



DProf thesis

**Practice as the site of learning: a case study of higher education
in an aviation degree**

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Doctorate in Professional Studies

Project Title:

**Practice as the Site of Learning: A Case Study of
Higher Education in an Aviation Degree**

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Practice as the Site of Learning: A Case Study of
Higher Education in an Aviation Degree

Keith G. Buckland MEd.

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partial fulfilment of the requirements for the degree
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Glossary and Abbreviations Used

AAIB	Air Accidents Investigation Branch
ATC	Air Traffic Control
ATPL	Airline Transport Pilots License
ATO	Approved Training Organization
BALPA	British Airline Pilots Association
CAA	Civil Aviation Authority
CoP	Community of Practice
CPL	Commercial Pilot License
CRM	Crew Resource Management
DADF	Degree Apprenticeship Development Fund
DODAR	Diagnose Options Decide Act Review
EASA	European Aviation Safety Agency
EITB	Engineering Industry Training Board
EMR	Evaluating and Managing Risk
FHEQ	Frameworks for Higher Education Qualifications
FI	Flight Instructor
FIC	Flight Instructor Course
FIS	Flight Instruction Standardisation
FQHEIS	Framework for Qualifications of Higher Education Institutions in Scotland

FTO	Flight Training Organisation
HE	Higher Education
HEFCE	Higher Education Funding Council
HEI	Higher Education Institution
HEPI	Higher Education Policy Institute
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IR	Instrument Rating
ISO	International Standards Organisation
IWBL	Institute for Work Based Learning
MCC	Multi-Crew Co-operation
MDX	Middlesex University
MORE	Middlesex Online Research Ethics
MPL	Multi-Crew Pilot License
MU	Middlesex University
NOTECHS	Non-Technical Skills
PAPP	Professional Aviation Pilot Practice
PAT	Pilot Aptitude Testing
PF	Pilot Flying
PIC	Pilot In Command
PM	Pilot Monitoring
PPL	Private Pilot Licence
PSRB	Professional, Statutory and Regulatory Body
QAA	Quality Assurance Agency
SEEC	Southern England Education Consortium
SWOT	Strengths Weaknesses Opportunities Threats
TEM	Threat and Error Management
ULT	University Link Tutor
VFR	Visual Flight Rules
VLE	Virtual Learning Environment
WBL	Work Based Learning
WBS	Work Based Studies
WIL	Work Integrated Learning

Abstract

There has been a growing momentum in ideas that challenge Higher Education Institutions (HEIs) to re-think delivery models for undergraduate degree programmes. Integrating professional practice with degree study is one such idea, however, this can be conceptualised in a variety of ways. This inquiry focused on how student pilots learn through the complex mixture of training, higher education and professional practice in aviation.

This is an inquiry into situated learning experienced by student professional pilots taking an aviation degree and considers the interwoven pedagogical approaches adopted by the flight training organisation, higher education institution and the workplace. A qualitative research approach has been used. Case study has allowed the real-world problem to be viewed from multiple perspectives including those from students, the university and the partner organization. These perspectives have been interpreted from the position of an insider-researcher using questionnaires and content analysis of student work. Semi-structured interviews have been carried out with flight training organisation and university staff and a constant comparative and theme mapping approach was used to aid analysis.

This research shows how taking a systemic perspective can assist in defining the contextual dimensions of partnership programmes in order to gain a conceptual overview of the site of learning. It also shows how learning in the context of professional aviation pilot practice allows students to incrementally build knowledge and skills from their experience. Undergraduate work-based students in aviation were seen to develop an important range of professional and graduate skills and capabilities during the joint-degree programme. The combination of pedagogical approaches from the flight training organisation, the university and the employer proved to be highly effective in enabling students to progress into their chosen profession through this learning partnership approach. Encouraging students to become critically reflective practitioners was an integrated theme through the degree and this was seen to be effective when students reported on their practice. This inquiry also describes the failure of the work-based learning partnership and this work can add to increased understandings of collaborative learning partnerships between commercial organizations and institutions of higher education, with particular respect to strategic awareness.

The recent pandemic has challenged higher education to adapt and change pedagogical approaches and in some cases, move to more distanced types of learning. This research will add to understandings about less traditional routes through higher education, work-integrated learning and professional practice.

Chapter One

Introduction

the workplace can take many forms and is significantly different to the classroom. It can be seen as a distinct setting in which people can engage in learning. (Fuller and Unwin, 1998, p. 157)

Just as the workplace can take many forms, learning related to or within the workplace can also be formulated in different ways for different purposes. Sometimes the terms used to describe learning at work may present a confusing picture. However, the focus on developing our understandings of the relationship between work and learning has been carried forward in recent decades by practitioners, researchers and academics. There continues to be gaps in knowledge within this broad landscape and understanding can sometimes be blurred (Talbot and Lilley, 2014) even for those, like myself, working in close proximity with practitioners aiming to develop themselves and their practice.

Research into learning at work...suggests that the most effective and valuable learning for people in work is often that which occurs through the medium of work, ...While this kind of learning can be instrumental, it can also be highly developmental, particularly when it is linked to a personally-valued purpose and engaged with critically and reflectively. (Lester and Costley, 2010, p. 562)

This research will add to the knowledge base of work and learning with the particular focus of inquiry being work-based learning as undertaken by undergraduate aviation pilots at Middlesex University. The degree programme and focus of inquiry is the BSc (Hons) degree in Professional Aviation Pilot Practice.

Positionality and Interpretation

This research is a case study and therefore, an interpreter is required, the interpreter is me. My position within the research as an active agent needs to be explained, in order that the necessary subjectivity that I will bring can be understood within the context of this research (Thomas, 2016, p. 68).

I am a Senior Lecturer in the Department of Design, Engineering and Mathematics at Middlesex University. The department is situated in the Faculty of Science and Technology. I am a programme leader for a joint BSc (Hons) degree programme in Professional Aviation Pilot Practice. I have worked at the university for more than ten

years working with professionals from a variety of sectors engaging in work based learning (WBL) and studying within their own practice.

Costley and Lester (2012, p. 258) have explained that increasing numbers of mid and later-career practitioners are choosing to undertake doctoral programmes for reasons such as: "...taking forward a specific area of practice, consolidating and establishing recognition for an area of expertise..."

This resonates with my rationale for taking the doctorate and these authors go on to discuss the evidence of experience that many practitioners possess and make the important connection to the various forms of evidence of experience that may exist in different forms of output. These may or may not exist in traditional published works for some practitioners. In my case, almost a lifetime of experiences from professional practice provided the underpinning capacity to embark on this journey. In considering the evidence that would support this claim for capacity, I reflected on my early career when I completed an apprenticeship as a mechanical engineer and my subsequent work in design offices. I worked as an engineer in an international packaging company and in smaller scale manufacturing and engineering maintenance companies before entering engineering training at the training organization where I had started out in my first year. I gained technical academic qualifications at each step and then entered mainstream education working as a lecturer in engineering within a large college of further education. Essentially, I had learned something of the *practice* of an engineer and then the *practice* of a teacher. Examples of some of the artefacts and products of my practice as an engineer were technical drawings produced within a drawing office or the manufacture and building of automated systems and machines in a workshop environment. Some examples of artefacts of my practice as a teacher were the production of teaching materials associated with a variety of engineering course subject syllabi, linking computers to machine tools and working with paper and computer-based administrative systems. I later learned skills in the *practice* of leadership and management, additional to those normally required of the classroom teacher. As a Head of School in a large department of engineering I faced many challenges, there were many successes and some failures. Some examples of outputs from this practice were: creating new sites of learning for apprentices working in the process and chemical sectors, creating curriculum pathways between secondary education and Chartered Engineer by introducing a Foundation Degree and B.Eng (Hons) degree and partnership working with a significant range of employers. This and much other work culminated in

the achievement of a national Training Quality Standard for Excellence award in the vocational area of engineering.

