions as prime determinants of learning outcomes (Hansman, 2001). In keeping with Vygotsky's Zone of Proximal Development, OJIs were then challenged to optimally stretch their abilities (Merriam & Bierema, 2013) by approximating new coaching strategies in the real-life environment. A scaffolding approach was used as the level of coaching faded, but opportunities remained for ongoing support through the use of video recording and dialogue. In the coaching model, the OJI entered into a period of self-directed learning with ongoing practice in the actual work environment.

As a situated form of learning, the OJIs own professional learning occurs within the context of workplace learning. Through a coaching conversation, the coach used job-embedded coaching to model effective coaching and formative feedback. The OJI subsequently challenged themselves to enact the modelled coaching approach in the context of on-the-job training as they provided coaching and formative feedback to the trainee based on the coaching protocol.

Review of the Literature

Key terms used in this literature review include: (a) on-the-job training, workplace learning, structured on-the-job training; (b) professional development, professional learning; (c) coaching, instructing, instructional coaching; (d) instructional skills, feedback, formative feedback, teaching practice; and, (e) air traffic control. Terms were searched individually and in various combinations primarily in the University of Calgary library database, ERIC, and partially in Google Scholar.

A review of the searched literature is provided and is organized in four major categories representing a progressive specificity in focus. First, OJT is reviewed to situate the context within which the research occurred. Second, emerging from the review of OJT is the importance of the OJI and the necessity of providing adequate training through professional development. Third, the use of coaching as an applicable form of professional learning is reviewed in the literature. Finally, consideration is given to the literature on formative feedback in recognition of feedback as both an essential component of coaching and an effective instructional skill at the centre of the OJI's debrief with the trainee.

On-the-Job Training Context

On-the-job training (OJT) is situated and discussed within the context of workplace learning. Findings centre on formal OJT, its advantages and disadvantages, and a description of structured OJT. Recognition of the crucial role of the instructor is provided, along with a synthesis of key dimensions and training principles for on-the-job instructors. Consideration is given to why learning in the complex domain of air traffic control is challenging from the instructor's perspective and how training in air traffic control is recognized as a distinct form of vocational learning.

Workplace learning. Workplace learning is frequently recognized as an effective strategy for developing employee competence (Matsuo & Nakahara, 2013; Metso & Kianto, 2014) and is widely used in a variety of organizational environments (Jacobs, 2003). The scope of workplace learning is broad and there is no consistent definition evident in the literature. Hunter (2014) defined it as "ways of learning for paid work, in any setting and through any means" (p. 49) while Garavan et al. (2002) defined workplace learning as a "set of processes which occur within specific organisational contexts and focus on acquiring and assimilating an integrated cluster of knowledge, skills, values and feelings" (p. 61) in addition to the "development of new or novel cognitive processes in conjunction with skill acquisition" (p. 61). Traditionally, workplace learning relied on mandatory training programs to provide passive participants with the knowledge and skills deemed applicable for direct transfer to their jobs or development programs aimed at preparing employees for future positions (Noe, Clarke, & Klein, 2014). Increasingly, employees are valuing feedback about performance in their current role and seeking active opportunities to further increase their knowledge and skills in ways that are personally fulfilling but still contribute to wider organizational goals (Noe et al., 2014). Workplace learning is recognized by many authors as including both organizational learning and individual learning (Aik, 2005; Garavan et al., 2002; Polo, Cervai, & Kantola, 2018) however, my research focused primarily on individual learning within a professional learning context.

Workplace learning encompasses both formal and informal learning (Garavan et al., 2002; Matsuo & Nakahara, 2013). Formal workplace learning includes distinct, intentionally developed training with structured learning activities aimed at providing instruction for specific jobs (Garavan et al., 2002; Matsuo & Nakahara, 2013) whereas informal learning occurs unprompted through regular work activities and is frequently not recognized as learning, being

viewed instead as "part of the job" (Boud & Middleton, 2003, p. 195). Although Matsuo and Nakahara (2013) suggest that the majority of learning in the workplace occurs through informal means and that it plays a significant role in the development of expertise, informal learning is often invisible (Boud & Middleton, 2003) and as such, my research focused on formal individual learning, fully accepting the hidden contributions of informal learning. In a mixed methods study involving 462 survey responses and 29 interviews, Littlejohn, Milligan, and Margaryan (2011) identified that formal learning is the most valued type of workplace learning among both novice and expert knowledge workers. Workplace learning has currently shifted to become more learner-centred with recognition that it occurs naturally and is socially situated (Noe et al., 2014).

Formal on-the-job training. Formal workplace learning for employees entering the domain of air traffic control can take a number of different forms, including classroom instruction, simulation sessions, and on-the-job training, to develop the necessary competence to work independently. On-the-job training "focuses directly on real-world application" (Aik, 2005, p. 17) using a novice-to-expert approach to help the learner progress. OJT can be described as "task-related knowledge building" (Metso & Kianto, 2014, p. 130) with the employee learning new skills while conducting regular work activities (Ouellet, 2012), allowing the learner to make sense of the knowledge and skills they are developing (Littlejohn et al., 2011). Formal OJT is an opportunity to promote learning through "goal-oriented, guided work in workplaces" (Virkkula & Kunwar, 2017, p. 267).

On-the-job training typically occurs under the one-on-one instruction (van Zolingen, Streumer, de Jong, & van der Klink, 2000) of an experienced employee; however, it is no longer viewed as a simple transmission of knowledge and demonstration of skills by the employee in the instructor role. Rather it is accomplished with the learner playing a primary role and the

instructor acting as a facilitator for the learning process (Ouellet, 2012) through explanations, demonstrations, and subsequent practice by the learner (Matsuo & Nakahara, 2013). This approach to OJT is espoused within Canadian air traffic control training.

      Advantages and disadvantages of on-the-job training. Sisson (2001) identified the advantages of on-the-job training as being a hands-on approach involving realistic practice that integrates the learning with the work. Furthermore, time is not wasted teaching knowledge or skills that will not be used (Aik, 2005). Despite these advantages, Ahadi and Jacobs (2017) noted that in 2015 the Association for Talent Development identified that the most common approach to training delivery continues to be off-the-job training. This may be attributable to challenges such as: the possible need for multiple instructors due to the one-on-one nature of the training; and, the potential removal of instructors and associated work tools from normal work operations (Aik, 2005). Lastly, Sisson (2001) noted "traditional on-the-job training" (p. 4) is potentially inconsistent, inefficient, and ineffective in its delivery as it occurs in an "uncontrolled training situation that cannot produce consistent results" (p. 4).

      Through a small-scale survey (n = 63) and four case studies (n = 21) on critical success factors for implementing OJT, van Zolingen et al. (2000) explored both the advantages and disadvantages of such an approach to workplace learning. The advantages included a clear link between the training and the job, increased effectiveness of skill acquisition, cost-effectiveness for the organization, flexibility in the timing of delivery and content adjustments, and a decrease in issues related to transferring training into practice. The identified disadvantages of OJT included concerns such as: training being perceived as an extra burden by current workers, a workplace atmosphere unconducive to learning, the requirements of a heavy workload impeding training, difficulty keeping learning materials updated, a lack of focus on the necessary

background of knowledge and skills due to time constraints, and most importantly, inadequate training for employees fulfilling the instructor role (van Zolingen et al., 2000).

Structured on-the-job training. Unlike traditional and informal on-the-job training, formal on-the-job training uses a planned, systematic approach to training. One such method that has received much attention in practice is structured on-the-job training (S-OJT) although, through an integrative literature review based on 56 articles, Ahadi and Jacobs (2017) identified that there is limited scholarship in this area. The authors drew on Jacobs' (2003) earlier work to define S-OJT as a system-based framework that uses a "planned process of having an experienced employee train a novice employee on a unit of work at or near the actual work setting" (Ahadi & Jacobs, 2017, p. 326).

Various components of S-OJT are identified in the literature including preparation, delivery, and follow-up. S-OJT is based on prepared, well-documented training materials that incorporate clear objectives based on job skills and defined content or checklists. The delivery of S-OJT is scheduled, uses a pre-established training process, and is conducted by a knowledgeable, trained instructor. Follow-up activities include tracking the training and documenting learner progress towards expected outcomes (Ahadi & Jacobs, 2017; Cho, 2009; Jacobs & Jaseem Bu-Rahmah, 2012; Sisson, 2001). Due to the formal nature of S-OJT it requires management support with resources such as time, people, and equipment (Ahadi & Jacobs, 2017; Jacobs & Jaseem Bu-Rahmah, 2012; Sisson, 2001).

On-the-job instructors. A recurrent theme in the literature is recognition of the importance of the instructor in S-OJT and the need to provide training for this role (Ahadi & Jacobs, 2017; Johnson & Leach, 2001; Oprins et al., 2012; Virkkula & Kunwar, 2017). Frequently, experienced employees are chosen to provide OJT because they have the technical

expertise needed to do the job being trained (Ouellet, 2012) but they do not necessarily have the required instructor-related skills needed to facilitate learning (Johnson & Leach, 2001). Additionally, those with a high level of technical expertise may be less conscious of the automatic cognitive and physical tasks used to perform the job, thereby making them ineffective in the instructor role (Johnson & Leach, 2001). To address this, Ouellet (2012) suggested instructor training include an analysis by instructors of their own working practices to "become conscious of knowledge that has become unconscious" (p. 235).

The outcome of the training process depends on the instructor's ability to effectively deliver training (Cho, 2009), provide feedback, and evaluate progress (Ahadi & Jacobs, 2017). Instructor performance can be a critical success factor for training implementation and instructors must be prepared and recognize the value of using an instructional model (van Zolingen et al., 2000). This requires the provision of necessary supports such as preparation time and a resource person (Ouellet, 2012). Additionally, a quantitative study based on a return of 235 questionnaires found that providing training for instructors was causally related to a number of advantages, including increases in professional competencies, organizational commitment, and self-efficacy in their instructional abilities (Cho, 2009).

Instructional skills. The role of the instructor is also important in air traffic control training as successful learning outcomes are dependent on the quality of the instructor (Oprins et al., 2012). Johnson and Leach (2001) identified that "transforming a content expert into an effective instructor is not a trivial task" (p. 428) due to the lack of a clear model delineating the needed competencies. Through a review of effective training programs in three different organizations, the authors identified four critical training principles for experts being used as instructors. The principles include: training the instructors to determine content priorities of

critical knowledge and skills, dividing content into manageable chunks to prevent overload, ensuring the learner's confidence and abilities are increasing, and using a systematic approach to the delivery of on-the-job training. With the exception of confidence, these principles focus on the organization and structure of the content.

Subsequent studies have focused on specific instructional skills. Matsuo (2014) used a quantitative questionnaire with 715 respondents across 22 organizations to determine how experiential learning is promoted by excellent on-the-job instructors. Results indicated four types of instructional skills, including "promoting reflection of results", "monitoring progress", "providing positive feedback", and "stretching objectives" (p. 232). In a qualitative case study involving 62 participants in a vocational setting, guidance from the instructor was determined to be important and learning was promoted through cooperative planning and goal setting (Virkkula & Kunwar, 2017). In a qualitative study of two instructors working with three groups of apprentices (n = 7), the need to develop skills for training in the workplace, including pedagogical practices, was noted despite the lack of skill training in the study (Ouellet, 2012).

Instructors in OJT must also be able to provide instruction to the learner while ensuring the regular work is completed. Should difficulties arise relating to the work, the instructor's primary responsibility is to ensure productivity is maintained with training assuming a secondary role (Ouellet, 2012; Sisson, 2001). Likewise, if difficulties arise with the learner's progression, it can be challenging for the instructor to provide the necessary support to the learner while continuing to work; this is an especially important consideration in a safety-critical environment such as air traffic control. On-the-job instructors therefore require a variety of skills to be able to successfully combine training responsibilities with real work (Ouellet, 2012).

Learning in a safety-critical, complex domain: OJT for air traffic control. Air traffic control is a unique learning environment for the provision of OJT and poses a number of challenges for enacting effective instructional practices; for example, the work involves a reliance on teamwork, the use of numerous technological devices, rapidly changing situations, the inability to pause or stop the work, and the requirement to attain specific work goals within a given period of time (Grundgeiger, Hurtienne, & Happel, 2019). As a result, the work environment itself has a necessary influence on the design of the training program curriculum and the organizational choices enacted for instructing within OJT.

Air traffic control OJT happens within the contextual environment of a dynamic, safety-critical system. A safety-critical system is one in which "failure could result in loss of life, significant property damage, or damage to the environment" (John Knight, 2002, p. 547). As a result, training within the air traffic control industry occurs within an overarching culture of safety whereby the organizational training policies and procedures of air navigation service providers (ANSP) typically support enactment of a training model based on the requirements of a regulatory agency (Martin, Strzempkowski, Young, Fontecchio, & Delaine, 2020). Within Canada, air traffic control training is regulated by Transport Canada through the Canadian Aviation Regulations (CARs) pertaining to personnel licensing and training which require trainees to "demonstrate the level of knowledge, judgement, experience and skill for the endorsement" (CARs, 2019) while working under the supervision of a qualified air traffic controller. However, little is known about the "ways in which instructional activities facilitate trainees' knowledge development and participation in training activities in safety critical environments" (Koskela & Palukka, 2011, p. 296) despite effective training for air traffic

controllers being recognized as a critical component in the provision of a safe and efficient air traffic control system (Schultheis, 2014).

In order to prepare trainees for the safety-critical environment of OJT, air traffic control training programs frequently rely on the acquisition of knowledge through of the use of instructor-led classroom training and skill development through extensive high-fidelity simulation exercises (Schultheis, 2014) primarily focused on the development of procedural knowledge (Koskela & Palukka, 2011). Within OJT, training programs are usually divided into progressive phases with defined and "augmenting *performance standards*" (Oprins et al., 2012, p. 29) which require the trainee to advance towards the incorporation of efficiency within the safety parameters while also working increased traffic complexity and decreasing their reliance on the OJI as expertise is acquired (Oprins et al., 2012). In OJT, the training focus shifts from global procedural knowledge to the development of local procedures and knowledge inherent to the specific operational work position (Koskela & Palukka, 2011) necessitating the sharing of tacit knowledge. To maintain safety within this training context, the OJI must be positioned in close proximity to the trainee's work position in order to maintain situational awareness of the operation, access auxiliary equipment, and if necessary, override the trainee's radio transmissions to aircraft.

There is limited research on the impact of these training conditions on an instructor's ability to be effective; however, there is recognition that additional variables beyond the learning context may influence outcomes (Tracey & Tews, 2005) and the training choices OJIs make based on the prioritization of safety. Within OJT, it is frequently necessary for on-the-job instructors to choose between what they would like to do to guide the learner and what they can actually do based on constraints of the work and the work environment (Ouellet, 2012). This is

particularly relevant when training within an operational air traffic control environment where learning tasks cannot be completely planned, structured, and sequenced in a pre-defined, progressive manner and multiple tasks are frequently trained simultaneously (Oprins et al., 2012). Additionally, air traffic control skill acquisition is highly complex (Oprins et al., 2012), involving the development of multi-faceted cognitive skills.

Complexity can be subjective, objective, or an interaction between the two. Subjective complexity relates to the perceived importance or significance of a task. Objective complexity involves the extent to which a task is structured and can be described in detail, with less structured tasks being more complex (van Gog, Sluijsmans, Joosten-ten Brinke, & Prins, 2010). Within air traffic control training, learners encounter scenarios involving the interaction of both subjective and objective complexities; this presents as multiple events, of equally high importance, occurring nearly simultaneously with the potential for multiple solutions (Owen, 2009). Likewise, complexities exist for the instructor whose role is also described as a complex domain. The instructor role involves ill-structured tasks, varying situations, the need to simultaneously access multiple knowledge elements, and multiple paths to attain an acceptable solution (van Gog et al., 2010). The interaction of the air traffic control complexities with the complexities of the instructional role highlight the challenges of providing effective instruction in this OJT environment.

Instructors in air traffic control OJT must be able to adapt to individual learner differences such as "cognitive abilities, learning styles, personality, pre-education, [and] external influences" (Oprins et al., 2012, p. 33) which can often be compounded by other influences on the learner such as the "mental pressure to succeed [in] training or the complex working environment (physical conditions, colleagues)" (Oprins et al., 2012, p. 32).

Instructing in OJT for air traffic control. Although there is limited research focusing on the role of the instructor in workplace learning (Owen, 2009), discrete but significant contributions are provided by both Owen (2009) and Koskela and Palukka (2011) relating directly to the role of instructors in the air traffic control workplace and the varying instructional styles employed.

Owen (2009) undertook a five-year phenomenological qualitative study involving 100 interviews on the effect of organizational culture on learning in OJT for air traffic controllers. Three commonly held cultural beliefs and values were identified as required attributes for successful air traffic control performance. They were described as: (a) the belief in ability—explained as having an innate ability to be a good air traffic controller, (b) the importance of performance to demonstrate one's ability and in turn gain self-worth, and (c) the need to exude confidence as an element of good controlling (Owen, 2009).

Instructors typically used one of three pedagogical strategies depending on which of the three beliefs or values they espoused. First, when "acting on the trainee" (Owen, 2009, p. 485), the instructor provided exposure for the learner to build experience and confidence. This could occur through either an active or passive instructional approach and aligned with a belief in ability and the need for confidence. Second, "working with the trainee" (Owen, 2009, p. 487) was used by instructors who held a strong belief in the value of performance and involved enactment of a facilitator role (including instructional strategies such as feedback and reinforcement). Finally, "working against the trainee" (Owen, 2009, p. 488) was employed by instructors who saw their role as a gatekeeper and held a strong belief in innate ability. Not only did these instructors fail to use effective instructional strategies, they actively attempted to weaken confidence and detect a lack of ability (Owen, 2009).

Koskela and Palukka (2011) video recorded six simulator instructors and two on-the-job instructors for a total of 38 hours and then used conversation analysis and ethnomethodology to identify concrete instructional practices used to guide air traffic control training. Five types of interventions were identified: "giving orders, asking test questions, complementing speech production, providing instruction, and giving information" (Koskela & Palukka, 2011, p. 299). These interventions served either as a directive function by guiding attention to relevant information or as a corrective function by addressing mistakes. In OJT, the instructional approach changed from the trainer-driven approach used in simulation to a more collaborative approach as the instructor focused more on making visible the tacit knowledge and local requirements for a specific work position.

Although not specific to a Canadian air traffic control context, these research findings are significant as they recognize on-the-job training as a distinct form of vocational training (Koskela & Palukka, 2011) and identify some of the unique complexities associated with developing effective on-the-job instructors in an air traffic control environment. There are implications for the development of instructor training programs (Owen, 2009) and instructor professional development activities and it is suggested that the quality of air traffic control training could be improved by reflecting on actual training events (Koskela & Palukka, 2011).

From Professional Development to Professional Learning

Recognizing the pivotal role of instructors in the outcome of OJT, it becomes important to address how best to positively influence their instructional skills—especially given that instructors are often selected because of their technical expertise rather than for their instructional abilities. Webster-Wright (2009) noted that it is essential for professionals in any field to engage in continuous professional development in order to maintain high-quality practice

and Smith (2010) stated that this requires a "wide range of learning experiences" (p. 71). As a form of workplace learning, professional development can be taken up through both traditional and reform-based approaches, as well as reconceptualized as professional learning.

      Defining professional development. Professional development includes a wide variety of activities (Desimone, 2009) and as such does not have an agreed upon definition. Dogan and Yurtseven (2018) drew on work by the Organisation for Economic Co-operation and Development (OECD) to define professional development as "activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher" (p. 67), while Hoekstra, Kuntz, and Newton (2018) used the term "professional learning" and described it as "engaging in activities that lead to improved professional behavior or the capacity to behave in improved ways" (p. 238). Professional development is both an "intellectual and personal endeavor" (Girvan et al., 2016, p. 130), enacted by way of an ongoing process, as instructors integrate learnings to their specific context. While professional development is typically conceptualized as more complex and broader than discrete activities (Desimone, 2009), it is still relevant to identify the three different types of professional development activities addressed in the literature: traditional, reform-based, and informal (Dogan & Yurtseven, 2018; Garet, Porter, Desimone, Birman, & Yoon, 2001).

      Traditional forms of professional development, such as courses, conferences, and workshops, are typically scheduled sessions occurring outside the usual workplace setting and conducted by a leader with specific expertise (Garet et al., 2001). This type of professional development is quite common; however, one-time events, such as workshops, are often considered to be ineffective (Garet et al., 2001; Girvan et al., 2016; Hoekstra et al., 2018; Hunzicker, 2011) and insufficient for producing changes in practice due to their short duration,

lack of participant ownership, and their "one-size-fits-all approach" (Dogan & Yurtseven, 2018, p. 68). Guskey and Yoon (2009) drew on research by the American Institutes for Research to identify that workshops can produce positive changes when they have "focused on the implementation of research-based instructional practices, involved active-learning experiences for participants, and provided teachers with opportunities to adapt the practices to their unique classroom situations" (p. 496). Additionally, positive improvements in student learning can be attained when external experts, such as researchers, present new ideas and provide instructors with guidance for implementation (Guskey & Yoon, 2009). Traditional activities, such as formal courses, have also been found to serve as a prompt for learning in vocational and professional education instructors (Hoekstra et al., 2018).

Reform-based professional development activities occur within the context of the regular instructional setting, thereby making them more sustainable and possibly facilitating direct connections to practice (Garet et al., 2001). Typical reform-based activities involve in-depth collaborative work by instructors (Dogan & Yurtseven, 2018) and use coaching, mentoring, peer observations, feedback, study groups, and local support networks as forms of professional development (Dogan & Yurtseven, 2018; Garet et al., 2001). Overall, reform-based professional development (PD) is considered to be more effective than traditional activities (Dogan & Yurtseven, 2018; Garet et al., 2001) but Guskey and Yoon (2009) stated that their "true value has yet to be determined" (p. 498). In later research, findings pointed to instructional quality as being significantly influenced by reform-based professional development and "if we want to use teachers' professional learning as a means to advance instructional quality, we need to invest in reform-based PD activities" (Dogan & Yurtseven, 2018, p. 80) although no causal effect is noted.

Informal professional development activities are those that are unplanned and spontaneous, possibly even occurring unconsciously, thereby making it difficult to identify specific activities (Dogan & Yurtseven, 2018). They occur within everyday learning and may include trying out a new teaching method, reading literature, or informal dialogue with colleagues on improvement strategies (Dogan & Yurtseven, 2018). Such informal activities and their outcomes are typically undocumented (Timperley, Wilson, Barrar, & Fung, 2007) and do not appear to be sufficient to engender improvements to instructional quality (Dogan & Yurtseven, 2018) as they may not provide the necessary support for change (Hoekstra & Korthagen, 2011). Informal professional development activities such as self-directed learning processes are less common (Hoekstra et al., 2018); however, they may be more effective when coupled with formal supervision (Hoekstra & Korthagen, 2011).

Moving to professional learning. Through a review of 203 articles in the literature on professional development across professions, Webster-Wright (2009) identified that practices often focus on the delivery of content rather than the enhancement of learning. This approach to professional development is considered as a deficit model with the professional in need of developing and directing. Webster-Wright (2009) proposed a "shift in discourse and focus from delivering and evaluating professional development programs to understanding and supporting authentic professional learning" (p. 702). Although more than just a change in terminology, within this reconceptualization the term "professional learning" aligns more closely with the activities of reform-based professional development. This conceptualization moves from passive development to an emphasis on situated active learning dependent on a holistic approach. It aligns with a social constructivist orientation with the acceptance of learning through experience,

learning from reflective action, and learning mediated by context. Professional learning was used as a construct within this study.

Core features of professional development. In their seminal work, Garet et al. (2001) identified both "structural features [and] core features" (p. 919) to use in their comparative analysis of the characteristics of high-quality professional development. Structural features are those that relate to the design of the professional development activity and include: the *form* of the activity (e.g., reform-based or traditional); activity *duration* (total contact hours and time span); and the extent of *collective participation* by teachers from the same school, department, or grade. The core features address the substance of the professional development activity and include *content focus* (subject content knowledge), *active learning* (ways for teachers to become engaged in their learning), and *coherence* (alignment of activity with teachers' goals and organizational goals). These six characteristics were used as a basis for further research and the following presents a summary of the findings.

Form. In the original research it was identified that the type of activity may not be a defining factor since activities of equal duration had similar outcomes regardless of being traditional or reform-based (Garet et al., 2001). This finding is not necessarily supported in subsequent research that indicated substantial benefit from reform-based professional development (Desimone, Porter, Garet, Suk Yoon, & Birman, 2002). Although, as previously noted, there currently may be insufficient data to make a clear determination (Guskey & Yoon, 2009) on the effectiveness of each form. In a synthesis of evidence on professional learning by Timperley et al. (2007), it was noted that no particular form was more effective but, rather, it was important that teachers engaged in "multiple and aligned opportunities that supported them to learn and apply new understandings and skills" (p. xxxv). Desimone (2009) suggested that

professional development becomes more measurable if there is a focus on critical features rather than the type of activity and this is reflected in subsequent research (Desimone & Garet, 2015) when type is excluded as a variable and emphasis is placed on the following five remaining core features.

Duration. Duration was found to have an effect when it was sustained and intensive (Garet et al., 2001) both in terms of time span and total hours. Activities with 20 hours or more of contact time distributed over a school semester, or an intense summer session with similar ongoing follow-up, were found to be beneficial (Desimone, 2009). Sufficient time is required for teachers to deepen their understanding, consolidate new learnings, and incorporate new approaches (Lopes & Cunha, 2017; Smith, 2016); however, simply increasing time will not result in changes if it is not planned and purposeful (Guskey & Yoon, 2009). In recent research, duration, as measured by professional development days, was not found to have a direct and positive effect on instruction, nor a statistically significant effect on instructional quality (Dogan & Yurtseven, 2018) indicating that a finite number of hours alone does not result in change (Girvan et al., 2016). This is further supported in the synthesis by Timperley et al. (2007), which found little evidence that simply providing sufficient time and resources would promote professional learning that positively impacted student outcomes and indicated "how the time was used was more important than the amount of time" (p. xxviii).

Collective participation. Collective participation by groups of teachers is a critical feature—especially when it involves teachers from the same school, grade, or department as it provides the opportunity for dialogue (Desimone, 2009) and the development of an interactive learning community (Desimone & Garet, 2015). Additionally, this characteristic relates to coherence and provides opportunities for active learning (Garet et al., 2001) amongst

participants. Conversely, some research findings disputed the necessity of a homogenous group of teachers, choosing instead to recognize the importance of "teachers' knowledge of teaching" (Gore et al., 2017, p. 110). By working across usual divisions, opportunities arise to enhance professional relationships and create a culture of learning (Gore et al., 2017). Collective participation can, however, reinforce ineffective practices; therefore, opportunities must be provided to process new learnings and their implications, and focus on analyzing the impact of teaching on student learning (Timperley et al., 2007).

Content focus. Professional development focused on the academic subject matter of the discipline (e.g., math concepts) can produce an increase in knowledge and skills (Garet et al., 2001) and is identified as the most influential feature (Desimone, 2009) for improving practice. There must be an inclusion of not only subject matter content, but also the pedagogical aspect of how that content is learned by students (Desimone, 2009; Hunzicker, 2011). Professional development focused on specific teaching practices increases the implementation of those practices in the classroom regardless of their prior use by a teacher (Desimone et al., 2002). In air traffic control, instructors are already subject matter experts; thus, a content focus on the academic discipline knowledge of air traffic control would be of little value for professional development. Rather, instructors could benefit from content focused on the pedagogical aspect of how students learn air traffic control subject matter.

Active learning. Changes in knowledge and skills are most likely to occur when teachers are provided with opportunities for active engagement (Desimone et al., 2002; Garet et al., 2001). This may include a variety of activities, such as: observing expert teachers, receiving feedback and participating in discussion after being observed, and interacting with colleagues (Desimone, 2009). Repeated opportunities to learn, especially following the presentation of key

concepts and theoretical principles, was found to be an essential component of professional learning (Timperley et al., 2007).

   Coherence. Improvements were noted when content, goals, and activities of professional development align with the teachers' knowledge, beliefs, and goals, as well as the goals and policies of the institution (Desimone & Garet, 2015). Coherence can also be interpreted to include the integration of professional development into daily activities (Garet et al., 2001) rather than activities external to the practice setting.

   Desimone (2009) recognized these five core features (duration, collective participation, content focus, active learning, and coherence) as essential aspects of effective professional development and proposed that they be used as a core conceptual framework; however, it is a "complex relationship between professional development and improvements in student learning" (Guskey & Yoon, 2009, p. 495) and adhering to the framework may not result in changed practices. Additionally, the inclusion of content focus as a core feature may be more attributable to what was measured rather than what could be measured —for example, quality (Gore et al., 2017).

   While it is unclear how to effectively translate these core features into practice, the following five insights are suggested in the literature: (a) it is easier to alter a specific procedural behaviour than it is to improve content knowledge; (b) there is considerable variation in individuals' responses to the same professional development activity necessitating opportunities for differentiation within collective participation; (c) improved success occurs when professional development is explicitly aligned to daily instructional practices and lessons; (d) consideration must be given to the realities of principal, teacher, and student mobility, especially as it impacts

research; and (e) support and guidance from leadership are essential in the implementation of new learnings from professional development (Desimone & Garet, 2015).

Best practices in professional development. Timperley et al. (2007) make a major contribution through their synthesis of evidence on best practices for professional learning and development, its impact on teaching practices, and the subsequent effect on student outcomes. Through a review of 97 core studies and a number of additional supplementary studies, they identified findings in three key areas: the context of professional learning and development, the content of professional learning and development, and activities constructed to promote professional learning. A brief overview of the key features identified as effective in each area is provided.

Context. Seven important elements were identified for the professional learning context that positively impacted student outcomes, including: ensuring sufficient and effective use of time for extended learning opportunities (including frequent contact with the professional learning provider); engaging external expertise; engaging teachers in the learning process; challenging prevailing and problematic discourses, especially assumptions related to the learning ability of some groups of students; providing opportunities to interact in a community of professionals, whether school-based or externally-based; ensuring content was consistent with wider policy and research trends; and having leadership actively support and promote the professional learning opportunities (Timperley et al., 2007).

Content. Findings in this area included: the integration of theory and practice as a key feature of the professional learning opportunity; focusing on the relationship between teaching and learning and the teacher taking responsibility to promote learning rather than dismiss learning problems as inevitable; using assessment to identify both professional and student

learning needs; and features associated with sustained professional learning, such as having a strong theoretical base for practice decisions and having the skills needed to collect relevant evidence on the impact of teaching (Timperley et al., 2007).

Activities. Timperley et al. (2007) identified the key features of effective activities and suggested they should comprise a pedagogy for professional development. This included: aligning content and activities, providing a variety of activities and learning opportunities, recognizing that engagement with the content is more important than the particular activity, using a typical sequence (rationale, theoretical instruction, practice activities) for professional instruction, and providing opportunities to discuss understandings and negotiate meaning.

Current themes in professional development. In the last few years, a number of experimental studies have focused on specific approaches to professional development to determine their impact on instructional skills and improved student achievement. The approaches include the Dynamic Integrated Approach (DIA) (Antoniou & Kyriakides, 2013), the knowledge and skills needed to implement the instructional model of Response to Intervention (RtI) (Castillo et al., 2016), experiential learning (Girvan et al., 2016), Quality Teaching Rounds (QTR) (Gore et al., 2017), self-directed professional development (SD-PD) (Lopes & Cunha, 2017), and an intensive data-based, decision-making intervention (van der Scheer, Glas, & Visscher, 2017). A number of common themes emerged from a review of these research articles that include: (a) the importance of coaching, reflection, and support; (b) the effectiveness of gradual improvements; (c) the need for differentiated activities; (d) the combined value of intensive training with job-embedded activities; and (e) a focus on instructional skills over subject matter content. These five common themes show some alignment and some dissonance

with the core features. Nonetheless, the themes provide deeper insights into effective aspects of professional development and learning activities.

Coaching, reflection, and support. The use of coaching, guided reflection, and additional supports appear to be important aspects of effective professional development and align with professional learning. Both critical and guided reflection, focusing on the specific knowledge and skills related to a teacher's developmental stage, as opposed to general reflection, were found to be a fundamental component of professional development (Antoniou & Kyriakides, 2013) and this reflective teaching can be triggered through collaborative work with peers and researchers (Lopes & Cunha, 2017). Participating in coaching, whether in the form of job-embedded coaching or an intensive coaching-based program, was found to improve the instructional skills of educators (Castillo et al., 2016; van der Scheer et al., 2017). Additionally, changes to practice occurred more quickly when support, informal discussions, mentoring, and scaffolding were provided by colleagues and management (Girvan et al., 2016). With SD-PD, it was identified that the will of the teacher alone was not sufficient to stay committed to effective professional development and additional support was a necessary component (Lopes & Cunha, 2017). This theme, contrary to Desimone (2009), suggests that it may be important to give consideration to the type or form of professional development. Coaching, reflection, and support also align with aspects of collective participation and active learning.

Gradual improvements. Antoniou and Kyriakides (2013) suggested that teachers must master simple skills before acquiring more demanding skills and that these improvements may occur gradually. This is supported in the finding by Girvan et al. (2016) that many teachers start with small changes and, through sustained progress, make gradual changes to practice over the long-term. Thus, it is possible for a single teacher to consistently improve teaching practice over

time. It is not even necessary to make radical changes—such as introducing a new teaching trait, in order to impact practice—but rather significant improvements can be achieved through small changes, such as altering the frequency of a trait (Lopes & Cunha, 2017). This provides support for the assertion that professional development requires "multiple opportunities to learn and should be carefully monitored and evaluated" (Castillo et al., 2016, p. 894). Gradual improvements support the need to consider duration and ensure the adequate provision of ongoing professional development activities as skills are acquired and mastered.

Differentiated activities. It is important for the content of professional development activities to address the specific learning needs of each teacher or group of teachers, with priorities for improvement being identified through the collection of data on teacher classroom behaviour. It is also necessary to take into account a teacher's developmental stage of teaching skills, allowing for differentiated activities or courses for teachers with similar experience (Antoniou & Kyriakides, 2013). Likewise, differentiated professional development can account for variation in both initial skill level and improvement rate, recognizing factors such as the "unique contexts within and across schools" (Castillo et al., 2016, p. 906), the career stage, and individual feelings towards innovation (Hunzicker, 2011). Differentiated activities provide insight on collective participation and recognize that simply grouping participants by commonalities, such as subject or grade taught, may be inadequate to meet the learning needs of individuals. There is potential for differentiated activities to provide teachers with coherence between their learning needs and the professional development activity.

Intensive training and job-embedded activities. Job-embedded professional development is both relevant and authentic through its seamless integration into daily practice (Hunzicker, 2011). Participation in direct, intensive coaching sessions (e.g., multiple full-day

training activities) produced significant increases in specific instructional skills when combined with job-embedded coaching, such as modelling, practice, and collaborative feedback (Castillo et al., 2016). A similar approach was used in the QTR model of professional development with a two-day training session followed by rounds of observation and discussion with peers. This model produced significant and sustained improvements in teaching quality, morale, and sense of appraisal and recognition (Gore et al., 2017). Lastly, teachers began to change their practice after participation in initial training that included experiential learning for a new learner-centered approach to teaching followed by job-embedded implementation in their classrooms (Girvan et al., 2016). Job-embedded activities align with the core features of coherence and active learning as the professional development activities link directly with practice.

  Focus on instructional skills. As already noted, despite being less relevant in air traffic control training, content focus on academic subject matter is considered to be a core and influential feature of professional development (Desimone, 2009; Garet et al., 2001). However, Gore et al. (2017) identified that, regardless of content area, "training in particular techniques enables teachers to reproduce those techniques more frequently or more consistently" (p. 108), potentially contributing opportunities for increased instructional practices for on-the-job instructors. As well, focusing on enhancing teaching practices was found to be a key component of successful SD-PD as it improved both the quality of teaching practices and the learning of students (Lopes & Cunha, 2017), with effective instructional skills contributing to deep and intentional learning (Blumberg, 2014). Centering professional development on a specific instructional skill (e.g., data-based decision making) significantly improved both teachers' skill and frequency of use in the targeted area regardless of the teachers' initial teaching skills (van der Scheer et al., 2017). Additionally, professional development focusing on the implementation

of new instructional skills was effective in changing practice as teachers learned to focus more on the instructional skill of self-directed active learning and less on content transmission (Girvan et al., 2016).

Coaching

The provision of coaching is a key responsibility for on-the-job instructors working with trainees in an air traffic control environment; however, it is also necessary to consider how coaching can be leveraged to support and develop the capacity of the OJT instructors. Coaching will be discussed as a professional learning activity, recognizing that there is a diverse range of coaching types and styles. Instructional coaching will be used as a basis for discussing the coach, considering the seven guiding principles for coaches and the changing nature of the coach's role. Three key components identified in many instructional models will be briefly described. Two models will be overviewed in support of the potential positive benefits of instructional coaching and gaps recognized. Coaching types and styles will then be aligned to the air traffic control OJI context.