In 2011 I joined the Institute for Work Based Learning (IWBL) at Middlesex University as a Senior Learning Development Tutor. It was here that I started to learn the *practice* in facilitating higher education. I learned that although I had a wealth of experience and knowledge of working with students and employers engaged in ‘work-based learning’, I had very little knowledge of the field of study of work based learning and how the Middlesex University model and work based learning framework (Middlesex University, 2011) could be applied through higher education. Subsequent work with many undergraduates, post graduates, partner organizations and colleagues has helped in developing my practice to this date.

My motivation for embarking on a programme of professional extension (Costley and Lester, 2012), the professional doctorate, arose from feelings that I should write something after working extensively with a large number of work-based students and professionals who were themselves extending their practice. I had recognised that there was still much more to learn within the field of work based learning and that my own practice could be enhanced by undertaking some associated research. I also understood that by improving my own knowledge base I would be able to facilitate the learning of others more effectively. Further motivations included a desire to make the most of the significant opportunity that existed within Middlesex University in being able to work with colleagues who were continuing to work at the forefront of the field of work and learning.

The Context of the Project

The project arose from the original development work in the aviation sector that had been carried out by members of staff within the Institute for Work Based Learning (IWBL) at Middlesex University from 2012 onwards until the Institute closed down in 2017. At this time, all staff and programmes within IWBL were gradually dispersed into the faculty structure of the university. Some programmes closed including the generic undergraduate and post graduate programmes in Work Based Learning Studies and Professional Practice. The university chose not to revalidate this provision, however, some modules were recoded for use in the School of Health and Education and a new programme was subsequently validated in this area. The undergraduate work-based degree programmes in aviation had begun in 2014. They had healthy recruitment and

during the transition from IWBL were positioned in the Department of Design Engineering and Mathematics in the Faculty of Science and Technology. No similar provision existed within the faculty, the main connection being the scientific and technological link.

The small team of four full-time members of university staff that moved into the Faculty of Science and Technology had responsibility for running three different partner programmes in aviation with one of this team having a partial role in aviation due to commitments with a range of work-based construction programmes that had also come under the umbrella of the Faculty. One additional member of staff from the former IWBL was temporarily assigned to aviation programmes, however, this was also a partial commitment due to the staff member being based in a different Faculty and carrying programme responsibilities there. My role also included responsibility for oversight of IWBL students being phased out on undergraduate and post graduate programmes in Work Based Learning Studies and Professional Practice. The number of students taking full-time aviation programmes at this time was around one hundred and eighty. The staffing component supporting aviation programmes naturally included partner organization staff who were engaged in first year ground school and the normal flight training undertaken by student pilots.

The aviation degree programmes had been validated by the university as joint partnership programmes with three different experienced and well established Flight Training Organisations (FTOs). The programmes were unique in their conception of utilising the theoretical principles of work-based learning and blending these with aviation pilot development with an ambition of improving the professional practice of aviators by encouraging them to become reflective practitioners.

Each of the programmes developed in their own way as there were significant differences within the training structures of each partner organization as well as different curriculum and pedagogical considerations. Synergy was maintained in the university approach wherever this was possible, as a means of simplifying operational and pedagogical issues. Fundamental to each of the contractual partner relationships was the need for good communication between the university and partner and each partner had a University Link Tutor (ULT) as a formal point of contact in line with normal university operations. My role combined the functions of tutor, programme leader and ULT.

The rationale for choosing this case study as an object for research lies mainly in the fact that it is the central focus of my current practice. The programme is unique in the way that it integrates training, work and higher education in supporting the development of students aiming to become professional aviators. Furthermore, there has been no research into the impact or effectiveness of this particular provision. This lack of critical review exposes a gap in understanding of the adopted pedagogy and in particular how it facilitates the integration of work and learning in this particular area of practice.

The structure of the connections associated with the aviation degree being analysed in this case study exposes a potential ‘four actors’ or quadripartite relationship as shown in Figure 1.1. This differs from the tri-partite learning agreement model (Garnett and Workman, 2009, p. 5) that can be found within some examples of work based learning programmes. Within this particular aviation degree, the quadripartite structure can be viewed as ‘potential’ since some students may complete the degree prior to entering a work organization that is external to the FTO. However, for many students the quadripartite structural relationship exists as they complete the degree while working for an airline employer.

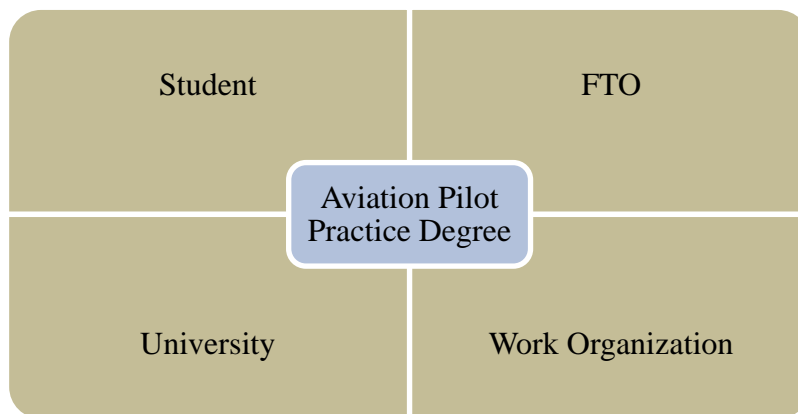


Figure 1.1 Potential quadripartite relationship in the aviation pilot practice degree

On choosing case study as a methodological approach, I recognised the importance of maintaining the focus on a single and specified programme. Case study creates the possibility for patterns and connections to be recognised, derived from the powers of exploration and narrative (Thomas, 2010) and as we will see, there is much to explore and important connections to be recognised. This case study encompasses the

complexities of work and learning remote from campus and the consequent challenge for pedagogy. There are issues of organizational and institutional concern that arise from engaging in joint programme delivery and partnership working. In considering the context for this inquiry, it is crucial to recognise the safety-critical nature of aviation. Students on this programme carry significant responsibilities for the safety of themselves and for others on a day-to-day basis; there are few professions that carry this scale of risk.

As will become apparent, this research was carried out against an unfortunate backdrop. During this period, university and employer partnerships within the subject area of aviation at Middlesex University went through stages of slow collapse and subsequently disintegrated. This research can convey part of that story as the subject of ‘partnership’ has crucial importance when aiming to marry the learning ambitions of higher education and commercial or industrial partners.

The Challenge for Higher Education

The following call from Universities UK is part of their thinking in response to the fourth industrial revolution (Schwab, 2016):

The linear model of education–employment–career will no longer be sufficient. The pace of change is accelerating, necessitating more flexible partnerships, quicker responses, different modes of delivery and new combinations of skills and experience. Educators and employers need to collaborate more closely, and develop new and innovative partnerships and flexible learning approaches. (Universities UK, 2018: Executive Summary).

In the UK the landscape of technical education and skills has gained much attention during the past decade. The Augar (2019) review was partly a response to debates around the costs and value of higher education, its remit was to look at the long-term funding of universities and the balance between university-based higher education and advanced technical and vocational education. However, the review contained important signals to institutions of higher education by addressing the whole post-18 (tertiary) sector of education. In addition to costs and funding issues, the review (p. 38) suggested flexible approaches to the acquisition of education and academic credit:

The post-18 system should become flexible enough to facilitate additional routes to higher skills be it through higher or further education providers. This will be essential to ensure individuals already in the

workforce can learn on a more modular basis and not have to choose work or study. 25

and

Funding based on credits, which could be built up over any stretch of time would make sense, not least for part-time providers like the OU and Birkbeck which need to be flexible to accommodate usually adult and therefore 'messy' learners... A flexible funding system would encourage more innovative models which might mix full-time, part-time, distance and work-based provision over varying stretches of time. 27

These signals, while not of immediate concern in relation to the aviation programme being considered within this research, nevertheless, point to a possible future of higher education where *flexibility* is the key word. In this possible scenario, flexibility in funding, administration, credit accumulation, student cohort and crucially, both the site of learning and pedagogy will be of significant importance. This research will explore some of the space where flexibility in learning resides, specifically, within work-based learning.

Within the last decade there have been calls to provide research that critically examines pedagogy in work-based learning through higher education (Nottingham, 2016, Costley and Dikerdem, 2011, Kettle, 2013) and Lester *et al.* (2016) made a call for further research in testing work-integrated learning pedagogies and curriculum models. Interestingly, Bezerra, J. *et al.* (2021) have provided evidence of recent growing interest in WBL of all types in their worldwide bibliometric and network analysis of work-based learning research. They point to an upsurge in academic outputs, particularly in the UK and Australia. What seems clear is that international interest in learning through practice is increasing.

The Importance of Practice

Practice exists, sometimes unnoticed in many facets of our lives. It is often exhibited by professionals who may not even describe themselves as 'practitioners'. Indeed, the term 'practice' is understood by many to be positioned on a lower rung of importance to the theoretical. This long-standing undervaluing of practice is recognised by Nicolini (2012, p. 23):

the demotion of practice is a constant characteristic of Western thought and it is for this reason that a focus on practice is still potentially subversive and innovative.

Thompson (2017, p. 1) attempts to introduce some balance to the issue and contends:

that effective, high-quality practice needs to be informed by a sophisticated understanding of the practice world, drawing on a range of concepts that form an explanatory framework or, in other words, a theory.

In rejecting the idea that theory and practice can be conceived as separate entities, Thompson (2017, p. 2) argues that these are fused and cannot be separated. He explains:

In reality, all of our professional actions are based on some form of understanding. The major question is this: Is our understanding the best we can achieve in the circumstances or are we allowing ourselves to rely on untested assumptions, prejudices, habits and guesswork? Professional education and training involve helping students and practitioners to build up their knowledge base over time and to cultivate their skills in making sense of complex issues. In other words, education and training help us to theorize what we do, to develop understandings of our actions and their consequences and the various important aspects of the context in which they take place. In effect, to engage in practice is to theorize that practice (to draw on sets of ideas to make sense of it) and to practise theory (to make use of those ideas in a practical context).

Interestingly, Reich and Hager (2014, p. 419) have argued that while ‘learning’ has received much attention from theorists, ‘practice’ has often been taken for granted and “...remained significantly under-theorised in the education and workplace learning literature.” They point out that the ubiquity of using the term ‘practice’ alongside a domain, for example, ‘professional practice’ or ‘workplace practice’ has sometimes led to the term having lower impact and less attention has subsequently been paid to problematizing it.

Aims of the Project

The aim of this inquiry is to find out exactly what is happening in relation to learning within the nexus of training, work and higher education for aviation pilots who are undertaking an undergraduate degree in professional aviation pilot practice. The student pilots are based within the same Flight Training Organisation (FTO) and some will have transitioned into airline employment while completing the final year of the degree. The integration of training, higher education and work within this specific context provides the focus for inquiry.

Products and Outcomes

The following outcomes are anticipated from this research:

1. Feedback into the programme and the joint programme partnership by providing a description and critique of integrated pedagogy. This will inform the joint partner staff group as well as staff groups within Middlesex University.

2. Feedback into the aviation sector from a critical review of the pedagogy and learning from this particular programme. Useful insights should be gained in relation to the effectiveness of this type of programme structure, specifically, how the alignment of study with traditional stages of pilot development and the integration of higher education play their parts in the professional training and education of aviation pilots.
3. Improvements in student learning, curriculum delivery and assessment are expected outcomes. The inquiry will be conducted within a 'live' work-integrated learning environment and this means that any recognised areas for improvement will be able to be shared with aviation team colleagues within the university, collaborative partner colleagues, students or other stakeholders with the intention of providing indicators to 'best practice' for this type of provision.
4. Wider application of findings should be possible within other types of work-based learning programmes and areas of professional learning.
5. Wider dissemination to those interested in learning through work. For example, through the work and learning e-journal, the work and learning research group at Middlesex University, Faculty of Science and Technology staff groups at Middlesex University, Research Students Summer Conference and external events.

Focus of the Project Report

This report will describe the process of carrying out the case study and the outcomes from this work. Chapter One has outlined my own position as well as the context and rationale for the project. It has also considered the aim of the project and the expected outputs. Chapter Two will continue to establish the context of the research and examine key themes through literature that aid this inquiry. The objectives for the project will also be summarised. Chapter Three will discuss the rationale for adopting an interpretive, flexible research approach through a case study research design. The methods of data collection are specified and the general issues of quality and validity are explored. Chapter Four presents the detailed findings from research activities and specifies the process for determining emerging themes. Chapter Five discusses the findings from each of the methods of data collection and explores the emerging themes. Chapter Six presents a summary of conclusions from the findings and recommendations for future practice. Chapter Seven concludes with personal reflections on undertaking the research project and the professional doctorate.

Summary

This chapter has presented the rationale for the project and my position and experience that allow me to take up the role as an interpreter of the case study. The challenge for higher education has been highlighted by showing through policy, the likely future expectations of employer collaboration and flexible learning. The centrality of practice in professional education has been proposed as a key theme. The intended impact of carrying out this research is internally, within the aviation programme team at Middlesex University and externally with partner colleagues in flight training organisations. The research will also contribute to understandings in work and learning in the wider academic community at national and international level.

Chapter Two

Literature Review and Project Objectives

Introduction

This chapter will discuss relevant literature that informs this project and set out the objectives for the project. The literature search process was assisted by the project planning phase whereby the focus for the project was established and key areas of influence for the research emerged (Gray, 2014).