Defining coaching. Coaching is one form of professional development (Denton & Hasbrouck, 2009; Desimone & Pak, 2017; Lofthouse, 2019) frequently used in educational settings and is based on learning theory which suggests the necessity of providing learners with "opportunities to discuss and reflect with others, to practice the application of new ideas and receive feedback from an expert, and to observe modeling" (Lockwood et al., 2010, p. 374). Coaching builds on evidence that professional development is more effective when it includes "intensive forms of support" (Devine, Houssemand, & Meyers, 2013, p. 1126). There are both numerous ways to describe and define coaching as well as multiple coaching models (Lock, 2018). Aguilar (2013) recognized that coaching meets the learner at their current level and

encourages, supports, and pushes them to uncover and develop strengths, skills, knowledge, and capacity. This is achieved through "patience, compassion, humility, attentiveness, and a willingness to listen deeply" (Aguilar, 2013, p. 6) on the part of the coach. When coaching is used as an evidence-based approach to professional learning for teachers it is typically referred to as educational or instructional coaching (Jim Knight & van Nieuwerburgh, 2012) and defined as:

> a one-to-one conversation focused on the enhancement of learning and development through increasing self-awareness and a sense of personal responsibility, where the coach facilitates the self-directed learning of the coachee through questioning, active listening, and appropriate challenge in a supportive and encouraging climate. (van Nieuwerburgh, 2012, p. 17)

Instructional coaching is often described as job-embedded (Denton & Hasbrouck, 2009; Howley, Dudek, Rittenberg, & Larson, 2014; Lock, 2018; Lockwood et al., 2010) and as a "form of in-class support to enhance teaching competence through systematic reflection on professional practice….directed at strengthening the instructional competence of the teachers" (Veenman & Denessen, 2001, p. 389). A central concept within coaching is the notion of creating value (Lock, 2018) for the instructor being coached, the student, and the organization. Coaching should never be used as a remedial or supervisory process to address ineffective instructors (Aguilar, 2013; Gallucci, Van Lare, Yoon, & Boatright, 2010; Suarez, 2018), nor as a means to enforce a program (Aguilar, 2013); rather, it is a formative educational process (Lofthouse, 2019).

There are three types of coaching: one-on-one coaching; group coaching; and, systems coaching. In the traditional view of coaching as a one-on-one interaction (Mangin & Dunsmore, 2015), the focus is on supporting the instructor to attain specific role-related goals

(Narayanasamy & Penney, 2014) using a two-way conversation based on a supportive, encouraging, and trusting relationship (van Nieuwerburgh, 2012). Group coaching involves intermittent sessions to attain team goals with several people in a workplace environment (Narayanasamy & Penney, 2014). The group method is not always viewed as an effective coaching approach as it does not provide the necessary depth of trust and confidentiality required in a coaching relationship (van Nieuwerburgh, 2012). Lastly, systems coaching extends beyond the individual to work within a system, such as a team, organization, or institution, to effect change (Mangin & Dunsmore, 2015; Narayanasamy & Penney, 2014); it is grounded in systems thinking and makes connections between the individual, the system, and the broader societal context (Aguilar, 2013). Mangin and Dunsmore (2015) suggested systems coaching, aimed at system-wide change, conflicts with the traditional notion of one-on-one coaching aimed at addressing individual needs.

At its core, the foundational basis of coaching is to "enhance or grow the potential of the individual instructor" (Lock, 2018, p. 310) typically by using a collaborative (Devine et al., 2013) dialogical approach (Haneda, Teemant, & Sherman, 2017; Lock, 2018; Lofthouse, 2019), including questioning, listening, discussing, and challenging (van Nieuwerburgh, 2012) to provide feedback and promote reflection. Dialogue must occur in a positive, supportive, and encouraging climate, yet there is a continuum ranging from facilitative (or reflective) interventions to directive (or instructive) interventions (van Nieuwerburgh, 2012) with the aim of changing behaviours (Aguilar, 2013). Many coaches draw from both facilitative and directive strategies (Denton & Hasbrouck, 2009).

Facilitative coaching, with its use of a partnership approach to build on instructors' existing skills, knowledge, and beliefs (Aguilar, 2013), is repeatedly represented in the literature

(Jim Knight & van Nieuwerburgh, 2012; Narayanasamy & Penney, 2014; Reddy, Dudek, & Lekwa, 2017; van Nieuwerburgh, 2012; Wang, 2017). Hammond and Moore (2018) are an exception with their "unapologetically directive and prescriptive" (p. 126) approach to instructional coaching. Facilitative coaching positions the coach not as an expert but as a support, allowing the instructor to take the lead (Denton & Hasbrouck, 2009). It is most effectively enacted when the "intention is to build self-esteem, independence, or self-confidence" (van Nieuwerburgh, 2012, p. 17) and develop responsibility in the instructor. Facilitative coaching includes cognitive coaching, which builds metacognition and encourages reflective practices leading to self-directed learning (Aguilar, 2013; Veenman & Denessen, 2001). Cognitive coaches work to change instructor practices through direct content instruction, modelling techniques and practices, observations of the instructor applying the modelled behaviour, and facilitation of reflection (Wang, 2017). Howley et al. (2014) provided an opposing view of cognitive coaching, stating that it can enhance reflection but is unlikely to improve performance of discrete skills.

Directive coaches, conversely, are positioned as experts who teach defined knowledge or skills to the instructor (Aguilar, 2013). There may be an emphasis on program implementation (Denton & Hasbrouck, 2009) with the coach providing resources and making specific suggestions. Directive coaching is criticized for not contributing effectively to learning and long-term change (Aguilar, 2013); however, its use may be advocated depending on the situational context and the desired outcome (van Nieuwerburgh, 2012). Coaches may adopt a directive approach when there is a significant amount of information to convey or when the learner's motivation to make changes is low (van Nieuwerburgh, 2012). In their findings,

Hammond and Moore (2018) specifically attributed the significant and measurable change in classroom practice to the directive elements of their coaching.

Elements of instructional coaching. A collaborative partnership approach to coaching requires a foundational relationship based on "trust, respect, openness, honesty and unconditional positive regard" (Narayanasamy & Penney, 2014, p. 569). To do this effectively, Jim Knight (2011) articulated seven principles that can guide instructional coaches to evaluate their interactions and make decisions on current and future actions (Jim Knight & van Nieuwerburgh, 2012) as respectful and responsive coaches (Jim Knight, 2016). The principles are equality, choice, dialogue, praxis, voice, reciprocity, and reflection.

Principles. Equality values the partnership allowing ideas to be shared; it is closely related to the principle of choice which allows for instructors to make their own individual choices on which practices to adopt and for decisions to be made collaboratively between the coach and the instructor. Instructors are encouraged to take the lead in focusing on what is most useful to their own professional development (Denton & Hasbrouck, 2009; Devine et al., 2013) and coaches work to overcome any perceived power imbalances (Lofthouse, 2019). The centrality of dialogue has been previously noted and the importance of exploring ideas and learning through conversation is valued. Lofthouse (2019) emphasized the role of "dialogue based on curiosity, listening, [and] creating spaces in conversations" (p. 34).

Praxis is described by Jim Knight (2011) as the "act of *applying* new knowledge and skills" (p. 20). It underscores the need to put new ideas into practice, allowing individual instructors to reconstruct content to be useful (Jim Knight & van Nieuwerburgh, 2012). This principle is evident in earlier references to job-embeddedness and the focus on "real application of research-based interventions" (Devine et al., 2013, p. 1129), as well as the emphasis on

ensuring practice opportunities (Jim Knight & van Nieuwerburgh, 2012; Narayanasamy & Penney, 2014; Reddy et al., 2017) for new skills.

Partnerships allow individuals to learn from others and the coach must ensure that instructors are free to give voice to their concerns, opinions, and goals through the lens of reciprocity whereby experiences are shared and every interaction is entered into as a mutual learning opportunity (Jim Knight, 2011; Lofthouse, 2019). Elsewhere in the literature this principle is represented as a teacher-centered approach (instead of coach-centered), honouring the expertise and voice of the teacher/instructor and building rapport (Wang, 2017) through trusting and nurturing relationships (Howley et al., 2014; Lock, 2018; Lofthouse, 2019). Individual thought and reflection allow for growth and the coach acts as a "thinking partner" (Jim Knight, 2011, p. 21) for the instructor. Reflection is included as a central component of most instructional coaching (Johnson, Finlon, Kobak, & Izard, 2017; Sailors & Price, 2015; Suarez, 2018; Wang, 2017) since it "serves as the foundation for continuous learning and improvement in educational practice" (York-Barr, Sommers, Ghere, & Montie, 2001, p. 8).

Reflection is an active process that provides the opportunity to examine practice experiences and gain new contextual understandings that lead to improvements through subsequent action (York-Barr et al., 2001). Central to reflective practice are the two basic processes of reflection-on-action and reflection-in-action (Merriam et al., 2007). Reflection-on-action involves returning to an experience after it has occurred to re-evaluate the experience, consider how it could be handled differently, and put a new approach into action (Merriam et al., 2007). Schön (1991) observed that "practitioners often think about what they are doing, sometimes even while doing it" (p. 50); which he termed reflection-in-action. This form of reflection is often triggered by surprise when thoughts and actions no longer work in a particular

situation (Merriam et al., 2007); through reflection-in-action, the practitioner reconsiders their initial understanding to construct, then test, new ways of responding (Schön, 1991). Within coaching, reflection becomes a social phenomenon through dialogue with the coach as a partner, leading to increased insights and learning (York-Barr et al., 2001).

Roles. Through an action research study with three participants, Wang (2017) analyzed the specific coaching roles assumed during reflective debriefs as the coach moved the teacher's evolving reflections to conclusions and actions plans. Four distinct roles were identified and were often used in every session: facilitator, instructor, collaborator, and empowerer. In the facilitator role, the coach provided scaffolding questions to assist the teacher with reflection. The instructor role was used to teach concrete strategies, present ideas, and model specific practices; whereas, the collaborator role allowed for brainstorming and role playing. By assuming the role of empowerer, the coach supported the development of professional identity and personal voice. The roles of instructor and collaborator were used the least and empowerment only occurred in conjunction with facilitation. The facilitator role was used most commonly and, even when the other roles were being enacted, the use of facilitative questioning was included to move the teacher towards reflection (Wang, 2017).

Coaching models. Denton and Hasbrouck (2009) recognized that there is overall "consensus that coaching is a form of sustained, job-embedded professional development" (p. 155); however, there are few clearly articulated, evidence-based models for instructional coaching (Denton & Hasbrouck, 2009; Jim Knight & van Nieuwerburgh, 2012). Coaching can take many forms (Lofthouse, 2019) and models may draw on multiple approaches (e.g., technical, problem-solving, reflective practice, reform, instructional, collaborative) simultaneously (Denton & Hasbrouck, 2009).

The instructional coaching cycle identified by Jim Knight et al. (2015) includes a number of steps incorporated into three main components: identify, learn, and improve. These three steps appear to be representative of similar components in various coaching models described in other articles although different terms may be used. Suarez (2018) referred to a coaching cycle of planning, teaching, and reflection. The peer coaching model COACH (Colleague Observation And CoacHing) used observation, discussion, and reflection (Johnson et al., 2017), while the CORE model (Consortium on Reading Excellence) is based on plan, execute, reflect and debrief (Denton & Hasbrouck, 2009). The SIPIC model (Support for the Improvements of Practices through Intensive Coaching) advised the use of a pre-conference to prepare, followed by guided observation, planning, guided reflection, and guided conversation (Sailors & Price, 2015). In the Classroom Strategies Coaching Model, a number of steps were identified but the core components of planning, implementing, and feedback are present (Reddy et al., 2017). The following uses the instructional coaching cycle as a basis to provide a brief description of the three main components of many instructional coaching models.

Identify. Several steps are incorporated in this component, including determining the current reality, identifying a change or goal, and selecting a strategy to attain the goal (Jim Knight et al., 2015). This stage uses collaboration and conversation to arrive at teacher-selected goals that build on strengths while moving the instructor towards new, effective practices (Suarez, 2018). Elements of observation are typically included in this stage, often through live-observation (Johnson et al., 2017), video recording (Jim Knight et al., 2015), and co-teaching or guided conversations (Sailors & Price, 2015).

Learn. This component involves the instructor learning how to implement the identified strategy. Jim Knight et al. (2015) recommended that the coach be extremely knowledgeable in a

selection of highly effective instructional strategies and provide clear and precise explanations for their implementation, often through the use of checklists. This assumes a directive approach with a content-expert coach and would not necessarily be applicable in more facilitative coaching models. Examples of coaching techniques utilized in this component include modelling, providing training, co-teaching, or providing opportunities to observe another instructor (Denton & Hasbrouck, 2009; Jim Knight et al., 2015; Suarez, 2018). It is important to ensure a learning objective related to the teacher's goal (Suarez, 2018) when enacting these techniques; the use of guiding questions during an observation by the teacher can provide a basis for further discussion with the coach (Sailors & Price, 2015).

Improve. The final component involves implementing the strategy and monitoring to determine progress (Jim Knight et al., 2015). This is a time for discussion and reflection, including providing feedback on observed behaviours, engaging in debriefs through conversation, and revising goals or identifying further areas of focus (Denton & Hasbrouck, 2009; Suarez, 2018). Sailors and Price (2015) suggested the use of both "guided reflection" (p. 119) enhanced through stimulated recall and "guided conversation" (p. 119) to develop the instructor's thinking processes.

Models in practice. While not all studies show "positive outcomes of the impact of coaching on practice" (Sailors & Price, 2015, p. 116), in a number of studies there is evidence pointing towards encouraging outcomes. This section provides a brief review of the findings in two such empirical studies focusing on the implementation of instructional coaching models in practice.

The SIPIC coaching model involves a sustained, classroom-based embedded approach employing a hybrid coaching model using both directive and responsive coaching. The study

used a pre-test–post-test control group design with 120 participants spread across four school districts in two large metropolitan cities to empirically demonstrate that coaching continues to be a "viable means of improving the instructional practices of reading teachers" (Sailors & Price, 2015, p. 124). Treatment teachers became more adaptive in their instruction, provided students with more opportunities to engage in cognitive instruction, and gave better explanations or co-constructions of reading strategies. Coaching may have positively impacted students' reading achievement as demonstrated through greater gains on standardized reading measures. Additionally, there was a statistical association between coaching time and teachers engaging students with cognitive strategy instruction indicating that the most effective use of the coach's time may be working directly with teachers. The instructional practices of teachers were statistically associated to exchanges with their coaches, empirically demonstrating that "coaches' behaviors may influence the professional practices of teachers with whom they work" (Sailors & Price, 2015, p. 125).

The second model, the Classroom Strategies Coaching (CSC) Model is grounded in adult learning, social learning, and behavioural consultation. The model uses a collaborative teacher-coach approach involving active learning, observational learning, modelling, practice, and feedback. It implements multiple, brief job-embedded interventions to focus on improving teachers' practice and skills through goal-oriented problem-solving (Reddy et al., 2017). A randomized control trial with 89 teachers found the model to be a valid instrument for improving teacher practices. A significant improvement in the observed use of the targeted instructional strategies was noted after receiving coaching with similar improvements noted when the control group received the intervention (Reddy et al., 2017). Participants also self-reported greater improvements in classroom strategies after the coaching intervention.

While these studies provide examples of encouraging support for the use of instructional coaching to improve instructional practices (Reddy et al., 2017; Sailors & Price, 2015), neither was able to determine the lasting effects of coaching and whether changes were sustained over time. With the exception of Sailors and Price (2015), most studies do not address or establish the connection between improved instructional practices and increased student achievements (Desimone & Pak, 2017; Haneda et al., 2017; Johnson et al., 2017; Reddy et al., 2017).

Coaching appears to be a valuable form of professional learning for improving the instructional skills of teachers but Jim Knight (2011) cautions that poor coaching can be ineffective, wasteful, and destructive. The work of a coach is complex and challenging; it cannot be carried out by anyone (Wang, 2017). Coaches must be carefully selected and provided with learning opportunities to develop and refine coaching skills (Lock, 2018), interpersonal skills, and skills for peer work in professional relationships (Denton & Hasbrouck, 2009). There is little research on the link between coach preparation and changes in outcomes (Mangin & Dunsmore, 2015) or on the supports needed to facilitate the implementation of coaching practices (Sailors & Price, 2015). This may be exacerbated by the lack of well-defined instructional coaching models and varying interpretations of coaching (Denton & Hasbrouck, 2009).

Within the context of air traffic control, the use of instructional coaching as a form of professional learning for on-the-job instructors necessitated the use of a facilitative and collaborative one-on-one model. This form of coaching allowed the OJI to assume the lead in their own learning by focusing on what was important to their practice and constructing meaning relevant to their context, based on their own experiences. A facilitative coaching style also promoted self-directed learning, potentially encouraging ongoing independent professional learning by the OJI in the coach's absence. Nonetheless, when working with an OJI, the coach

would, at times, draw from both facilitative and directive approaches and would use a range of

roles (facilitator, instructor, collaborator, empowerer) to best guide the OJI's professional

learning.

Formative Feedback

A recurring theme in the literature pertaining to instructional practices is that "feedback is

critical for learning any new skill" (Chan, Konrad, Gonzalez, Peters, & Ressa, 2014, p. 96). The

skills associated with teaching and instructing are frequently new for air traffic controllers

fulfilling the role of on-the-job instructors and, as such, feedback can be expected to play an

important part—not only in their instructional role with trainees, but also in their own

professional learning. It is beneficial to gain an understanding of how feedback is currently

represented in the literature and consider implications of its use to improve the instructional

practices of instructors.

Feedback will first be considered and then the specific instructional practice of formative

feedback will be delved into more deeply. Common defining elements will be overviewed and

specific definitions from the literature will be provided. Next, considerations pertaining to the

structure of formative feedback will be presented, followed by a delineation of how instructional

practice can be aligned as a form of formative feedback. Attention is given to research relating

to the implementation of formative feedback with linkages provided to directive feedback and its

potential applicability in air traffic control training.

Defining feedback. In the context of teaching and learning, definitions of feedback often

appear to consider the process of feedback and define it based on various elements related to

what kind of information is provided, who is receiving the information, the purpose of making

improvements, and when the feedback should be provided. Brookhart (2012) referred to

feedback simply as "helpful, learning-focused comments" (p. 25). Hattie and Timperley (2007) provided the following comprehensive definition of feedback: "information provided by an agent…regarding aspects of one's performance or understanding of it. It occurs typically after instruction that seeks to provide knowledge and skills or to develop particular attitudes" (p. 102).

One type of feedback addressed in the literature is that of formative feedback. It is defined as "information communicated to the learner that is intended to modify his or her thinking or behavior for the purpose of improving learning" (Shute, 2008, p. 154) and is usually presented "in response to some action on the learners' part" (Shute, 2008, p. 153). Formative feedback can be considered relational (Ellegaard, Damsgaard, Bruun, & Johannsen, 2018) and is often construed as a conversation or dialogue between the instructor and learner, whether verbal (Brookhart, 2011; Mavin, Kikkawa, & Billett, 2018) or written (Ellegaard et al., 2018; Frank, Simper, & Kaupp, 2018). Bloxham and Campbell (2010) also noted an increased emphasis on the importance of dialogue for learner engagement with feedback in recognition that "learning tacit knowledge is an active, shared process" (p. 291) resulting in a shift from feedback transmission by the instructor to a process in which learners actively construct new knowledge and skills (Nicol & Macfarlane-Dick, 2006). The use of formative feedback is recognized as having the potential to significantly impact and positively influence learning outcomes (Frank et al., 2018; Hattie, 2012); however, "not all feedback is equally effective" (Chan et al., 2014, p. 97) and Shute (2008) cautions it must be delivered correctly to be effectual.

Structure of formative feedback. In addressing how formative feedback is structured, consideration will be given to four different levels of feedback. The implications of timing, duration, and complexity of feedback will also be discussed.

Levels of feedback. In their seminal work, Hattie and Timperley (2007) used a conceptual analysis to provide a synthesis of the evidence pertaining to feedback and its role in teaching and learning. They identified four major focus levels of feedback and recognized that feedback effectiveness will vary depending on its focus and the level at which that focus is directed. These four levels appear frequently in other research articles (Chan et al., 2014; Frank et al., 2018; Schütze, Rakoczy, Klieme, Besser, & Leiss, 2017; Skipper & Douglas, 2012) and include feedback about: (a) a task or product, for example, indicating if something is correct or incorrect; (b) the process used to complete the task or product, focusing on information processing and understanding; (c) self-regulation, including aspects of self-evaluation and confidence which significantly influence self-efficacy; and (d) the person or the "self" which is often unrelated to the performance of the task, for example, "you are a great student" (Hattie & Timperley, 2007, p. 90).

Each of the different feedback focus levels appear to have value in particular situations and be less applicable in other contexts. Feedback about a task, or corrective feedback, is most effective for simple tasks when the learner is functioning under an incorrect interpretation or hypothesis versus a lack of information (Hattie & Timperley, 2007). Feedback at the process level relates to the underlying cognitive processes, such as the what, why, and how, associated with a task (Shute, 2008). Process feedback is most beneficial for developing the learner's ability to self-correct through error detection and thus contributes to deeper learning (Hattie & Timperley, 2007). Feedback about self-regulation impacts the learner's commitment, control, and confidence. It too contributes to deep learning and is most beneficial in its ability to assist the learner to "monitor, direct, and regulate actions towards the learning goal" (Hattie & Timperley, 2007, p. 93) thus empowering the student as a self-regulated learner (Nicol &

Macfarlane-Dick, 2006). The final level, feedback about the individual as a person, is generally

perceived to be ineffective due to its lack of information related to the learner's performance.

For those experiencing failures, personal feedback, in the form of praise, may be especially

detrimental to their performance, affect, and level of persistence, potentially engendering a

helpless response (Skipper & Douglas, 2012). While Hattie (2012) acknowledged that people

enjoy receiving praise, he advised that it not be delivered with feedback as it diminishes the

effect of the feedback. Shute (2008) argued that "feedback that has negative effects on learning

is not formative" (p. 156). This argument could apply to feedback focused on the person due to

its potentially harmful effect. Regardless, Hattie and Timperley (2007) argue that "too much

feedback within a level may…detract from performance" (p. 91).

Feedback in air traffic control training is often provided at the task level; however, the

work involves complex cognitive skills and an ability to monitor performance, detect errors, and

make corrections. Thus, the ability to effectively provide feedback at the process and self-

regulation levels is an essential skill for OJIs in this context.

Timing, duration, and complexity of feedback. Issues relating to the timing, duration,

and quantity of feedback arise in the literature. It is frequently suggested that feedback be

delivered to the learner immediately so as to be both relevant and useful (Chan et al., 2014;

Graham-Day, Fishley, Konrad, Peters, & Ressa, 2014); however, context is important and there

is support for both the immediate and delayed timing of feedback. Shute (2008) defined

immediate feedback as occurring "right after a student has responded to an item or problem" (p.

163) and delayed as "relative to immediate…occur[ing] minutes, hours, weeks, or longer after

the completion of some task or test" (p. 163). Hattie and Timperley (2007) advised that feedback

cannot be considered in isolation from the above noted levels of feedback. Receiving immediate

error correction can result in faster new task acquisition (Hattie & Timperley, 2007) and more efficient retention, especially for easy items such as certain verbal, procedural, or motor skills (Shute, 2008). Conversely, when building fluency and automaticity at the process level, delayed feedback avoids interrupting the learner and allows the necessary time to process more complex learning, resulting in improved transfer (Hattie & Timperley, 2007; Shute, 2008). This contrasts with Clariana's (as cited in Shute, 2008) view of timing and task difficulty, which suggests that difficult tasks need immediate feedback and delayed feedback is preferable for simpler tasks. Within air traffic control OJT, opportunities exist for immediate feedback of short duration; however, due to the demands of the operational environment and the importance of building automaticity, the majority of feedback is typically delayed until a post-session debrief.

In addition to timing, the duration and complexity of feedback plays a role in its effectiveness. Feedback complexity relates to both quantity (how much) and content (what information) with it being recognized that long and complicated feedback may overwhelm the learner and diminish its value (Ellegaard et al., 2018; Shute, 2008). The learner's performance level may also affect the duration of the feedback, with poor performance often requiring more time for review, reflection, and discussion. A mediating factor for length may be the learner's mental and physical condition, with tiredness impacting their ability to engage with feedback (Frank et al., 2018); this is an important consideration in air traffic control training.

Instructional practices associated with formative feedback. Feedback is not formative when it has a negative effect on the student's learning (Shute, 2008). For feedback to be formative the intent cannot be to point out failure, rather feedback must aim to move the student's learning forward (Chan et al., 2014). This can be achieved by ensuring the feedback is

deliberately aligned with the intended learning goals and through the use of instructional strategies, such as guidance and scaffolding, as a means for providing formative feedback.

Alignment with goals. Formative feedback seeks to advance the learner's progression towards a desired outcome and therefore must be closely aligned with learning goals and linked to assessment. To do this successfully, learners must be provided with "goal-directed" rather than "discrete response" feedback (Shute, 2008). One method to effectively accomplish this is by addressing the three key questions suggested by Hattie and Timperley (2007): "where am I going?...how am I going?...where to next?" (p. 87) which aim to close the learning gap between current performance and desired outcome.

The first question, *where am I going*, considers what must be accomplished by identifying the intended learning goals. The goals must be clearly defined behavioural objectives and instructors need to fully understand both the goal and how the learner will successfully demonstrate attainment of the goal (Chan et al., 2014). The second question, *how am I going*, focuses on the current performance or progress being made by the learner. This requires the collection of evidence, by both the instructor and learner, through the use of formal and informal formative assessments aligned with the learning goals (Chan et al., 2014; Graham-Day et al., 2014). The final question, *where to next*, addresses what the learner must do to improve progress towards the desired goals. The collected evidence provides value when used by the instructor, both as a guide to adapt instructional strategies and as a basis for feedback to assist the learner to recognize next steps and adopt effective learning strategies (Chan et al., 2014).

Guidance and scaffolding. Formative feedback is an effective instructional method for providing learners with both guidance and scaffolding (Merrill, 2002; Shute, 2008). Guidance can decrease the complexity of a problem and reduce a student's cognitive load (Frank et al.,

2018). In the workplace, guiding activities such as coaching and modelling can be used to develop skills, while techniques, such as questioning, diagrams, and explanations, contribute to the development of conceptual knowledge (Billett, 2003). Providing learners with feedback has "long been recognized as the most important form of learner guidance" (Merrill, 2002, p. 50); however, it may be necessary to tailor the guiding feedback to the learner's skill level. Directive feedback, such as corrective information, may be best suited to novice learners, while facilitative feedback, such as guidance and cueing, may be more helpful as the learner advances (Shute, 2008).

Scaffolding is an instructional strategy used for complex tasks to allow learners to progress beyond their current ability (Frank et al., 2018). It works with the concept of Vygotsky's Zone of Proximal Development, which recognizes the difference between skills the learner can do independently and skills the learner can only do with assistance from the instructor (Mavin et al., 2018). Scaffolding advances learning by setting challenging goals for the learner that are "at and just above their current level" (Hattie, 2012, p. 21), with instructors providing support by "performing parts of the task that the student cannot perform and gradually reducing the amount of guidance and shifting the control" (Merrill, 2002, p. 50) back to the learner as their abilities increase. Scaffolding is used as an instructional strategy in air traffic control when traffic volume and complexity increase beyond the trainee's current skill level; the on-the-job instructor completes duties such as coordination with other controllers and data board management, while the trainee focuses on the radar and aircraft communication.

Implementing formative feedback. Feedback typically improves performance; however, a quantitative meta-analysis including 131 articles identified that the effect of feedback can be variable with over one-third of feedback interventions resulting in decreased performance.

Moreover, this negative effect became more apparent when the feedback focus shifted away from the task towards the person (Kluger & Denisi, 1996). It thus becomes important to consider how best to provide effective feedback since "different forms of feedback can have strikingly different consequences" (Skipper & Douglas, 2012, p. 327).

Through the analysis of a written data set of 174 segments of teacher feedback and student responses, it was identified that the possibility of feedback being received and used constructively is connected to the manner in which it is formulated (Ellegaard et al., 2018). Although it was not an assured relationship, a reflective and productive response was more likely to be obtained with certain types of feedback formulations. Ellegaard et al. (2018) "identified a group of productive responses–*reflective response, students investigate own thinking, explanation*–that were clearly and highly significantly linked to a group of questioning types of feedback–*open question, wondering question and leading question*" (p. 742). These feedback questions are considered to be highly formative (Ellegaard et al., 2018) and are briefly described as follows: an open question guides the learner "towards further work with the topic [using] 'why' or 'how' questions" (p. 736); wondering questions call for additional "thought and/or clearer explanation" (p. 736) for example, "it is not clear to me how…" (p. 736); and, leading questions point the learner to a specific gap in their argument or understanding. The group of elicited responses are described as reflective responses wherein the learner thinks about the feedback and describes their response, learners investigate their own thinking by describing and potentially modifying the thought process that led to their original response, and explanation involves the learner explaining their decision (Ellegaard et al., 2018).

Learning to provide formative feedback in "complex everyday instruction" (Schütze et al., 2017, p. 486) may require training and support due to the nature of instructional settings. It

is suggested that feedback be clearly provided as an invitation to conversation and dialogue between the instructor as the feedback provider and the learner as the feedback receiver (Brookhart, 2011; Ellegaard et al., 2018). This requires a "culture conducive to feedback" (Chan et al., 2014, p. 99), including a safe environment where learners can use mistakes as learning opportunities and where mutual trust exists between the learner and the instructor (Chan et al., 2014; Edgerly, Wilcox, & Easter, 2018). By allowing learners to take an active role in setting goals, tracking progress, and self-assessing performance, the instructor can create a student-centered environment that encourages formative feedback (Chan et al., 2014; Edgerly et al., 2018). There is a requirement to adapt and adjust feedback to the learner's needs so as to ensure it is tangible, transparent, understandable, and usable (Brookhart, 2011; Wiggins, 2012). Through the use of probing questions, it is possible to check the learner's understanding of the feedback (Brookhart, 2011).

To create a feedback-focused environment, opportunities for feedback should be intentionally embedded in instructional activities by allowing the learner multiple formative opportunities to show evidence of their learning and receive feedback (Chan et al., 2014; Edgerly et al., 2018). Additionally, successful feedback should focus on the learner's work by identifying strengths in relation to learning goals, providing suggestions for improvements or next steps (Brookhart, 2011), followed by an opportunity for the learner to practice and demonstrate the same knowledge or skills (Brookhart, 2012). Despite the necessity of relating feedback to learning goals, Edgerly et al. (2018) cautioned that detailed instructions and rubrics can "diminish the cognitive complexity and creativity of the task" (p. 44) and suggested instructors ensure "feedback *does not tell* students exactly what they should have done" (p. 45).

Effective feedback must also be clear to the student (Hattie, 2012), descriptive in its comparison of the learner's performance to the established criteria, and convey confidence in the learner (Brookhart, 2011). In a stressful learning environment such as air traffic control OJT, feedback may occur in a debrief session during which it is necessary to consider factors such as the physical and mental energy level of the learner, stress and anxiety from previous experiences, and the general outcome of the completed training session (Mavin et al., 2018).

In considering trainer style, Harris, Chung, Hutchins, and Chiaburu (2014) used a survey design with 243 participants to examine the use of directive behaviours, such as structuring learning, outlining goals, and providing feedback, and identified a significant relationship with the two learning outcomes of training transfer and satisfaction. The relationship was especially strong for learners with a high "learning goal orientation" (Harris et al., 2014, p. 340) described as "motivation to acquire new knowledge, master new situations and learn from experience" (p. 333); possibly because it prevented the learning frustration associated with multiple experimentational attempts. Furthermore, a directive style (as opposed to collaborative or enabling) may be especially important in workplace "instructional settings where learners encounter new concepts, are tasked with learning new skills and rely on more guidance than in typical day-to-day settings" (Harris et al., 2014, p. 333), such as an air traffic control training environment with strict rules, procedures, and safety requirements. Likewise, in research on pilot training, Mavin et al. (2018) observed and recorded the debrief sessions from 32 simulator training assessments and then conducted thematic analysis on three pilot pairs. Findings suggested that the need to use a directive style may be related to individual learner characteristics, such as level of reflective capacity and learner experience level, with less experienced learners demonstrating a preference for instructor-led feedback in a debrief scenario.

In implementing formative feedback, it is thus important to consider the variables impacting effectiveness, including the focus of the feedback, how the feedback is formulated, the learning environment, the characteristics of the learner, and the enacted instructional style of the instructor. Since "true instruction is not occurring in the absence of feedback" (Chan et al., 2014, p. 101), it is encouraging to note that "trainer style may be an especially coachable attribute" (Harris et al., 2014, p. 333). This recognizes the importance of formative feedback both for trainees in OJT and for OJIs in their professional learning and further suggests the potential for improvements to the OJIs' instructional capacity through the use of coaching.

Positioning of the Study

Workplace learning is widely used as an effective strategy for training employees with the approach of on-the-job training providing a clear link between the training and the job. There is recognition that the abilities of the on-the-job instructor can affect the outcomes of training; however, instructors themselves are often not adequately trained and prepared for their instructional role. The use of coaching as a means of professional learning is supported in the literature and can be an effective way to improve instructional practices and facilitate the implementation of new instructional strategies. One instructional skill, identified in the literature as critical due to its ability to influence learning outcomes, is formative feedback; however, it must be provided correctly to be effective. Within this study, instructional coaching was used as a means to provide OJIs with job-embedded formative feedback on their own coaching skills with the intent of increasing their own instructional capacity when providing coaching and formative feedback to a trainee in OJT.

Research on workplace learning frequently focuses on the learner rather than the instructor. As a result, there is a clear gap in the literature related to the design and

implementation of processes to improve the instructional capacity of OJIs. The reviewed literature primarily focuses on the use of instructional coaching as a means of professional learning for teachers in a classroom setting. It is unclear how instructional coaching could be used to assist on-the-job instructors who are not professional teachers and whose instructional setting is a workplace rather than a classroom. Within the air traffic control setting, OJIs have a high level of operational expertise but, unlike teachers, have a limited knowledge of learning principles that could be transferred to benefit their own learning. Additionally, classroom teachers focus exclusively on teaching and learning, while an OJI's primary responsibility is ensuring the safe separation of aircraft, with instructing and trainee learning needs as a secondary focus. Limited literature is available on the use of effective instructional skills and coaching strategies in a complex, time-sensitive, and safety-critical environment. My study aimed to contribute to addressing this gap in knowledge by focusing on the use of coaching as a means of professional learning for the OJI by exploring how a coaching protocol could influence their instructional capacity in the unique on-the-job training environment of air traffic control. The following question guided my inquiry: How can instructional coaching be used as a means of professional learning to help OJIs identify and implement improvements to their instructional practices?

Chapter Summary

This chapter reviewed the literature related to on-the-job training, professional learning, coaching, and formative feedback. On-the-job training is the workplace learning context within which the OJI is situated; consideration was given to the role of the instructor in OJT since their ability to effectively deliver training can impact training outcomes. The core features of professional learning were reviewed in the literature as a means to develop the instructional

capacity of the OJI. Coaching was identified as a successful professional learning activity and reviewed in the context of instructional coaching for the OJI with awareness that it models effective coaching for the OJI to use in their own practice. Finally, the literature on formative feedback was reviewed as a necessary instructional skill for advancing learning and potentially improving training outcomes.

Chapter Three provides a detailed description of the research design of the study that used a design-based research methodology within the OJT context. An explanation is provided on the methods of data collection and analysis used to gain deeper insights into the phenomenon of professional learning for OJIs in air traffic control.

CHAPTER THREE: RESEARCH DESIGN

This study explored the phenomenon of how instructional coaching can be used as a means of professional learning to help air traffic control on-the-job instructors (OJIs) identify and implement improvements to their instructional practices. The dual purpose was to (a) design a usable professional learning coaching protocol for OJIs as a practical solution for their complex training problem, and (b) contribute to the development of theoretical understanding of instructional practices in this unique educational setting. The study focused on the use of coaching as a means to build the capacity of OJIs to provide effective formative feedback to trainees during on-the-job training.

A qualitative research design was selected for the study as it is "a situated activity that locates the observer in the world. [It] consists of a set of interpretive, material practices that make the world visible. These practices transform the world" (Denzin & Lincoln, 2017, p. 10). A qualitative approach permitted the researcher to state both the purpose and the research questions in an open-ended way (Creswell & Guetterman, 2019) that allowed for evolution as greater insight was gained into the challenges of stakeholders and the experiences and views of participants. This was especially relevant in a study such as this wherein multiple variables exist within a real-life, authentic context, thereby requiring an exploration of the central phenomenon to better understand the research problem. It is my position that an interpretive, qualitative research approach provided the best means for exploring a complex problem and developing a deep understanding of the phenomenon as it is socially situated within a naturalistic setting. As a methodology, design-based research contributes to a usable solution and yields valuable results for theoretical understanding.

This chapter provides a comprehensive overview of the research design for my study. Design-based research is presented as the methodology, including a rationale for its selection, its strengths, and my response to areas of critique in this methodology. The research questions are elaborated on, along with the population and sampling. A detailed discussion explains how the design-based research (DBR) phases were conducted, including the methods of data collection and analysis. The integrity of the study is discussed, and the boundaries are identified through the limitations and delimitations. Ethical considerations are addressed, and my background and role as the researcher is stated, along with my assumptions.

Methodology

This methodology section provides a discussion of design-based research as an appropriate methodology for this study, identifies its strengths, and considers the challenges of the methodology identified by its critics.

Design-Based Research

My study used design-based research (DBR) to gain a deeper understanding of how the design and implementation of a coaching protocol can be used as a means of professional learning for on-the-job instructors in an air traffic control environment. As a genre of inquiry, DBR is committed to the dual goals of concurrently producing "valuable results for both theoretical understanding and educational practice" (McKenney & Reeves, 2012, p. 1) in collaboration with stakeholders (Crippen & Brown, 2018). Solutions to practical problems are developed and refined through iterative cycles of design, development, and evaluation to produce a context-specific intervention (Crippen & Brown, 2018). Contributions to theoretical understanding typically occur over multiple studies (McKenney & Reeves, 2012) as usable knowledge is produced and adapted to new practical contexts (Crippen & Brown, 2018). The

complexities and variations inherent to real-world practice are acknowledged as situated within the sociocultural context (Crippen & Brown, 2018) and attended to through both analytical and creative approaches (McKenney & Reeves, 2012).

The commitment of design-based research methodology to the key elements of "developing theoretical insights and practical solutions…in real world…contexts, together with stakeholders" (McKenney & Reeves, 2012, p. 7) aligns with my study's purpose of using professional learning as a means to increase the capacity of air traffic control OJIs to effectively coach in a safety-critical environment through the design of a coaching protocol. First, as a theoretically-oriented approach, DBR uses existing educational theory both as a basis for the inquiry (McKenney & Reeves, 2012) and to support the design of a solution within the inquiry (McKenney & Reeves, 2012; Wolcott, Lobczowski, Lyons, & McLaughlin, 2018). Through iterative cycles of testing and refinement, theoretical understanding continues to evolve. Second, DBR aims to develop a practical, high-quality and novel solution to a real-world, complex educational problem (Wang, Hsu, Reeves, & Coster, 2014; Wolcott et al., 2018). Third, DBR recognizes the importance of working collaboratively with stakeholders to ensure a design solution that is contextually sensitive and constructed as a realistic and acceptable solution to the identified problem (Crippen & Brown, 2018).

Within this study, these key elements of theoretical insights, practical solutions, and collaboration with stakeholders were enacted through the research design. Instructing in the air traffic control context is a unique and complex real-world problem due to the safety-critical nature of the work and the necessity for the OJI to focus primarily on the operational environment rather than the learning needs of the trainee. My study developed an innovative solution to positively impact the problem of improving the instructional practices of OJIs in this

context. DBR was used to design and collaboratively test an intervention for the problem, based on theoretical understandings in the literature pertaining to professional learning and coaching. It is intended that, through my refinement of the intervention and reflection on the design principles, the study will make a contribution by providing deeper insights and new theoretical understandings of coaching in the OJT context.

Strengths of DBR

The common characteristics of DBR—theoretically oriented, interventionist, collaborative, responsively grounded, and iterative (McKenney & Reeves, 2012)—are recognized in the literature as strengths of this methodology. First, DBR is theoretically grounded through its use of existing theory to frame the problem (McKenney & Reeves, 2012) and shape solutions aligned with current learning theories (Cobb, Confrey, Disessa, Lehrer, & Schauble, 2003; Wolcott et al., 2018) resulting in evidence-based claims and design principles that contribute to theoretical understanding (Anderson, 2012; Barab & Squire, 2004). Second, an intervention for an everyday problem of practice is developed by way of a practical solution within a real-life setting (Shavelson, Phillips, Towne, & Feuer, 2003; Wolcott et al., 2018). Being situated within the practice setting ensures results are applicable to the context (Anderson, 2012). Third, through the use of a collaborative approach, DBR draws on the expertise of both the researcher and the practitioner to ensure an optimal solution (Wolcott et al., 2018). Knowledge is co-constructed through collaboration with researchers and practitioners learning from each other (McKenney & Reeves, 2012; Shavelson et al., 2003) resulting in meaningful changes to practice (The Design-Based Research Collective, 2003). Fourth, as a responsively grounded methodology, DBR uses design innovation (Cobb et al., 2003) to adapt solutions to the instructional setting (Wolcott et al., 2018). Additionally, the limits of theory are acknowledged

(Wolcott et al., 2018) and the "emergence of other potential pathways for learning and development" (Cobb et al., 2003, p. 10) are fostered. Finally, the iterative nature of DBR allows for early testing, evaluation, and ongoing refinement of the intervention to best suit the needs of the specific context (Anderson, 2012; Wolcott et al., 2018). The dual goals of DBR to contribute to both theory and practice (Collins, Joseph, & Bielaczyc, 2004) create the potential for meaningful progress in addressing real-life educational challenges (Reeves, 2015).

Challenges of DBR

DBR is described as a "complex and multi-faceted endeavor" (McKenney & Reeves, 2012, p. 13). It is acknowledged that the dual focus of solving a practical problem and contributing to the generation of theory is ambitious and can be challenging to balance (Crippen & Brown, 2018). Wolcott et al. (2018) also warned that as a complex process it requires extensive planning, time, and resources. Likewise, the implementation of multiple, cyclical research activities can prove challenging (Hira & Hynes, 2019) in a real-life setting.

The iterative nature can make the research appear disorganized, particularly when prototypes test partially formed ideas (Wolcott et al., 2018) and uncertainty can exist regarding when the design is complete and when the need for further refinements is finished (Anderson, 2012; Crippen & Brown, 2018). Additionally, multiple iterations can culminate in large amounts of data that may go unanalyzed due to volume, lack of resources, and time constraints for the next iteration (Collins et al., 2004; Wolcott et al., 2018). Dede (2004) argued that this abundance of data is a flaw in that the same findings could be induced with much less data and no further insights are gained from the additional data. Many variables that cannot be controlled affect the outcomes (Collins et al., 2004) in DBR, leading to potentially limited generalizability as researchers work to design locally valuable solutions (Crippen & Brown, 2018; The Design-

Based Research Collective, 2003). Furthermore, it is noted that DBR necessitates a dual role in which the researcher is both advocate and critic of the intervention (The Design-Based Research Collective, 2003), which can prove difficult.

In my study, I made efforts to mitigate the identified challenges through careful planning and design of the study, determining the purpose of each data set prior to collection, and establishing clear links between methods and research questions. As both the designer and the researcher, I assumed a reflective stance in considering my dual role and worked collaboratively with others to gain alternate perspectives. The strengths of DBR provided opportunities for significant contributions to the outcome of this study, thereby making DBR well-suited to the purpose of my study.

Research Questions

The following questions guided my DBR study:

1. How does an on-the-job training professional learning coaching protocol influence the instructional capacity of instructors?

    (a) What are the key components of a coaching protocol for on-the-job instructors in air traffic control?

    (b) What are the opportunities and challenges that emerge in using the coaching protocol for on-the-job instructors?

Population and Sampling

This qualitative study used a purposeful sample to select participants. The research setting was a regional air traffic control unit area control centre. This site was selected due to the large size of the unit, the high volume of training, and the general positive attitude towards training on the part of the managers, training supervisors and OJIs. It was expected that this site

would provide information-rich data. The unit is comprised of eight specialties, seven high and/or low level en route control specialties and one terminal control unit. The site also includes one traffic management unit, which was not included in the sample as the air traffic controllers do not communicate directly with airborne traffic—thereby creating a different coaching environment.

The primary research participants were active OJIs from any of the eight specialties in the unit. OJIs actively working with a trainee have usually been carefully selected and assigned to the role by the training supervisor and therefore, as a population, already represent typical case sampling. It was not expected that active OJIs would be atypical in any way and therefore they represented the norm that was being researched. Additionally, OJI changes occur throughout training, therefore, criterion sampling was used to ensure the sample was comprised of only primary OJIs currently assigned to a trainee and who intended to remain with that trainee for the necessary time required to participate in the study. Participants could be new or experienced OJIs. Secondary OJIs would have been considered for participation if they would be working with the trainee for two or more consecutive cycles of training (approximately 10-12 days); however, this was not required due to the availability of the primary OJI.

Normally, there are approximately 15 trainees in on-the-job training in the unit at one time with each trainee having an assigned OJI. At the time of data collection there were only 10 trainees in OJT, therefore the initial population was 10 and, although possible, it did not increase as a result of OJI changes. As intended, a sample of three OJI participants was obtained, which provided an opportunity to gain an in-depth understanding of the influence of the intervention and identify adjustments for subsequent iterations. The three OJI participants were all from different en route control specialties in the unit.

The secondary research participants in this study were comprised of a group of seven training stakeholders recruited through purposeful sampling to provide data pertinent to the DBR phases of prepare (analysis cycle) and evaluation (assess cycle). Stakeholders included national managers, local managers, a training supervisor, and a coaching consultant.

A tertiary population of participants in this study was comprised of the three trainees assigned to the OJIs participating in the study as primary participants. The trainee participants were not the subject of the research; however, they were interacting with the OJI during data collection. No interaction with the researcher occurred with this population for the purpose of data collection during the study.

The OJIs and stakeholders identified as potential participants were initially contacted through their work e-mail to introduce the study, provide basic information, and advise them that I would contact them directly to schedule a meeting. At the meeting full details of their potential involvement was outlined for the purpose of obtaining informed consent. An informed consent form was provided for signature to those agreeing to participate. Once the OJI participants had consented to participate, their trainee was contacted through their work e-mail to provide basic information on the study, to advise them that their OJI had consented to participate, and to inform them that I would contact them directly to schedule a meeting. At the meeting full details of their potential involvement was outlined and all provided informed consent to contribute as tertiary participants.

Methods of Data Collection

In the following section the methods of data collection are identified through a description of each of the sources of data. Next, each of the phases is described to provide an overview of the study.

Sources of Data

To gain insight into the phenomenon of coaching the coaches, a variety of data collection methods and sources were amalgamated to provide a deeper, more nuanced appreciation, thereby allowing for rich, thick description through triangulation. All data were collected on-site to gain understanding through the lens of the real-world setting with the exception of the final stakeholder interviews, which were conducted remotely. Table 3.1 provides an overview of the realized outcomes of the data collection methods for each phase of the study in relation to the research questions. A description for each method of data collection and a rationale for its appropriateness is provided. The study's three phases of data collection are further discussed in the subsequent section.

Table 3.1

Overview of Data Collection Methods Outcomes Aligned to Research Questions

Research Questions	Phase I	Phase II	Phase III
How does an on-the-job training professional learning coaching protocol influence the instructional capacity of instructors?	Identify starting points and gaps in instructional capacity through ■ Interviews with stakeholders ■ Document review	Testing the intervention through ■ Video-based recording ■ Document analysis ■ Field notes	Consideration of expected effects of the protocol through ■ Interviews with stakeholders
What are the key components of a coaching protocol for on-the-job instructors in air traffic control?	Identify design parameters through ■ Interviews with stakeholders	Identify areas for refinement through ■ Interviews with OJI participants	Evaluation of internal structure of the protocol through ■ Interviews with stakeholders
What are the opportunities and challenges that emerge in using the coaching protocol for on-the-job instructors?	Identify early potential opportunities and challenges for implementation through ■ Interviews with stakeholders	Identify factors impacting implementation through ■ Interviews with OJI participants ■ Field notes	Consideration of functionality for implementation and spread of protocol through ■ Interviews with stakeholders

Interviews. Interviews offer the "potential to elicit rich, thick descriptions" (Bloomberg & Volpe, 2016, p. 154). This was further enhanced by the use of a semi-structured interview format to provide the opportunity to seek clarification, probe for further details, and gain deeper understandings of the participant's own perceptions. There were three discreet sets of interviews 1) initial interviews with stakeholders (see Appendix A), 2) interviews with OJIs during testing (see Appendix B and C), and 3) concluding interviews with stakeholders (see Appendix D). All interviews were one-on-one, which was appropriate as the participants in this setting are typically "not hesitant to speak…are articulate, and…can share ideas comfortably" (Creswell & Guetterman, 2019, p. 218). This also best accommodated participants who travel amongst

locations (national managers) or work shift work (training supervisor and OJIs). The interviews were typically approximately 30 minutes in length and were audio recorded.

For the initial interviews with stakeholders, purposeful sampling was used to deliberately select those stakeholders most vested in the problem and therefore able to provide rich information. Interviewees were also selected based on their knowledge of required endpoints for the solution, as well as their experience and assigned responsibility for managing or supervising operational training within the organization. A total of seven interviews were conducted in this phase. Selected stakeholders consenting to participate included:

(a) the national managers (three participants) with responsibilities related to the on-the-job instructor training program, the training progression of trainees, and quality assurance. These participants were well-positioned to identify endpoints for the solution and will play a vital role in its future implementation and spread;

(b) the regional managers (two participants) responsible for the delivery of operational training. These participants are familiar with local contributing factors impacting solutions and will also play a role in future local implementation;

(c) a unit training supervisor (one participant) responsible for regular oversight of the on-the-job instructors. This participant was well-positioned to provide information pertaining to coaching starting points, as well as the practical realities of implementation; and

(d) a national coaching consultant (one participant) with experience delivering professional learning coaching sessions to on-the-job instructors and contributing to the adoption of performance coaching best practices with air traffic control on-the-job training.

Interviews were next conducted with OJIs as part of each cycle of testing. The interviews occurred post intervention and followed the same format of one-on-one semi-structured interviews. The interviews with OJIs focused on gathering data relevant to the utility of the coaching protocol for inclusion in the subsequent approximation of the tool. The third and final set of interviews was conducted with five of the same stakeholders initially interviewed and again followed the identified format. The purpose of the concluding interviews with stakeholders was to evaluate the final approximation of the coaching protocol and to gain insights into considerations for its implementation and future spread.

Document reviews. Document reviews provided a "valuable resource for confirming insights gained through other methods" (Bloomberg & Volpe, 2016, p. 157). The daily training report is a formal document produced independently from the research. It is completed by the OJI and reviewed with the trainee at the end of each shift. The report is intended to provide a brief summary of the feedback discussed during the verbal debrief session. A review of these documents provided the opportunity to supplement both interview information and observations from the video recording of the debrief sessions. The daily training reports may be completed as a hand-written document or through an electronic version; any hand-written reports were transcribed, and both were saved electronically for review and analysis.

A document checklist (see Appendix E) was used to review the training reports for data collection and occurred at two separate times in the study. First, a review of past daily training reports was conducted during Phase I as a means to gain further understanding of design requirements for the solution. A typical sampling of recent (within the past two years) daily training reports was selected from archived reports. Reports are only archived once a trainee has completed on-the-job training. The use of typical sampling provided an opportunity to gain

deeper insights into usual OJI report writing. Creswell and Guetterman (2019) suggested asking a person at the research site to select a typical case. As a practitioner at the site, I selected a sample of typical reports in collaboration with another knowledgeable colleague. Second, a review of the current daily training report associated with the video recorded debrief session was conducted to supplement the other data collection methods in Phase II.

Video recordings. Video recordings are frequently used within educational research (Creswell & Guetterman, 2019) as they provide the opportunity for educators to objectively and accurately view themselves, which can be a motivator for change (Jim Knight et al., 2012). Video recordings are essential to the coaching process as they allow for the objective identification of an instructional challenge followed by goal setting (Jim Knight et al., 2012). In this study, video recording was used as a basis for the instructional coaching and, therefore, was focused on the OJI and not the trainee. Each participating OJI was video recorded providing two debrief sessions per cycle including one pre-coaching intervention and one post-coaching intervention.

Field notes. In qualitative research, observation is a well-accepted method of data collection (Creswell & Guetterman, 2019) with the researcher frequently becoming "the main instrument of data collection" (Bloomberg & Volpe, 2016, p. 23). Field notes were primarily used to record my observations during the debrief session between the OJI and the trainee. This provided an opportunity to record the activities of the OJI, the trainee, and the interaction between them (Creswell & Guetterman, 2019) that were less apparent through the video recording (e.g., the trainee's reaction to the OJI's coaching). Reflective field notes were also maintained following interviews and document reviews to record my personal thoughts and insights.

Phases of DBR

      The design of my study draws on the generic model for conducting design research in education proposed by McKenney and Reeves (2012), the approach used by Reeves (2006) for educational technology research, and the approach described by Gravemeijer and Cobb (2006) from a learning design perspective. My study design used a three-phase model to prepare, design, and evaluate a professional learning coaching protocol for OJIs in an air traffic control environment (Figure 3.1).
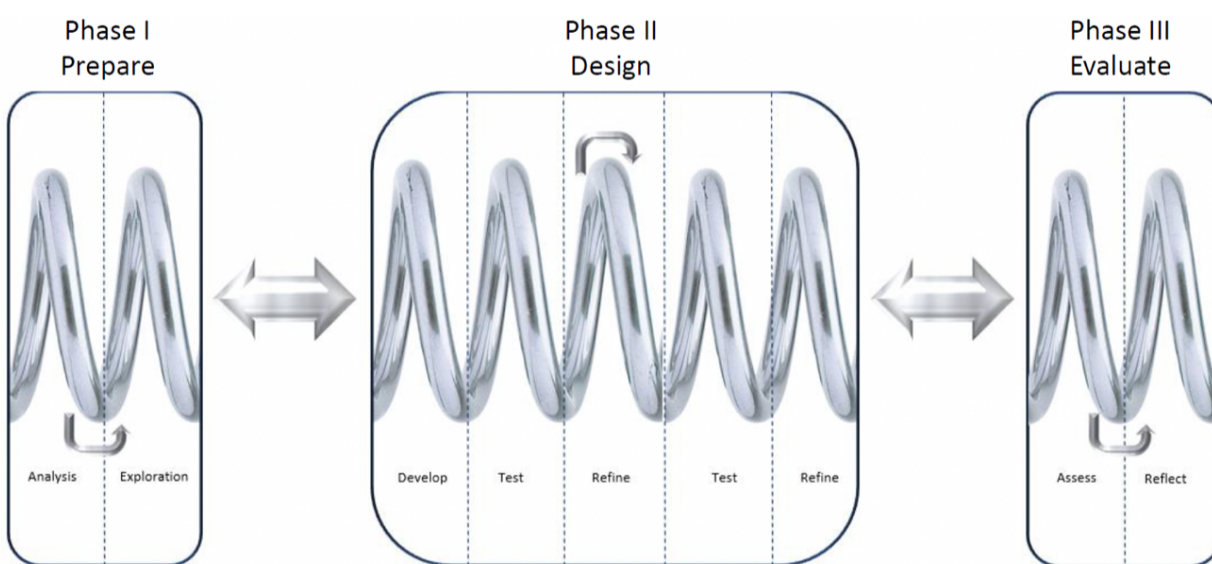
Figure 3.1. Model of DBR Phases

      Phase I – Prepare: Analysis and Exploration. This phase focused on verification of the identified problem, confirmation of stakeholder needs to identify initial design requirements, and exploration of options to ensure a usable solution. The analysis cycle conducted data collection through semi-structured interviews with the group of seven secondary participant stakeholders (managers, supervisor, coaching consultant) and document reviews of past training reports.

The exploration cycle focused on the early consideration of coaching protocol solutions through the generation of ideas based on the determined design requirements and propositions. This involved using the data generated in the analysis cycle and returning to the literature to consider solutions. This cycle resulted in design specifications and a skeleton of the intervention.

Phase II – Design: Development and Testing. This phase focused on completing the design and development of the coaching protocol. A purposeful sample of three on-the-job instructors was selected to test the tool for the purpose of making refinements. Each of the two iterative cycles evaluated a successive approximation of the intervention.

Cycle 1 – Develop, Test, Refine. The first prototype of the coaching protocol was developed based on the design specifications from the exploration cycle. Video-based instructional coaching was used to test the implementation of the protocol through a coaching intervention (Figure 3.2).
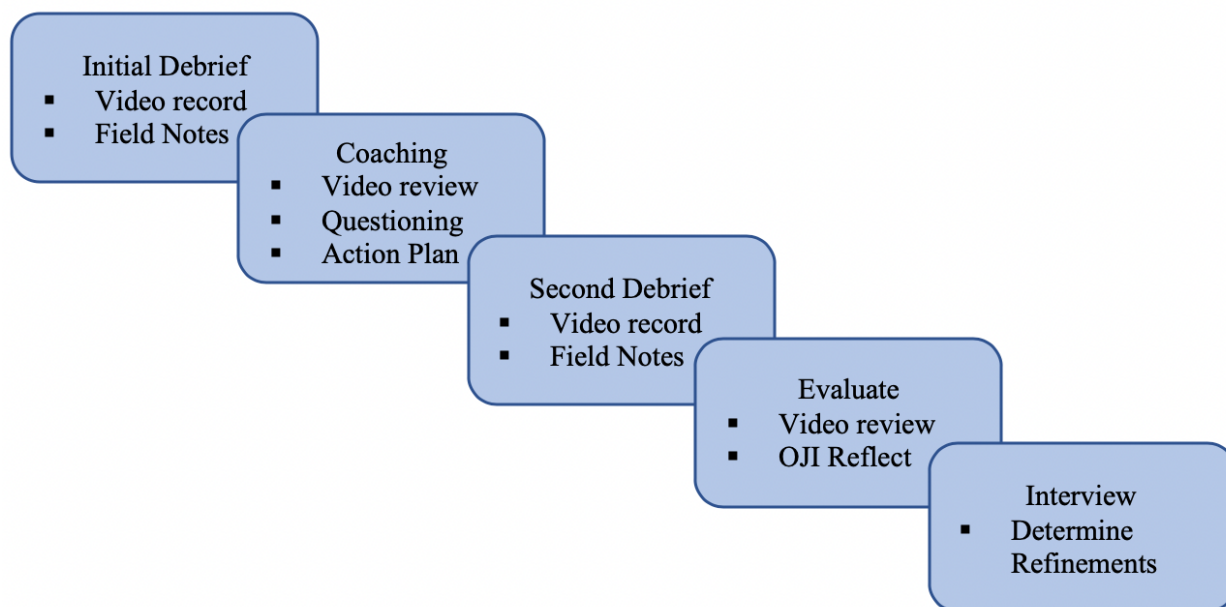
Figure 3.2. Steps in Intervention Testing

The following description provides details of the testing steps.

1. Initial Debrief. The OJI was recorded (Video Recording #1) providing a verbal debrief to the trainee. The researcher recorded observational field notes. The researcher, assuming the role of a coach, and the OJI, each independently reviewed the video. The coach highlighted coaching opportunities based on specific elements identified in the coaching protocol. The OJI identified a minimum of two positive elements of the debrief and one area in need of improvement. The coach reviewed the associated daily training report from the debrief session.

2. Coaching Intervention. The instructional coach (researcher) and OJI together conducted a debrief of the OJIs initial debrief with the trainee. Using the first iteration of the coaching protocol, the coach guided a coaching conversation that allowed the OJI to implement improved instructional strategies. The OJI was then introduced to the coaching protocol and set a goal for improvement based on the conversation and the designed coaching protocol.

3. Second Debrief. The OJI was recorded (Video Recording #2) providing a second trainee debrief during which efforts were made to attempt to implement the improved instructional strategies. Observational field notes were recorded. The video was again reviewed independently by the coach and the OJI.

4. Evaluation Session. The coach and OJI together conducted a debrief of the OJIs second trainee debrief session. The focus was on identifying the extent to which the OJI was able to successfully implement the new instructional strategies and attain the set goal. The coach also reviewed the associated daily training report.

5. Interview. The cycle concluded with the researcher conducting an interview with the OJI to evaluate the effectiveness of the coaching intervention tool and identifying areas for further refinement.

Cycle 2 – Develop, Test, Refine. The second prototype of the coaching intervention was developed based on an analysis and implementation of the refinements identified in Cycle 1. Testing of the second prototype then occurred following the same format used in Cycle 1. All three OJI participants from Cycle 1 remained available for Cycle 2 and it was not necessary to select a new sample. Refinements identified through the Cycle 2 interviews were integrated into the coaching protocol. Only two iterative cycles of testing were conducted within the context of my doctoral work.

Phase III – Evaluate: Assess and Reflect. During this phase, the focus was on an assessment of the internal structure of the design, its functionality, and the expected effects. Data collection focused on assessing six key areas: soundness; feasibility; local viability; institutionalization; effectiveness; and, impact (McKenney & Reeves, 2012). Data collection involved returning to a select group of the interview participants from Phase I for evaluation of the intervention through further semi-structured interviews. Finally, a formal structured reflective process was used to establish design principles aimed at contributing to theoretical understanding.

Methods of Data Analysis

For each of the three phases of the study, a description of the purpose of the data is provided with the associated methods of data analysis. For the semi-structured interviews, a detailed description of the data analysis is delineated through the steps of: preparation and organization of the data; exploration and coding of the data; and, development of themes

(Creswell & Guetterman, 2019). Data analysis was approached as an ongoing iterative process occurring concurrently with data collection (Creswell & Guetterman, 2019; Miles, Huberman, & Saldaña, 2014).

- During Phase I – Prepare: Data collection focused on verification and clarification of the identified problem, as well as confirmation of stakeholder design requirements through the use of audio-recorded semi-structured interviews and document reviews.

- Phase II – Design: This occurred through testing of the intervention. It included video recordings of the OJI participants providing verbal debriefs to the trainee, an audio recording of the coaching session between the instructional coach (researcher), an audio recording of the semi-structured interview with the OJI to appraise the intervention and identify areas for refinement, and document reviews of the training reports.

- Phase III – Evaluate: Assessed the design and functionality of the intervention through audio-recorded semi-structured interviews with a portion of the initial stakeholder group. Researcher field notes were maintained during each phase to record observations and insights.

Table 3.2 provides a summary of the data collection methods used in each phase for reference, with the methods of data analysis discussed below.

Table 3.2

Summary of Data Collection Methods by Phase for Purpose of Data Analysis

Phase for Data Collection Methods	Audio Data		Written Data		Audiovisual Data
	Interviews	Coaching Sessions	Document Reviews	Field Notes	Video of Debriefs
Phase I – Prepare: Analysis and Exploration	Semi-structured with stakeholders		Sample of daily training reports	Observations from interviews	
Phase II – Design: Development and Testing	Semi-structured with OJI	Instructional coach (researcher) with OJI	Daily training report for debrief session	Observations from debrief, coaching session, and interviews	Debrief by OJI with trainee
Phase III – Evaluate: Assess and Reflect	Semi-structured with stakeholders			Observations from interviews	

Audio Data

Interviews. The following describes the data analysis process for the semi-structured interviews with the stakeholders in Phase I (seven interviews) and III (five interviews) and the OJI participants in Phase II (six interviews) at the end of each cycle.

Preparation and organization of data. Audio recording of the interviews was transcribed through the use of a transcriptionist. I then reviewed the transcript for accuracy while listening to the audio recording to both edit inaccuracies and gain a precursory sense of the data. Transcription files were dated, assigned an identification code, and listed on a master tracking sheet for easy retrieval. A duplicate copy of data was securely stored in a separate location. Due to the manageable number of interviews in each phase, a physical copy of the transcripts was printed for use in manual pen-and-paper analysis.

Exploration and coding of data. I began with a preliminary exploration analysis (Creswell & Guetterman, 2019) of the data by carefully reading through the entire transcript multiple times (minimum twice) to gain a general sense of the data. Notes were jotted in the margins when applicable. I next conducted inductive first cycle coding through the use of two elemental coding methods: in vivo coding and process coding. In vivo coding involved using "words or short phrases from the participant's own language" (Miles et al., 2014, p. 74) as data codes. In vivo coding was selected since it is applicable for all qualitative studies and appropriate for my role as a new qualitative researcher (Miles et al., 2014). Process coding, the use of gerunds, was used to code references by participants to any observable actions desired by stakeholders or enacted by OJI participants as outcomes from the coaching protocol intervention. The coded data were then entered into a spreadsheet by individual participant and subsequently printed for use in second cycle coding.

Development of themes. An interpretive approach was used for second cycle coding and involved working with the resulting first cycle codes (Miles et al., 2014) to again explore the data by reading through them and making jot notes, as well as analytical memos pertaining to recurring patterns. Based on this exploration, an initial list of pattern codes (Table 3.3) was developed and used for initial second cycle coding. A review of the pattern codes was then conducted to identify overlap and eliminate redundancy (Creswell & Guetterman, 2019). Previously coded data were revised based on the refined list of codes. Review and reflection were used to make connections amongst patterns and iteratively identify major themes relating to my research questions.

Table 3.3

Overview of Pattern Codes by Phase for Purpose of Data Analysis

Phase I	Phase II	Phase III
Assessing	Actionable priorities	Communication
Challenging	Adaptable framework	Clarity for trainee
Clarity	Clarity of expectations	Ease of use
Coaching	Coaching conversation	Embedded in training
Communication	Learning culture	Evolving needs
Learner-centred	Logistical feasibility	Integrate with current system
Problem solving	Reinforce positives	OJI buy-in
Professional learning	Targeted progression	Oversight
Progressing performance		Quality of training
Structure		Roll-out of tool
Timing		Standardized approach
Tool/Job aid		Time requirements
Utility		Trainee difficulties
		Training and support
		Unit culture
		Using as intended

Table 3.4 provides an example of the data coding process across all three phases. The inductive first cycle coding shows the use of both in vivo and process coding within a sample participant quotation. An example is provided of the associated interpretive pattern code in the second cycle coding and then linked to the resulting theme.

Table 3.4

Example of First Cycle and Second Cycle Coding by Phase

Original Quotation	First Cycle Coding	Second Cycle Coding	Resulting Theme
Phase I Sample "One being the need for OJIs to talk less and listen more. I find that there can be the potential for them to discuss the problem and offer a solution without giving voice to the student."	In vivo – "OJIs to talk less and listen more" In vivo – "discuss the problem and offer a solution" Process – assuming versus active listening	Communication	Coaching conversation
Phase II Sample "I think it just sort of laid it out in a little bit more of a clear, concise method to then debrief somebody."	In vivo – "clear concise method"	Adaptable framework	Improved structure
Phase III Sample "Depending on the individuals, there will be some that will go through it and the pieces they like they'll do and the pieces they don't like they won't."	In vivo – "depending on the individuals" In vivo – "the pieces they like they'll do and the pieces they don't like they won't" Process – adopting the protocol	OJI buy-in	Change management

Coaching sessions. The following describes the data analysis process for the coaching

sessions between the instructional coach (researcher) and OJI. Audio recording of the coaching

sessions was used to produce a summary narrative account of the coaching intervention for each

of the three OJI participants so as to provide context for the Phase II themes. Audio recordings

of the coaching sessions were transcribed through the use of a transcriptionist. I then reviewed

the transcripts for accuracy while listening to the audio recording to both edit inaccuracies and

gain a precursory sense of the data. Transcription files were dated, assigned an identification code, filed by both cycle and OJI participant, and listed on a master tracking sheet for easy retrieval. I again read through the entire transcript multiple times as a preliminary exploration (Creswell & Guetterman, 2019) to gain a general sense of the data. Notes were jotted in the margins when applicable. I next highlighted relevant elements of the transcript pertaining to the OJI's analysis of their debrief performance, my provision of feedback on effective coaching strategies, and the OJI's established goal for professional learning. The highlighted material was then used as a basis for writing the summary narrative and served as a source for supporting participant quotations.

Written Data

Document reviews. The following describes the data analysis process for the document reviews of the daily training reports collected in Phase I and Phase II. Hand-written training reports were transcribed and verified for accuracy against the original source document. Electronic training reports were saved as PDF files. Data coding commenced by reading through the full material multiple times for a preliminary exploration. A document review checklist (see Appendix E) was then completed for each daily training report to identify examples of formative feedback (e.g., goals, strengths, areas for improvement, strategies, etc.) within the written training reports. The Phase I sample training reports data analysis outcomes were used to triangulate the outcomes of the Phase I stakeholder interviews and further support verification of the identified problem. The Phase II training reports data analysis outcomes were used to gain a holistic view of the feedback provided by the participant OJI to the trainee to support the instructional coaching intervention.

Field notes. As described by Miles et al. (2014), field notes can be "sketchy" (p. 71) and those "taken during an interview usually contain a fraction of the actual content" (p. 71). Since all data collection sessions were recorded, field notes taken during interviews were used primarily within the same interview as reminders for the researcher to return to particular participant statements to seek clarification or probe for further elaboration and details. Field notes taken during the OJI debrief session were used as raw data to triangulate data from the audiovisual recording when preparing feedback for the OJI's instructional coaching session.

Audiovisual Data

Video recordings. The following describes the use of the audiovisual data recording of the Phase II debrief sessions between the OJI and the trainee. These data were collected as part of the coaching protocol intervention and were used primarily as a basis to inform the instructional coaching sessions between the OJI and the instructional coach (researcher). The video recordings were viewed by the OJI as a method to objectively review their coaching performance so as to identify strengths and potential areas for improvement to be used in goal setting. The video recordings were viewed by the researcher to prepare formative feedback for the instructional coaching sessions with the OJI. The audio portion was transcribed, verified for accuracy, and filed by the OJI. Transcripts were used to triangulate data from the Phase II interviews with the OJI participants.

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Integrity of the Study

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Validating the accuracy of qualitative research findings required careful attention to the ways in which data are collected, analyzed, and interpreted (Merriam, 1998). Qualitative researchers use different terms and methods than quantitative researchers to describe and demonstrate the trustworthiness of their findings. Guba (1981) proposed four criteria for

assessing trustworthiness in qualitative research, which are linked to terms used in quantitative

research: credibility (internal validity); transferability (external validity/generalizability);

dependability (reliability); and, confirmability (objectivity). These terms are used within a social

constructivist paradigm (Creswell & Miller, 2000) and continue to be a popular approach in the

literature (Creswell & Guetterman, 2019). Trustworthiness must be considered from three

perspectives: the researcher, the participants, and the reader/reviewers (Creswell & Miller,

2000), thus multiple methods are used to ensure validity of the findings. Table 3.5 provides a

summary of the methods used in this study to establish trustworthiness.

Table 3.5

Methods to Establish Trustworthiness

Credibility (Internal validity)	Confirmability (Objectivity)	Transferability (External validity)	Dependability (Reliability)
Extent to which the findings are congruent with reality (Merriam, 1998).	Extent to which the findings emerge from the data (Shenton, 2004).	Extent to which the reader can apply results to their own situation (Merriam, 1998).	Extent to which the study can be repeated (Shenton, 2004).
Triangulation Member checking Researcher reflexivity	Triangulation Researcher reflexivity	Rich, thick description	Triangulation Audit trail

Triangulation involves the use of multiple sources of data and multiple methods of data

collection to improve the accuracy of the findings (Merriam, 1998). Triangulation is used to

form themes by identifying convergence among findings from multiple sources; likewise, the

findings can be searched for disconfirming evidence (Creswell & Miller, 2000). Within my

study, data were gathered from multiple sources, including managers, supervisors, and OJIs; and,

through multiple methods, including individual interviews, document reviews, and observations

through video recordings. Triangulation considers trustworthiness from the perspective of the

researcher and disconfirming evidence supports a social constructivist paradigm (Creswell & Miller, 2000).

Member checking involves taking data and emerging interpretations back to the participants to ensure they are complete, plausible, and accurate (Creswell & Guetterman, 2019; Merriam, 1998). This method considers trustworthiness from the perspective of the participant and occurred at multiple times throughout the study. All transcriptions from interviews, coaching sessions, and video recordings were returned to the original participant for review and confirmation of content. Training report transcripts were verified against the original source documents. Additionally, member checking occurred as changes were made in each iteration of the coaching tool and returned to the OJI for testing and to the stakeholders for evaluation.

Rich, thick description conveys to the reader in detail the actual situation being described, thereby providing the opportunity for the reader to self-determine the applicability of findings to their own unique context (Shenton, 2004). A social constructivist perspective was used to provide a detailed description of the participants and context as a basis for ascertaining transferability to other settings (Creswell & Miller, 2000). With this method, trustworthiness is considered from the perspective of the reader.

An audit trail was used to provide clear documentation of decisions and activities to explain how I arrived at my findings through the identification and analysis of patterns and the development of themes (Creswell & Miller, 2000; Merriam, 1998). This was accomplished by maintaining a written account of decisions, and memoing during data analysis.

Researcher reflexivity considers the perspective of the researcher. It makes an important contribution to trustworthiness within the social constructivist orientation of this study by acknowledging that multiple realities exist with understanding constructed through the

interpretation of shared interactions with participants. With the researcher as the prime

instrument of data collection and analysis (Merriam, 1998), our lived experiences will "always

come out in the knowledge we generate" (Lincoln et al., 2017, p. 117). To account for this, I

provided an account of my background and details of my role as the researcher. Reflection was

also used on an ongoing basis throughout the study. After each session of data collection, I

reflected on my biases and assumptions and how this may have influenced data collection. The

reflective process was also used at keys stages of data analysis. Reflections were recorded in my

research journal.

Limitations and Delimitations

In my study, limiting factors were identified and consideration was given to minimizing

their potential impact on the outcomes of the research. Limitations are attributable to both the

use of a qualitative approach and to the methodological design of the study. Strategies to

minimize the impact of these limitations were identified through reflection and careful

consideration. Qualitative research uses an interpretive approach to make sense of findings and

construct meaning (Denzin & Lincoln, 2017) in the data. The collection of data, through

observation and interview, and its interpretation within this study, were naturally influenced by

my own subjective position as the researcher. Closely related to this is my role within the

organization and my previously established professional relationships with the participants.

Within DBR the development of a usable solution benefits from the deep immersion of a

researcher with context-specific knowledge; however, the responses from participants may be

affected by this relationship, whether it be a desire to provide overly cooperative answers or a

hesitancy to provide criticism of the intervention. I endeavoured to account for this limitation by

reflecting on my potential biases and clearly stating my assumptions. I also reflected on the

various ways I could potentially influence participants in general or individually. I then considered and enacted strategies to diminish or eliminate those influences, such as offering to conduct audiovisual recordings without being physically present during the debrief session (all declined the offer), allowing OJIs to independently review their video in a private location, and reminding OJIs to freely express their thoughts of the coaching protocol, as a forthright critique would be most beneficial for my study.

A further limitation of this study relates specifically to the design and the sample population. The selection of actual participants was affected by the specific specialties within the site that had trainees in on-the-job training at the time of data collection. Additionally, participant selection was further limited based on which individuals within those specialties were currently assigned to an OJI role. These limitations possibly resulted in a lack of diversity in air traffic control specialties (e.g., terminal/en route, high level/low level, etc.) within the population sample and may potentially contribute to low generalizability amongst specialties within the unit. This limitation is accounted for through the aim of qualitative research for transferability rather than generalizability. The study aimed to provide detailed accounts of context and rich descriptions to allow others to make informed decisions regarding applicability and adaptability of findings in other unique settings, as discussed in the integrity section. The development of design principles, a key aspect of DBR, aims to contribute to theoretical understanding but also provides insights for transferability.

Delimitations of this study relate to the selection of DBR as a methodology, the associated timeframe of the study, and the selection of location and population. It is necessary to acknowledge that DBR was selected as the most appropriate methodology for this inquiry due to its "commitment to developing theoretical insights and practical solutions simultaneously, in real

world…contexts, together with stakeholders" (McKenney & Reeves, 2012, p. 7). Thus, DBR provided the methodology best suited to attaining my professional and personal research goals for this inquiry. DBR ideally responded to my research questions through the design of a usable solution for a practical problem encountered in my professional work, including opportunities for implementation and spread of the intervention beyond the immediate study. DBR also contributed to my professional development as a researcher by providing opportunities to contribute to the wider scholarly community through theoretical insights and the development of design principles. As a methodology, DBR aligned with my value of working collaboratively with stakeholders to create a more robust product, enhanced my own learning, and ensured the needs of the organization were met.