The fundamental context of aviation pilot development that incorporates degree study is inherently complex. The requirement of meeting professional standards, engaging simultaneously in real-world work, pilot training and degree level higher education illustrates this complexity. This literature review will help to explore the potential antinomy between ‘training’ and ‘learning’ as well as providing the essential foundational understanding required for critical analysis of this particular joint degree programme. Wherever possible, the topics being discussed in the literature review will be directly associated with the aviation degree programme and my personal experience in order to illustrate possible connections to the case study.

The notion of ‘practice’ permeates this study. It is clear that how students learn to be aviation pilots while undertaking an undergraduate degree in professional aviation pilot practice is of overriding concern. However, it may not be so obvious that their practice as students, their practice as flight instructors, their practice as first officers and their practice as workers will be of interest. In a similar way, the practices of individual members of the staff team at the FTO will affect the study and likewise, the practices of individual members of the staff group at the university. These ideas can be signposted graphically as shown in Figure 2.1:

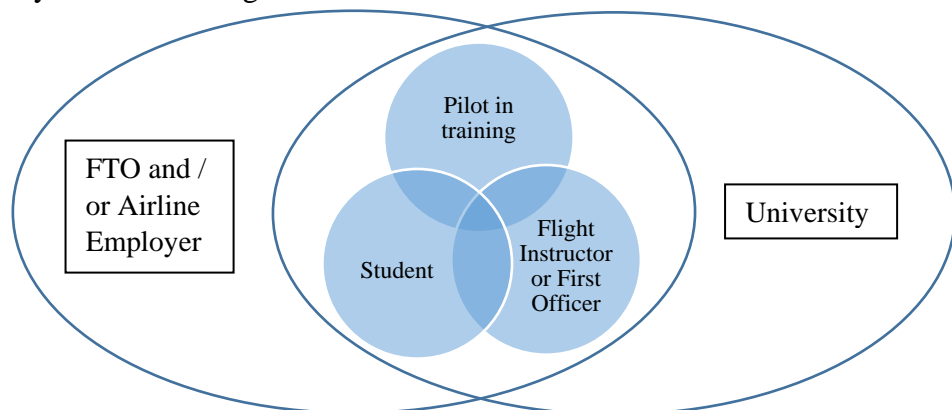


Figure 2.1: Identifying practices in context

In Figure 2.1 the varying practices of the individual practitioner-student are focused in the central area, this Venn part of the diagram is located within the intersecting boundaries where work and study take place. These boundaries are themselves created by the flight training organisation / airline employer and the university. These two dimensions can be considered as supporting contextual dimensions and the independent practices that take place within each would require a much larger systemic diagram. Figure 2.1 also offers a conceptual overview of the site of learning and this will be used as a guiding framework for analysis. The literature review will provide the necessary critical underpinnings to aid understanding of this particular case.

The literature review is closely linked with three important perspectives. It begins by considering the professional dimension for aviation pilots. Aviation pilots are generally recognised as professionals in their role, this part of the review will consider professional knowledge, skills and competence as these are enacted in a strict regulatory environment. This is followed by a section on the learning dimension of higher education for aviation pilots and this considers the specific expectations for students undertaking an undergraduate degree as well as outlining the detailed requirements of the degree in Professional Aviation Pilot Practice. This section will also consider commentaries and other work on current understandings of 'learning from practice' as this is a key proposition for the aviation degree. The final section focuses on the integration of work and learning. A variety of approaches to integrating work and learning are analysed as well as some of the pedagogical approaches taken within the aviation degree. The sections are arranged as follows:

The Professional Dimension for Aviation Pilots

- a) Professional knowledge, skills and competence
- b) Requirements of aviation regulatory bodies
- c) Airline competences, competence and capability

The Learning Dimension of Higher Education for Aviation Pilots

- a) Graduate skills and future skills
- b) PAPP degree requirements
- c) Learning from practice

Integration of Work and Learning

- a) Apprenticeship
- b) Work Based Learning
- c) Work Integrated Learning
- d) Considering pedagogical approaches within the aviation degree

The Professional Dimension for Aviation Pilots

a) Professional knowledge, skills and competence

Specialist professional domains are founded upon knowledge that carries value within the specified workplace. In considering workplace knowledge, Lester (2012) helpfully describes the commonly represented hierarchy of ‘pure’, ‘applied’ and ‘contextual’ knowledge and indicates that the domains of academic and vocational education have a tradition of dealing with the first two types of knowledge respectively. Developments in the recognition of how contextual knowledge supports practitioner development have been facilitated in some professions by implementing approaches and pedagogies based on reflection, observation and practical experimentation. These currents and perspectives that assist the development and construction of situationally-derived knowledge owe much to the seminal works of Donald Schön (1983) and David Kolb (1984).

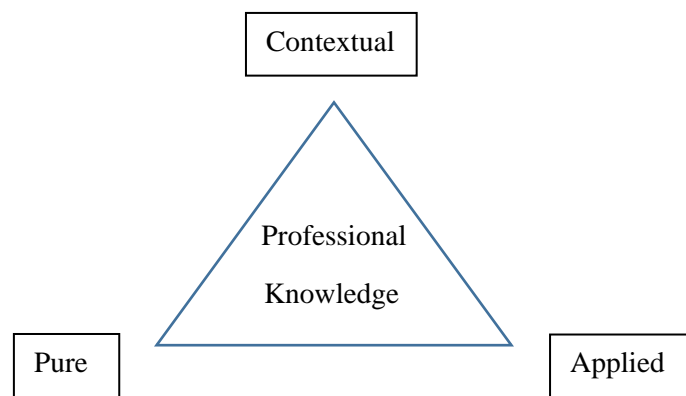


Figure 2.2: Professional knowledge, adapted from the text of Lester (2012)

In considering the professional dimension for aviation pilots it is useful to pose the question “What does professional in this context mean?” Evetts (2012) helps to uncover the sociological research around professions and professional groups by considering

three concepts: Profession, Professionalization and Professionalism. A profession is described conceptually as a distinct and generic category of professional work. However, Evetts argues that trying to define what is and what is not a profession has proved elusive. The distinction between ‘profession’ and ‘occupation’ provides ongoing work for sociologists and generic occupational groups. In relation to the role of aviation pilot, it can be argued that the role exists as a distinct and generic category of work.

The term ‘professionalization’ refers to the process whereby an occupational group achieves the status of ‘profession’. Evetts explains that pursuing, developing and maintaining closure of the group had previously been an important focus for professions, however, this has diminished since the 1980s. Also, that newly emerging occupations continue to seek the status and recognition associated with the term ‘professional’.

The acquisition of the status of ‘professional’ is sometimes viewed as being problematic in itself:

(professionalism) ...is a certain combination of ‘theory’ usually taught at higher education level and then an almost automatic ‘application’ of this ‘theory’ as professional practice without often problematizing the differences in context, fluidity, problem-solving, contingency etc. etc. The ‘theory’ component often means codification of propositional knowledge, reducing practice often to unreflected ‘physical action’ or carrying out pre-determined tasks. (Middlesex University, 2021a)

For aviation pilots in the U.K., professionalism is championed by the recognised professional body, the British Airline Pilots Association (BALPA). BALPA is the professional association and registered trade union established to represent the interests of all UK pilots. It represents over 10,000 pilots and over 85% of all commercial pilots flying in the UK. BALPA was established in 1937 as a pilots association with the intention of forming a proper level of pilot safety. In 2021 the organization plays a significant part in professional engagement with the sector and continues with the original focus on safety by operating study groups and committees that are led by professional pilots.

The term ‘professionalism’ is of most interest to this work here as the degree programme title promises an award of ‘Professional Aviation Pilot Practice’. Evetts (2012, p. 3) explains that:

Professionalism was initially interpreted as an occupational or normative value, as something worth preserving and promoting in work and by and for workers.

Also, that the discourse of professionalism operates at macro, meso and micro levels within an occupational group. For pilots in aviation the macro level effects may be influenced by governments within broad geographical areas. At meso level the discourse is influenced by aviation authorities, for example, the CAA (Civil Aviation Authority) in the U.K. and EASA (European Aviation Safety Agency) within Europe. The various airline organizations also carry influence at this level. At micro level the discourse is influenced by Professional, Statutory and Regulatory Bodies (PSRBs), for example, BALPA and communications through pilot forums, for example, PPRuNe (2022). It can be seen that the discourse of professionalism is multi-faceted and includes an international dimension, regulatory issues and pays close attention to issues at the heart of practice. Crucially, professionalism for aviation pilots is linked with the safety critical aspect of this role.

The term ‘professional practice’ is used widely and regularly within the facilitation of learning for aviation pilots undertaking the degree programme. This coupling of the words *professional* and *practice* uncovers the essential mechanism that enables professional behaviours and values to be demonstrated, put simply, *through practice*. The act of carrying out the professional role may seem to be an obvious and necessary requirement when attempting to recognise the demonstration of professionalism within a given occupational role, however, it is worth a moment to consider that it is only *through practice* that professionalism can exist. A deeper understanding of professionalism within an occupational role can only be obtained by considering the fundamental characteristics of the particular role and specifically, by theorizing its intrinsic practice (Thompson, 2017).

The intrinsic practice will include the acquisition of competence and not unexpectedly, within aviation, regulatory approval to practice as a pilot is a consistent and ongoing requirement.

Professional values emphasize a shared identity based on competencies (produced by education, training and apprenticeship socialization) and sometimes guaranteed by licensing. (Evetts, 2012, p. 9)

Eraut (1994, p. 6) proposes five distinctive modes of training and professional preparation that are used by professions:

- a period of pupillage or internship, during which students spend a significant amount of time (up to five years) learning their ‘craft’ from an expert;
- enrolment in a ‘professional college’ outside the higher-education system;
- a qualifying examination, normally set by a qualifying association for the occupation;
- a period of relevant study at a college, polytechnic or university leading to a recognised academic qualification; and
- the collection of evidence of practical competence in the form of a logbook or portfolio.

Each of these distinctive modes are used in the development of aviation pilots who provide the focus for this research.

Professional knowledge can also be described as practice knowledge. This raises the question of levels of knowledge or knowledge that can be applied in the demonstration of suitable performance in the occupational context.

Eraut (1994, p. 2) suggests that there is broad recognition of expertise as being the prime source of professional power and influence. This raises the question of routes to, or signifiers of, expertise and how these may be manifested. In considering professional frameworks of competence, Lester (2014, p. 36) states that “...arguably the standard for practice is replacing the body of knowledge as the profession’s defining text.”

b) Requirements of aviation regulatory bodies

Most aviation regulation and policy is harmonised across the world to ensure consistent levels of safety and consumer protection. Worldwide safety regulations are set by the International Civil Aviation Organisation and within Europe by the European Aviation Safety Agency. (CAA, 2021a)

In the U.K. the Civil Aviation Authority (CAA) has a wide remit as an independent specialist aviation regulator. They are a public corporation, established by Parliament in 1972 and have responsibilities for safety standards, aviation consumers, the environmental impact of aviation and security.

The CAA also has the responsibility for the issue of a range of licences, permits and approvals to individuals and organisations throughout the aviation industry. Students on the degree programme are required to obtain their licensed credentials as they develop their practice culminating in achieving the ATPL (frozen) licence. Indeed, the CAA in its regulatory role had been consulted as part of the original development of the degree in professional aviation pilot practice; the essential components of CAA licensing were

required to be maintained in order for the degree to be validated (Bravenboer and Lester, 2016). Students taking the aviation degree programme use the key licensing stages to assist in developing their understanding of the route to becoming a professional pilot. The language used in defining these licensed stages demonstrates the close alignment with required training phases and is consequently, embedded within any natural dialogue that relates to pilot training and development in the U.K. For the purposes of this research, it is useful to recognise the licensing stages as a starting point in establishing the framework of development that aviation degree students experience. The licensing stages are shown in Table 2.1:

Licences, training and ratings	Notes
Private Pilot Licence (PPL)	The minimum age to get a PPL is 17 and applicants need to hold a Part MED Class 2 Medical Certificate. A PPL for aeroplanes allows the holder to act as pilot in command (PIC) in non-commercial operations on aeroplanes or touring motor gliders (TMGs).
Commercial Pilot Licence (CPL)	The minimum age to get a CPL is 18 and you will need to hold a Part MED Class 1 Medical Certificate. If you hold a CPL you can, on the appropriate aircraft category: Exercise all the privileges of the holder of a LAPL and a PPL. (To exercise LAPL privileges you will need a LAPL licence) Act as pilot in command (PIC) or co-pilot of any aircraft operations other than commercial air transport. Act as PIC in commercial air transport of any single-pilot aircraft, subject to some restrictions. Act as co-pilot in commercial air transport subject to some restrictions.
Flight Instructor Licence	Successful completion of Flight Instructor training and examination at an ATO is required. The type of licence obtained is FI (A).
Multi Crew Co-operation	The objectives of MCC training are to develop the technical and non-technical components of the knowledge, skills and attitudes required to operate a multi-crew aircraft.
Instrument Rating (IR)	An instrument rating needs to be attached to the licence in order to fly under instrument flight rules. The instrument rating enables a pilot to fly the aircraft solely with reference to the in-cockpit instrumentation. This allows a pilot to fly in cloud and other circumstances of reduced visibility. The rating also gives the ability to fly under IFR with a minimum decision height of 200 feet (60 m) on instrument approach procedures.
ATPL (f)	Frozen ATPL until type rating completed
ATPL (A)	To apply for an ATPL, you must have fulfilled the training and experience requirements for the type rating of the aircraft used in the skill test. For example, if you are taking the skill test on a Boeing 737, you must have met the relevant flight training requirements for that type of aircraft before the Skill Test. Pre-requisites: If you are applying for an ATPL (A) you will need to already: hold an MPL, or hold a CPL (A) and a multi-engine IR for aeroplanes and have completed instruction in multi-crew co-operation (MCC).

Table 2.1: Aviation licences obtained during BSc (Hons) degree in Professional Aviation Pilot Practice

It is important to note that a Class 1 medical certificate is valid for 12 months and is mandatory for holders of CPL, MPL and ATPL licences (CAA, 2021b).