Further delimitations of this study included the associated timeframe. The iterative nature of DBR allows for multiple cycles of analysis, design, and evaluation extending over a potentially prolonged time period. For the purpose of my study, the two cyclical phases of data collection through protocol testing occurred over approximately a two-month period. This timeframe was necessary to ensure OJI participants were available and continued to be assigned to work with a trainee for the duration of the study. Lastly, this study was delimited to the air traffic control OJIs in one area control centre who work operational positions that communicate directly with airborne traffic.

Ethical Considerations

As a researcher you must "ensure that your practice is ethical" (McNiff, 2013, p. 112). This is crucial in qualitative research when understanding of a phenomenon is often sought through in-depth descriptions by participants of their personal lived events (Creswell & Guetterman, 2019). My research study was designed on a foundational value of respect for

human dignity (Tri-Council Policy Statement 2, 2014) with a sensitivity to potential ethical issues and steps for mitigation. A research application was submitted and approved by the University of Calgary's Research Ethics Board (REB). In addition, approval was received from the air navigation service provider (ANSP) and, given no formal REB within the organization, the research proposal was reviewed by the Privacy Officer.

Within research, "participant confidentiality is of the utmost importance" (Creswell & Guetterman, 2019, p. 233). Confidentiality was maintained for all participants by assigning a number for use in data analysis and a pseudonym for use in reporting. Findings were shared with participants. Participants were reminded of their privacy prior to data collection and could decline to answer any questions. Trainees were not visually included in the video recording although their voice was audible. The privacy of the debrief was maintained by allowing only the OJI and the researcher to view the video as a basis for the coaching conversation and data analysis. Anonymity was challenging and could not be assured due to the limited number of participants and the intimate research setting.

Background and Role of the Researcher

I have come to my current role in air traffic control training as a result of a common theme of adult learning in the workplace interwoven throughout my experience. Many of my employment opportunities have included a coaching or instructional role which has been a portable skill that I have carried across a number of industries. My current role as an adult educator within a regional air traffic control operational training unit includes work with trainees, on-the-job instructors, and training supervisors. It is a multi-faceted role, within a student-centered training team, that encompasses all aspects of learning, instructing, and courseware design throughout each stage of training. Ongoing coaching and development of OJIs is a key

part of my role. Participants within my study are colleagues and I have no supervisory responsibilities over them. Trainees are adult employees and I am not responsible for determining their success in relation to performance standards.

To attend to my biases, I engaged in a critical reflective process using the ladder of inference model (McArthur, 2014) as a framework to examine my assumptions and associated reasoning. This included the use of a critical friend as a partner to challenge me to make my reasoning transparent and seek alternative explanations. Additionally, within the design of my study, I included multiple data collection sources and methods as a means to decrease personal subjectivity. As colleagues, participants are familiar with my particular practitioner lens; nonetheless I provided reminders at key times by clearly stating my positionality and willingness to engage collaboratively through an incorporation of their experience in the co-construction of knowledge. By ensuring my research was reflective of the reality of participants, I was required to acknowledge and challenge my own biases.

Chapter Summary

This DBR study was designed to explore the phenomenon of how instructional coaching can be used as a means of professional learning for OJIs within an air traffic control context. An interpretive qualitative research design was selected as the best approach for developing a deep understanding of the socially situated phenomenon. The study design used a three-phase approach as a means to prepare, design, and evaluate a professional learning coaching protocol. Data were collected through multiple sources and methods, including interviews, document reviews, and coaching sessions. Iterative testing of the coaching protocol through an instructional coaching intervention occurred with a purposefully selected primary sample of OJIs. A group of secondary participants made up of managers, supervisors, and a coaching

consultant, was purposefully selected for data collection pertaining to intervention requirements and anticipated endpoints. Data analysis included the development of themes through an ongoing iterative process over the course of the study. The themes identified through analysis of the data for all three phases of the study are described in Chapter Four: Findings.

CHAPTER FOUR: FINDINGS

This chapter presents the findings of the study based on an analysis of the data collected for the purpose of gaining a deeper understanding into the phenomenon of how the design and implementation of a coaching protocol can be used as a means of professional learning for instructors in an air traffic control on-the-job training environment. The qualitative study used a design-based research (DBR) methodology with a three-phase model to prepare, design, and evaluate a solution to this problem of practice. Data were collected from a variety of sources including interviews, document reviews, video recordings, and field notes. The data were analyzed, and the findings are presented through the use of themes. Each of the three phases is presented individually and provides a description of the context, the study participants, and the themes.

- Phase I – Prepare: Analysis and Exploration also includes the design requirements and the design propositions that emerged as a result of the data analysis.

- Phase II – Design: Development and Testing includes the findings for both Cycle 1 and Cycle 2 of the design process, and also provides a summary of the coaching interventions for each of the OJI participants.

- Phase III – Evaluate: Assess and Reflect includes an assessment of the internal structure, functionality, and expected effects of the designed coaching protocol.

Tables are included as appropriate to summarize and highlight the findings for each of the three phases.

Phase I – Prepare: Analysis and Exploration

The purpose of the first phase of the study was to prepare for the design of a coaching protocol intended to be a means of professional learning for on-the-job instructors in an air

traffic control environment. This section outlines the context of the phase, provides an introduction to the study participants for this phase, and describes the themes identified from the analysis of the data. The section concludes with a list of the design requirements and propositions for the intervention.

Context for Phase I – Prepare

This phase focused on verifying and clarifying the identified problem, confirming the needs of stakeholders so as to identify design requirements, and exploring potential options for a usable solution. An analysis cycle was used to gain a better understanding of both the phenomenon and the needs of stakeholders. This allowed for a more informed perspective in the subsequent exploration cycle which determined the necessary specifications for the design of an initial solution to the problem under investigation. These design requirements, in conjunction with the literature, contributed to the development of a skeleton of the intervention which was then used as the basis for development of the coaching protocol in Phase II – Design.

This section presents the major themes obtained from the analysis of seven in-depth, semi-structured interviews, a sampling of recent daily training reports from archived reports, and field notes from the interviews. The seven interviews included three national level managers, two local regional managers, one local training supervisor, and one national coaching consultant. The daily training reports were from within the last two years and were selected from three trainees: one who successfully qualified as an air traffic controller with no supplemental training, one who qualified after receiving supplemental training, and one who did not qualify despite the provision of supplemental training.

Study participants. Purposeful sampling was used to recruit a group of seven secondary research participants comprised of various stakeholders with an in-depth knowledge of the

organization's training needs. At the time of data collection, all participants, except one, had current responsibilities directly related to operational on-the-job training. The one remaining participant had previous experience with direct responsibilities for on-the-job training prior to moving to a new role with an indirect relationship to training. All participants provided consent to participant in data collection for both Phase I and Phase III. Participants were initially assigned a unique participant number to facilitate data collection, organization, and analysis. At the conclusion of data collection, each participant was asked to provide a pseudonym to enable participant confidentiality in reporting.

Marc. Marc has worked in air traffic control for approximately 24 years in three different area control centres. He has extensive experience working as an OJI and is currently in a regional management role, responsible for supporting and advancing the training culture and ensuring compliance with the regulator. Marc always "assumes positive intent" on the part of all team members and stakeholders and thus approaches training in a collaborative manner to "discuss successes or challenges and develop solutions". Marc finds it rewarding to develop new alternatives and implement innovative solutions within all levels of training.

Joe. Joe has 29 years of experience in air traffic control, including extensive work as an OJI and training supervisor within a unit. In his current role as a regional manager, Joe oversees training activities in the latter stages of training through guidance and advice to managers, training supervisors, OJIs, and trainees. For Joe, student success is both the most rewarding and most challenging aspect of managing training within the air traffic control environment. His approach to training is one of "support and inclusivity to ensure the delivery of fair and proper training".

Don. Don has 10 years of management experience in a variety of academic and workplace learning environments. He is currently responsible for providing national oversight for the delivery of operational training with a focus on trainee and instructor support services. Don describes his approach to training as one of a "just culture" wherein he tries to "consider all elements of the training experience and how they impact outcomes". He appreciates the value of personal and professional growth for employees and, by extension, the benefit for others but also recognizes the challenge to "impact, improve, and enhance a large multi-faceted system" such as that encountered in air traffic control training.

Wilbur. Wilbur has worked in the aviation industry and air traffic control for approximately 30 years. He has experience as an air traffic controller in an area control centre, including instructional duties within the classroom, simulator, and on-the-job training. He has extensive experience in a variety of management roles and oversees organizational quality assurance processes. Wilbur promotes the adaptation of training to suit the learning needs of trainees. He recognizes the capacity for the OJI to positively or negatively affect training outcomes and emphasizes the need for the OJI to consider how they may "impact the chance of success" in delivering feedback.

Neo. Neo is a national coaching consultant with over 25 years of experience in the coaching industry. He has extensive experience in coaching amateur sports, life coaching, executive coaching, and team performance coaching, with a focus on positive psychology and teaching effectiveness. Neo uses a collaborative and supportive approach to coaching wherein he meets the client where they are in their developmental journey and helps them focus on the next step. Neo recognizes the potential for high performance through practice in all clients and enjoys "seeing them get good at what they want to get good at". Neo has three years of

experience coaching in the air traffic control industry, and is specifically tasked with supporting the integration of coaching best practices into the new instructor development program for OJIs.

Albert. Albert has worked in air traffic control for approximately 28 years, both as an air traffic controller and in a variety of management roles. He currently oversees the national delivery of operational training and has extensive experience instructing, coaching, and providing feedback within operational training. Albert recognizes the challenges of making changes due to the large number of individuals involved in training, the expansive geography of the organization, and the extensive time required for a trainee to move through the system. He describes his overall approach to training as "student-centric" and supports the need for training to be "customized to enhance learning".

Scott. Scott has been an air traffic controller for 18 years and has been actively involved in training since early in his career. He is currently a training supervisor responsible for overseeing all aspects of training within his specialty and has broad experience developing a variety of courseware. For Scott, the most rewarding aspect of training occurs when trainees "recall previous classroom lessons and apply them" to solve situations in the operational environment. Scott approaches training with a philosophy of "assumed success" for all and strives to provide trainees with balanced feedback that acknowledges success but still situates it within a context of further growth.

Phase I Themes

The data analysis of the seven interviews with the managers, supervisor, and coaching consultant identified the two macro themes of process components and content components (Table 4.1). The theme of process components relates to *how* the coaching protocol should support the OJI in delivering effective feedback to the trainee. The theme of content components

relates to *what* feedback the coaching protocol should guide the OJI to deliver to the trainee. The two macro themes encompass two sub-themes each, which are made up of specific elements. The following is a descriptive discussion that aims to individually explain and support both of the themes, along with the associated sub-themes and elements, for a deeper understanding. Efforts have been made to ensure "rich, thick descriptions" (Bloomberg & Volpe, 2016, p. 154) through the use of quotations from the interview transcripts that support the theme.

Table 4.1

Overview of Phase I Themes: Components of a Coaching Protocol

Process Components	Content Components
Fostering a Coaching Perspective	Focusing on Present Performance
Learning Culture	Clarity of Expectations
Coaching Conversation	Reinforce Positives
Utility in a Coaching Protocol	Focusing on Future Performance
Adaptable Framework	Targeted Progression
Logistical Feasibility	Actionable Priorities

Process components of a coaching protocol. The process components theme underpins the necessary design requirements for the coaching protocol to provide the OJI with guidance and support regarding both a context and a structure for delivering effective feedback during an on-the-job training debrief feedback session. Process components do not relate to what is actually being said in the feedback session but rather to how the coaching protocol is contextualized and enacted by the OJI. It includes two sub-themes: 1) the importance of fostering a coaching perspective; and 2) the importance of utility in a coaching protocol. Each sub-theme is described along with the component elements.

Fostering a coaching perspective. The sub-theme of fostering a coaching perspective describes the need for the coaching protocol to provide the context through which the OJI should approach their role as a coach and engage in a feedback session with a trainee. It encompasses

the two elements of adopting a learning culture and engaging in a coaching conversation. The learning culture element describes the lens of coaching that the OJI should adopt to approach their own professional learning within their role as a coach. The element of a coaching conversation addresses the approach that the OJI must use for the development of their trainee when engaging in a debrief feedback session. Learning culture and coaching conversation will each be described based on an analysis and synthesis of the data.

Learning culture. The importance of developing a learning culture amongst the OJIs was identified in various ways by all seven participants in this phase of the study. The term learning culture was only used by one participant; however, the concept emerged in all the interviews in three common ways: the development of OJIs, strategies for the provision of ongoing learning and development, and the expected outcomes and benefits of developing OJIs through a learning culture.

Participants recognized and supported the value of providing ongoing development for OJIs. Neo, a coaching consultant, specifically spoke of the "coach's development" while five of the other participants used terms such as training, guidance, coaching, and support for OJIs. The remaining participant, Scott, discussed how there may already be a small percentage of OJIs who are skilled at giving debriefs but the remainder could benefit from further development. This was supported in the observation by Marc that there "is a gap that we have in training" the OJI and it acknowledges a shared responsibility for development. The notion of ongoing development represents the need for professional learning and acknowledges that within a learning culture, opportunities exist for continued growth.

Three aspects emerged regarding strategies for enacting ongoing learning and development for OJIs within a learning culture, including setting expectations for the debrief,

providing learning opportunities, and promoting the use of self-reflection. Two participants raised concerns that OJIs lack awareness of the expectations for an effective debrief and therefore may be unaware of how they could improve. Don described the need for "clear guidance and clear direction on what's expected" in the provision of feedback, while Scott stated that there has not been a "good job in the past of explaining [to OJIs] what the debrief needs to be". Proposed learning and development opportunities for OJIs provided by the participants could contribute to increased OJI knowledge of the expectations and included: observation of a modelled debrief, a worked example of a debrief for use as a reference, and providing suggested strategies for effective debrief sessions. The use of self-reflection as central to a learning culture emerged in four of the interviews. Participants used terms such as reflecting, watching yourself, self-scan, and self-awareness to describe the need for OJIs to engage in reflective practice as a means to increase their instructional capacity. Self-reflection was especially highlighted by Neo, the national coaching consultant, as a means to gain awareness and mitigate for personal bias when coaching and debriefing the trainee. A caution was raised by Marc that the "OJI respects he is being coached" so as to engage fully in the learning opportunities.

The outcomes and expected benefits from adopting a learning culture were twofold. First, there was a firm confidence among all seven participants that by developing the OJIs, their skills would be enhanced leading to an overall improvement in individual performance. This notion of improvement was described by the seven participants through the following words: quality (4/7), building capacity (2/7), greater success (2/7), improvements in feedback/debrief (2/7), raise the bar, effective/better coaches, and higher performance. Second, there was a belief brought forth by three of the participants that within a learning culture the benefits of individual OJI improvement extend to others through a learning culture. As noted by Marc, a skilled OJI

"becomes a force multiplier in that their skill set gets shared amongst others", which Albert

described as a means to "help the whole population" of OJIs.

Ultimately, a learning culture was seen as an important way to create an environment that

encourages and fosters new and ongoing professional learning by supporting OJIs to enhance

their coaching and instructional skills and sets the OJI up for success in their role.

Coaching conversation. The significance of communication was recognized by each of

the seven participants as an important aspect to be addressed within a coaching protocol for on-

the-job training. Three aspects emerged from the data: the form of communication, the purpose

of the communication, and techniques for communicating.

The term *conversation* was used by six of the participants to describe the ideal form of

communication within a feedback session. The use of the term conversation emphasizes the

need for active involvement by both the OJI and the trainee during a feedback session. As

participants described a typical debrief session, it was apparent that feedback is frequently

delivered by the OJI through a unidirectional approach with limited discussion and little

opportunity for input from the trainee. This was described by Albert as "just dumping

feedback", which included lecturing and using a directive approach to tell the trainee what to do.

Learning to communicate effectively by using conversation to explore back and forth and solicit

the trainee's perception was seen as beneficial. This will require many OJIs to develop new

communication skills, such as active listening, and to value the trainee as an active participant in

the conversation, which was described by Marc as "giving voice to the student".

Establishing the purpose of the communication was only identified by Neo, the coaching

consultant; however, it represents a learner-centered approach that is foundational to the

coaching protocol. Neo emphasized that OJIs must enter the debrief conversation with "clarity

of what the conversation is supposed to produce" beyond simply delivering feedback on the

trainee's performance. Primarily, the conversation must serve to help the trainee build

reflectivity and independence in their learning by guiding them to develop self-assessment skills

and identify solutions within their learning. This form of conversation was described by Neo as

a *coaching conversation* and requires the OJI to build a relationship with the trainee, which he

referred to as: rapport, connection, establishing trust, and being "partners in this journey of

development". This was supported by Scott who, in his role as a training supervisor, recognized

that effective communication "relies on a relationship being there" between the OJI and the

trainee.

Four participants identified the use of various fundamental communication skills, such as:

open-ended questions, probing questions, active listening, deep listening, and checking for

understanding as a key aspect of the coaching conversation. Underlying this is the need for the

OJI to adopt a flexible communication style that can be adapted to the needs of different trainees

and adjusted so as to be useful. This was expressed by two of the most experienced managers

and is explained in the following way by Albert:

> The feedback is tailored based on how it's being received, so I'm going to adjust it if it's
>
> not [being received]…I can tell by the feedback that I'm getting [from the trainee] that
>
> it's not clear or not understood, then I can reframe it, or I can change what I'm asking.

Overall, participants recognized the importance of the debrief as an opportunity to use

communication as a means to engage with the trainee, but highlighted the need for the coaching

protocol to guide the OJI to use a coaching conversation as an effective form of communication.

Utility in a coaching protocol. The utility in a coaching protocol describes the need for

the protocol to facilitate rather than hinder the authentic delivery of feedback to the trainee. It

encompasses the two elements of an adaptable framework and logistical feasibility. The adaptable framework element relates to the need for the coaching protocol to provide a structured but flexible format for the feedback session. The element of logistical feasibility pertains to the practicality and ease of use of the coaching protocol within the current on-the-job training context as an important consideration for acceptance by the OJI. Adaptable framework and logistical feasibility will each be described based on an analysis and synthesis of the Phase I data.

Adaptable framework. The need for the coaching protocol to provide the OJI with some form of framework for the provision of feedback during a debrief session was identified by all seven of the participants. The words most commonly used to describe this were: structure (4/7), format (3/7), and standardized (3/7). One participant used the term framework while another, Neo, described it as a "disciplined approach" to debriefing a trainee. Albert advocated the use of a structure to address issues with debriefs that he described as "formless" and "all over the place". The need for an adaptable framework came out in the data in three main ways: the benefits of a framework for the OJI, the benefits of a framework for the trainee, and the essentiality of flexibility within the framework.

Benefits of a framework for the OJI were identified by five of the participants and focused mainly on providing the OJI with guidance, and a shared understanding, on how to deliver feedback in an organized and comprehensive way. Joe described it as "an organizational planner to help them structure their debrief; keep them on track" while three other participants touched on the benefit of ensuring all pertinent information was covered and nothing essential was missed or forgotten. The provision of a structured format was described as a type of job aid

or tool that could help the OJI discern the correct debrief approach, what elements to include, and guide them to provide "good, meaningful feedback" stated Albert.

A standardized approach was also considered by five participants to be beneficial to the trainee as it provides a familiar and uniform process. The term consistency was used extensively by three of the participants to describe the benefit of a standardized framework to the trainee. It was expected that a familiar repetition would allow the trainee to know what to expect and therefore how best to prepare for the debrief session. Neo described it as a way to normalize feedback as a routine part of the learning process. This was reinforced in the observation by others that a standardized format allows for a consistent debrief experience, independent of the OJI delivering the feedback (e.g., a temporary OJI), potentially leading to a reduction of wasted time while a new OJI tries to assess a trainee's current stage of learning.

The need for an established framework was countered by the necessity for flexibility within the format. The coaching protocol was seen to have greater utility if it was adaptable to both the trainee's performance and their learning approach. Albert cautioned that the framework must not be something that "detracted from the actual feedback" and expressed concern that, if used incorrectly, a structured debrief format could become "so formulaic [the feedback] becomes meaningless" or it simply becomes a "checklist rather than…really changing anything". This was supported by Scott, who stated that it could not be a "one-size-fits-all solution", he explained rather that the framework is "there to help you; you're not there to complete it…the expectation shouldn't be that every element of this tool is going to be appropriate in every debrief". He advised that OJIs should not feel compelled to put something in that is not going to contribute to the debrief. It was suggested by Marc that within the coaching protocol it "doesn't even have to be specifically the questions that you *need* to ask, it might just be what kind of

questions you *can* ask". Wilbur furthered the notion that flexibility contributes to utility by linking it to diverse ways of learning within individual trainees; he saw adaptability as a way to remain learner-centered, stating that if the "tool wasn't flexible you could end up with that mismatch…which only caters to one or two types of learners…so the risk is, if you build too rigid a tool, you won't be doing that for everybody".

   Logistical feasibility. The importance of logistical feasibility was addressed in four key ways by the participants: ease of use, integration with current reality, impact on break time, and impact on the operation. All six of the internal organization participants, comprised of the managers and supervisor, emphasized the need for ease of use with the coaching protocol, conveyed through words such as: quick, easy, simple, clear, concise, and accessible. Additionally, it was noted that the coaching protocol must be easy to follow, not overload the OJI, and not create more work or it would not be used. In keeping with Marc's role as a regional manager tasked with overseeing the pilot testing and implementation of new initiatives, he emphasized the need for the coaching protocol to integrate effectively with currently established practices, "link into the procedures and processes we're using now", and take into consideration how it would help to reinforce what was already in place within operational training.

   Participants noted the importance of taking sufficient time to provide a complete debrief rather than rushing through the process to go on break; however, any adverse impact on break time for anyone working in the operation was seen as detrimental. Both Marc, as a local manager, and Scott, as a front-line training supervisor, stated the need for adequate rest and recovery time for both the OJI and the trainee, especially to prevent cognitive overload after a busy training session in the operating position or an in-depth debrief. Neo noted that even in the

corporate coaching realm, finding time to adequately debrief is always challenging; however, within a safety-critical industry this becomes an essential consideration.

Lastly, three participants identified that the coaching protocol must not adversely impact the working environment in the operation or create a resource drain in terms of time and training costs. Scott noted that everything occurring in the operation is subject to observation by others; if the debrief session looks markedly different or takes much longer, a negative impression could be created within the unit and deter others from accepting future OJI responsibilities due to the extra work. Alternatively, concern was expressed that some might use the coaching protocol to manipulate the process or, as stated by Don, "try to leverage overtime or schedule changes" if it resulted in longer debrief times.

Content components of a coaching protocol. The content components theme underpins the necessary design requirements for the coaching protocol to provide the OJI with guidance and support regarding the essential areas of focus for the actual feedback content of the debrief. Content components pertain to the message being delivered and are intended to direct the OJI to focus feedback on the trainee's current level of performance in relation to established goals, as well as providing direction on the necessary next steps for increased performance. It includes two sub-themes: 1) the importance of focusing on present performance; and 2) the importance of focusing on future performance.

Focusing on present performance. The focus on present performance describes the need for the coaching protocol to guide the OJI to provide the trainee with feedback directly related to their current performance in the training session. It encompasses the two elements of clarity of expectations and reinforce positives. The element clarity of expectations describes the necessity for both the OJI and the trainee to have a clear understanding of the objectives of a training

session. The reinforce positives element highlights the importance of moving the feedback focus away from solely mistake identification to include the recognition of successful performance. Clarity of expectations and reinforce positives will each be described based on an analysis and synthesis of the Phase I data.

Clarity of expectations. The need for clarity of expectations was expressed within the data by all but one of the participants in this phase of the study. The concept emerged in three common ways: clarity for the OJI on the objectives, clarity for the OJI on the trainee's understanding of the expectations, and ensuring clarity by aligning expectations between the OJI and the trainee.

Clarity for the OJI on the aim of the training session was recognized by five of the participants using terms such as: expectations, focus, objectives, and performance goals, with Joe noting that "expectations aren't always clear". Clarity of expectations is fundamental for the provision of effective feedback; therefore, clarity begins with the OJI before the training session starts through the use of standardized, pre-determined, and well-defined objectives. All spoke of the need for the OJI to provide feedback and coaching based on these objectives and the extent to which they were achieved by the trainee; for Albert giving feedback by "linking it to actual performance goals" was essential. This also provides a means for the OJI to prioritize feedback by reconnecting to the objectives of the session themselves to determine what information is presently most pertinent to the trainee so as to build both confidence and competence through the feedback.

The importance of clarity of expectations for the trainee was acknowledged by five participants, but more essential was recognition that the OJI must have clarity on what the trainee understands to be the expectations. Two participants noted in the absence of clarity of

expectations, misunderstandings arise on the part of the trainee as they use guesswork to try and decipher performance expectations, while the OJI assumes the trainee knows what they are working on. Neo emphasized the need for the OJI to gauge a trainee's level of awareness and understand the image in their mind. Within his own work as a coach, Neo described his need to:

understand where the student is instead of me assuming this is where they are. It helps me understand what the student understands and what they don't understand; what they're struggling with and what they're really good with. So, I guess it helps me to create a clearer picture of where the student is.

The final element relates to the OJI achieving clarity for the trainee by guiding them to develop a more accurate picture of the expected performance so they can effectively guide their own efforts towards success. While this was described by participants in various ways such as being on the same page, building a picture of success, filling in the gaps, helping trainees understand, and putting things in perspective, it really represents what Joe termed "aligning expectations" between the OJI and the trainee. Scott recognized the potential for different understandings and cautioned that while objectives may seem obvious to the OJI that is not necessarily the case for the trainee. It thus becomes, in Marc's view, the responsibility of the OJI as the coach to help the trainee gain "clarity as to what they're working on during the sessions".

Reinforce positives. The element of reinforce positives within a feedback session was given prominence by four of the participants. Two of those four participants also acknowledged the emphasis on errors in giving feedback within OJT, which provides necessary context for the need to reinforce positive performance.

Joe explained how feedback in OJT, both written and verbal, can have an overriding negative connotation in that it immediately starts with negatives and emphasizes errors. He

described feedback for the trainee as "just a chronicle of what we did wrong". In his role as a training supervisor, Scott sees this firsthand and explained how focusing on negative performance results from using a trait that serves air traffic controllers well in a safety-critical environment but is detrimental within a training context. In his words: "we're really good at pointing out what the students do wrong…it's an errors-focused industry. If something goes wrong, it's very apparent and it's the controller's job to fix it; so that is where our mind goes immediately". Additionally, the detection and correction of errors becomes such a focus for the OJI that successful performance and correct action by the trainee may not be acknowledged since, as stated by Scott, such a response is "so ingrained and second nature [for the OJI]; it hardly seems worth mentioning".

Participants recognized the need for OJIs to shift their focus away from a trainee's mistakes to the identification of situations where the trainee performed well. It was apparent that Albert understood positive reinforcement to be a valuable form of positive feedback when he expressed the need to "identify situations where we did it well or aspects of the situations that we did well so we can use those to build on…and bring them in as part of the conversation". Others noted that by doing this, the trainee could then work to maintain the positive behaviours as well as turning their focus to new areas of learning. Overall, participants suggested that within the feedback session, the OJI needs to recognize successful performance and provide feedback to reinforce that success in order to build confidence and self-efficacy in the trainee.

Focusing on future performance. The focus on future performance describes the need for the coaching protocol to guide the OJI to provide the trainee with clarity on where they are headed in their learning and how to get there. It includes the use of both targeted progression and actionable priorities. The element of targeted progression identifies what the trainee needs

to work on now to maximize performance later. The element of actionable priorities emphasizes the importance of narrowing down the areas of focus to those that are most important and providing implementable strategies for continued performance advancement. Targeted progression and actionable priorities will each be described based on an analysis and synthesis of the Phase I data.

Targeted progression. The need for OJIs to use targeted progression as a coaching strategy within a feedback session was addressed by six participants. It relates to consistently addressing learning in an organized and planned way and is rooted in both formative and summative evaluation. It encompasses three closely related aspects: assessing performance, progressing performance, and challenging the trainee.

Assessment was brought up in various ways by all seven participants; however, five discussed it in a way specifically applicable to targeted progression. Through formative assessment the OJI must assess the trainee's performance in a current session against the established objectives and then fit that determination of performance levels into the overall expected performance for an assessment period within OJT. Within this formative assessment it is important to place that trainee's performance within an overarching context of needed progression. It was described by Don as "how that fits into their…overall performance", by Albert as "where they are in their learning path", and by Joe as a means for the trainee to know "am I behind or am I ahead", but all reference a continuum of learning progression within the trainee's performance.

Progressing performance was highlighted by five participants. It flows from the formative assessment of learning performance and refers to identification of the trainee's subsequent area of focus. Participants again used phases that emphasized a continuum of

learning in relation to the trainee; Joe and Neo described it as "next steps", Neo also referenced "moving them up the line", while Albert saw it as what to "do moving forward". Most importantly though is a subtle distinction drawn out by the participants regarding what is needed now for immediate success versus what is needed now for future success. This involves intentionally targeting certain learning objectives as a present priority to facilitate and maximize performance at a later time in OJT. Joe described how it involves "looking ahead, next steps for the expectations going forward…and an understanding of what they're going to need the next cycle". Marc spoke of both addressing "issues which would become more critical as training goes on" as well as "not forgetting about pieces within the initial phases which form the bedrock of continuing to progress in the later phases". These comments further highlight the continuum of learning and emphasize the need for the OJI to consider not just immediate learning needs when providing feedback, but also to consider what is needed holistically for future success.

Challenging the trainee was only brought up by one participant but it contributes significantly to the use of a targeted progression approach and supports Vygotsky's Zone of Proximal Development (Merriam & Bierema, 2013) through an emphasis on optimally challenging the trainee. While challenging the trainee relates to progressing performance, it is slightly different in that it pertains to recognizing when a trainee is performing well for the current stage of training yet still challenging them to learn new tasks required in the next stage of OJT. Marc expressed concern that the OJI not waste training time by "sitting back and letting it run" if the trainee was progressing well, but instead know when to challenge and stretch the student for maximum progression. Using every training session as a learning opportunity was viewed as essential to progress effectively and avoid wasting time. As Marc explained, this requires "reinforcing the importance that every time and position is a learning opportunity so

we're not losing time where the student's progressing fine…reinforce that we will go through these [coaching] questions anyway and identify gaps or areas to focus and develop" even with satisfactory trainee performance.

Actionable priorities. Five of the seven participants discussed issues connected to a requirement for actionable priorities to be established in a feedback session. Actionable priorities relate to determining what area of focus is most germane at that point in training and establishing realistic activities for advancing the trainee's learning in that area. It is closely related to clarity of expectations and includes first setting the priorities and then translating them into implementable strategies.

Three participants addressed the need for OJIs to set priorities when focusing on future performance. It was recognized by Neo that trainees can only "take in so much information" and as such can easily become overwhelmed with the quantity of feedback typically provided in the debrief session. This is a distinct possibility for trainees working operational traffic in OJT since they are dealing with multiple dissimilar scenarios within one training session and therefore may require coaching and feedback on multiple areas of performance. When this occurs, Marc noted that the trainee can miss the most important points and be unable to focus their learning; he explained that the "key messaging can get lost in the noise of everything else". Prioritization of feedback items is necessary to ensure a focus on what is most pertinent or valuable to the trainee at that point, thereby requiring the OJI to guide the trainee in the accurate identification of a limited number of main learning points or key take-aways from the coaching session. Due to the OJI's overriding responsibility to get the work done and as a result of the safety-critical nature of the work, there is a tendency for OJIs to provide feedback on everything that occurred in a particular training session. Participants saw the need for OJIs to let go of some areas of feedback

if they are not safety-critical and are not the priority focus for learning. Scott described how this may be facilitated through the pending implementation of training guides that establish objectives for each phase of OJT, thereby providing direction regarding priorities which could contribute to the key focus in the feedback session.

Three of the five participants who discussed priorities also addressed the necessity of ensuring the priorities are actionable. To make the priorities actionable, participants expressed the responsibility of the OJI to provide the trainee with small manageable actions to work on improving. This was best described by Don, who stated that "ideally their performance…is broken down for them in pieces that are easy to understand, and they're provided with strategies or objectives that are easy for them to then apply to their work". This was supported by Albert, who connected it to the notion of doing by stating that at the end of the feedback session there must be "some actionable things. So, we need to define what those actionable things we're going to do are" so the trainee can focus their efforts appropriately. Actionable priorities ensure a solutions-focused approach to the challenges of OJT by providing the trainee with implementable strategies for progressing their learning and performance.

Phase I Outcome – Design Requirements and Design Propositions

The Phase I outcomes are produced through the analysis and exploration cycles which contributed to the generation of the partial design requirements and initial design propositions. The design requirements relate to the intended long-range goal of the solution and "specify criteria the intervention should meet" (McKenney & Reeves, 2012, p. 112), while the design propositions are intended to "provide guidance on how to achieve the long-range goal" (McKenney & Reeves, 2012, p. 112). As described by McKenney and Reeves (2012), the design requirements remained relatively constant over the course of the study, while the design

propositions were iteratively refined as the coaching protocol intervention was tested in the

Phase II cycles. Table 4.2 outlines the final design requirements and propositions.

Table 4.2

Phase I Outcome: Coaching Protocol Design Requirements and Propositions

Design Requirements	Design Propositions
Guide the OJI to adopt a reflective practice.	Provide an initial step for the OJI to self-scan for biases and adopt a developmental coaching approach.
	Provide a final step for the OJI to reflect on the coaching session for the purpose of professional learning and improving their performance in the future.
Guide the OJI to generate a conversation with the trainee.	Provide a list of open-ended starter questions for the OJI to use to begin the conversation.
	Provide reminders for OJI to "talk less, listen more" and listen for understanding not judgement.
Guide the OJI through a standardized debrief framework while allowing flexibility in adapting it to the current needs of the trainee or situation.	Provide an established structure for the debrief. Indicate non-mandatory sections, adaptable sections, and offer different choices.
Ensure the tool is simple and easy to follow.	Provide a job aid with clear graphics to depict key points. Use succinct wording.
	Emphasize that a long debrief session can overwhelm the trainee and diminish the value of the feedback.
Guide the OJI to gain clarity for themselves on the trainee's learning objective, gain insight into the trainee's understanding, and facilitate the alignment of expectations between both.	Provide a question to the OJI on the objective *(e.g., what is your trainee working on this session?)*.
	Use open-ended question about the trainee's perspective/understanding of the training session through an analysis of strengths and difficulties.

Design Requirements	Design Propositions
	Provide strategies to align expectations *(e.g., practice curiosity to get deeper into reasons for their perspective)*.
Guide the OJI to identify and reinforce successful performance by the trainee.	Provide a heading in the protocol on "positives" to guide the OJI and trainee to collaboratively identify successes *(e.g., what did you do well today?)*.
	Use a reminder box to support an objective perspective and "park their bias" so as to not default to error identification.
Guide the OJI to consistently set progressive learning goals that challenge the trainee to stretch their performance beyond their current comfort level.	Provide a heading in the protocol on "next steps" to ensure the OJI and trainee have a shared understanding of "where am I going"? and guide them to collaboratively identify the next progressive learning goal.
Guide the OJI to discern a limited number of priorities for improvement with associated actionable strategies.	Provide guiding questions to identify 2-3 key priorities for learning *(e.g., what are we going to work on next?)* that are then linked to specific strategies for improvement *(e.g., what will you do differently next time?)*.
	Ensure the questions guide a conversation with the trainee regarding the priorities.

Phase II – Design: Development and Testing

The purpose of the second phase was to undertake the design of a coaching protocol intended to be a means of professional learning for on-the-job instructors in an air traffic control environment. This section provides the context for Phase II, an introduction to the study participants, including an overview of their individual coaching interventions in both cycles, and the themes that emerged from the Cycle 1 and Cycle 2 data analysis.

Context for Phase II – Design

This phase focused on using the design specifications identified in Phase I – Prepare: Analysis and Exploration to complete the design and development of the coaching protocol intervention. Two iterative cycles were conducted to evaluate and refine the design and implementation of the coaching protocol intervention. Each cycle included five discreet data collection events per participant, as outlined in Table 4.3. The daily training reports associated with the trainee debrief sessions were also collected and reviewed. Cycle 1 developed and tested the first prototype based on a skeleton of the intervention constructed as an output in Phase I. Refinements were made to the coaching protocol intervention based on the Cycle 1 testing in order to produce a second prototype of the intervention. Cycle 2 testing was based on this refined second version of the prototype. Further refinements to the intervention were identified in this cycle and integrated to produce the final solution.

Table 4.3

Steps in Cycle 1 and 2 Intervention Testing

Step	Data Collection Activity
Initial Debrief	Video recording of the OJI providing verbal feedback to the trainee
Coaching Intervention	Coaching session between the OJI and the instructional coach (researcher) to discuss OJI performance in the initial debrief
Second Debrief	Video recording of the OJI attempting to implement feedback strategies identified in the coaching session
Evaluation Session	Coaching session between the OJI and the instructional coach to evaluate performance progress in the second debrief
Interview	Evaluation of the effectiveness of the coaching intervention

This section presents the major themes obtained from the analysis of the in-depth semi-structured interviews conducted with the three OJI participants at the end of Cycle 1 and an additional three interviews conducted with the same participants at the end of Cycle 2. The debrief sessions between the OJI and the trainee, as well as the coaching interventions and evaluation sessions between the OJI and the instructional coach, provided the means through which the intervention prototypes were tested. These sessions do not form part of the direct data analysis for the phase, but were used to triangulate data and are summarized below to provide context for the themes.