The European Union Aviation Safety Agency (EASA), (EASA, 2021a) was established in 2002 and has a mission to:

- Ensure the highest common level of safety protection for EU citizens
- Ensure the highest common level of environmental protection
- Single regulatory and certification process among Member States
- Facilitate the internal aviation single market & create a level playing field
- Work with other international aviation organisations & regulators

The United Kingdom (UK) systems and requirements for aircrew training and licensing were fully integrated with EASA when it was a member state of the European Union. On leaving the European Union (EU) in February 2020, a transition period was agreed until 31st December 2020 during which time negotiations on the future relationship could be carried out. At the time of writing, agreements only relating to the design and manufacture of aeronautical products had been reached. This means that for the purposes of aircrew training and licensing the United Kingdom has ‘third country status’ within the EU. The effect of this is that UK licences issued after December 2020 will not be valid in the EU and processes of licence conversion and recognition will be required. Licensing is a key issue within the aviation sector and specifically, for those undertaking training and wishing to practice as commercial pilots. Training for student pilots is often discussed with reference to particular licence milestones, e.g. “I’m working towards CPL (Commercial Pilot Licence)” and this is understood by those working in the sector as describing a student who is completing the ‘hours building’ phase of flying with associated training, prior to taking a licence skills test. Indeed, these licensing milestones and training phases are embedded within the syllabi and learning outcomes of modules within the Middlesex University aviation degrees.

c) Air safety

The working environment for licensed pilots is consistently dynamic and unpredictable. Pilots are required to deal with unforeseen flight situations e.g. technical abnormalities, adverse weather conditions and complex airspace procedures (Franks *et al.* 2014). This can be further complicated by human factors relating to aircrew, passenger issues, aircraft handling and commercial pressures. This list is by no means exhaustive. Each

flight takes place within the wider systemic boundaries of aviation and sometimes accidents occur.

The aviation sector consists of a broad range of activities and two particular categories of activity where accidents occur are important to this research: General Aviation (GA) and Commercial Air Transport (CAT). These categories, in turn, contain further specified activities. For example, the category of General Aviation, amongst other activities, includes pilot training while the category of Commercial Air Transport includes passenger and cargo flights. During the course of their degree programme, students may find themselves transiting category from GA to CAT. In relation to the statistical occurrence of accidents this distinction in category is important.

AOPA Air Safety Institute (2018) reviewed trends in the U.S. and in their classification of aircraft accidents suggested that the causes of GA accidents may be broken down into three broad categories:

- Pilot-related - accidents arising from the improper actions or inactions of the pilot.
- Mechanical / maintenance - accidents arising from mechanical failure of a component or an error in maintenance.
- Other / Unknown - accidents for reasons such as bird strikes and unexplained losses of engine power, plus those for which a specific cause has not been determined.

At the time of this report, pilot-related issues were the main cause of non-commercial fixed wing aircraft accidents, accounting for roughly 74 percent of all total and fatal accidents. Mechanical-related accidents accounted for roughly 16 percent of accidents and 8 percent of fatal accidents. Other or unknown causes accounted for 10 percent of accidents and 17 percent of fatal accidents. The report showed 967 accidents in general aviation in the year 2015. Later reports are available from the U.S. and trends have been disturbed by the recent pandemic.

The European Union Aviation Safety Agency (EASA, 2022) provides the most detailed analysis of air safety in member states in their annual safety review. For aeroplanes, these are categorised as commercial air transport (including passenger and cargo operations), special operations (including aerial work, parachuting and glider towing) or non-commercial operations (including leisure flights and flight training). The safety review shows that there were no fatal accidents or fatalities in commercial air transport in 2021; however, there were 12 non-fatal accidents and 48 serious incidents. In non-

commercial operations there were 58 fatal accidents and 95 fatalities, in addition, there were 335 non-fatal accidents and 186 serious incidents.

Recent reporting from the UK Civil Aviation Authority (2022) presents a mixed picture. In 2021, the scheduled CAT sector flew over 26 million passengers and 600,000 tonnes of cargo on just under 300 thousand flights. There were 2 accidents and 15 serious incidents, no fatal or serious injuries were reported. Both accidents involved cargo flights with no passengers. The majority of accidents and serious incidents occurred within the UK (75%) and the most common identified cause was due to technical malfunction of the aircraft.

The UK statistics for GA, the sector that includes pilot training establishments and owners and/or operators of approximately 11,000 general aviation aircraft reported approximately 670,000 flown hours in 2021. The Civil Aviation Authority (CAA) received almost 2000 occurrence reports, of which around 10% were classified as accidents or serious incidents (high severity occurrences). In 2021 there were 187 accidents and serious incidents, of which 89% resulted in no injuries. However, the 5 accidents that occurred during this time caused 7 people to sustain fatal injuries. There were also 16 accidents which resulted in serious injuries. Accidents and serious incidents in the GA category largely involved aeroplanes and were mostly associated with aircraft handling issues, mainly on landing as well as situations arising from in-flight technical malfunctions. Losing control of the aircraft while landing and veering off the runway accounted for the majority of occurrences. Little difference in the causal factors of accidents or serious incidents was observed across the period 2017 – 2021.

It is reassuring to see the relatively low numbers of reported occurrences of accidents and incidents in the scheduled CAT sector in the UK. It is worth noting that pilots in the commercial sector operate in a professional capacity and have high levels of training, recurrent testing and experience. The statistics from the US, EU and the UK for GA accidents and incidents emphasise the importance of the role of the pilot and the requirement for those operating in this sector (including student pilots) to demonstrate the highest levels of competence.

d) Airline competences, competence and capability

Lester (2014, p. 32), following Eraut and du Boulay, explains that “Competence is broadly concerned with what a person is able to do ...” and that it can be described as “the ability to perform [...] tasks and roles [...] to the expected standard”. Further, that

the International Standards Organisation (ISO) (2012) defined competence as “ability to apply knowledge and skills to achieve intended results.” Lester helpfully describes the dual perspectives that can be taken of competence, *internal* and *external*. The internal version of competence can be considered as belonging to the person, for example, a person may have a set of attributes and that this is likely to change over time as development takes place and currency is maintained or diminished. The external version of competence refers to “...what it is that the person does to produce a result that can be considered to be competent, whether in a study context, social situation or more commonly at work.” In this way, Lester brings forward the importance of context, competent actions or competences.

In their critique of competency-based training for *ab initio* pilot training, Franks *et al.* (2014, p. 132) give reference to the Australian National Quality Council (2009) definition of competency:

competency is: the consistent application of knowledge and skill to the standard of performance required in the workplace. It embodies the ability to transfer and apply skills and knowledge to new situations and environments. It encompasses the following concepts of competencies - that they:

1. Are demonstrated to standards required in the workplace;
2. Comprise the application of specified knowledge and skills relevant to that occupation;
3. Make appropriate reference to required generic and employability skills;
4. Cover all aspects of work performance; and
5. Can be demonstrated consistently over time, covering a sufficient range of experiences (including those in simulated or institutional environments).

Each of these concepts can be evidenced within the Middlesex University degree in Professional Aviation Pilot Practice since each student transitions from professional foundational learning through to employed status within the three year programme.

In considering the required aptitudes of aviation pilots, the International Air Transport Association (IATA), (IATA, 2019) state the eight pilot competencies, developed by industry and the International Civil Aviation Organization (ICAO), that should be developed during training and then used throughout their career, these are:

- Application of procedures and compliance with regulations

- Communication
- Aeroplane flight path management, automation
- Aeroplane flight path management, manual control
- Leadership and teamwork
- Problem solving and decision making
- Situation awareness and management of information
- Workload management

The full detail of this competency framework can be found in Appendix 2. These competencies have been adopted into the training matrices of major airlines and some of these have been compared within this research. The competencies are not listed in any order of priority and EASA has added a ninth competency: knowledge (EASA,2021c, p.77).