Study participants. The primary research participants in Phase II included three OJIs selected through typical case sampling from three different en route control specialties within the air traffic control unit. Criterion sampling was used to both ensure the participants were active OJIs currently assigned to a trainee and expected to remain assigned to the trainee for the necessary time anticipated for full participation in the testing of the intervention. All three OJI participants fully completed both Cycle 1 and 2 of data collection.

All three OJI participants provided consent to participant in data collection for Phase II. Participants were initially assigned a unique participant number to facilitate data collection, organization, and analysis. At the conclusion of data collection, each participant was asked to provide a pseudonym to enable participant confidentiality in reporting. Although not direct participants of the research, the three trainees also provided consent to participate in data collection since their voice was audible on the video recordings of the debrief session with their OJI.

Michael. Michael has been an air traffic controller for seven years with experience in three different units. He has been the primary OJI for one student and worked on an ad hoc basis

with a number of other students. Michael's overall approach to training is building confidence in the trainee and he enjoys watching them move from "a blank canvas to a finished product". At the time of the intervention, Michael was assigned as the primary OJI for an ab initio (no previous training experience) trainee who had completed classroom and simulation training and had been in OJT for three months. He was scheduled to continue working with this trainee for about two more months before a planned transfer to a new OJI was scheduled to occur halfway through OJT.

Henri. Henri has been an air traffic controller for 15 years with experience in two area control centres. This was his first opportunity working as a primary OJI and he was assigned to an ab initio trainee who had completed classroom and simulation training. For Henri, the most rewarding aspect of training is seeing improvements in trainee performance and he approaches training with the intent to be an OJI "who improves the system" for the benefit of the trainee. At the time of the intervention, the trainee was over halfway through OJT with six months of experience. A scheduled transfer to a new OJI for the remainder of training occurred immediately following the completion of data collection for this study.

Lewis. Lewis has been an air traffic controller for 18 years working exclusively in his current specialty. He has experience instructing in the classroom and simulator and developing courseware, as well as previous experience as a primary and ad hoc OJI. He values training as a means to increase staffing levels in his current specialty. Lewis describes his overall approach to training as having a nice, friendly manner, "not being super critical", and correcting errors in a supportive way. Lewis was assigned as the primary OJI for a trainee with approximately 10 years of experience within air traffic services. Lewis had worked with the trainee for the full

duration of OJT and the trainee successfully qualified as an air traffic controller shortly after the completion of data collection for this study.

Cycle 1 Data Analysis

This cycle focused on protocol development, testing, and refinements. This included completing the development of the first prototype of the coaching protocol intervention, testing it with the three OJI participants within the context of trainee debrief sessions followed by coaching conversations with the instructional coach (researcher), and a final interview to gain insight into the effectiveness of the coaching intervention and areas in need of refinement. For this cycle, the solution tested by the OJIs was the full, multi-page version of the coaching protocol.

This segment presents the findings developed from the Cycle 1 data analysis. It first presents a summary of the coaching interventions for each of the three participants based on the coaching conversations between the OJI and the instructional coach after the trainee debrief sessions in order to contextualize the intervention. Next, an analysis of the data from the end of cycle interview between the OJI and the researcher is presented through themes relating to both areas of effectiveness and areas for refinement within the coaching protocol.

Participant coaching interventions. The following presents a summary of the coaching interventions for each of the three OJI participants. During the first coaching conversation, each of the OJIs expressed having had two minor areas of concern prior to the recording of their first debrief session. First was concern that the training session would have enough traffic to provide adequate content for a full debrief. The OJIs were advised that the coaching protocol was designed to be relevant for any length of debrief session and testing with varying lengths of debriefs would contribute to determining its utility in practice. The second concern related to

some initial feelings of hesitancy around being recorded; however, after reviewing their first recording, all three OJIs recognized how it contributed to an improved self-assessment and even increased confidence as they realized the debrief was better than they thought. The OJIs all had many areas of strength within their debrief sessions and these were highlighted by the coach in the *reinforce positives* section of the coaching conversation and are outlined below, along with the OJI's own professional learning goal.

      Michael. During our first coaching intervention, Michael expressed that it was nice he "actually had something to talk about" and felt he was able to get his point across as he normally would when not being recorded. He recognized that the goal of the video recording was to provide a sample of a typical debrief session to be used for review and reflection on his performance. Michael's two key coaching goals for his trainee were to build confidence and to establish good air traffic control work habits. After reviewing the video recording of his trainee debrief session and reflecting on his performance, Michael identified four successful strategies he had used in providing feedback. These strategies included: selecting a specific focus for the debrief rather than going over everything (actionable priorities); getting input from the trainee (coaching conversation); stating the tasks that were done well (reinforce positives); and, identifying the next step to achieve a goal (targeted progression).

      Despite having prioritized feedback by selecting one specific area of focus in the debrief, Michael felt he was still not sufficiently focused and that some feedback may have been lost in communication. As a professional learning opportunity, he set a goal for improvement for himself to be more succinct and make the priorities more actionable by connecting the strategies to achieve a learning goal with the situations encountered in OJT. Through the coaching conversation, Michael established the following strategy to progress towards his improvement

objective: state the trainee's goal at the start of the debrief; select a scenario from OJT and relate it to the goal; and, highlight the goal at the end to direct future learning. His implementation strategy focused on following the feedback framework established in the coaching protocol.

After Michael had completed the second debrief and reviewed the video, we conducted the evaluation session and discussed the extent to which he was able to successfully implement the new instructional strategy and attain his goal. He accurately assessed that he had improved on setting actionable priorities by ensuring the debrief remained centralized on one specific area of focus and by communicating both strengths and areas still in need of improvement to the trainee. This debrief was longer than the initial debrief and Michael felt he could make further improvements by remaining more focused and succinct in providing feedback within the specific area of focus. Michael described his learning in the following way:

> my take-aways are that I know I am at least doing a decent debrief, which is nice, and I
> think it has been helpful for me as well, because just like I am giving feedback to the
> student to help them improve, you are giving feedback to me as well, so it makes me
> think more about the way in which I am conducting the debrief and learning what works
> and what I need to change and I think just learning to focus more so on a certain
> deficiency and make it a little bit more concise, I think that will help him to really have
> something to focus on.

Henri. Our first coaching conversation was based on the initial debrief which had limited content and was of extremely brief duration. Other than the brevity, the initial debrief still provided an appropriate sample of a typical debrief session and was able to be used by the OJI as the basis for reflection on his performance. Henri's trainee had just returned to OJT after a few days of absence which can frequently result in minor struggles with performance;

however, this was not the case and he was pleased with his trainee's work. After reviewing the video recording of his trainee debrief session and reflecting on his performance, Henri identified two successful strategies he used in providing feedback. These strategies included: recognizing tasks that were done extremely well (reinforce positives) and using foundational communication skills such as body language and eye contact (coaching conversation).

Using foundational communication skills relates to one aspect of coaching conversations; however, it does not address the aspect related to the essential purpose of guiding the trainee to develop independence in their learning. Henri recognized the importance of this as a key area of professional learning for further developing effective feedback skills. He set for himself an improvement goal of increasing trainee involvement and input in the debrief session and stated that this would be valuable for the trainee going forward. Through our coaching conversation, Henri established the following strategies to progress towards his improvement objective: advise the trainee ahead of time that he is expecting deeper answers to his questions; use more open-ended questions; and, follow-up on responses with probing questions. His implementation strategy focused on speaking to the trainee ahead of time to set clear expectations for involvement, and using the coaching protocol for examples of appropriate open-ended questions.

Once the second debrief and video review were completed, we conducted the evaluation session to discuss the extent to which Henri was able to successfully progress towards his goal of implementing the new instructional strategy. In reviewing the video and reflecting on his performance, Henri was able to identify that he was initially successful in using open-ended questions but then, as he described, "fell back into sort of the typical standard lecture model". During the second debrief, the trainee responded well to his request for increased input when sample questions were used, and Henri stated a desire to continue to work towards asking more

open-ended and probing questions. He summarized his key learning from the instructional

coaching session as follows:

> the positive reinforcement of watching the video and the debrief technique in general;
> sort of holistically…also seeing the more constructive or learning side is the failure I
> guess to integrate the probing questions throughout the debrief. So those are the two big
> take-aways for me, and I think we've addressed them and come up with sort of a plan of
> action.

Lewis. The initial debrief between the OJI and the trainee was a moderate length and

provided suitable content to form the basis for our first coaching intervention. Lewis recognized

the intent of video recording a typical debrief session so as to provide a sample for review and

reflection on his feedback performance. The trainee was nearing the completion of OJT and was

very proactive in discussing his performance. Once Lewis had reviewed the video recording of

his trainee debrief session and reflected on his performance, he noted that the content of the

debrief was good and identified two successful feedback strategies he had implemented. These

strategies were: seeking the trainee's view in conjunction with listening to his input (coaching

conversation); and, commenting on improvements the trainee had made in relation to errors from

the previous week (reinforce positives in relation to an area identified for targeted progression).

Lewis identified that his thoughts were not well ordered and as a result the debrief

session had rambled slightly. He recognized this as a professional learning opportunity and set a

goal to improve in this area by being more organized in the provision of feedback. Within the

context of the coaching conversation, Lewis was able to determine strategies for progression

towards his improvement objective, including spending a couple of minutes organizing the

feedback content prior to starting the debrief session and following the structured format set out in the coaching protocol.

Once Lewis had completed the second debrief and reviewed the video, we conducted the evaluation session to discuss the extent to which he was successful in implementing his strategies and progressing towards his goal of a more organized feedback session. Lewis stated that he had been able to take some time to organize his thoughts and jot down a few notes prior to the session. Through reflection on his performance, he stated that he felt somewhat more organized and that he had successfully grouped content to follow the basic order of the coaching protocol while still engaging in an active coaching conversation. He did note that during the second debrief, he was flipping through the pages of the protocol and pausing as he continued to organize his thoughts. Lewis set a further goal for himself to continue to improve the organization of his feedback by becoming more familiar with the coaching protocol and gaining more practice using it. In referring to the coaching protocol and the instructional coaching session, Lewis expressed surprise at "how quickly it seemed to organize my thoughts…and the effectiveness…it seemed to get through to him pretty clearly".

Cycle 1 themes. Interviews were conducted with the three OJI participants at the end of Cycle 1 to both evaluate the effectiveness of the coaching intervention and identify areas for refinement in the coaching protocol. Overall, the OJIs described the protocol as relevant and effective with all components being useful. The components they found less useful were the ones they felt were already a standard component of their debrief routine prior to the introduction of the coaching protocol. These areas naturally varied by individual; Michael recognized that he already provided a lot of positive feedback, Henri stated that he had a well ingrained initial OJI self-scan, and Lewis stated he did not implement the *determine next steps* component of the

coaching protocol although it was observed that he did direct the trainee to continue to work on a previously identified area of focus. Even though the OJIs felt those components were less useful to them personally, they recognized that not all OJIs have the same expertise and felt all components should be left in the document for the protocol to be applicable to the needs of all OJIs.

Five themes emerged through analysis of the data (Table 4.4). Three of the themes related to aspects of the coaching intervention found to be effective. Two additional themes pertained to aspects of the coaching intervention in need of refinement. Each of the themes is described below through the use of "rich, thick descriptions" (Bloomberg & Volpe, 2016, p. 154) and supporting quotations from the OJIs.

Table 4.4

Overview of Phase II Cycle 1 Themes: Testing the Coaching Protocol

Effective Aspects	Areas for Refinement
Enhanced communication	Learning to use the coaching protocol
Improved structure	Developing a job aid
Increased formative feedback	

Effective aspects of the coaching intervention. The three themes that emerged as outcomes that the OJI participants found to be particularly effective aspects of the coaching intervention include enhanced communication, improved structure, and increased formative feedback. An individual description of each theme is provided.

Enhanced communication. All three of the OJI participants identified how the coaching intervention and the use of the protocol lead to enhanced communication with the trainee. Michael and Henri used the term "more effective communication" while Lewis described the resulting communication as "quite helpful". The use of open-ended questions was recognized by

the participants as contributing to increased trainee involvement in the feedback conversation, resulting in the OJI having a better understanding of the trainee's perspective. A detailed description is provided for how these three aspects of enhanced communication (open-ended questions, increased trainee involvement, and better understanding) were perceived by the OJIs.

The provision of sample open-ended and probing questions in the protocol was acknowledged as beneficial by participants as it provided a usable example of the right type of questions to ask the trainee and guidance should the OJI not have any questions prepared. All three OJI participants particularly identified how the use of the coaching protocol led to increased trainee involvement in the feedback session which they found to be positive. Michael identified open-ended questions as one of the most beneficial aspects of the protocol as it "focused on getting the student involved in the debrief". Likewise, Henri stated that the protocol "helped open up communication channels" and that he could see the trainee's comfort levels increasing as he used open-ended questions and allowed for trainee input. Lewis recognized that he already tended towards a back and forth dialogue with his trainee but noted that that the protocol may have "helped out that even further" since it created more interaction and a sense of collaboration as it allowed the trainee to come up with many of the answers.

Participants recognized how the increased involvement on the part of the trainee resulted in the OJI gaining improved insights and a better understanding of the trainee's perspective. Henri found this to be beneficial for himself since gaining a better perspective on what the trainee was thinking in a particular scenario brought to light the fact that he made more assumptions than he realized about the trainee's thinking in a given training situation. He felt some of these assumptions could be eliminated through the use of the open-ended questions on the coaching protocol. Lewis also saw the coaching protocol as providing the opportunity to find

out what the trainee was thinking but saw this as beneficial to the trainee as he would now get their opinion rather than just immediately telling them the errors.

Enhanced communication supports the design requirement for the coaching protocol to guide the OJI to generate a conversation with the trainee. Enhanced communication aligns with the theme of a coaching conversation, in particular the form of communication (a conversation with dialogue back and forth) and the purpose of the communication (to build reflectivity and independence in the trainee's learning).

Improved structure. The three OJI participants all commented on how the structure of the coaching protocol supported the delivery of the feedback content within the debrief session. The areas of particular note to the OJIs included the provision of a standardized configuration, a means for organization of the material, and the capacity for flexibility.

Clear direction on a standardized debrief plan amongst all OJIs was considered to be positive and predicted to be effective for both the OJI and the trainee. The OJIs perceived the debrief structure as a somewhat sequential process commonly referring to it as steps; for example, Henri stated that "it goes through the steps that I feel like I should be going through". This process was especially important to Michael who referenced it multiple times and stated the protocol provided a "step-by-step guide as to how to deliver a debrief" in the proper format. He also recognized the flexibility in its application as he further described how the protocol provided a relevant, general guideline that afforded a scheme through which to develop a debrief session. Concern was expressed that, for some OJIs, the structure could potentially extend the debrief period as they addressed each step, but Henri commented that this would probably result in a "more effective debrief and learning opportunity". This was further supported in Henri's

recognition that as he moved to a standardized use of open-ended questions, his trainee knew what to expect and therefore was better prepared for the debrief.

The structure of the coaching protocol provided an improved means for organizing the feedback content being delivered in the debrief session with expected benefits for the OJI and the trainee. By following the protocol, the OJIs could easily arrange their feedback content into the provided categories thereby supporting a better organization to their thoughts. As Lewis explained, it kept him organized, on track, and provided a good concise flow to the debrief session without "jumping back and forth between everything". An improved organization was also considered beneficial to the trainee as different OJIs place diverse value on certain aspects of feedback, possibly resulting in feedback points being unintentionally missed by OJIs not recognizing their importance. The structure of the protocol ensures, according to Michael, that "all the information that needs to get delivered is getting delivered" within an organized, linear format that makes it easier for the trainee to understand and retain information.

All three OJI participants found the flexibility within the coaching protocol to be beneficial. For two of the OJIs this flexibility was within the suggested questions while the third OJI appreciated the flexibility within the structure. Michael saw value in using the headers for each category then filling them in based on the specific scenario being discussed by selecting the appropriate questions, adjusting the existing questions, or coming up with his own questions. Michael described this as giving the OJI "the freedom to incorporate" questions that were relevant. This was supported by Henri who recognized, that within the suggested questions, he was able to quickly discount the ones that were not necessary or use the existing ones as prompts to come up with questions "applicable to a certain situation". After using the protocol multiple times, Lewis realized he did not need to go "through every part every time" but rather the

structure could be flexible based on the trainee's learning needs and the number of debriefs within a given shift.

This theme of improved structure aligns with the design requirement for the coaching protocol to guide the OJI through a standardized debrief framework while allowing flexibility in adapting it to the current needs of the trainee or situation. Within the sub-theme of the importance of utility in a coaching protocol, improved structure supports the element of an adaptable framework with regards to all three aspects of benefits for the OJI, benefits for the trainee, and flexibility within the framework.

Increased formative feedback. All three of the OJI participants identified the section of the coaching protocol entitled "check current progress" to be most beneficial. This section uses open-ended and probing questions to dialogue with the trainee about their performance during the OJT session. The OJI guides the trainee to reflect on and delve into their strengths (e.g., what did you do well?), areas for improvement (e.g., what difficulties occurred?), and future changes (e.g., what would you do differently next time?). The OJI participants identified the two elements of trainee self-evaluation and trainee perspective as being key aspects in this theme of increased formative feedback.

The benefits of trainee self-evaluation related to both present performance and future performance. Participants described how the coaching protocol effectively allowed the trainee to reflect on their present performance by assessing the training that had just occurred. Through guided self-evaluation questions, learning would occur as the OJI asked the trainee to describe and communicate things that had transpired during the OJT session. At times these would be things the trainee was unsure of but through open-ended and probing questions, the trainee

would start to make meaning and come to their own conclusions regarding their performance in the OJT training session. Michael described this as "critical thinking about what they've done". By asking the trainee to consider how else a scenario could be handled or what they would do differently the next time, the focus shifted to future performance and was valuable in encouraging the trainee, rather than the OJI, to come up with most of the answers.

All three OJI participants described how the coaching protocol allowed them to gain better insights into the trainee's perspective or way of thinking in a given situation. The OJIs further described how insights into the trainee's perspective resulted in altered coaching behaviours. This was particularly evident to Henri when he completely changed his feedback on the basis of the trainee's explained thought process. This was likewise reflected by Lewis who commented on the value of determining the trainee's thinking "instead of just immediately telling them" how they should have handled the scenario while Michael noted that if the trainee was "saying it, they obviously believed it" and therefore did not require him to provide further explanation. Henri alone suggested long-term benefits of dispelling incorrect assumptions, such as shorter training times and increased success rates, as problems would come to the surface more quickly and could be addressed promptly by the training team.

This theme of increased formative feedback aligns with the four design requirements established in the Phase I theme of content components of a coaching protocol. In particular, these include the requirements for the coaching protocol to guide the OJI to: gain insight into the trainee's understanding (part of clarity of expectations); identify and reinforce successful performance (reinforce positives); consistently set progressive learning goals that challenge the trainee (targeted progression); and, discern a limited number of priorities for improvement with associated actionable strategies (actionable priorities).

Areas for refinement. The two additional themes that emerged from the Cycle 1 data pertain to aspects of the coaching protocol in need of refinement including learning to use the coaching protocol and the development of a job aid. An individual description of each theme is provided.

Learning to use the coaching protocol. All three of the OJIs were provided with a brief individual overview of the coaching protocol which included an explanation of the purpose of the tool, a description of each section with highlights of key elements, and preemptive clarification for potential areas of confusion. Two of the OJIs then used the protocol later the same day to debrief and one OJI used it the next day. Three areas emerged in this theme including the initial challenges encountered, activities that facilitated learning, and expected outcomes once becoming more accustomed to using the protocol.

All three of the OJIs encountered some initial challenges around becoming acquainted with the coaching protocol; this was described by one OJI as needing to gain familiarity while another explained that it was a lot to go through the first time. Henri described how using the protocol initially required a conscious effort to focus on adopting a new routine and engaging the trainee in a different manner which, he noted, could be challenging. This was supported by Michael who felt he paused more the first time he used the protocol and identified the potential for initial OJI confusion, leading to a more convoluted delivery of feedback; although, he did not think this would affect the trainee's ability to retain the information. For Lewis, his confusion centered around challenges with flexibility and adaptability of the framework as he sought clarification and confirmation to use only the questions and sections applicable for the feedback being provided in a particular debrief session.

The activities that helped the OJI participants learn to use the coaching protocol included both individual learning and coaching. Individual strategies included reading through the document and thinking about it prior to using it, as well as applying the provided coaching techniques and sample questions. Michael also used the technique of visualizing its use in "real-life practice" and explained that simply becoming more familiar with it was useful in learning to use it. The coaching strategies that assisted the OJIs to gain clarity about the use of the protocol included the introductory explanation, discussion around how to use it effectively, and, for one OJI, setting his own professional learning goal within the coaching session. Henri explained that his goal of asking open-ended questions prevented confusion and made it easier to use the protocol in practice as he focused on that skill. It was further suggested that learning to use the protocol should be incorporated in new OJI training as ample time would be available to explain it in detail.

Two of the OJIs expressed that they had no expectations prior to being introduced to the protocol but described how learning to use it had already resulted in improvements to their debrief sessions. Michael took a continuing view of the expected outcomes and explained that as he became more familiar and comfortable with the protocol, it would have more benefits. Michael considered it to be a "long-term plan" to learn to use it effectively and stated that it would also "end up providing benefit to the next students" he would be assigned to instruct.

This theme of learning to use the coaching protocol aligns with the design requirement for the coaching protocol to guide the OJI to adopt a reflective practice. Within the sub-theme of the importance of fostering a coaching perspective, learning to use the protocol supports the element of learning culture with regards to the three aspects of ongoing development for OJIs,

strategies for the provision of ongoing learning and development, and the expected benefits of developing OJIs.

Developing a job aid. The OJI participants were unanimous in their request for a job aid; a shorter version of the coaching protocol that could be more easily used as a reference during the debrief session. They used words such as cheat sheet, worksheet, tip sheet, checklist, and condensed version to convey this request. The main reason for the request was to improve its effectiveness by making it easier to use both during the OJT session and especially in the debrief session. Two OJIs saw benefits to using the job aid during the OJT session as a worksheet to make notes and add questions for the trainee that were specific to current traffic scenarios. All the OJIs saw the job aid being used during the debrief session as a quick reference to keep the OJI on track by providing questions and prompts when not familiar with the full protocol.

The three OJIs stated that the full coaching protocol was quite relevant, expressing that it was useable, the content very applicable, and according to Lewis it "all works well" when implementing it in practice. The full coaching protocol was considered a good reference, especially if it could work in conjunction with a job aid. Henri however felt there was a necessary substance to the full protocol and that in creating the job aid, it was better to start with a little extra content rather than slim it down too much and risk removing "something that would speak to even one individual".

This theme of developing a job aid aligns with the design requirement to ensure the protocol is simple and easy to follow without too much extraneous detail. Within the sub-theme of the importance of utility in a coaching protocol, the development of a job aid supports the element of logistical feasibility within the document especially with regards to ease of use.

Cycle 2 Data Analysis

This cycle focused on further protocol development, testing, and refinement. The refinements identified in Cycle 1 testing were integrated to produce a second prototype of the coaching protocol. The second prototype was again tested with the same three OJI participants within the context of two trainee debrief sessions—each followed by a coaching conversation with the instructional coach (researcher), and a final interview to gain insights into the effectiveness of the second prototype of the coaching intervention, as well as the areas in need of refinement. For this cycle, the solution tested by the OJIs was the associated job aid to accompany the full coaching protocol. The full, multi-page version of the coaching protocol remained available as an additional resource and support tool for the OJIs.

This segment presents the findings that emerged from the Cycle 2 data analysis. It once again presents a summary of the coaching interventions for each of the three participants based on the coaching conversations between the OJI and the instructional coach after the trainee debrief sessions so as to provide context for the intervention. An analysis of the data from the end of cycle interview between the OJI and the researcher is then presented through the developed themes pertaining to both areas of effectiveness and areas for refinement within the coaching protocol and the accompanying job aid.

Participant coaching interventions. During this cycle, the OJIs all expressed satisfaction with their trainee debrief sessions. Michael stated that he "thought it went well", Henri noted improvements and said he "felt really good about it", and Lewis also thought the debrief sessions "went fairly well". Despite there being a gap of a few weeks between the end of Cycle 1 and the start of Cycle 2, all the OJIs clearly recalled their professional learning goals. It was observed that the OJIs all appeared more accustomed to the video recording of the debrief

sessions and, through review of the recorded feedback sessions, demonstrated a high level of self-awareness by accurately assessing their performance for areas of strength and opportunities for improvement. Within Cycle 2, it was also observed that the OJIs appeared to have developed an increased level of comfort in using the coaching protocol as demonstrated through some improved fluidity in their speech and an increased flexibility at times in applying the protocol. The coaching conversations are briefly summarized, including the OJIs intended ongoing professional learning goals.

Michael. During the third coaching intervention with Michael, he indicated that he had continued to work on his goal to be more concise and focused during all his debrief sessions with the trainee, even those debrief sessions not included as part of data collection for the study. Michael used the coaching protocol job aid for the third video recorded debrief session with the trainee. He followed the format of the job aid effectively but felt he still rambled which he partially attributed to wanting to ensure a full, substantive debrief for the purpose of data collection. Despite this concern, there were a number of strengths to the debrief, including actionable strategies, and Michael felt he was able to successfully convey his message. He decided to continue to work on the same professional learning goal so as to further refine his ability to remain focused and concise during the debrief session. Through the coaching conversation, Michael determined he needed a clear plan to progress towards his goal and established three strategies for achieving this, including: making notes on the job aid, listing specific examples to discuss, and asking the trainee during the debrief session to state the current OJT learning goals being working on.

Michael was able to implement all three of the strategies in the fourth debrief session and stated that he had been able to focus on a few points, yet still cover all the feedback he wanted to

address. He also found it beneficial to use the coaching protocol job aid to give the trainee "an opportunity to self-critique and describe" his own performance. This was the final coaching session as part of the research study and the conversation focused on goals Michael would continue to work on independently. He planned to continue to use the coaching protocol as a framework for his debrief sessions, to maintain the focus of the debrief on a limited number of areas, and to continue to work on being more succinct. He was encouraged to identify specific strategies that could assist him with this ongoing goal and he suggested adopting the use of open-ended questions, as indicated in the protocol, to allow for greater input from the trainee—thereby allowing him to be more succinct as he would only be required to step in to add something significant.

Henri. Henri used the coaching protocol job aid to guide the third video recorded debrief session with his trainee. He included all components of the protocol in the debrief but varied the order to suit the conversation (adaptable framework). He also used positive reinforcement to clarify expectations and develop his trainee's self-assessment skills. During the third coaching intervention, Henri described how he was very satisfied with the adoption of open-ended questions in his debrief. He felt that this approach had allowed him to develop a better rapport with his trainee and he found value in hearing the trainee's perspective prior to offering his own comments. He noted that integrating open-ended questions was challenging as it required a different way of thinking but he found it became easier with practice and he was attempting to self-monitor to ensure he continued to develop the skill. He felt that in the debrief session he had again used open-ended questions at the start but did not maintain the approach as the debrief progressed. He explained that, now realizing the benefit of open-ended questions, he wanted to continue to work on integrating them more extensively in his debrief sessions. He set a

professional learning goal to continue to work on this as he felt he was progressing very well and wanted to continue to make progress.

During the fourth and final coaching intervention, Henri stated that his "goal is always to paint as clear a picture and to positively reinforce…good behaviours". He identified that, through use of the coaching protocol job aid, he had successfully connected his feedback for the training session to the performance goal previously established with the trainee and had also provided positive reinforcement. He further noted improvement on his professional learning goal of continuing to ask open-ended questions and using them to further probe responses throughout the full duration of the debrief session. Additionally, he praised the value of two-way communication, explaining how it was critical to learning and described how the trainee's actions made more sense based on the responses to his questions. As Henri explained, "there's always more room to add open-ended questions" and so decided to continue to work independently on incorporating open-ended questions into his debrief sessions. It was suggested that he challenge himself to use a coaching conversation with open-ended questions even when debriefing areas of difficulty with the trainee.

Lewis. During the third coaching intervention, Lewis discussed his use of the coaching protocol job aid during the debrief session and expressed satisfaction that he had followed the components in order, but realized in reviewing the video recording that he had missed a section at the end asking for any final input or questions from the trainee. This was offset by the fact that Lewis had already established a strong dialogue format within the debrief session which he described as "letting him [the trainee] talk and listening to what he says, and having a back and forth" discussion rather than just telling him what to do. Lewis noted that he felt rushed transitioning from the training session to the debrief session, which contributed to some long

pauses during the debrief session in addition to the trainee misinterpreting one of the questions he asked. Based on this, he expressed a desire to continue with his professional learning goal of trying to improve the preparation and organization of the feedback in his debrief sessions. He decided to refocus on his Cycle 1 strategy of spending a couple of minutes organizing the feedback content prior to delivering it and added in the two additional strategies of highlighting the component he missed to cue himself, and developing new wording for the question that was misunderstood by the trainee.

At the final coaching intervention, Lewis identified that he had made notes on the coaching protocol job aid during the OJT session and looked over the job aid briefly prior to conducting the fourth video recorded debrief session. He described how the session went very well with improved organization of the feedback, less pauses, inclusion of the highlighted section previously missed, as well as continued effective use of a dialogue back and forth with the trainee. Lewis also demonstrated increased comfort with the flexibility of the protocol framework in noting that he had blended two sections together (strengths in check current progress and provide positive feedback) as it made more sense, was working better for him, and facilitated a more natural conversation. Lewis stated that he did like following the coaching protocol, had continued to use it beyond the scope of data collection for the study, and planned to maintain it. As an ongoing professional learning goal, he intended to continue to work on blending the two identified sections to avoid repetition and facilitate organization. He was also encouraged to challenge himself by using the protocol with a future trainee who may have had a difficult OJT session and was not as skilled at self-evaluation as his current trainee.

Cycle 2 Themes. At the end of Cycle 2, interviews were again conducted with the three OJI participants to further evaluate the effectiveness of the coaching intervention and to identify

areas for refinement in the coaching protocol and the associated job aid. For this cycle all three OJIs used the job aid, rather than the full coaching protocol, to guide their debrief feedback sessions with their trainee. During our interview, they were asked to reflect on both the coaching protocol and the job aid in answering the questions, but they primarily referred to the job aid. Overall, the OJIs provided positive comments about the job aid, describing it as relevant, beneficial, effective, and useable. Michael explained that the job aid made it easier to debrief through a "concise way that the student's really going to understand", Henri stated that the "protocol and the job aid are beneficial to the training process", and Lewis described how the job aid as a "final version…is much more effective". The OJIs were unanimous in stating that they experienced no negative impacts with the use of the coaching protocol or the job aid.

A total of five themes were identified through analysis of the Cycle 2 data (Table 4.5). One new theme related to the effectiveness of the coaching intervention was identified and pertained to the value of instructional coaching for the OJI. Three of the themes identified in the previous cycle as effective outcomes re-emerged in this cycle, including: enhanced communication, improved structure, and increased formative feedback. Finally, one theme emerged from the data pertaining to minor refinements to the job aid to increase its ease of use. Each of the themes is described below through the use of "rich, thick descriptions" (Bloomberg & Volpe, 2016, p. 154) and supporting quotations from the three OJI participants.

Table 4.5

Overview of Phase II Cycle 2 Themes: Testing the Coaching Protocol

Effective Aspects	Areas for Refinement
Value of instructional coaching	Enhancements to the job aid
Enhanced communication	
Improved structure	
Increased formative feedback	

Effective aspects of the coaching intervention. Four themes emerged in this cycle regarding effective aspects of the coaching intervention. The newly emerged theme in Cycle 2 pertains to the perceived value by the OJI participants of instructional coaching on their own coaching abilities. The other three themes were initially identified in Cycle 1 and clearly reappeared in Cycle 2, including the development of enhanced communication between the OJI and the trainee, the contributions to an improved structure within the delivery of feedback information, and increased formative feedback. A description of the new theme is provided. The returning themes are also elaborated below, both to describe how the OJIs further refined the themes in the second cycle, and to emphasize their ongoing importance to the participants.

Value of instructional coaching. All three of the OJI participants found value in the instructional coaching and felt it had a positive impact on their instructional skills. They discussed the coaching they received in three significant ways: the benefits of the coaching interventions, the effect on their coaching, and the projected future impacts.

The coaching interventions for the OJIs included: reviewing the video and reflecting on their performance in the trainee debrief, engaging in a coaching conversation between the instructional coach and the OJI, observing a modelled use of the protocol within the coaching conversation, receiving positive feedback on their performance, and setting OJI goals for performance improvements. The OJIs each emphasized that the different coaching intervention strategies all worked together to provide value in varying ways. The combined two strategies of watching the video and discussing their performance in the coaching conversation were described as the most beneficial coaching interventions by all the OJIs. Receiving positive feedback and setting performance goals were both briefly acknowledged as beneficial, but viewed primarily as an outcome of the coaching conversation rather than separate interventions.

Only one OJI discussed the benefit of observing the modelled use of the protocol, while another stated he had not noticed use of the protocol by the instructional coach, despite it having been stated that it would be followed, verbally referencing it several times, and having it visually present.

Each of the OJIs described slightly different benefits associated with the video review but all centered on gaining clarity on both the strengths and areas for improvement in their own performance through an objective view of the debrief session. For Michael, he found it beneficial "to hear how I deliver the debrief and sort of see what he's seeing" as well as hearing what he said in the debrief. Henri found it beneficial to "watch myself as an OJI because it did help build confidence". Lastly, Lewis described the benefit of "being able to see myself and evaluate myself" as well as "seeing what I felt I was doing well". In keeping with a social constructivist approach to coaching, the OJIs shared the view that the coaching conversation was useful because it provided an additional perspective on performance and encouraged them to think about their performance in new ways. Michael found the discussion beneficial because "you'd have your points and we'd discuss sort of thing and you'd ask me the questions that got me thinking" which, he explained, provided him with another way to self-assess. Henri stated that it was "really beneficial to talk about it and then have your feedback". Similarly, Lewis explained the benefits to be "just getting another opinion of what I'm seeing or what I am thinking; an outside view of it" which in his case contributed to building confidence because it let him realize the debrief was better than he thought.

The OJIs discussed the overall constructive effect the instructional coaching had on their own coaching. Michael stated, "I've improved my debrief skills over the course of these meetings", Henri also felt that he had "probably improved" his instructional skills, and Lewis

stated that instructional coaching had "helped a fair bit" in enhancing his skills. Through

analysis of the data, it emerged that the instructional coaching specifically affected the OJIs' own

coaching in three positive ways: through the development of consistency, the adoption of new

approaches, and the establishment of new habits, as described below.

The OJI participants described how the instructional coaching had contributed to an

increased focus on consistency with certain skills. Michael described how he was now more

aware of how he was delivering the debrief sessions and explained how the OJI self-scan ensured

he had set clear goals for his trainee, while the instructional coaching contributed to consistency

by creating accountability. Henri also discussed how the job aid contributed to consistency as a

physical reminder of his goal and led him to automatically start thinking about open-ended

questions with the instructional coaching helping to monitor his goals. Lewis described how he

was already doing a lot of the components of the debrief "but maybe not as often as maybe I

could", whereas the instructional coaching focused him on doing these things more consistently.

Two of the OJIs described how the instructional coaching contributed to new ways of

approaching the debrief. Henri explained that he was drawn to think about what he was trying to

achieve with the use of the protocol and how he could use this "new way to debrief" within the

context of a particular air traffic control scenario. Michael described trying to set himself up for

success for the next time we would discuss his performance by entering the debrief with a clear

idea in his head of his own goal and what was discussed in the coaching conversation. As a

result, he was now "doing clear goals [for the trainee] because I want to be able to bring that

back" to the next instructional coaching session.

The OJI participants also described how the instructional coaching contributed to the

development of new, effective coaching habits. For Michael, this was the use of the OJI self-

scan to ensure he had provided his trainee with clear goals for the training session. Henri

established the habit of asking open-ended questions and "trying to understand the student's

thinking more than making assumptions". He also expressed surprise at the extent of the impact

this had on his coaching and the understanding it established between himself and the trainee.

Lewis developed the new habit of using the coaching protocol framework on a regular basis; he

reported that "every time we have a busy session, I am not necessarily pulling out the sheet, but

I'm going through the steps".

  The OJI participants also all described how they expected the instructional coaching to

continue to impact their own coaching in the future and their intent to continue to use the

coaching protocol. Michael described how going forward, he was "definitely going to be more

conscious of the things we've discussed". He explained that he planned to continue to set clear

goals for himself and his trainee and that by having thought through a clear plan he would be

able to see himself develop, as well as give the trainee a "clear plan of how to achieve success".

Henri stated that he planned to continue to utilize the coaching protocol whenever he was

coaching and that the benefits of instructional coaching would continue as long as he was

involved in training. In keeping with professional learning as a holistic approach, Henri also

described how he had started to use open-ended questions as a communication strategy in other

areas of his life and felt it was "impactful in any relationship". Lewis described that he was

already using the coaching protocol as a regular part of his debrief sessions and planned to

continue to do so as he believed it would "improve the quality of the training".

  The OJIs were already thinking beyond their own coaching to more widespread impacts

of instructional coaching with future OJIs. Participants felt the coaching protocol would allow

for different OJI personalities and that instructional coaching would provide a means for them to

improve their capacity more quickly and efficiently. This was predicated on a requirement of

training for OJIs being introduced to the protocol and coaching on the expectation that feedback

is now a two-way conversation. Participants also noted the need for future OJIs to be open to

new approaches and to be willing to adopt and use the protocol which, according to Lewis, is

"probably the hardest part" of implementing the protocol.

This theme emphasizes the value of instructional coaching in support of the Phase I

theme of fostering a coaching perspective and the development of a learning culture for OJIs. It

supports the design requirement that the coaching protocol guide the OJI to adopt a reflective

practice and provides a basis for professional learning.

Enhanced communication. In Cycle 1, the theme of enhanced communication was

developed from the data for all three of the OJI participants. It was recognized that the use of

open-ended questions on the coaching protocol contributed to increased trainee involvement in

the feedback conversation, thereby allowing the OJI to have a better understanding of the

trainee's perspective. This theme of enhanced communication also clearly reappeared in Cycle 2

through the use of the job aid. All three OJIs described how the coaching conversation increased

the contribution and involvement of the trainee in the construction of feedback. Michael

identified that the questions, "especially the ones that got the student talking were very effective"

and this focused him on getting the trainee involved and giving him an opportunity to speak and

provide feedback. Henri again praised the use of open-ended questions in opening the channel of

communication and expressed surprise at the resulting extent of the impact on understanding

between the OJI and the trainee. Lewis also recognized how use of the job aid "kind of opens it

up to back-and-forth", leading to increased input for the trainee.

The three OJIs again identified how the enhanced communication provided a window on the trainee's thinking and thus a deeper understanding of the trainee's perspective. Michael described it as very effective to get the trainee's feedback and "see where their head is at". This was echoed in Henri's assertion that the two-way communication "allowed me to sort of get inside her mind and understand a little more what she was thinking or what she was doing". Lewis also appreciated gaining insight and connected this to an increase in OJI clarity through understanding that the trainee was "actually going somewhere that I didn't realize". An example of this was evident in a debrief session when one OJI no longer needed to provide corrective feedback once the trainee provided a description of his thought process in making a particular control decision.

The return of the theme enhanced communication continues to support the design requirement for the coaching protocol to guide the OJI to generate a conversation with the trainee. As in Cycle 1, enhanced communication aligns with the theme of coaching conversation, in particular the form of communication (a conversation with dialogue back and forth). In this cycle, OJIs also made connections with the theme of content components and the need for the protocol to guide the OJI to gain insight into the trainee's understanding so as to align expectations (clarity of expectations).

Improved structure. The theme of improved structure to the debrief session developed in Cycle 1 included the provision of a standardized configuration, a means for organizing the feedback content, and the capacity for flexibility within the coaching protocol. This theme also reappeared in the Cycle 2 data, with the OJIs again discussing the same three key elements.

The OJIs discussed the two elements of standardized configuration and organization of content as interconnected. Overall, the structured format was seen as a well-defined and succinct

method to organize feedback, keep them on track, and ensure that they did not miss anything. Additionally, the consistent way of debriefing would accommodate different OJI personalities, thereby allowing the trainee to be more comfortable with the information and more easily note the key message—regardless of the OJI.

Two of the OJI participants stressed the necessity for flexibility within the coaching protocol. Initially the OJIs struggled with getting lost or jumping back and forth as they tried to adhere to the structure too rigorously, but once they adopted a more flexible approach, these issues were corrected. Michael explained that it took a couple of attempts to incorporate the flexibility but "the benefit of getting used to it outweighs" the initial lack of flow he experienced.

The return of the theme of improved structure continues to support the design requirement for the coaching protocol to guide the OJI through a standardized debrief framework and again emphasizes the value the OJI places on the need for flexibility within such a framework. As in Cycle 1, improved structure relates to the sub-theme of the importance of utility in a coaching protocol, in particular the element of an adaptable framework and the two aspects of benefits for the OJI and flexibility within the framework. The third aspect of benefits for the trainee was only touched on briefly in this cycle by one of the OJIs.

Increased formative feedback. During Cycle 1, all three OJIs identified an increase in formative feedback through the use of the check current progress section of the coaching protocol, as it promoted trainee self-evaluation and increased insights into the trainee's perspective. This theme reappeared and was further developed in Cycle 2 with the OJIs discussing certain benefits of the coaching protocol and the job aid that contributed to increased formative feedback through changes to the content components of their debrief sessions. The two key changes included: increasing the trainee's understanding of expected performance

requirements, and improved goal-setting, along with ways to achieve these established goals within the training session.

The check current progress section of the job aid, which focuses on strengths, weaknesses, and making changes, was again identified by the OJIs to be the most beneficial aspect of the protocol and was key to ensuring the trainee understood what was required of them. By enacting the protocol through a coaching conversation, trainees were provided with the opportunity to verbally discuss the expectations and seek clarification. Talking through the points allowed the trainee to construct meaning, made it more likely they would remember them, and brought gaps in understanding to the OJI's attention. As Michael explained, "if they come out and say something completely different…[it] brings your attention to okay maybe we need to go over these points again, or maybe there is something that I've missed". The trainee's understanding of expectations was also enhanced through a dialogue focused on their performance. In discussing examples of proper performance, areas of difficulty, and what to do differently next time, the trainee was able to gain further insights into their performance and refine their understanding of expectations. Henri especially appreciated the relevancy of increasing the trainee's understanding within the context of correct performance and noted the trainee needs that "positive reinforcement in order to…know accurately what you want".

Two OJI participants identified that the job aid contributed to improvements in their coaching by serving as a constant reminder to consistently set goals for the trainee and keep them at the forefront of their coaching. It was recognized that this contributed to effective coaching by making it easier to connect the trainee's performance to the goal. Additionally, it provided the OJI with the ability to tailor the training session by focusing the coaching on the established goal and to prompt or cue the trainee on the main points identified as important. This was described

by Michael as giving the trainee a "clear plan of how to achieve success" and was considered by Henri to also be a means to keep the trainee focused on the goal.

The return of the theme of increased formative feedback further refines the contributions to effective coaching that emerged in the Cycle 1 theme of increased formative feedback. Within Cycle 1, the theme of increased formative feedback identified trainee self-evaluation and trainee perspective as key aspects in the theme. Within Cycle 2, the theme is further developed through the two additional elements just described: increases to the trainee's understanding of performance requirements and improved goal setting. This supports the design requirements related to all four elements in the Phase I theme of content components, including the need for the coaching protocol to guide the OJI to: ensure an alignment of expectations between the OJI and the trainee (clarity of expectations); identify and reinforce successful performance (reinforce positives); set progressive learning goals (targeted progression); and, discern priorities for improvement with associated actionable strategies (actionable priorities).

Areas for refinement. Through analysis of the Cycle 2 data, one theme emerged in relation to an area of refinement. This theme describes further enhancements for the job aid to facilitate its use and effectiveness within a debrief feedback session, as described below.

Enhancements to the job aid. The three OJI participants all expressed satisfaction with the job aid document, describing it as relevant, effective, useable, and well laid-out. It was especially noted to be quite helpful as a way for OJIs to start a coaching conversation. Two potential areas of refinement emerged from the data as a means to increase the utility of the protocol, including additional note space and clarity on frequency of components.

The request for more note space was brought forth by two of the OJIs, while the third felt there was ample room compared to what he had previously used. The OJIs connected the note

space to the realities of their OJT context in which several tasks are trained simultaneously and multiple scenarios are encountered within a single training session; conversely, it was noted that there are times when there is very little requirement for notes. While the amount of needed note space is quite variable and relates to the physical rather than the structural design of the coaching protocol, it nonetheless had clearly been considered by each OJI as they used the tool and reinforces the importance of functionality for the end-user.

One OJI queried whether some components of the protocol, including the OJI self-scan and determining next steps, would be more applicable to conduct on a weekly basis rather than at every debrief session and suggested indicating this on the job aid. He indicated that while it was nice to have the next steps listed as a reminder of the goals, they would not be changing on an hourly or even daily basis. The intent of the coaching protocol is to improve the quality of feedback being provided, which includes ensuring a clear learning goal at all times—even if the goal remains unchanged from the previous session. The OJIs all expressed that the job aid was easier to use in practice than the protocol; however, this suggestion for refinement makes it apparent that value may be lost (i.e., the purpose of each component) when transferring to the job aid and suggests the need to both enhance the job aid and to provide further training on using the protocol effectively, the value of each component, and ongoing coaching to flexibly adapt a component without omitting it.

This theme of enhancements to the job aid aligns with the design requirement to ensure the protocol is simple and easy for the OJIs to follow. It emphasizes prominence for the sub-theme of the importance of utility in a coaching protocol, in particular the element of logistical feasibility as it relates to ease of use for the OJI.

Phase III – Evaluate: Assess and Reflect

The purpose of the third and final phase was to evaluate the design of the coaching protocol intervention within the context of professional learning for on-the-job instructors in an air traffic control environment. This section outlines the context and provides a description of the themes established through analysis of the data.

Context for Phase III – Evaluate

This phase focused on evaluating the designed coaching protocol intervention through an assessment of the internal structure of the intervention, its potential functionality in the context of an air traffic control environment, and the expected effects engendered within on-the-job training. The phase included an assessment cycle focused on gaining insights into six key areas, including: soundness, feasibility, local viability, institutionalization, effectiveness, and impact. The phase also included a cycle of reflection aimed at establishing design principles which will be described in the following discussion chapter.

This section presents the major themes obtained from the analysis of five in-depth semi-structured interviews and field notes taken during the interviews. Data collection for the semi-structured interviews involved returning to those initial stakeholder participants from Phase I most closely implicated in the future implementation of the coaching protocol. The five interviews included the two national level managers (Don and Albert), the two regional managers (Marc and Joe), and the one training supervisor (Scott).

Phase III Themes

The data analysis of the five interviews with the managers and supervisor identified themes in all three areas of assessment: internal structure, functionality, and expected effects (Table 4.6). The internal structure of the intervention was assessed through data collection

related to both the soundness of the design and its potential feasibility. Assessment of the

functionality of the coaching protocol included data collection relating to the local viability of

the tool and its broader institutionalization within the organization. An assessment of the

expected effects of the coaching protocol intervention occurred through analysis of the data

related to the probable effectiveness of the tool and its potential impact within on-the-job

training.

Table 4.6

Overview of Phase III Themes: Assessment of the Coaching Protocol Intervention

Internal Structure	Functionality	Expected Effects
Coaching conversation	Training culture	Learning culture
Adaptable framework	Change management	Trainee performance
Logistical feasibility		

Internal structure of the coaching protocol intervention. The internal structure of the

intervention was assessed through an analysis of data collected in relation to both soundness and

feasibility. Soundness considered the design ideas and how they are applied within the coaching

protocol. Feasibility of the design considered issues such as potential associated resource costs.

In assessing the internal structure of the coaching protocol, three themes were identified that

align with three of the process component elements identified in Phase I, including: coaching

conversation, adaptable framework, and logistical feasibility. The process components relate

primarily to how the protocol is enacted by the OJI rather than the actual content of the feedback

session, and they underpin the design requirements for the coaching protocol to provide the OJI

with guidance and support regarding the context and structure of how feedback is delivered in

on-the-job training. Each of the three themes is individually described below.

Coaching conversation. In Phase I, the importance of communication through two-way dialogue was recognized by all the participants as an important aspect of a feedback session and they noted the need for the coaching protocol to lead the OJI to engage in such a coaching conversation with the trainee. This resulted in a design requirement for the coaching protocol to guide the OJI to generate a conversation with the trainee. During Phase III, all five participants reaffirmed the importance of a coaching conversation and recognized that the design of the coaching protocol contributed to guiding the OJI towards this form of dialogue. In Joe's words, the protocol provides a "good template, a good starting point for dialogue to be generated from". From the data, it was apparent that the participants viewed the protocol as both providing support for OJIs to engage in a genuine conversation and as contributing to improved content within the conversation.

Two participants highlighted how dialogue is used infrequently by OJIs in the context of a debrief and noted that the coaching protocol provides the OJI with support to engage in a coaching conversation. The support included guidance for the OJI to have more meaningful conversations by taking the opportunity to first listen to the trainee, then learning to dig deeper into those statements for additional insights and increased understanding. There was an expressed need for the protocol to be explicit around the requirement for the OJI to talk less and listen more. As Marc explained, these skills do not "come naturally for a lot of our instructors, and it's that collaborative piece, it's that listening, it's that working together, taking their feedback, it's hearing what they have to say" that is an important aspect of the protocol.

Four of the five participants identified how, in addition to supporting the use of a coaching conversation, the protocol also contributed to improvements within that conversation through constructive dialogue. It was clear that participants saw the potential for the protocol to

not only increase communication between the OJI and the trainee, but also to contribute to clarity within the conversation, thereby increasing the likelihood of the trainee taking away something of value from the debrief to implement in practice. Don discussed this clarity within the context of a socially situated coaching conversation and expressed that the "protocol helps enhance communication between the two people and it allows for their relationship to be more transparent and constructive and it takes…some of the grey away from the two-way communication".

Adaptable framework. The need for a debrief format was identified as a necessity by all of the participants in Phase I; it was noted that it could provide benefits for both the OJI and the trainee, but should not be overly rigid. This resulted in a design requirement for the coaching protocol to guide the OJI through a standardized debrief framework while allowing flexibility in adapting it to the current needs of the trainee or situation. During Phase III, participants discussed their assessment of the designed protocol framework in three ways that aligned similarly with the Phase I requirements, including: benefits for the OJI, benefits for the trainee, and adaptability to evolving needs.

The benefits identified for the OJI were threefold: 1) clarity of expectations; 2) a consistent or standardized approach; and 3) actionable guidance for conducting a debrief session. All participants identified that the coaching protocol benefitted the OJI by providing them with clarity on the expectations for providing feedback to the trainee during a debrief session. Three of the five participants described how the protocol would clarify what is required of the OJI and what is meant to happen in a debrief session. This mirrors the need to provide the trainee with clarity of expectations for their performance and applies this need to the OJI's role. As with the trainee, this was viewed by participants as beneficial since once the OJIs know what is required of them it will be much easier for them to attain those expectations. Don observed that clarity

through the protocol ensures OJIs are "not guessing around how to instruct and how to coach and they're not trying to figure out what we're asking of them", thereby allowing them to focus on the content of the feedback rather than the process. The four manager participants also appreciated the standardized approach provided by the protocol, describing it through terms such as: consistency (2/4), a common standard/formula (2/4), and being on the same page (2/4). Standardization in the delivery of feedback was seen as beneficial for the OJI, but Don also connected it as being an organizational benefit in that the protocol standardizes how coaching is defined in the debrief session and lays out a "framework for how that coaching-learning interaction looks" within OJT. The third benefit of the protocol for the OJI, the inclusion of guidance on actionable steps for providing feedback, was acknowledged by all five participants. Participants described how the protocol provides a detailed breakdown of the necessary pieces and essentially walks the OJI through conducting the debrief. As a training supervisor who leads debriefs, Scott found the protocol to be "generic and vague enough, in a good way, that a lot of these questions I could ask exactly as they're written, and follow these steps…it's quite clear, exactly what I'm meant to do with this and how it can help". He felt it pushed him to determine precisely what he wanted to see from the trainee and how he would provide learning opportunities for the trainee to reach those goals. From the data, it was clear that while OJIs are told to provide good feedback, they have not been coached on how to do that and are unsure how to translate this requirement into concrete strategies. The coaching protocol was seen as filling this gap for the OJI; as Albert explained:

> it gives them guidance that they will use, like it gives them questions they wouldn't have thought to ask. So, it's sort of a way to turn what we want them to do into reality because now they have some actual tools to do it with, so I think lots of potential benefit…

The four managers also described the benefits of a framework for the trainee, primarily through the lens of clarity on what to expect during the debrief as the learner. Participants noted that by bringing structure to this aspect of OJT it would deliver a more consistent debrief experience to the trainee regardless of the instructor and provide them with what Joe termed "an easy checklist" to be better prepared for the feedback session. From Marc's comment that it would allow the OJI and the trainee to be "operating with the same code book", it was understood that this was not always the case and trainees may at times be unclear on the debrief process. Don noted that the framework of the protocol was "all about defining goals and defining working conditions and coaching conditions" for the trainee and this clarity would ultimately allow them to perform better.

The four managers also discussed the need for the protocol to be adaptable to the evolving needs of the trainee and the stage of learning, but were split over the extent to which this was achieved in the protocol. Two managers perceived the protocol as providing the needed adaptability, describing how it is an effective tool for recognizing that each learner is different and how it supports the OJI in adapting their coaching and instruction based on the trainee's need in that moment. As Don described, given that the

> learning opportunities are constantly changing in the live environment, and our
> instructors have to be able to adapt the way they coach given whatever the specific
> learning opportunity is…so I think that this framework will support that, because it
> really, it really touches on the key elements of the coaching relationship and then allows
> the coach to apply those elements in different situations.

Conversely, two other managers queried whether an OJI following the protocol would repetitively ask the trainee the same questions from the start to the end of OJT. It was suggested

that the protocol could potentially provide a list of evolving questions for each progressive

assessment period to accommodate an increase in learner independence as they gained

experience in OJT. It was further suggested that rather than providing the specific questions, the

protocol could simply provide the kinds of questions to ask at different stages in relation to the

specific objectives of each assessment period. This perception of the protocol highlights the

importance of adequate training on protocol usage not only for OJIs, but for all those involved in

protocol implementation.

       Logistical feasibility. The importance of logistical feasibility was discussed in Phase I by

the six participants internal to the organization resulting in a design requirement for the protocol

to be simple and easy to follow without too much extraneous detail. In Phase III, the need for

logistical feasibility was assessed by the participants and similar areas were addressed, including:

ease of use, integration with current reality, and potential impacts from time requirements.

       Three participants discussed the length of the protocol and the job aid as they related to

ease of use. It was identified that the protocol provided a high degree of clarity for ease of use,

and it was also voiced that the job aid was an appropriately concise length so as to address any

challenges associated with using the full protocol during a debrief session. It was apparent that

this was an important consideration as participants identified that if the tool was too wordy, the

OJIs would not use it but, likewise, if it was too basic, they would not bother to reference it and

then gradually forget about it. One participant expressed concern that valuable content might be

lost if the OJI only referenced the job aid since the full coaching protocol contained a greater

variety of sample questions and suggested there be an easy way to move between the two

documents. Scott described how he envisioned using the tool himself as an OJI and appreciated

its ease of use, the "real-world examples of questions that you could ask verbatim", and the fact

Functionality of the coaching protocol intervention. Assessment of the functionality of the coaching protocol included an analysis of the data pertaining to two aspects: its local viability as a tool for OJIs; and, the broader institutionalization of the tool within operational training. Two themes were identified in the analysis and involve the training culture of the air traffic control unit and the requirement for change management. While both of these themes pertain to the internal organizational environment in which the coaching protocol will be enacted rather than its immediate design, consideration of these two themes is crucial for ensuring functionality. Within both themes, participants also identified potential solutions or mitigations for the identified environmental condition. The solution for potential challenges related to the training culture was ensuring the protocol is an embedded component of the training programs. The mitigation to support the need for change management was the provision of adequate and appropriate training for all levels of protocol users. The following is an individual description of each of the two themes.

Training culture. The "training culture, I think that's the biggest hinderance to this" was noted by Albert and echoed in various ways by all of the participants as a key factor that could serve to both foster or inhibit the adoption of the coaching protocol by OJIs in on-the-job training. Two aspects were discussed as potential factors, that of the culture within the OJI's air traffic control unit and the level of engagement from the individual OJI. One additional aspect, embedding the coaching protocol within training, was suggested as essential for supporting implementation within the context of these two identified factors.

Participants recognized that the attitude towards training can vary in different units; this was described by Marc as the "training maturity of the unit" and he acknowledged that some units are not as far along the training maturity continuum. There was agreement that perceptions

and opinions within the unit could potentially impact an OJI's willingness to adopt the tool, with Albert explaining that for those units where there is "not a great training culture; they're not going to embrace anything". It was noted that the opinion of the training supervisor would be a strong influencer on the acceptance of the protocol within a unit and for those units that are set in their ways, it would be necessary to invest in supports to further develop their training culture and move them further along the continuum. Three participants saw the potential for the coaching protocol itself to foster an improved training culture through positive changes in the unit attitude towards training. It was suggested that the protocol could create a more flexible mindset in OJIs, provide a common frame for discussion within the unit, and create change by aligning their training efforts and activities. This was addressed by Don as he explained that "if you have a protocol, it allows you to more effectively or more systematically maybe, manage culture and change it".

The level of engagement from the OJI was described through terms such as buy-in (3/5), the right mind set, and commit to it, and was closely associated with the existence of competing priorities and possible feelings of curtailed independence evoked in the OJI. Don indicated the "challenge of being able to get people to adopt it…there's a lot of competing priorities for the OJI's attention" which echoes the same concern identified by Scott in Phase I. In this phase, there was also recognition that some OJIs may struggle to adopt certain parts of the protocol and therefore may skip them or rush through them just for the sake of complying but without really changing the actual coaching being provided. This was connected by one participant as potentially dependent on the existing coaching relationship between the OJI and the trainee and the OJI's attitude towards the inclusion of positive feedback. Although participants did not believe the tool would actually create a loss of independence for the OJIs, it was identified as a

potential feeling contributing, in some OJIs, to an unwillingness to adopt the protocol. This was

expressed by Joe as the OJI not wanting to be "hampered in" or feel that the creativity is taken

out of their debrief and echoed by Don as a "perception that they're being boxed in and that

maybe their ability to have their own approach is limited". Furthermore, it was suggested that

some OJIs' hesitancy to adopt the protocol may centre on concerns for how it reflects on them.

For example, Don commented, if they

> feel they need to change the way they instruct, specifically if they've had… success in the
>
> past, I think there may be concern that having a protocol exposes them, in terms of their
>
> performance and…they may feel accountable in a different way…it may be easier for a
>
> student or for a supervisor or for another stakeholder to point to deficiencies in their
>
> performance as an instructor.

Don went on to state that this hesitancy would be less of a factor if the OJI has "a belief that this

will yield/result in more successful outcomes". Participants further expressed how gaining a

positive level of engagement from the OJI towards adopting the protocol and genuinely

committing to its implementation offered a lot of potential and could only be beneficial.

In order for the culture in the unit and the level of engagement from the OJI to most

effectively support implementation of the coaching protocol, four of the participants discussed

how the protocol must become a fully entrenched component of operational training. Albert

described how the coaching protocol "has to be part of the training program itself, so it's

embedded in there…and it just becomes a part of how we train". In order for this to occur it is

necessary for the protocol to be fully supported by the senior leadership team and have

ownership at the management level. It also needs to be built into the training policies and

processes with supports provided for other members of the training team working with OJIs and

trainees. This was reinforced by the strong view that, for the protocol to be consistently implemented, it would need to be a document that was continually referenced when supporting and coaching OJIs to ensure its ongoing use as a true formative feedback tool. For Joe, protocol adoption is also dependent on the message communicated to OJIs as to whether "you must use it, you should use it, you could use it". As a training supervisor, working with OJIs on a daily basis, Scott explained that the "most successful strategy is: introduce it early and stay true to it and continue to refer back to it".

Change management. Components of change management were also identified in various ways by all of the participants as a second key factor that could either foster or inhibit adoption of the coaching protocol. The two aspects discussed as potential factors were the deployment of the coaching protocol and its application by the OJIs. An additional aspect, training coupled with ongoing support, was suggested by participants as an essential change management strategy to support implementation of the coaching protocol.

The deployment of the coaching protocol was also described through terms such as how it is rolled-out (2/5), communicated, or introduced (2/5) with one specifically using the term change management to address the need for a planned implementation of the coaching protocol into practice. This was heavily emphasized by Albert, the manager most experienced in deploying new initiatives within the organization; he explained it would be unviable to just "throw it out there and assume that because it's so good, people are going to use it and take us up on it" without having put the necessary resources, supports and infrastructure in place right from the start. This includes investing the necessary time and resources to make sure users at all levels (OJIs, managers, and training team supports) are adequately prepared to use it and understand their accountabilities in relation to its application. In conjunction with this is the

importance of timing the deployment to avoid the risk of fatigue for OJIs recently exposed to a number of other new initiatives, both within training and the operation.

Three elements were identified regarding application of the tool in practice: adherence, negative usage, and complacency. Two differing perspectives on adherence were discussed. On the one hand it was suggested that if the protocol was followed too rigidly or literally without the intended flexibility, its application in practice could result in a lengthy debrief session with key learnings being lost through following of the process. Whereas other participants suggested that even within a standardized protocol there is always room for interpretation and, as noted by Don, some OJIs "might take quite a bit of latitude in how they interpret elements of the protocol". Concern was raised that in this context OJIs might not apply the protocol in a way genuinely focused on trainee success by not bothering to use it if all was progressing well and only pulling it out when difficulties arose as a means to highlight deficiencies. Despite there always being potential for not implementing a tool as intended, participants still recognized it as no greater concern than the current situation in which OJIs establish their own debrief format.

Complacency was discussed by four participants, again with differing perspectives. Two managers saw the potential for complacency to develop if OJIs only use the protocol as a formulated checklist without any conscious thought by routinely repeating the same questions with no prompting for further insights. Additionally, this could foster a helpless response in trainees as they start to answer based on what they think the OJI wants to hear. Two other participants had the opposite perspective, with the protocol contributing to a proactive approach to coaching by decreasing complacency, especially through the setting of daily goals. Specifically, Marc noted it would eliminate the "tendency by some to sit back and wait for the later stages of training, when the harder stuff comes along, to really start to coach" by reinforcing

the value of coaching right from the start through establishing learning objectives to appropriately challenge the trainee. This was supported by Scott, who recognized that if the OJI effectively implements the protocol, they will set a goal and take steps to help the trainee achieve that goal rather than "fall in the trap of let's see what the next hour brings" which is a common approach in the context of a live, dynamic environment.

Participants were unanimous in recognizing the importance of training as essential for effective change management incorporating initial training to use the protocol, adequate practice, regular review, and ongoing support. Initial training to use the protocol was referred to by all the participants and included incorporating core education as part of the foundational training for new OJIs as well as training for experienced OJIs, training/unit supervisors, and the training team members who support and coach the OJIs. Inclusion of adequate practice time using the protocol was seen as essential for OJIs to gain familiarity with the protocol and construct meaning. Participants expressed the need for OJIs to explore the protocol in a classroom setting with role play opportunities so as to remove any initial awkwardness when implementing it with a trainee. Additionally, this was seen as a way to foster learning through a social constructivist approach, with Albert noting that by providing "time to have those conversations because if the OJIs just sit in the classroom…they may leave with good intentions, but they really need a deep understanding of it". This notion of good intentions was also reflected in Scott's comment that through practice, the OJI can "spend a little more time with it, give it a little more thought as to why I'm doing what I'm doing and not just falling back into habits" when attempting to implement it in practice. Three participants also highlighted the need for OJIs to be provided with regular refresher training on the protocol, either through just-in-time training when assigned a new trainee or incorporated within the current OJI refresher workshops.

In addition to training to use the protocol, ongoing support was discussed by all five participants. It was recognized that OJIs want additional support in their role and, to a certain extent, participants felt the protocol and the job aid themselves provided that support by helping the OJI link back to the training. It was also recognized however that the protocol tool on its own was not enough and additional OJI support was necessary, thereby requiring guidance for the training team on how to follow-up with the OJI, ensure they were using the protocol, and support them to use it the right way. Without training and ongoing support, participants predicted a lack of successful implementation. It was stated that the protocol would fail if it was informally introduced and never mentioned again. As Don explained, the protocol would be "effective if people have the right kind of training and preparation to use it and the right kind of tactical support; it will be ineffective if…we don't properly invest in the training required".

Expected effects of the coaching protocol intervention. The expected effects of the coaching protocol were assessed through data collection associated with the participants expectations of the probable effectiveness of the tool to meet the intended goals and the potential impact of the tool to create change in the delivery of effective feedback in on-the-job training. Analysis of the data identified two themes: the effect on the learning culture, and the effect on trainee performance. The first theme of learning culture aligns directly with the Phase I process component element of learning culture. As stated above, the process components relate to how the protocol is enacted by the OJI. The second theme of trainee performance parallels the Phase I theme of content components, including the sub-themes of focus on present performance and focus on future performance. The content components relate primarily to the actual content of the feedback message being provided to the trainee in a debrief session regarding their performance in on-the-job training. Each of the two themes are individually described below.

Learning culture. The importance of developing a learning culture amongst the OJIs was identified by all of the Phase I participants. The benefits of establishing an environment that provides the OJI with support and fosters new learnings was recognized as essential for enhancing the coaching and instructional skills of each OJI. In Phase III, all five participants again recognized the learning culture as important and expected the coaching protocol intervention would contribute to professional learning. The coaching protocol's contribution towards fostering a learning culture was discussed through three expected and interconnected outcomes: 1) the development of the OJI leading to 2) an improvement in the quality of instruction, and, thus, 3) an improvement in training outcomes.

Using the coaching protocol as a tool to help develop the OJI was identified by all five participants as a means to provide targeted coaching, add value, and build capacity. The protocol was viewed as a good framework through which to deliver instructor training as, in Don's words, it "helps develop the instructors in their own ability, knowledge, and skills as coaches". Similarly, Marc noted the value of the protocol as a means for professional learning when he suggested it be used to "identify their strengths, let them see some of the pieces they want to work on and improve upon, and set the bar"; thus allowing the coach to offer feedback directly related to the OJI's own targeted area for improvement.

Participants also described how the protocol would provide the opportunity to identify specific OJIs who were struggling with particular skills and could benefit from additional training and development. From the opposite perspective, other participants described how the tool could be used to develop outstanding instructors by identifying those that are particularly strong and further targeting their learning for advancement. Lastly, it was suggested the protocol could be used by managers, coaches, and training supervisors to facilitate the provision of

coaching and feedback to the OJI by providing standardized expectations. As Albert noted "it makes it easier to have conversations with people because now you have something with which to refer" as the feedback standard to work towards when providing OJIs with feedback.

The potential for the coaching protocol intervention to improve the instructional quality of the OJI was recognized by three of the five participants. It was perceived that the protocol was a useful tool to continue to raise the quality of training delivery by providing ongoing support to increase the OJIs capacity. This was particularly important to Don as it aligned with his managerial responsibilities; he described it as a "mechanism for ensuring quality in the training". He further explained that "inevitably with practice, and repetition, and comfort, the instructors will become better coaches the more they instruct within a defined coaching protocol". This related to participant comments that giving good feedback was built right into the protocol and by providing OJIs with those basics their performance would increase. A fourth participant felt that the job aid alone could increase awareness of the feedback requirements but rightly questioned if it could improve the OJIs' instructional skills on its own without additional OJI development and support.

The potential for an improvement in training outcomes was acknowledged as a probable positive effect of the coaching protocol intervention by three participants. All three envisioned benefits for the trainee, one of which Don expressed as "a better training experience for the instructor and the student". This was supported in acknowledgement by other participants that the trainee would benefit from a more prescriptive approach on how to train, more concrete strategies for implementation, and an improved quality of feedback resulting in more effective learning. Both national managers and the training supervisor also saw the importance of these trainee benefits in relation to long-term training outcomes and discussed the potential for

improved value in the training programs and increased success rates. It was expressed by Don that "ideally above all else, it increases the success of the students, which ensures, you know, the longevity and the health of the organization".

Trainee performance. In Phase I, four design requirements were identified that relate to the content components of the debrief and align with trainee performance. The design requirements aim to ensure the OJI focuses on the trainee's present performance by setting clear expectations and providing positive reinforcement, as well as focusing on future performance through targeted progression and actionable priorities. In Phase III, participants recognized the potential for the coaching protocol to have an effect on trainee performance through increased oversight of training delivery, earlier recognition of trainee difficulties, and improved resolution of those difficulties.

The ability for improved oversight was addressed by the two national managers and one local manager as it aligns with their role responsibilities. In Don's words, they viewed the protocol as providing a "higher degree of control around the learning experience" by ensuring better oversight and monitoring of the training programs and allowing them to intervene if required. Additionally, the protocol was perceived as a support tool for the managers themselves if difficulties arise by providing them with direction on what they should look for, when they should get involved, and how to engage in conversation should an OJI not be following the protocol.

The opportunity for earlier recognition of trainee difficulties was noted by three of the participants. The coaching protocol was described as potentially providing a means for the early recognition of training concerns; with an improvement in the quality of coaching and feedback, Marc noted that "we may see the challenges that the student is having being identified a lot

earlier" and acted on more quickly. As difficulties start to arise in training, the OJI starts to look for supports and it was noted that the coaching protocol would help with the early identification of trends and patterns in performance difficulties. It was also recognized that the protocol might help with the early identification of the source of the difficulty, whether with the trainee's performance or with the coaching, before it progressed too far.

Lastly, it was identified that the coaching protocol could contribute to the improved resolution of potential concerns and training difficulties. Three participants described the value of the tool in the development of a training intervention to address a performance problem, including: reducing the length of time needed to develop the intervention, preparing the OJI to answer analysis questions, and bringing to light gaps in the coaching. It was viewed that the protocol would provide a basis for a more complete review of the training, help identify the source of the problem, and enable faster identification of any disconnect between the OJI and the trainee. It was noted that within the context of a training difficulty, the protocol would be a powerful tool for the OJI to provide support and direction and ensure they are not missing anything. If, through the training analysis, it is apparent, as Albert noted, that "we're not following the protocol…why not?", OJIs can be subsequently guided on how to use it as an effective coaching tool to resolve trainee difficulties.

Summary of Findings

Based on an analysis of the data in the study, three major findings were identified as the key outcomes. One major overarching finding was identified in each of the three phases and is explained and supported through key sub-findings within that phase.

Phase I Finding – Importance of Process and Content Components

Phase I used an analysis cycle to gain a deeper understanding of the problem and identify the needs of stakeholders. The major finding was the requirement for the coaching protocol design to provide the OJI with support and guidance on both the process of providing feedback and the content of a feedback session. The process theme contextualizes how the protocol is enacted and highlights the importance of developing a coaching perspective within training and ensuring utility of the protocol. It was identified that a coaching perspective could be fostered through the development of a learning culture amongst OJIs and use of a coaching conversation when providing feedback. Within the learning culture it was recognized that OJIs often lack awareness of the expectations for a debrief and could improve their instructional skills through ongoing learning, coaching, and development. One of the key areas identified for development was adopting a coaching conversation approach as a means to actively involve the trainee in the feedback process to build reflexivity and independence in their learning. Utility emphasized the need for the coaching protocol to facilitate the delivery of feedback by providing an adaptable framework and being logistically feasible to enact. An adaptable framework was seen as benefiting the OJI by providing an understanding of how to effectively deliver feedback but required flexibility in adapting to the needs of each trainee. A framework would also benefit the trainee by providing a familiar and consistent process for the debrief session. Logistical feasibility stressed the importance of assuring the protocol was easy to use, could integrate with the current reality, and would not adversely impact the operation or necessary rest and recovery time.

The content theme addresses what areas to focus on in the provision of feedback including the trainee's present level of performance in relation to established goals as well as

direction for future performance. Feedback on present performance requires both a clarity of

expectations and the reinforcement of positive performance. The OJI is responsible for assuring

the trainee has clarity of expectations for their performance which necessitates the establishment

and communication of well-defined learning objectives. Participants also advocated for the

provision of formative feedback through the reinforcement of positive performance which they

emphasized was challenging for OJIs due to the ingrained skill of identifying and correcting

errors in a safety-critical industry. A focus on future performance by providing the trainee with a

targeted progression plan and actionable priorities was also identified. Targeted progression

promotes the formative assessment of learning, a determination of the next learning step, and

appropriately challenging the trainee to maximize progress. For this to be effective, the OJI must

avoid overwhelming the trainee by providing actionable priorities which focus current learning

on limited key areas and provide specific, implementable strategies for improving performance.

In order to adequately meet the needs of stakeholders in the design of the coaching protocol, the

above findings resulted in the specification of eight design requirements linked directly to the

four process related components and the four content related components identified in the

analysis.

Phase II Finding – Confirmation of Design Requirements

Phase II focused on developing and testing the protocol through the coaching

intervention. The major finding, through a formative assessment of the protocol, was

confirmation of the Phase I design requirements as enacted in the solution to the problem of

practice. In discussing their experiences using the tool, the OJIs identified effective aspects of

the solution and areas for refinement, which are summarized into three key sub-findings related

to the design of a coaching protocol. The first two sub-findings reflect the role of the process

components in the design and the third finding conveys the role of the content components. The first sub-finding is the importance of fostering a coaching perspective with the OJIs. Within their own learning (learning culture), all participants encountered some initial challenges as they learned to use the protocol; these were resolved with training and increased familiarity but highlight the essential need for coaching when adopting new workplace practices. This was supported in the perception by all OJIs that instructional coaching was valuable and contributed to an improvement in their instructional skills through the development and consistent use of new approaches to debriefing. OJIs applied a coaching perspective to dialogue (coaching conversation) with their trainee and found the protocol to be effective in enhancing the communication, primarily by involving the trainee in the construction of feedback through the use of open-ended questions, thereby resulting in a better understanding of the trainee's perspective. The second sub-finding is the necessity of ensuring utility in the coaching protocol to promote its acceptance and usage. The design of the protocol provided OJIs with a standardized format (adaptable framework) that was beneficial as it specified the necessary steps for the debrief and facilitated organization of the content while still allowing for some flexibility in its application. Additionally, while the full protocol provided a good reference for OJIs, the job aid was easier to use (logistical feasibility) and refer to in a debrief session; however, key content must not be lost and value diminished by transitioning to the shorter job aid. The third sub-finding is the importance of the combined content components of the coaching protocol towards increasing formative feedback. The discussion of present performance was found to be especially beneficial to the OJIs as it allowed the trainee to self-evaluate and provided the OJI with insight into the trainee's perspective. OJIs used this insight to guide future performance by setting goals and providing clarity to ensure the trainee understood performance requirements.