IATA (2019) also provides useful detail on what are considered to be necessary aptitudes of pilot recruits:

- English language proficiency
- Basic mental abilities
- Composite mental abilities
- Operational abilities
- Social-interpersonal abilities
- Personality traits

These aptitudes are considered as measuring dimensions and are related to the pilot competencies when used in the context of Pilot Aptitude Testing (PAT).

A critique of the use of competence standards includes the notion that the centre of interest resides in the external version, i.e. what the person actually does, rather than a person-centred approach of what attributes or characteristics are required to show competence. The argument is that the competence approach is more focused on assessment, as Lester (2014, p. 35) states “... from a development perspective leaving the process of becoming competent as something of a black box.” However, the general process for developing competence can be found embedded within the work of Dreyfus and Dreyfus (1980) and Dreyfus (2004). These authors developed a five-stage model of adult skill acquisition using examples from foreign language acquisition, chess learning and from flight instruction. Dreyfus (2004) described the stages of skill acquisition as: Novice, Advanced Beginner, Competence, Proficiency and Expertise.

Through all of these stages there is an assumption that skills development is taking place within some form of supported and developmental environment. In Stage 1, the novice experiences task instruction with context-free features and is given the basic rules to follow that are associated with a particular task. However, in many practices, simply following the basic rules can lead to poor performance as the context of the practice needs to be understood in order for the practitioner to be more effective; for example, in aviation, a novice will have learned through a pre-flight briefing the importance of flying the aircraft straight and level, but in focusing on this requirement they may find that they have been pushed off course by cross winds. In Stage 2, the advanced beginner builds experience in real situations and begins to develop understanding of the context in which the practice is taking place. The advanced beginner draws knowledge from situational as well as non-situational elements of the practice and is able to apply previously learned maxims to the situation; for example, during a flight the student pilot may experience a situational element of unexpected poor weather and a lowering cloud base. The student will be aware of the non-situational requirement to maintain Visual Flight Rules (VFR) and to keep below the cloud. However, this may present problems of keeping to safe altitude and continuing the journey could lead to danger. Returning to the departure airfield or diverting to another airfield is often the safest action. This aligns to the well-known maxim in aviation: “Better to be down here, wishing you were up there; than up there wishing you were down here.” (Pratt, 2010, p. 2.6). In Stage 3, competence requires the student to deal with a greater number of experiences and associated elements and procedures. The student may often feel overloaded by the volume of connected features and the subsequent complexity of their situation. In achieving competence, the student demonstrates how they have learned to create a plan or choose a perspective that helps them to rationalise and filter the most important elements of the situation in order to deal with it. Aviation pilots are very familiar with the concept of mental ‘capacity’ and describe themselves as “not having capacity” when they experience mental overload when flying. This occurs invariably when the student pilot is exposed to situations of multiple demands. Dreyfus (2004) describes how the student becomes emotionally involved in tasks at Stage 3: competence and explains how the student may experience feelings of fear, elation, disappointment or discouragement depending on how well their choice of plan or perspective has worked. There is a significant connection here between developing competence, expectations of responsibility and the emotional effect on students. In describing Stage 4, Dreyfus (2004) explains how a competent performer

moves to a state of proficiency. This involves the performer becoming more emotionally involved in the tasks and through active participation will experience both positive and negative outcomes from the practice. In this way, successful perspectives will be strengthened and unsuccessful perspectives inhibited. Making situational discriminations and building a repertoire of experiences are key characteristics of developing proficiency. The proficient performer may take more time in decision-making than the expert. In Stage 5, expertise is typically demonstrated by an individual who has developed an extensive repertoire of situational discriminations and has the ability to make subtle and refined discriminations. The expert performer will be able to make immediate and *intuitive* situational responses that will invariably lead to positive outcomes. In her seminal work 'From Novice to Expert', Benner (2001, p. 13) refers to the Dreyfus Model and identifies changes in three general aspects of skilled performance through the different levels:

One is a movement from reliance on abstract principles to the use of past concrete experience as paradigms. The second is a change in the learner's perception of the demand situation, in which the situation is seen less and less as a compilation of equally relevant bits, and more and more as a complete whole in which only certain parts are relevant. The third is a passage from *detached* observer to *involved* performer. The performer no longer stands outside the situation but is now engaged *in* the situation.

Benner's work illustrates the breadth, complexity and importance of nursing clinical practice within seven general domains. Clinical practice may often be carried out at times of high intensity and danger to life; not unexpectedly, there are similarities that read across into aviation pilot practice. In Benner's (2001, p. 109) identified domain of "Effective Management of Rapidly Changing Situations" she considers skilled performance in extreme life-threatening emergencies:

This area of skilled practice includes the ability to grasp the problem quickly, to intervene appropriately, and to assess and mobilize the help available.

As we will see, aviation pilots use decision-making models to assist in the management of emergency situations and this process is embedded within the ICAO competency framework (Appendix 2). The area of competency "Problem Solving and Decision Making" indicates the necessary observable behaviours of pilots when experiencing

problems during flight; however, the other seven competency areas may also feature within any particular situational response.

An alternative concept to competence in the recognition of professional attainment is that of *capability* (Lester, 2014, p. 37). Capability is less tangible than competence in that competence pays undiverted attention to getting the specific job or task done correctly, while capability allows space for the practitioner to perhaps make judgements about the task. The assessment of capability is more complex as the practitioner is observed as being somewhere on a continuum, however, it can be argued that the approach is open and developmental. In some professions this will work well. Nottingham (2012, p. 43) argues that "...capability is ... seen as a more key concept than competence in workplace learning." The context for the argument is centred in describing the emergence of a transdisciplinary model of work based learning. This model of work-based learning involves a tri-partite relationship between the employer, the student and the university. The student will be following a workplace curriculum with generic learning outcomes. However, Lester (2014, p. 37) suggests that capability is not so easy to define and that it "... has a know-it-when-you-see-it property that cannot easily be translated into standards and specifications." This could prove problematic within the highly regulated aviation sector. As will be discussed later in this chapter, the pedagogical terrain for work-based learning is particularly complex and in this context of considering an undergraduate degree in professional aviation pilot practice there are structural issues to contemplate, in particular, in answering the question of "Where on a work-based learning continuum can this programme be positioned?" Notions of competence, capability, negotiated learning and professional practice will all feed into attempting to answer this question.

Within aviation pilot training the safety critical context takes precedence and this may point to the rationale for the sector, in recent years, choosing a competence-based approach to training rather than a capability-based approach. Flying an aircraft is necessarily procedural and a competence-based approach for licensing pilots is appropriate within these parameters. However, the situation within the cockpit is dynamic and every flight is different. The idea of capability (Lester, 2014) should not be dismissed completely within the aviation context and the opportunity that a degree programme in professional aviation pilot practice offers alongside pilot training may be a way of introducing the wider attributes and benefits of capability. For example, for practitioners working in emergent contexts, making ethical and intelligent judgements

in their evolving practice, these are things that the challenge of higher education can shine light upon.