Phase III Finding – Value of the Intervention

Phase III focused on an evaluation of the designed protocol through an assessment of the internal structure, functionality, and expected effects of the solution. Based on a summative assessment of the coaching intervention, the major finding was that overall the coaching intervention was considered, as a professional learning tool, to be an effective solution to the problem of practice; however, consideration must be given to the existing training culture to ensure functionality. Three key sub-findings were identified to support this finding. In the first sub-finding, the internal structure of the coaching protocol was found to effectively support the implementation of the design requirements relating to three of the process components. The soundness of the tool was apparent in acknowledgement that the design promoted a coaching conversation between the OJI and the trainee and provided an adaptable framework for feedback. Feasibility was supported through recognition that implementation of the protocol was logistically feasible in this context with the one provision that it not be found to impact rest and recovery time. The second sub-finding, on the functionality of the tool, was that the existing training culture within the unit would have the biggest impact on the local viability of the protocol. It was suggested that the protocol itself could foster an improved training culture but ultimately, the protocol must be supported by all levels of management and fully embedded as a standard approach within the training programs. Institutionalization of the protocol within the organization can only be achieved through change management with an intentionally planned implementation, consideration of differences in application by various OJIs, and supported by adequate training and ongoing coaching on protocol usage. In the third sub-finding, expected effects of the coaching protocol were found to support the design requirements for a learning culture and those related to the content components. In considering the effectiveness of the

protocol to meet its goal, the key sub-finding was that the protocol would help to establish and promote a learning culture by providing a context for OJI development and professional learning. It was found that participants expected this to improve the quality of instruction, thereby meeting the goal of improved instructional capacity. It was expected that change would be created through more effective feedback resulting in improved training outcomes.

Chapter Summary

This chapter has provided a detailed description of the findings from this DBR study which sought to gain a deeper understanding into the phenomenon of professional learning for on-the-job instructors in air traffic control through the design and testing of a coaching protocol. The findings from Phase I described the themes developed from interviews with stakeholders to verify and clarify the problem of practice and were used as a basis for the listed design requirements and propositions. The Phase II findings summarized the iterative development and testing of the coaching protocol with a sample of OJIs and presented the themes that were identified as effective aspects of the coaching protocol and areas for refinement. The findings from Phase III described the assessment of the internal structure of the coaching protocol, its functionality, and its expected effects as evaluated through interviews with the initial group of stakeholders. In Chapter Five, the research questions will be discussed drawing on the findings.

CHAPTER FIVE: DISCUSSION FOR A COACHING MODEL

The intent of this study was to explore the phenomenon of how instructional coaching can be used as a means of professional learning to help air traffic control on-the-job instructors (OJIs) identify and implement improvements to their instructional practices. The dual purpose of the study was to (a) design a usable professional learning coaching protocol for OJIs as a practical solution for their complex training problem, and (b) contribute to the development of theoretical understanding of instructional practices in this unique educational setting through the development of design principles for the professional learning coaching protocol. The study focused on the use of instructional coaching as a means to build the capacity of OJIs to provide effective formative feedback during on-the-job training (OJT). Findings from this study are used to respond to the three research questions that guided this study:

1. How does an on-the-job training professional learning coaching protocol influence the instructional capacity of instructors?

   (a) What are the key components of a coaching protocol for on-the-job instructors in air traffic control?

   (b) What are the opportunities and challenges that emerge in using the coaching protocol for on-the-job instructors?

The chapter will first draw on the findings from this study and the existing literature to discuss the key components of a coaching protocol in this environment, including the developed design principles. Next, the arising opportunities and possible challenges of using the coaching protocol will be discussed. Finally, consideration will be given to how the coaching protocol potentially influences the instructional capacity of the instructors.

Key Components of a Coaching Protocol

Through an analysis of the data in Phase I of the study, early coaching protocol components were identified for use in the initial design of the coaching protocol. The components addressed both the process and content aspects of the coaching protocol. The process components related to how the protocol should support the OJI in delivering feedback through the adoption of a coaching perspective context and provision of a utilitarian structure for the debrief session. The content components related to what type of feedback the protocol should guide the OJI to deliver to the trainee, including a focus on both present performance and direction for future performance. Both the process and content components contained a number of elements that formed the design requirements for the coaching protocol and were enacted through the design propositions. Through iterative testing of the coaching protocol in Phase II, the value of each element was affirmed, and each element was established as a key component of the coaching protocol. A total of eight key components (four process components and four content components) of a coaching protocol for OJIs in an air traffic control environment were identified through the data and form the basis of the design principles. Each component will be discussed based on the findings and situated in the literature. The design principles are then presented at the end of the section in Table 5.1.

A conceptual framework of the professional learning coaching protocol is depicted in Figure 5.1. A learning culture provides the overall context within which the coaching interaction occurs. Coaching is enacted through the use of a coaching conversation based on the coaching protocol, which is designed to provide an adaptable framework and be logistically feasible. The coaching conversation is an iterative process used to discuss a trainee's present performance based on a clarity of expectations and a reinforcement of positive performance. Outcomes of the

present performance are used to establish direction for future performance through the establishment of targeted progression objectives and actionable priorities which form the basis of input for the next training session and the subsequent discussion on present performance.
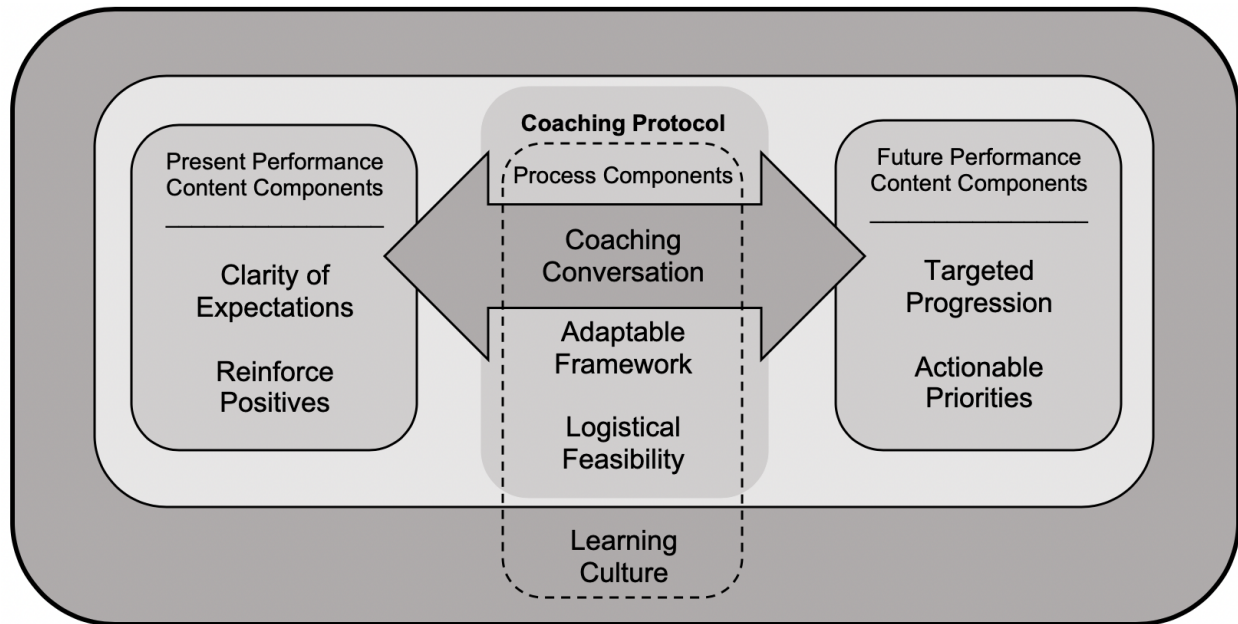

Figure 5.1. Components of a Coaching Protocol

Process Components of a Coaching Protocol

The four key process components of a coaching protocol provide support and guidance on the context and structure within which to deliver effective feedback during OJT. The process components include: 1) learning culture; 2) coaching conversation; 3) adaptable framework; and, 4) logistical feasibility. The learning culture provides an overarching context through which to implement use of the coaching protocol to enhance its role as a professional learning tool. The coaching conversation operationalizes the learning culture and provides a means through which to enact the framework, which must be adaptable and logistically feasible to withstand implementation in a real-life context.

Learning culture. A professional learning coaching protocol must be designed on a foundational basis of a learning culture for the OJI. A learning culture aims to create an environment that promotes and values ongoing learning and supports continued development of the OJI. Within a learning culture the principles of instructional coaching are adopted and applied as a means to build the capacity of the OJI through professional learning opportunities guided by the coaching protocol. The findings of this study indicate support for a learning culture approach on the part of the OJIs through their willingness to engage in the process, prepare for coaching sessions, and apply new learnings in practice. Approaching OJI development through the lens of a learning culture recognizes the potential for growth in all OJIs and accepts the need for both a collaborative approach (Devine et al., 2013) and a willingness to meet the OJI at their current level of development (Aguilar, 2013). A learning culture uses professional learning as a means to establish high-quality practice by promoting a shift from simply delivering content to a focus on enhancing the OJI's learning through a holistic approach (Webster-Wright, 2009).

A learning culture is a necessary component of a professional learning coaching protocol as it supports the ongoing and progressive nature of making improvements to instructional capacity. As was apparent in my study's findings, within a learning culture there is an expectation that OJIs approach learning as a long-term plan by setting goals to work on specific instructional skills, making incremental progress, and continuing to work towards further improvements in the same goal—despite encountering inevitable challenges. Continued practice was intuitively accepted by the OJI participants in this study as they chose to remain focused on making further progress with the same new skill, even after initial improvements. This recognizes that instructors may commence with small changes when implementing new practices

(Girvan et al., 2016), gradually make improvements over time (Antoniou & Kyriakides, 2013), and must be provided with "multiple opportunities to learn" (Castillo et al., 2016, p. 894). In addition, participating in professional learning that focuses on specific instructional skills can contribute to significant improvements in those skills, as well as an increased use of the skill (van der Scheer et al., 2017) in practice. A learning culture also promotes the sharing of newly acquired instructional skills amongst colleagues in the wider OJI population.

The notion of a learning culture encourages the provision of both initial training to use the coaching protocol and ongoing support for OJIs as they implemented it in practice; this was also emphasized in my findings by the manager participants. Professional learning opportunities wherein the OJI is provided with intensive training combined with job-embedded support are recognized as effective (Castillo et al., 2016), with the ongoing support contributing to a more rapid change in practice (Girvan et al., 2016). This form of professional learning aligns with instructional coaching as an ongoing process that includes intensive support (Devine et al., 2013) such as coaching and feedback. Thus, instructional coaching provides a means to enact a learning culture by approaching the OJI as a "professional engaged in self-directed learning" (Webster-Wright, 2009, p. 712) and supporting their professional learning journey through a "shift of emphasis from passive development to active learning" (Webster-Wright, 2009, p. 713). Within the context of a learning culture, the coaching protocol moves beyond a debrief checklist to become a professional learning tool capable of contributing to OJI development through instructional coaching and ongoing support.

Coaching conversation. The coaching protocol was designed on a collaborative model of communication that favoured a partnership in the sharing of performance feedback. This component is based on a social constructivist approach that centres on the use of a coaching

conversation between the OJI and the trainee to co-construct formative feedback. This was evident in the Phase II testing cycles when the OJI participants recognized that engaging in dialogue generated new meaning and understanding of the OJT experience for both themselves and the trainee. An example of this occurred when one OJI altered his feedback to the trainee after gaining new insights through dialogue with the trainee.

From my findings in Phase I, comments such as Marc's desire for the OJI to "talk less and listen more" and Albert's remark about the OJI "not just dumping feedback", it was apparent that the use of a dialogical approach may not currently be the norm for many OJIs. The use of a two-way collaborative dialogue is well-documented in the literature as an accepted and expected approach within a coaching setting (Devine et al., 2013; Haneda et al., 2017; Jim Knight & van Nieuwerburgh, 2012; Lock, 2018; Lockwood et al., 2010; Lofthouse, 2019). Thus, "effective coaches usually are good listeners [and] ask good questions" (Jim Knight, 2016, p. 30). The coaching protocol was designed to support the OJI in generating dialogue with the trainee, both by providing sample open-ended and probing questions to eliminate the challenge of developing pertinent questions, and by providing reminders to engage in active listening.

In my study's findings, the OJIs recognized the use of a two-way communication partnership as a more effective approach to coaching since involvement from the trainee provides the OJI with a means to gain increased clarity and insight on the trainee's perspective. This was evident in Henri's statement that the coaching conversation was "not just enhancing communication; it's I guess opening the door to allow the OJI to have a better perspective of what the student was maybe thinking in a given situation". Additionally, two-way communication guides the trainee to reflect, self-assess their performance, and come to their own formative conclusions such as when, through dialogue, Henri's trainee assessed an implemented

solution and "came to her own conclusion that it was still inefficient and not [the] thing to do".

Similarly, from the findings it was determined that the OJI participants found the use of a

coaching conversation within their own instructional coaching sessions to be particularly

beneficial as a source for new insights on which to reflect. Thus the coaching conversation is

based on a partnership wherein both participants learn together through exploration and

conversation (Devine et al., 2013) resulting in a learning-centred approach to training. This

becomes meaningful as the OJI uses the outcomes of the conversation to better align feedback to

the trainee's needs and the trainee is provided with an opportunity to engage in active learning

and make their own connections.

Brookhart (2011) identified, "some of the best feedback is in the form of conversations

with students about their work" (p. 35), which is especially relevant for developing the complex

cognitive skills required in air traffic control. Construing formative feedback as an ongoing

dialogue (Ellegaard et al., 2018) and using the coaching protocol to engage in a coaching

conversation moves the debrief session away from the simple delivery of a performance

assessment to a social constructivist exchange in which both the OJI and the trainee co-construct

feedback to emerge with a deeper understanding of learning needs.

Adaptable framework. It was evident from my study that a coaching protocol must

provide a basic framework for the feedback session, yet also allow for flexibility in its

application to adapt to the coaching situation. This component focuses on supporting the OJI by

providing a basic structure that incorporates the necessary tasks within a debrief session, while

still accounting for contextual variation in a real-world setting. An example of this was

illustrated when Lewis described incorporating positive reinforcement within the trainee's self-

assessment of strengths rather than waiting to provide it at the designated point in the coaching protocol as it made the conversation more natural.

A framework for the debrief session supports the OJI in delivering formative feedback by providing an organized and comprehensive way to structure the feedback content. Adaptability ensures utility and functionality by contributing to a more natural coaching conversation and by providing the OJI with the necessary flexibility to adjust the framework to different OJT scenarios. The adaptable framework affords consistency for the trainee in entering the coaching conversation by allowing them to be better prepared to participate in dialogue. Through the findings in Phase II, it was clear that the OJIs found the use of an adaptable framework to be beneficial as a way to address their self-identified challenges of being organized and succinct with the content of their feedback. This was supported in Michael's statement that the protocol framework "laid it out in a little bit more of a clear, concise method to then debrief somebody". The increased debrief structure provided by the framework was designed to ensure the provision of comprehensive, yet focused, feedback centered on the targeted learning objective. The allowance for adaptability provided flexibility which facilitated the tool's ease of use, thereby making it more useful to the OJI, and eliminated challenges encountered by attempting to rigidly adhere to the framework without accounting for context.

The requirement for an adaptable framework is supported in the literature relating to both formative feedback and professional learning. Brookhart (2011) asserted that "effective feedback should be adjusted depending on the learner's needs" (p. 36) which was enacted by the OJIs through both adjustments to the protocol's sample questions and the order of task execution within the debrief session. Guskey and Yoon (2009) identified that the implementation of new research-based instructional practices is more effective when it allows opportunities for the

instructor to adapt the practices to their unique situation. Designing the coaching protocol with an adaptable framework provides such an opportunity for the OJI as they adapt the tool to suit the evolving learning needs of the trainee and the unique requirements of coaching in the complex environment of air traffic control OJT, thereby facilitating its adoption in practice as a new instructional tool.

Logistical feasibility. A coaching protocol by necessity must allow for ease of use and integrate effectively with the current contextual reality of the organization. This component focuses on practicality and aims to support adoption of the intervention by enabling the OJI to successfully enact the coaching protocol in practice. Logistical feasibility is an important consideration within the context of both on-the-job training and design-based research (DBR).

From my study, it was evident that the logistical feasibility of the coaching protocol is an essential component at both the organizational level and the individual OJI level. Organizationally, the protocol must integrate with current training policies and not create an adverse impact on operational resources to gain management support for implementation. For the OJI, the coaching protocol must not create extra work nor impact compulsory rest and recovery time; otherwise it may be interpreted as too much effort—leading to a decreased willingness to invest in the provision of formative feedback. This was evident in Don's statement that if the "OJI interprets this as more work, or more trouble than it's worth, you might see a decrease in investment in debrief conversations and coaching by the OJI, as a response to a perceived increase in workload". This is supported in the literature pertaining to OJT through recognition that the primary focus for an OJI is always on ensuring the regular work is safely completed (Ouellet, 2012; Sisson, 2001), with training as a secondary focus. It was acknowledged by van Zolingen et al. (2000), that in the context of OJT, training may be

perceived as an additional burden, with the associated impact on training being further exacerbated by workload pressures and time constraints. Ouellet (2012) found that in OJT the "training activity interacts with all the other activities" (p. 224) and, as a result, instructors inevitably must make choices pertaining to what they can realistically implement in the work environment. It can be expected that any instructional-related duties, such as following a coaching protocol, that detract from the primary work or are burdensome in any way are less likely to be implemented or completed by the OJI.

From the Phase II findings of the study, it was apparent that logistical feasibility was highly important to the OJIs as it formed the main focus for suggested refinements to the coaching protocol. This was evident in both the request for a job aid after the Cycle 1 testing and the further suggestions for minor structural changes to the job aid after Cycle 2 testing, all with the intent of improving the functional utility of the tool rather than strengthening the substantive content of the feedback. Additionally, logistical feasibility in relation to the potential for increased time requirements for OJIs using the tool was a key concern in the findings from the group of stakeholder participants.

Within design-based research, the component of logistical feasibility becomes a key consideration in the output of a robust and relevant intervention. The aim of DBR to make a practical contribution through the development of a solution to a problem of practice necessitates the design of an intervention that can actually be implemented and sustained in the real-life context of OJT (McKenney & Reeves, 2012). In keeping with DBR, evaluation of the coaching protocol included assessing its practical application through consideration of its feasibility and local viability.

Content Components of a Coaching Protocol

The four key content components of a coaching protocol provide support and guidance on areas of focus for the actual substance of the feedback during the debrief session. The content components include: 1) clarity of expectations; 2) reinforce positives; 3) targeted progression; and, 4) actionable priorities. All four of these components are inter-related—for example: learning goals explained in clarity of expectations are based on the next steps determined in targeted progression; positive reinforcement aids the trainee in refining their understanding of expectations and assists in formatively assessing what to work on next in targeted progression; and, actionable priorities provide strategies to work towards the learning goals. Within the coaching conversation these components are likely to be discussed iteratively as the OJI and trainee co-construct feedback with the intent of moving performance forward.

Clarity of expectations. The coaching protocol must be designed to ensure both the OJI and the trainee have a clear understanding of the performance expectations for the training session through well-defined objectives. Using the coaching conversation as a context for setting expectations through clearly understood learning goals is the starting point for all formative feedback. Clarity of expectations therefore centres on the need to establish a clear aim or goal for each training session, align the OJI and trainee's understanding of these expectations, and then use them as a basis for the trainee to self-assess their performance, as well as a means for the OJI to prioritize the feedback being provided.

In keeping with the complex cognitive nature of air traffic control work, it was identified through the Phase II findings that the OJIs approached clarity of expectations not as a discreet task but rather as an ongoing process, with each training session providing the opportunity for further refinement of the trainee's understanding of the requirements. This was evident during

the debrief sessions as OJIs referenced ongoing learning goals by making connections as to how they applied to a specific scenario; for example, Henri responded to his trainee by stating "that's what we've been talking about, is using a little more space so when something like this happens…you still had seven [miles] left". Typically, this occurred through an iterative process whereby the OJI used the coaching conversation on current performance as a way to gain deeper insights into the trainee's present understanding of expectations. By discussing both strengths and areas for improvement, the OJI was able to increase their own understanding of the trainee's perspective, identify gaps, and clarify misconceptions to further align expectations. Clarity of expectations is an essential protocol component as it serves to focus the coaching efforts of the OJI, direct the learning efforts of the trainee, and provide a means for the OJI to guide the trainee to accurately self-assess their present performance in relation to the established learning goals. Clarity of expectations was also noted in the findings as providing a reference point for the early identification and resolution of learning challenges that may create barriers to success.

Brookhart (2011) stated that "effective feedback compares work with criteria. Students should know the criteria before they begin" (p. 34). Chan et al. (2014) described the criteria as "clear learning targets" (p.97) and identify that "teachers need a solid understanding of the learning goals and how students will show mastery of the learning" (p. 97). Additionally, the learning goals must be communicated to the learner as "students can only achieve learning goals if they understand those goals, assume some ownership of them, and can assess progress" (Nicol & Macfarlane-Dick, 2006, p. 206). Without a solid understanding of the learning goals (that match exactly with the OJI's criteria), feedback may be construed as evaluative rather than formative (Brookhart, 2012). The use of goals allows trainees to gain insight into their own progress by identifying successful performance and areas for improvement (Chan et al., 2014),

indicating that clarity on the expected performance is the first step in providing effective formative feedback. Additionally, when students do not have a clear understanding of expectations, feedback will be ineffective in reducing a performance discrepancy (Hattie & Timperley, 2007) and may limit their ability to engage in meaningful performance dialogue with the instructor (Bloxham & Campbell, 2010).

Clarity of expectations is especially pertinent in an air traffic control OJT context since the dynamic nature of the operational environment makes it difficult to structure training in advance of the session (Oprins et al., 2012); as a result, instructors will often rely on the flow of the work (Sisson, 2001) to set the learning for the session rather than using pre-established goals to focus learning within the arising scenarios. During the debrief session, the OJI is then more apt to provide feedback on any observed task deficiencies, potentially making it more challenging for the trainee to see relationships between complex skills and construct meaning. By incorporating clarity of expectations within the coaching protocol, the potential exists for improved training outcomes by using goal-directed feedback that provides information to the trainee on their progress towards a clearly established goal rather than providing feedback on individual tasks as they occur (Shute, 2008).

Reinforce positives. The coaching protocol must provide for the reinforcement of positive performance by the trainee. The component of reinforce positives highlights the importance of moving feedback away from focusing solely on mistake identification to include the recognition of successful progression towards the established learning goal.

Reinforce positives is a key component of the coaching protocol due to the common consensus within air traffic control that OJIs focus primarily on error correction in the provision of feedback and neglect to also use reinforcement as a form of feedback. Although OJIs within

the study used positive reinforcement to varying degrees within the debrief sessions, and acknowledged its value within the instructional coaching conversation, it was used primarily as a means to build confidence in the trainee and was only occasionally used formatively to confirm attainment of a learning goal. From the findings, it was apparent that OJIs are willing to incorporate the reinforcement of positive performance within their feedback, but could further expand its use as an instructional skill intended to intentionally guide the trainee's performance and learning progression. Giving specific examples of tasks performed well provides the trainee with a further clarity of expectations, develops their ability to self-assess their performance, and refines their efforts to improve progress towards the learning goal.

The value of positive reinforcement through recognition of strengths and a focus on successes is supported in the literature as effective feedback (Brookhart, 2011; Chan et al., 2014). According to Hattie and Timperley (2007), "feedback is more effective when it provides information on correct rather than incorrect responses" (p. 85). To be effective, positive reinforcement should be specific and provide information on what was done well in relation to the learning goal (Chan et al., 2014). It is necessary to differentiate positive reinforcement from praise which can be effective if focused on the task, learning strategies, and learner effort, but is considered ineffective when focused on the person (Hattie & Timperley, 2007; Kluger & Denisi, 1996; Nicol & Macfarlane-Dick, 2006; Skipper & Douglas, 2012). By incorporating positive reinforcement as a component within the coaching protocol, the OJI is guided to begin to use the learning goals as a basis for "describing, not merely praising, good-quality work" (Brookhart, 2011, p. 36) which moves the feedback beyond evaluation and error correction to a formative assessment of progress.

Targeted progression. The coaching protocol must provide a means for identifying the next sequential learning goal for the trainee. The component of targeted progression focuses on identifying what the trainee needs to work on next to maximize later performance by closing the gap between current performance and future desired performance. Targeted progression is an essential component of the coaching protocol as it is used to advance learning. This is accomplished by using the trainee's current performance as a basis for setting challenging but attainable progressive learning goals to guide the trainee towards the required expectations for future performance.

From my findings, it was noted that targeted progression may not have been consistently used by OJIs within every training session prior to the study. For example, Henri stated that the "actual setting of those goals probably happens more on a cyclical or biweekly sort of basis", while Michael acknowledged he was now more focused on setting goals each session. It thus appeared that OJIs typically set an ongoing learning goal for multiple training session but did not necessarily target incremental progress for attaining the goal at each session. The OJIs found that the coaching protocol served as a reminder to set goals for the trainee and acknowledged that a targeted progression also facilitated their own role by providing a clear focus for their coaching. Within the coaching protocol, targeted progression involves dialoguing with the trainee on what they could do differently next time and setting related goals to get there. Targeted progression provides the content basis for ensuring clarity of expectations is achieved and is implemented through the next component of actionable priorities by informing the OJI's coaching focus during the OJT session.

Feedback is not intended to simply provide information about the current level of performance, rather it aims to move the trainee towards the learning targets (Chan et al., 2014)

and "reduce discrepancies between current understanding and performance and a goal" (Hattie & Timperley, 2007, p. 86). To do this successfully, feedback must take into consideration the current goal being worked on, what progress has been made towards that goal, and finally the "feed forward" (Hattie & Timperley, 2007, p. 86) question of "where to next?" (p. 90). This question invites the trainee to join the OJI in considering the next incremental learning step and prompts the OJI to provide guidance on strategies and activities the trainee can use to improve their progress (Ellegaard et al., 2018; Hattie & Timperley, 2007) towards the overall goal or final performance outcome. In establishing targeted progression, the OJI must ideally consider how best to optimally challenge the trainee in keeping with Vygotsky's Zone of Proximal Development (Merriam & Bierema, 2013) by ensuring the goal is not so high as to be unattainable or so low that further effort is not promoted (Shute, 2008). Adapted to an air traffic control context, progressive learning may include activities such as: facing enhanced challenges that result from increased traffic volume or complexity, improving fluency and automaticity, using alternate techniques or strategies for resolving potential traffic conflictions, and gaining increased efficiencies within the operation (Hattie & Timperley, 2007).

Actionable priorities. The coaching protocol must provide the trainee with actionable strategies to attain the specific learning goals established through targeted progression. The component of actionable priorities focuses on limiting the areas of feedback focus to those that are currently most pertinent and providing implementable strategies for continued performance advancement. Actionable priorities are closely related to targeted progression.

Actionable priorities stress the importance of prioritizing the feedback to a focused number of key areas and limiting the quantity of feedback to avoid overwhelming the trainee. From my findings, it appears that the OJIs intuitively recognized the need to limit the quantity of

feedback; however, they still noted the challenge of ensuring it was appropriately focused. For example, when Michael described that as an OJI "there's a lot of information in your head, especially when you're trying to pinpoint things to talk about", he was acknowledging his need to be "a little more concise and a little bit less diluted" by focusing the feedback. The OJIs saw value in the coaching protocol as a means to prioritize both their comments and suggested strategies for improvement to those that connected directly to the established learning goals. Although participants suggested the established priorities be used by the OJI to provide the trainee with implementable strategies, it is necessary for the trainee to also actively collaborate in establishing realistic strategies (Chan et al., 2014; Virkkula & Kunwar, 2017) within the context of a coaching conversation. Both the OJI and the trainee should emerge from the debrief session with a well-defined understanding of the concrete strategies each can use to help the trainee attain the goal. Actionable priorities can be especially important when trainees are experiencing difficulties by providing a path to success.

When coaching, it is not necessary to include feedback on every skill or task (Brookhart, 2011; Chan et al., 2014); rather actionable priorities assist the OJI to focus on providing one small next step to the trainee at a time, while ensuring no progressive learning steps are assumed or skipped (Brookhart, 2011). When using experts to train within an OJT setting, there can be a tendency for OJIs to want to tell trainees "everything they need to know to perform the task" (Johnson & Leach, 2001, p. 430). This can be mitigated by prioritizing feedback in relation to the learning goals so as to avoid overwhelming students with too much or too technical feedback (Chan et al., 2014; Wiggins, 2012). This has been described as feedback that provides "*actionable* information" (Wiggins, 2012, p. 14) wherein coaching is provided on one key change that, if enacted, "will likely yield immediate and noticeable improvement" (p. 14) to the

trainee's performance by allowing them to know specifically what activities can be implemented to improve learning progression (Hattie & Timperley, 2007).

Due to the complex learning environment in air traffic control, learning goals are often ongoing over a number of training sessions. While this can be effective by providing an immediate opportunity for trainees to implement feedback (Brookhart, 2012), it can also be challenging as multiple tasks are trained simultaneously. This highlights the need to ensure actionable priorities are set for each session to effectively focus the OJI's coaching strategies and guide the trainee's learning efforts towards the incremental goal established in targeted progression.

Design Principles for a Professional Learning Coaching Protocol

Design principles are theoretical insights into a particular phenomenon that "recommend how to address a specific class of issues in a range of settings" (McKenney & Reeves, 2012, p. 19). Design principles are intended to make a theoretical contribution and can do so on a continuum of local, middle-range, or high-level theory. Local theory results when limited occurrences of a phenomenon are studied, middle-range theory results from multiple occurrences in several settings, and high-level theory results from a synthesis of middle-range theories derived across a large number of occurrences in a wide variety of settings (McKenney & Reeves, 2012). The design principles for this study were established through a final cycle of reflection in Phase III and are intended to make a contribution at the local level since they were derived from the findings of one small study with a limited number of participants.

In Table 5.1, the design principles derived from this study are presented in alignment with the identified key coaching protocol components. The design principles describe how the key components should be incorporated in the design of a coaching protocol to achieve the

intended outcome of increased instructional capacity. These design principles provide a

theoretical base through prescriptive statements that are intended to be used as a starting point by

others undertaking the design of a professional learning coaching protocol in similar contexts.

Table 5.1

Design Principles for an OJI Professional Learning Coaching Protocol

Components	Design Principles
Learning Culture	Design the protocol based on a learning culture to support professional learning - Provide training, coaching, and ongoing support to use the protocol - Prompt a reflective stance towards coaching practice
Coaching Conversation	Design the protocol to promote dialogue - Encourage collaborative communication to foster partnership - Promote the co-construction of performance feedback - Provide samples of open-ended questions
Adaptable Framework	Provide a basic framework for the feedback session but allow for flexibility in its application - Account for variation in training sessions, coaching style, and learning needs
Logistical Feasibility	Ensure ease of use and effective integration with the current contextual reality of the organization - Provide clarity on how to enact each step in the protocol - Accommodate for user time constraints
Clarity of Expectations	Provide for both the OJI and the trainee to have a clear understanding of performance expectations against which to assess progress - Promote development of the trainee's self-assessment skills through a dialogue on recent performance
Reinforce Positives	Promote positive reinforcement in the provision of feedback - Ensure specific, detailed examples of positive performance are given to the trainee
Targeted Progression	Promote the consistent setting of progressive learning goals - Challenge the trainee to close the gap between current performance and desired performance
Actionable Priorities	Promote the prioritization of learning goals and implementable strategies to attain them - Ensure the generation of both coaching strategies and learning strategies

Opportunities and Challenges of Using a Coaching Protocol

In using the coaching protocol as a designed solution with OJIs, there will be conditions favourable to adoption and those that create resistance (Brown, 1992). To gain maximum benefit from the protocol, it is important to identify the opportunities that facilitate acceptance and the challenges that potentially inhibit success (Tracey & Tews, 2005). The potential opportunities and challenges for the implementation of the professional learning coaching protocol with on-the-job instructors are described below.

Opportunities

Two main opportunities emerge from using the coaching protocol with OJIs, including the implementation and promotion of professional learning within a supportive learning culture and the establishment of a common, structured coaching approach for the delivery of feedback.

Promoting professional learning. The OJIs' use of the coaching protocol provides the opportunity, in conjunction with instructional coaching, for them to engage in high-quality, professional learning based on identified best practices. All seven participants in Phase I expressed the importance of developing a learning culture amongst the OJIs as a means of providing ongoing learning and development for the individual OJI with expected collective effects for all OJIs. The OJI participants all found value in the coaching intervention and, through ongoing contact with the instructional coach, had multiple opportunities to learn (Timperley et al., 2007), were provided with adequate time to incorporate new approaches (Lopes & Cunha, 2017), and were observed to make gradual improvements over time (Girvan et al., 2016). Furthermore, the OJIs recognized the potential for the professional learning to have an ongoing impact on their coaching skills with future trainees.

In their synthesis of evidence on best practices, Timperley et al. (2007) found that teachers can have a substantial impact on student learning through engagement in professional learning. The use of the coaching protocol as a professional learning tool focuses on an enhancement of learning for the OJI rather than simply the delivery of content (Webster-Wright, 2009) through the use of activities associated with effective professional learning, such as: instructional coaching, a focus on instructional skills, and direct training with job-embedded activities. Instructional coaching has been found to improve the instructional skills of educators (Castillo et al., 2016; van der Scheer et al., 2017) and support student achievement (Devine et al., 2013).

The coaching protocol intervention uses instructional coaching activities, including coaching, dialogue, reflection, and ongoing support for the OJI as they review their performance and set learning goals for improvement. Dialogue promotes professional learning by providing a social constructivist approach to discuss understandings and negotiate meaning (Timperley et al., 2007). Opportunities for ongoing learning over time through frequent contact with the coach, engagement of the coach to provide external expertise on formative feedback, and engagement of the OJI in the learning process, are all supported as effective contexts for promoting professional learning (Timperley et al., 2007). The coaching protocol provides professional learning focused on the instructional skill of formative feedback. By focusing learning on a specific skill, the instructor's ability with that particular skill and its frequency of use are improved (Gore et al., 2017; van der Scheer et al., 2017) with the development of instructional skills considered to be a "highly relevant and authentic" (Hunzicker, 2011, p. 178) form of professional learning. Timperley et al. (2007) found it necessary for teachers to "engage in multiple and aligned opportunities that supported them to learn and apply new understandings and skills" (p. xxxv)

and further identified that successful professional learning was promoted by a typical sequence

of a rationale to engage, instruction on theoretical principles, and the opportunity to apply the

theory in practice. The coaching intervention followed this design; the rationale to engage was

provided through a review and reflection on performance in the video recorded debrief session,

initial training was provided on formative feedback through the protocol and followed by

practice through job-embedded implementation and feedback, which has been found to be

effective (Castillo et al., 2016; Girvan et al., 2016; Gore et al., 2017) for professional learning.

Providing a standardized approach. From an organizational standpoint, the

opportunity exists to use the coaching protocol as a means to create a standardized baseline of

expectations for new and experienced OJIs in the provision of coaching and the delivery of

feedback. A standard approach also facilities the collection of data to support improvements

across the organization.

Participants in Phase I saw a structured and standardized approach to the debrief session

as beneficial to both the OJI and the trainee by providing the OJI with clearly defined guidance

and, for the trainee, by allowing them to be better prepared as a result of increased consistency.

In Phase III, participants recognized the opportunity for the coaching protocol to facilitate a

shared understanding amongst stakeholders at all levels on the expectations for providing

feedback. A recognized disadvantage of OJT is that a lack of structure or systematic approach

can result in ineffective or inefficient training opportunities (Johnson & Leach, 2001; Sisson,

2001), while workplace mentors have expressed satisfaction when provided with structured

guides (Jacobs & Jaseem Bu-Rahmah, 2012). While an overall systematic approach is used in

air traffic control training, the coaching protocol brings structure to one specific aspect of the

program by standardizing the approach used in the debrief session for the provision of formative

feedback. Providing structure for OJIs by identifying their tasks, defining performance standards for those tasks (Blumberg, 2014), and developing supporting materials to provide guidance contributes positively to a successful OJT program (Aik, 2005) and these elements are enacted in this context through the use of a common coaching protocol. By defining a common approach, organizational opportunities arise as managers, training supervisors, and OJIs are able to communicate more effectively on current and desired OJI performance levels, as well as on trainee performance in support of qualification decisions.

It was further recognized that there is presently no objective way to formatively collect data across the organization, review the outcomes of current feedback practices, and make decisions on ways to coach more effectively. The coaching protocol was seen as providing managers with an organization-wide assessment tool to promote excellence, implement improvements, and objectively discuss instructional performance (Blumberg, 2014) to better support those in need of improvement or to further develop those that are excelling. Implementation of a standard coaching protocol, therefore, provides the potential to systematically review the feedback that is provided so as to generate data and compare trends for evidence-based decision making in support of strategies that foster effective learning for the OJI and the trainee. By defining instructional coaching activities that facilitate trainee knowledge development (Koskela & Palukka, 2011) within OJT, the coaching protocol offers potential contributions for quality assurance within a safety-critical environment.

Challenges

Two challenges emerged from using the coaching protocol with OJIs, including the challenging task of accounting for training culture and the necessity of providing adequate and appropriate training on the protocol.

Accounting for training culture. The biggest potential challenge in the OJIs' adoption of the coaching protocol is accounting for the existing training culture. Participants used the term training culture primarily to describe the existing attitudes, perceptions, and "work-related factors that may influence training success and failure" (Tracey & Tews, 2005, p. 354). Training culture exists on three levels: the individual, the team, and the organization (Polo et al., 2018). Challenges were discussed in the OJT context as existing on both an individual level and a unit/team level, with recognition that they are interconnected, while the organizational level was seen as a means to manage these challenges.

On an individual level, challenges related to training culture centered on each OJI's level of engagement, including factors such as: receptivity to new innovations (Hunzicker, 2011), openness to coaching, and willingness to adopt the protocol. While it was recognized that only a small portion of OJIs would be unwilling to adopt the protocol, this was still considered to be a key challenge in its implementation. Albert saw implementation as "contingent upon the OJI buying into it, buying into their student's success, and buying in to this and really using it as its intended". This emphasizes the need for OJIs to be convinced of the value of a new intervention such as the coaching protocol for it to be successful (van Zolingen et al., 2000) and highlights the importance for adequate training time to explain the components and discuss its application in practice (van Zolingen et al., 2000).

On a team level, the attitude within the unit was seen as an important consideration for adoption of the protocol with the expectation that less progressive units would not be willing to incorporate any new initiatives until underlying problems were identified and addressed. Furthermore, Owen (2009) found that a unit's "collectively held values and beliefs mediated the approaches used by on-the-job instructors" (p. 477) in an air traffic control context, therefore

OJIs who are willing to use the protocol may be less comfortable doing so without the support of their peers in the unit. Marc emphasized that "if we can't help to further foster that development of the training culture, it may then be perceived as another tool that they have to go through the ropes of learning". Two participants also noted the challenge of introducing change in "change-weary times" (Webster-Wright, 2009, p. 704). Competing priorities that exist for the OJIs as a result of the recent deployment of a number of new initiatives make it necessary to acknowledge that other work demands within and beyond training may prevent OJIs from using the new knowledge and skills gained through instructional coaching (Tracey & Tews, 2005). When facilitating learning in the workplace for OJIs, both individual differences and unit situational factors will interact, suggesting the need to adopt a "person-in-situation perspective" (Noe et al., 2014, p. 255) to manage protocol implementation.

At the organization level of training culture, the need for support from all levels of stakeholders and integration of the coaching protocol into the culture were viewed as essential and considered to be a means for managing the individual and unit aspects of training culture. There is recognition that the work environment and the training climate in the organization play an influential role in the overall effectiveness of training activities, as well as in the vertical transfer of knowledge and skills to other OJIs (Tracey & Tews, 2005). This is an important consideration given that participants suggested individual OJI development through professional learning could extend to other OJIs through a learning culture. Organizational culture can both "enable and constrain the facilitation of learning in the workplace" (Owen, 2009, p. 477); as such, it would be unwise to implement a new initiative such as the coaching protocol if the training culture within a unit is not yet ready to provide the necessary context to adequately support its effective implementation in practice (Tracey & Tews, 2005).

Providing adequate training. A potential challenge exists in ensuring adequate training is provided for all levels of protocol users. This includes OJIs and training supervisors, managers, and training team members who guide and coach the OJIs. During the testing of the coaching protocol in Phase II, the OJI participants all encountered some minor initial challenges as they implemented the protocol in practice. Due to time constraints, OJIs were only provided with a brief introduction to the protocol in conjunction with the opportunity to discuss and ask questions. The initial training did not delve into the purpose of each section, nor provide time for guided practice, both of which could have potentially contributed to deeper learning and increased preparedness. Additionally, the manager participants in Phase III reviewed the coaching protocol but did not receive training; as a result, clarification was occasionally required during the interview to resolve minor misconceptions. Current structures exist that can support and incorporate the provision of training for all stakeholders; however, the challenge will be to ensure the right forms of training are provided and adequate time is allocated to construct meaning and become adept with the tool. Consideration must then be given to training through professional learning activities that include structural features such as reform-type activities of adequate duration (Desimone et al., 2002) and in-depth collaborative work (Dogan & Yurtseven, 2018) as well as core features such as active learning, coherence with the OJIs goals, and a content focus on the protocol (Desimone et al., 2002). Timperley et al. (2007) found that what are known to be effective forms of professional learning is not always what is implemented in practice as it can be challenging and require considerable support. As noted by Scott, "the way it will fail is if it just gets introduced in a throw-away session of the OJI course, or come up to the [training] office for an hour, I want to talk you through this", which reinforces the challenge of providing adequate training. Within the air traffic control context, Owen (2009) found that OJIs

need to examine their beliefs about training and be supported as they adopt new instructional approaches.

Influence of a Professional Learning Coaching Protocol on Instructional Capacity

The coaching protocol intervention was designed with a social constructivist orientation and used situated active learning by providing OJIs with the opportunity to learn through experience, reflection, and dialogue within the context of a learning culture. The OJIs all found value in the instructional coaching as an opportunity to enhance their instructional skills, which they described as improving over the course of the coaching sessions. For example, they noted "having improved my debrief skills" and being "more zoned in on how to deliver those debriefs now" as well as commenting that it was "really beneficial to talk about it and then have your feedback" since it "makes it faster and more efficient…if you get some coaching". Within the debrief sessions, the OJIs were observed to shift from an instructor-focused approach of delivering feedback to a more collaborative learning-centred approach. This was apparent through an increased use of instructional skills associated with formative feedback, including the promotion of reflection on results, the alignment of feedback with goals, and the provision of positive feedback. For example, Michael asked his trainee to reflect on "something that you'd want to do over or improve on if you could do it again", Lewis began asking the trainee to state the learning goals at the start of the debrief, and Henri inserted positive reinforcement at multiple points throughout his debrief. Participating in intensive professional learning and job-embedded coaching has been found to increase the perceived skills of educators (Castillo et al., 2016). Additionally, OJIs reflected on their own practice as instructors which, when combined with their improvement priorities and action plans, can contribute to instructional skill development (Antoniou & Kyriakides, 2013).

Matsuo (2014)identified promoting reflection on results as an effective instructional skill used in OJT to guide trainees to learn from their experiences. Using the coaching protocol, the OJIs began to improve their communication with the trainee through the use of open-ended questions designed to encourage reflective dialogue on present performance so as to make progress towards the desired outcome. The OJIs recognized this improvement and described the use of open-ended questions as enhancing communication with the trainee. This provided for an increased understanding of the trainee's perspective, at times leading to altered coaching that more accurately addressed the gap in learning. The use of open-ended questions (e.g., how did you handle that scenario?) and wondering questions (e.g., how else could you have handled that scenario?) are considered formative since they produce productive responses by encouraging the trainee to reflect, investigate their own thinking, and explain decisions (Ellegaard et al., 2018). This encourages the trainee to take an active role in their learning, facilitates the development of self-assessment skills, and encourages them to monitor their own progress (Chan et al., 2014), which can foster a growth mindset (Edgerly et al., 2018).

Formative feedback aims to reduce the gap between a trainee's present performance and the desired performance (Hattie, 2012) which requires the establishment of clear learning goals, assessment of progress towards those goals, and identification of goal-oriented learning strategies (Chan et al., 2014; Hattie & Timperley, 2007) to reach the goals. By following the coaching protocol, the OJIs appeared to more consistently set training session learning goals as an intentional instructional skill and subsequently use those goals to guide their coaching and direct the feedback discussion. The use of goal-directed feedback provides the trainee with information on progress towards their learning goals, which is more useful than feedback on discrete responses to individual tasks (Shute, 2008) as it promotes persistence in goal attainment

(Hattie & Timperley, 2007) and makes it more likely trainees will "actively seek and listen to feedback" (Hattie, 2012, p. 20). Learning goals must be clearly defined to close the gap in performance (Hattie & Timperley, 2007), which can be challenging in the context of air traffic control OJT where trainees are working to develop complex cognitive skills that the expert OJIs perform at an unconscious level (Ouellet, 2012).

Feedback is considered more effective when it focuses on a trainee's successful performance rather than strictly on error correction (Chan et al., 2014; Hattie & Timperley, 2007). Providing positive feedback was identified by Matsuo (2014) as an effective instructional skill used by OJIs. The coaching protocol incorporates the provision of positive feedback in its design and OJIs consistently included this in the debrief sessions. Within my study, there were examples of OJIs providing detailed and descriptive positive feedback, as well as positive feedback in relation to the established learning goals. Descriptive, content-focused positive feedback can serve to reinforce skills and behaviours that were done well (Chan et al., 2014), identify improvement from past performance (Brookhart, 2011; Chan et al., 2014), and confirm goal attainment, thereby allowing the trainee to focus attention on the next progressive learning goal. Within an experiential adult learning environment, the provision of positive feedback is essential and OJIs should aim to identify good performance even when identifying areas for improvement (Matsuo, 2014).

Within the context of the professional learning coaching protocol, OJIs were provided with the opportunity to engage in reflective practice. They especially identified the benefits of reviewing their debrief video, reflecting on their performance, and discussing new ways of debriefing as an important means of learning. Thus, the coaching protocol supported the OJIs primarily in reflection-on-action by allowing them to re-evaluate the debrief and consider what

they could do differently (Merriam et al., 2007). Since the intent of reflective practice is to "gain deeper insights that lead to action" (Merriam et al., 2007, p. 173), OJIs were then able to improve by applying new instructional skills within subsequent debrief sessions, further reflecting on their effectiveness, and constructing new meaning by participating in subsequent coaching sessions, thereby enacting the "concept that action and reflection are linked in ongoing PL [professional learning]" (Webster-Wright, 2009, p. 722).

Based on the findings of this study, I cautiously state that the professional learning coaching protocol appeared to contribute to an increase in OJI instructional capacity in this air traffic control context. While only small changes to practice were noted within the study, this can still lead to substantial improvements in the effectiveness of practice over time, even by simply increasing the frequency of a skill (Lopes & Cunha, 2017). Focused training on a particular technique also facilitates the frequency and consistency of use of that technique by an instructor (Gore et al., 2017). By starting with small changes to more basic skills, OJIs can make gradual changes to their instructional capacity through sustained practice (Antoniou & Kyriakides, 2013; Girvan et al., 2016). The OJIs themselves recognized the value of multiple opportunities to learn (Castillo et al., 2016), acknowledged improvements would be ongoing, and discussed how they would continue to work on their development goals beyond the coaching sessions. It is difficult to determine the ability of the OJIs to maintain improvements and continue to make changes once the intensive instructional coaching support from the study has been withdrawn, as this can be dependent on both the OJI's level of self-regulation and the organization's support for ongoing learning (Timperley et al., 2007). My study included a limited number of participants who voluntarily agreed to participate and were open and receptive to coaching and to the notion of professional learning; although, Guskey and Yoon (2009) noted

that it is advisable to carefully pilot test a new intervention with a small group, as was done with the coaching protocol, it can be expected that not all OJIs within this context will be as willing to fully engage in a provided professional learning opportunity. Finally, the relationship between improved instructional quality and student achievement has been established (Hammond & Moore, 2018); however, within the context of this study it was not possible to determine the extent to which the OJI's improved instructional capacity impacted trainee learning and outcomes.

Chapter Summary

This chapter identified four key process components (learning culture, coaching conversation, adaptable framework, and logistical feasibility) and four key content components (clarity of expectations, reinforce positives, targeted progression, and actionable priorities) for a professional learning coaching protocol. Critical to this chapter were the design principles which were generated from the identified components and provide theoretical understanding for design in a similar context. The success of such a protocol for professional learning is dependent on accounting for the training culture in units and amongst individuals and the varying level of acceptance towards the protocol. As well, success requires that all levels of users be provided with appropriate training to use the protocol as intended, which may be challenged by the necessity of ensuring sufficient time to participate in training and gain comfort with the protocol through practice. In the final chapter, I provide an overview of the study, examine implications for practice and offer recommendations for future research.

CHAPTER SIX: CONCLUSION

This chapter provides a summary of the study, including the key research findings synthesized from the findings within the three phases of data collection, a reflection on the successes and challenges associated with the research, and the contributions made to the discipline of adult learning and the practice environment of air traffic control on-the-job training (OJT). Implications of the findings are presented as they relate to the stakeholders vested in professional learning for on-the-job instructors (OJIs). Recommendations for future research are provided to stimulate further contributions to the understanding of professional learning in this context. A closing conclusion to the study offers a final perspective on the critical learnings of the research and its implications moving forward.

Summary of the Study

Coaching in air traffic control on-the-job training is challenging due to the complex nature of the work and the safety-critical environment. Given that training outcomes can be affected by the quality of the instructor (Oprins et al., 2012), this study was guided by the overarching question of how instructional coaching can be used as a means of professional learning to help OJIs identify and implement improvements to their instructional practices. The design-based research (DBR) study used a three-phase model to prepare, design, and evaluate a coaching protocol as a means to gain a deeper understanding of the effects of instructional coaching as a form of professional learning in this context.

Phase I of the study focused on preparing for the design of the coaching protocol by validating the problem and confirming needs through interviews with seven key stakeholder participants. The findings in this phase identified the initial design specifications, including the four process requirements of learning culture, coaching conversation, adaptable framework, and

logistical feasibility, as well as the four content requirements of clarity of expectations, reinforce positives, targeted progression, and actionable priorities. These design requirements resulted in the design propositions which were used to explore possible options for a usable solution.

In Phase II, the focus was on completing the design of the coaching protocol through two iterative cycles of development and testing with a group of three OJI participants. In each cycle, the OJIs were observed providing debrief sessions with their trainee and then participated in instructional coaching sessions to reflect and dialogue on their performance, set goals for improvement, and implement new instructional strategies guided by the coaching protocol. The OJI participants were then interviewed to evaluate the effectiveness of the coaching intervention and identify areas for refinement. OJIs found that the coaching protocol contributed to enhanced communication with their trainee, an improved structure to their debrief sessions, and an increase in formative feedback for trainees as they gained understanding and constructed meaning through dialogue. Additionally, OJIs found value in the instructional coaching intervention for its positive effect on their instructional skills and their projection of its ongoing impact. Areas for refinement identified by the OJIs related to the need for comprehensive training on the protocol and development of a job aid for ease of use in practice.

Evaluation of the coaching protocol intervention occurred in Phase III through an assessment of the internal structure of the design, functionality of the tool, and its expected effects. The coaching protocol was returned to the five Phase I participants most closely associated with its future implementation to determine the extent to which it met their needs as stakeholders. The internal structure of the protocol was assessed through soundness and feasibility and found to be favourable in its ability to guide the OJI to a coaching conversation with the trainee and its utility by way of an adaptable framework and logistical feasibility.

Functionality was assessed through local viability and broader institutionalization. Recognition was given to the need to account for the training culture within a unit and its impact on acceptance of the coaching protocol, as well as the necessity for change management when implementing a new initiative. Finally, the expected effects of the coaching protocol were assessed by participants through a consideration of the tool's probable effectiveness and potential impact. There was an expectation that the coaching protocol intervention would affect both the learning culture within OJT and trainee performance. The coaching protocol was expected to foster a learning culture through development of the OJI which would lead to improved instruction and better training outcomes. Trainee performance was expected to be positively affected through the improved instruction and by an increased ability to recognize and respond to learning challenges.

The key components of a coaching protocol were found to align with the process and content requirements identified in Phase I. The findings of the study were then used as a basis to conduct a formal structured reflective process resulting in the identification of the design principles for a coaching protocol in the context of air traffic control OJT. It was further determined that the coaching protocol provided a number of opportunities, including the promotion of high-quality professional learning for OJIs and the implementation of an organizational-wide standardized approach to coaching and the provision of formative feedback. Potential challenges include the need to account for training culture on both an individual and team/unit level, as well as the importance of ensuring adequate training for all levels of protocol users. The coaching protocol intervention used a social constructivist and situated active learning approach to professional learning. Over the course of the study, OJIs began to shift towards implementing new instructional skills associated with formative feedback such as:

promoting trainee reflection on performance, aligning feedback with goals, and providing

positive feedback, as well as reflecting on their own practice. Figure 6.1 provides a graphic

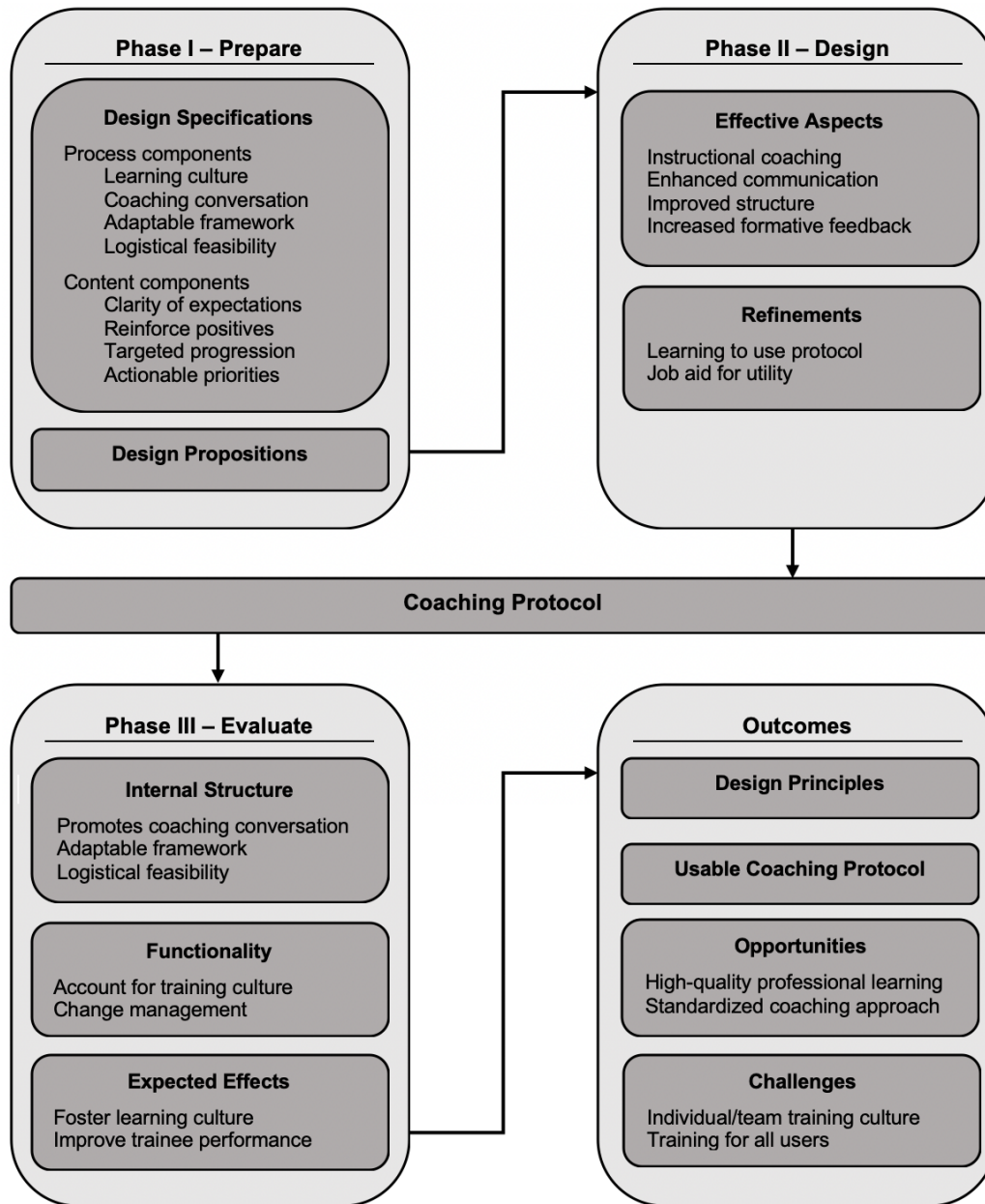summary of the findings identified in each phase of the study.

Figure 6.1. Summary of the Study

Key Research Findings

Three key findings emerged from this study. The first finding relates to the components of the coaching protocol and the shared importance of the process and content components; for the construction of formative feedback, both the process components and the content components are of equal importance in the design of a professional learning coaching protocol. There may be an initial tendency to consider the content components of greater importance since they guide the actual focus of the feedback, however, the process components establish the context through which coaching occurs and the content components are delivered. The process components of learning culture and coaching conversation provide the coaching perspective used to discuss present and future performance within the content components. The coaching conversation enables the content components to become formative by facilitating a shift from a directive delivery of all feedback to a social constructivist dialogue between the OJI and the trainee to co-construct performance feedback. The process components of adaptable framework and logistical feasibility are necessary for acceptance and effective enactment of the coaching protocol. Thus, the process components and content components are interrelated in the design of the coaching protocol to provide the *how* and the *what* of formative feedback.

The second finding pertains to the challenges and the impact of the training culture. The implementation of the coaching protocol will be affected by the training culture within the unit. Consideration must be given to determining the impact of the training culture and how it will either foster or inhibit engagement for the OJI and the unit with professional learning opportunities. This necessitates focused leadership to facilitate change management and support the integration of the professional learning coaching protocol as a fully entrenched component of

operational training. The provision of a suitable training culture environment is essential for successful implementation of the coaching protocol intervention.

The third finding addresses the necessity for the coaching protocol to be accompanied by adequate and appropriate training to effectively influence instructional capacity. Ideally, the training should follow the professional instruction sequence identified by Timperley et al. (2007) to promote professional learning. The professional instruction sequence begins with a rationale or catalyst for engagement, next provides a formal front-loading of new learning, and concludes with individual opportunities to learn. As content experts in air traffic control with training as a secondary duty, a rationale to engage is necessary to motivate OJIs to change their instructional practices. From the testing it was apparent that an intensive training session focusing on the purpose of each section of the protocol and how to enact it could provide OJIs with the necessary theoretical knowledge to use the tool effectively. Instructional coaching provided the opportunity for individualized support; however, repeated opportunities to practice with the tool and ongoing coaching and support are necessary for substantive practice changes (Timperley et al., 2007).

Successes and Challenges

This study had a dual purpose of designing a professional learning coaching protocol and making a contribution to the development of theoretical understanding of coaching in the unique educational setting of air traffic control OJT. A noted success in this study was the actual development of a usable coaching protocol as a practical solution to the complex training problem encountered by OJIs in providing formative feedback. The designed coaching protocol successfully integrated the study findings and the literature as a foundation for the design requirements to effectively support the development of the design propositions into an

implementable tool. The coaching protocol was tested within the complexities of a real-world practice environment and found to be acceptable by the OJIs, who identified a willingness and intention to continue to use the tool beyond the scope of the study. This success is partially attributable to working collaboratively with the stakeholders to identify their needs and ensuring a solution applicable to the context. Additionally, a contribution to theoretical understanding was attained through the development of the design principles (e.g., design the protocol to promote dialogue) to be used by others as a starting point for studies in similar contexts. The extent of this success will only be determined through a critical evaluation by those using the research in the future.

A second success of the study was the instructional coaching, which was well received by the OJI participants as an accepted form of professional learning. This was partially attributable to the design of the study that allowed OJIs to engage in the professional learning instructional coaching on a cyclical basis. Through multiple interactions, an effective and trusting coaching relationship began to develop between the OJI and the instructional coach, allowing for deeper opportunities to discuss performance in a supportive context. Over time, the OJIs also became more comfortable being video recorded and reflecting on their performance, allowing them to engage more fully in the coaching session for deeper learning. The OJIs also had several opportunities to practice and refine their new skills while receiving ongoing support, possibly making it more meaningful for the OJIs.

A third and final success was the strategy of first introducing the full coaching protocol and then providing the job aid after the OJIs gained familiarity with the tool. Through this approach, it became possible to differentiate between feedback related to learning to use the tool and feedback on the design of the protocol itself. Additionally, by having the OJIs use the

coaching protocol multiple times, they gained familiarity with the tool, as well as became more adept at using it. This made it apparent when to effect change through refinements to the design and when improvements could be made through adequate training.

McKenney and Reeves (2012) cautioned that DBR is a "complex and multi-faceted endeavor" (p.13), while other authors warn of the requirements for extensive planning, time, and resources (Wolcott et al., 2018), as well as the challenges associated with the implementation of multiple, cyclical research activities (Hira & Hynes, 2019). These challenges certainly were apparent within Phase II of this study. The two design cycles of development and testing required 30 discreet data collection events amongst the three OJI participants. Planning and scheduling of the multiple data collection sessions required extensive coordination with the OJIs to accommodate their highly variable shift work schedules. In addition, on any given shift the rotational schedule had to be accounted for and was typically only determined at the start of a shift thereby exacerbating the challenge of establishing in advance a specific time for meeting with the researcher/instructional coach. The OJI participants were all very committed to the study and demonstrated a willingness and flexibility to ensure data collection occurred over a relatively succinct timeframe. One exception occurred as a result of scheduled vacation resulting in the OJI being unable to review his video for several days making it more challenging for him to recall the operational details of the OJT training session. In this situation, the design of the study proved beneficial since the video recording assisted the OJI in recalling the debrief session with the trainee. Additionally, having set a clear professional learning goal at the previous instructional coaching session he was able to recall the instructional skill he was working on and the associated strategies, thereby allowing him to assess his performance progress. Some small challenges arose with scheduling delays for Phase III interviews due to changes in participant

availability related to the mandatory requirements for remote work and an associated increase in

their managerial responsibilities. This was easily overcome through my flexibility in

rescheduling the interviews; however, it created delays and further highlighted some of the

complexities associated with data collection in DBR.

Contributions to the Discipline and Practice

This study has made a contribution to the discipline of adult learning and the workplace

practice environment by providing a deeper understanding of the effects of instructional

coaching as a form of professional learning for OJIs within the unique context of air traffic

control OJT. Through establishment of the design principles, a contribution was made to an

identified gap in the literature pertaining to the role of the instructor in OJT in a dynamic, safety-

critical environment. The design and development of the coaching protocol contributed a

workable solution to a challenging problem of practice encountered by OJIs in this context.

Additionally, the coaching intervention implemented within this study made a key contribution

by enacting the shift in discourse proposed by Webster-Wright (2009) from "delivering and

evaluating professional development programs to understanding and supporting authentic

professional learning" (p. 702). Within this air traffic control practice context, the use of

instructional coaching promoted a change in focus from a traditional deficit model

conceptualizing the OJI as one in need of development, to acceptance of the OJI as a self-

directed professional (Webster-Wright, 2009) engaged in workplace professional learning as a

means to high-quality practice. The coaching intervention promoted a professional learning

approach by moving away from simply teaching the OJI to use the coaching protocol to

supporting the OJI through a holistic approach that focused on understanding the perspective of

the OJI so as to enable true learning through reflective practice and social constructivist dialogue

leading to action as the OJI adopted new instructional practices. By situating professional learning within the context of the OJI's authentic practice, it came to be viewed as an active and continuous process wherein meaning is constructed through participation in workplace embedded experiences naturally aligned to support the OJI's diverse range of self-identified learning opportunities.

Implications for Policy and Practice

This study explored how the phenomenon of instructional coaching can be used as a means of professional learning to help air traffic control OJIs improve their instructional capacity. Through the findings and analysis, three key findings were identified which have implications for policy and practice, both within the organization and beyond. Internal implications are provided for management, the operational training department, and members of the training team supporting OJI development. Additional implications exist for coaching beyond OJT and for other air navigation service providers (ANSP).

Recognition of the prominence of a unit's training culture as a key factor affecting professional learning has implication for all levels of management within the organization. The findings of this study highlight the importance of developing a comprehensive plan to address the long-term development of a training culture that supports effective workplace learning for OJIs. First, management should conduct an analysis of the present situation to gain deeper insights into how current programs promote and support the adoption of a learning culture and determine what additional approaches could be implemented to further advance the training culture. Consideration must be given to how professional learning is perceived within the training culture of the organization and the development of strategies for enhancement on the three levels of individual, team, and organization. Second, management must further develop

existing policies in support of professional learning to ensure processes can effectively facilitate the ongoing support and coaching necessary for the enhancement of instructional skills. Third, management should integrate the coaching protocol into the electronic training report application currently under development to facilitate standardization and leverage data collection opportunities for ongoing planning.

The findings of this study have implications for the operational training department responsible for the design and development of initial training and professional learning opportunities for OJIs within the context of the professional instructor development program. Integration of the coaching protocol within the instructor development program provides new OJIs with an early introduction to instructional skills associated with effective formative feedback and provides a foundational basis for ongoing professional learning. A training module within the program, following the professional instruction sequence of rationale for engagement, formal learning, and individualized learning opportunities through repeated practice (Timperley et al., 2007), should be designed to meet the learning needs of both new and experienced OJIs beginning to use the coaching protocol. Further implications exist for the design of the professional learning training module to incorporate a social constructivist approach through the use of an instructional coach and opportunities for situated active learning. Technology should be leveraged to support the delivery of professional learning such as video recording debrief sessions for review by the instructional coach at a later time and the use of video conferencing for the provision of coaching sessions to OJIs in remote units.

Implications for members of the training team relate to the necessity for ample preparation to effectively support ongoing OJI development and professional learning. In their role as instructional coaches, members of the training team play a key role in fostering the

development of a learning culture through professional learning activities related to the coaching

protocol. Instructional coaches can promote the learning culture by approaching professional

learning through the lens of a coaching perspective and use of a coaching conversation to

dialogue with the OJI. To effectively fulfil their role of coaching the coaches, these individuals

require a deep understanding of the rationale for the design principles associated with the

coaching protocol and the shared importance of both the process and content components. To

support an increase in instructional capacity, coaching interventions must aim to encourage the

development of reflective practice in the OJI by scaffolding the learning of skills such as

reflection, goal-setting, and self-assessment of progress.

Lastly, implications for practice exist beyond the scope of OJT. The findings of this

study and the designed coaching protocol may also be applicable for coaching air traffic control

trainees within a simulated environment. While the simulator provides a different training

context with the elimination of the safety-critical environment of OJT and the ability to pause the

exercise for feedback and discussion, the coaching protocol still provides a potentially suitable

framework for adaption to a post-simulation debrief session. Additionally, implications exist for

other ANSPs or safety-critical industries using OJT through the use of the findings and design

principles to develop their own context-specific coaching protocol.

Recommendations for Future Research

The findings of this study provided greater insights into the phenomenon of how

instructional coaching can be used as a means for professional learning with air traffic control

OJIs, including the design of a coaching protocol intended to contribute to improving their

instructional practices. The findings also brought forward a number of new questions and

potential areas for future research. Three major directions are identified as recommended areas

for pursuing future research, including: further assessment and validation of the coaching protocol tool, consideration of the student perspective and learning outcomes, and exploration of the impact of the training culture on workplace learning.

This was a small-scale study that iteratively tested the designed coaching protocol on three OJI participants in one air traffic control unit over a short period of time. To determine the credibility of the coaching protocol design, it is recommended that additional testing be conducted through a larger-scale longitudinal case study involving multiple OJIs across several different units. A larger study would also contribute to determining the transferability of the coaching protocol to the other area control centres and control towers within the ANSP. Similar to this study, research questions could focus on:

- How does the professional learning coaching protocol influence the instructional capacity of OJIs?

- How do components of the coaching protocol affect the provision of formative feedback?

- How do the arising opportunities and challenges from using the coaching protocol vary across units?

- How does instructional coaching influence the sustainability of improved instructional capacity?

The focus of my study was intentionally limited to the dual purpose of designing a usable coaching protocol for OJIs and making a small contribution to theoretical understanding for this unique instructional environment. With the intent of improving instructional skills, data collection related to the testing of the coaching protocol centered on the OJI and not the trainee. As adult learners, it is expected valuable insights into this phenomenon could be provided from

the trainee perspective. The use of a multiple case study design could provide an in-depth understanding through rich description and help identify common patterns in the trainee experience. Potential research questions include:

- What are the effects of a professional learning coaching protocol on trainee learning outcomes?

- What factors impact trainee involvement in a coaching conversation?

- How does the OJI's use of the coaching protocol affect the trainee's experience of the debrief session?

- To what extent does the coaching protocol promote trainee ownership of learning through self-efficacy, self-regulation, and self-assessment?

A key finding of my study was that the training culture, on both an individual and team level, will affect implementation of the coaching protocol. Exploring the impact of the training culture on workplace learning for both the OJI and the trainee, and on professional learning for the OJI, would be extremely valuable in understanding ways to effectively expand the OJI's instructional capacity. Options to explore the training culture exist using either a case study methodology or an interpretive phenomenological methodology to uncover the lived experiences of OJIs and trainees in the workplace. Consideration of the training culture phenomenon could be explored through questions such as:

- How does the training culture in the unit affect OJI engagement with professional learning?

- To what extent can engagement with professional learning impact the training culture?

- What factors contribute to enhancing the OJI's willingness to engage in a learning culture?

Additionally, one suggestion is to use action research, which provides opportunities to work collaboratively with units to seek effective local ways to develop a training culture conducive to professional learning. The iterative and cyclical nature of action research may be especially amenable to making small gradual changes to advance the training culture and inform future action.

Conclusion

Air traffic control is highly complex work and the safety-critical operational environment of OJT presents a unique and challenging context for workplace learning. Training outcomes in this setting are dependent on the quality of the instructor (Oprins et al., 2012); therefore, this study explored the use of instructional coaching as a form of professional learning with the intent of improving the instructional skills of OJIs. Using design-based research, my study developed and tested a usable coaching protocol as a solution to the real-world challenges of coaching in OJT. The study also identified eight design principles for a professional learning coaching protocol as a contribution to theoretical understanding.

Increased training success and improved qualification rates for air traffic control trainees can only be realized by fostering genuine professional learning for OJIs. The professional learning coaching protocol designed in this study promotes a robust workplace learning culture for OJIs that aims to support a continuous improvement in their abilities through an ongoing process of increasing their instructional skills. Within the context of the coaching protocol, the training of OJIs moves away from a deficit model to a learning approach. OJIs are accepted as skilled professionals who can benefit from professional learning as a means to further enhance

their instructional capacity through self-directed, active learning supported by job-embedded

coaching. The coaching protocol has a clear connection to authentic practice and provides a

well-defined tool for coaching the OJIs as they build their capacity to provide effective formative

feedback.

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Appendix A: Initial Interview with Stakeholders

Preliminary semi-structured interview questions

Question	Probe
What do you see as the greatest learning need for OJIs in providing effective debriefs?	• Content • Form • Communication • Substance
What do you see as the necessary components for a coaching tool for OJIs?	• Content elements
What elements would you consider to be a strength in such a tool?	• Content • Logistics
What elements would be detrimental to such a tool?	• Feasibility •
Describe any benefits you would hope to gain?	• For the OJI • For the trainee • For the organization
What risks do you foresee in testing this tool?	• For the OJI • For the trainee • For the organization

Emergent questions based on the conversation or previous interviews.

Do you have any additional thoughts or comments to add?

Appendix B: Interview with OJIs During Testing Cycle 1

Preliminary semi-structured interview questions

Question	Probe
How relevant did you find this coaching protocol to your practice?	• Immediate • Long-term
How useable was the coaching protocol?	• Content • Logistics • Clarity
Describe the benefits of using this coaching protocol?	• To you (OJI) • To your trainee
Describe any drawbacks/disadvantages to using the tool?	• To you (OJI) • To your trainee
Overall how did it affect your instructional skills?	• Positive impact • Negative impact
What parts were most beneficial?	• Review the key elements
What parts were least useful?	• Review the key elements
What changes would you like to see made before using the tool again?	• Content • Format • Language
Did the coaching protocol provide the results expected?	• Value-added
Where there any unexpected/unintended consequences as a result of using the coaching protocol?	• Positive • Negative
What other benefits/consequences do you foresee occurring as a result of using this coaching protocol?	
Emergent questions based on the conversation or previous interviews.	
Do you have any additional thoughts or comments to add?	

Appendix C: Interview with OJIs During Testing Cycle 2

Preliminary semi-structured interview questions

Question	Probe
How relevant did you find the coaching protocol job aid to your practice?	• Immediate
	• Long-term
How useable was the job aid?	• Content
	• Logistics
	• Clarity
Describe the benefits of using the job aid?	• To you (OJI)
	• To your trainee
Describe any drawbacks/disadvantages to using the job aid?	• To you (OJI)
	• To your trainee
Overall, how did the job aid affect your instructional skills (debrief skills)?	• Positive impact
	• Negative impact
What parts were most beneficial?	• Review the key elements
What parts were least useful?	• Review the key elements
What changes would you like to see made before the tool is implemented within the organization?	• Content
	• Format
	• Language
How did the instructional coaching sessions impact your training?	• Positive impact
	• Negative impact
What aspect was most useful? • Reviewing video • Coaching conversation • Modeling use of protocol • Setting objectives • Receiving positive feedback	• Review the key elements
What aspect was least useful? • As above	• Review the key elements
Did the instructional coaching provide the results expected?	• Value-added
Where there any unexpected/unintended consequences as a result of using/receiving: • The coaching protocol? • The job aid? • The instructional coaching?	• Positive • Negative
What other benefits/consequences do you foresee occurring as a result of using/receiving: • The coaching protocol? • The job aid? • The instructional coaching?	
Can you provide your overall impressions from having participated in this research?	
Emergent questions based on the conversation or previous interviews.	
Do you have any additional thoughts or comments to add?	

Appendix D: Concluding Interview with Stakeholders

Preliminary semi-structured interview questions

Question	Probe
You have had an opportunity to review the coaching protocol. Can you please provide your initial impressions of the coaching protocol?	• Perceived value • Clarity • Compatibility with existing policies • Value-added
What benefits to you foresee in enacting this coaching protocol?	• For the OJI • For the student • For the specialty/unit • For the organization
Describe what opportunities you envision for using this tool in practice.	• PIDP Foundational courses • Individual/coached professional learning • QA tool
Describe any unintended side effects/consequences that may occur as a result of using this coaching protocol.	• For the OJI • For the student • Within the specialty/unit
What challenges may be encountered in using this tool in on-the-job training?	• Resources – time, money • Buy-in • Logistics
What factors do you think may foster or hinder effective use of the coaching protocol?	• Personal factors • Organizational factors • Internal/external factors
What suggestions can you provide for improving the coaching protocol?	• Content • Format • Language
In what ways does this tool meet your criteria/needs?	
In what ways does this tool not meet your criteria/needs?	
How effectively do you think this tool will improve the instructional skills of OJIs?	
Under what conditions do you think this tool will be effective/ineffective?	• Prevalence of those conditions
Emergent questions based on the conversation or previous interviews.	
Do you have any additional thoughts or comments to add?	

Appendix E: Document Review Checklist

Checklist for Review of Daily Training Report

Criteria	Example
Learning goal recorded	
Strengths related to goal identified	
Other strengths identified	
Areas for improvement related to goal identified	
Other areas for improvement identified	
Strategies for making improvements identified	
New goal (next steps) identified	

Appendix F: Trust in a Coaching Relationship

Ten Steps to Build Trust in a Coaching Relationship
1. Plan and prepare for the coaching session
2. Cautiously gather background information only if required
3. Establish confidentiality
4. Listen with the intent of understanding
5. Ask questions
6. Connect to build rapport
7. Validate participant's contributions
8. Be open about who you are, what you do, and why you do it
9. Ask for permission to coach
10. Keep commitments

Adapted from: Aguilar, E. (2013). *The art of coaching: Effective strategies for school transformation*. San Francisco, CA: Jossey-Bass.