The learning dimension of higher education for aviation pilots

a) Graduate skills and future skills

In this analysis of degree level higher education that is integrated with the professional training of aviation pilots, it is important to understand how the degree requirements are standardised, what characteristics are being assessed and what attributes are expected to be displayed by graduates of the HE programme. This will add to the understanding of how well this complex mix of expectations from the professional and academic domains assist in pilot development.

When the degree in Professional Aviation Pilot Practice was developed, the Quality Assurance Agency *UK Quality Code for Higher Education* (QAA, 2014) provided the definitive reference point for all UK higher education providers. It had been designed to protect the interests of all students in higher education by ensuring that universities understood what was expected of them and to ensure transparency for the general public. The code was applied within all four nations of the UK and wherever UK universities operated internationally.

The Quality Code had three Parts. Part A: Setting and Maintaining Academic Standards; Part B: Assuring and Enhancing Academic Quality, and Part C: Information about Higher Education provision. Part A set out ‘The Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies’.

These Frameworks for Higher Education Qualifications (FHEQ) descriptors provided the benchmark standards for undergraduate degrees in the UK at the time. Students taking a Middlesex University BSc (Hons) degree in Professional Aviation Pilot Practice needed to meet the threshold standards in order to achieve the award. Appendix 3 shows the descriptor for a higher education qualification at level 6 on the FHEQ: bachelor’s degree with honours.

The Revised UK Quality Code for Higher Education was published in 2018 and at the time of writing there is an ongoing consultation on the ‘Higher Education Credit Framework for England: Guidance on Academic Credit Arrangements in Higher Education in England (second edition)’ 2020.

However, the QAA had published ‘Annex D: outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees’ in 2019 and this helpfully outlines six *characteristics* against which the degree student will be assessed:

- knowledge and understanding
- cognitive skills
- practical skills
- transferable skills
- professional competences, where relevant.

Detailed descriptors of these broad graduate attributes have been published (Appendix 4) and some flexibility is allowed in their application to allow for varied disciplinary provision and where emphasis of particular characteristics may be naturally skewed according to the programme.

Both ‘The Frameworks for Higher Education Qualifications of UK Degree-Awarding Bodies’ and ‘Annex D: outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees’ provide very good insight into expected graduate outcomes within English higher education. They also provide very useful benchmarks that can be used as reference points for this research when attempting to evaluate the attainment of undergraduate student pilots.

Middlesex University have developed a list of desired graduate attributes (Middlesex University, 2020) that programme developers should embed into their designs. The attributes have been drawn from:

the Framework for Higher Education Qualifications, SEEC Credit Level Descriptor 6, with themes drawn from the World Economic Forum’s identification of necessary skills for the next decade and HEPI’s 2015 review of required skills for employability. (Appendix 5)

The graduate attributes are expected to allow students to be:

- Strong communicators
- Effective team players
- Digitally literate
- Ethically informed
- Culturally competent
- Resourceful

- Creative
- Numerate

In their consideration of future, higher level skills requirements, Universities UK point to the need for a ‘whole skills approach’ that combines subject specific skills, transferable skills and the experience of the workplace:

Subjects and skills will need to be combined and re-learned throughout working life and the difference between academic and vocational qualifications, which is already blurred, will become less relevant, whereby a ‘whole-skills’ approach needs to be adopted. Subject-specific skills will need to be underpinned by a range of transferable skills. Work experience will be invaluable to developing learners who can apply their knowledge and skills to real-world problems and move easily between learning and working. To succeed in the future, learners will also need to think like employees, and employees will need to think like learners. (Universities UK, 2018, p. 4)

Further, in discussing the problem that educators need to be able to produce ‘work ready’ graduates, it can be recognised that this ability is a key feature of the aviation partnership programmes at Middlesex University. In the third year of the degree programme, the student must be working in the capacity as a Flight Instructor or as a First Officer with an airline.

The report emphasised the need for universities to have continual and flexible collaboration, communication and partnership with employers.

The linear career path is expected to ‘cease to exist’ (PWC, 2017), which will require future employees to be flexible, resilient and committed to lifelong learning as a fact of working life. (Universities UK, 2018, p. 10)

In relation to particular skills that graduates need, the report points to resilience as being important on the basis that the future landscape for careers and work is likely to be chaotic, turbulent and uncertain, for example, that ‘portfolio’ careers will become more commonplace. A commitment to lifelong learning is also an expected requirement as well as the ability to manage their own careers.

b) PAPP degree requirements

The BSc (Hons) degree in Professional Aviation Pilot Practice at Middlesex University is intended to prepare and support students in their early stages of training, development and practice as a commercial pilot. This almost sounds benign, however, the programme is structured with an ambitious and complex mixture of expectations. As we will see, the marrying of a heavily regulated and prescribed working practice with the regulated demands of higher education presents a particular set of challenges for those wishing to

engage in this type of learning. Part of the challenge for students is that codified knowledge exists within both domains and the pedagogical delivery mechanisms used in this specific case, involve real world as well as institutional engagement.

The aims of the programme (Middlesex University, 2019a) give useful detail of its specific intentions for students and can be found in Appendix 6.

The programme is framed within a standard, full time undergraduate schedule of three years, Table 2.2 provides the outline:

LEVEL 4	LEVEL 5	LEVEL 6
Pilot Review and Professional Development 30 credits WBS1201	Basic Flying 1 30 credits WBS2201	Advanced Flying 40 credits WBS3207
Flight Operations 30 credits WBS1202	Basic Flying 2 30 credits WBS2202	Multi Crew Co-operation 20 credits WBS3208
Navigation 30 credits WBS1203	Flight Instruction 30 credits WBS2205	Evaluating and Managing Risk 30 credits PPT 3011 or Aircraft Specifics 30 credits WBS3203
Aircraft and Air environment 30 credits WBS1204	Flight Instruction Standardisation 30 credits WBS2206	Threat and Error Management 30 credits PPT 3012 or Airline Orientation and Integration 30 credits WBS3204
120 credits	120 credits	120 credits

Table 2.2: BSc (Hons) Professional Aviation Pilot Practice Programme Structure (adapted from Middlesex University, 2019b)

Students are required to sequentially complete all of the modules at each particular level before progressing onto the next level of study and practice.

At level 4 the students complete the first module ‘Pilot Review and Professional Development’ during the course of the first academic year with support and guidance from the module leader at Middlesex University. The other three modules at level 4: Flight Operations, Navigation and Aircraft and Air Environment are wholly integrated with the CAA ATPL theoretical knowledge examinations that must be successfully completed before progressing further with commercial flight training. These present an intensive challenge for the students and comprise 14 examinations in the areas of: Air Law, Operational Procedures, Human Performance and Limitations, Meteorology, VFR Communications, IFR Communications, General Navigation, Flight Planning, Aircraft Performance, Principles of Flight, Mass and Balance, Aircraft General Knowledge - airframe/systems/powerplant, Radio Navigation and Aircraft general knowledge – instrumentation (CAA, 2021c). The detailed knowledge requirements can be found in ‘Easy Access Rules for Flight Crew Licencing (Part-FCL)’ (EASA, 2021b). Students are supported in their learning for these examinations by a team of instructional staff who operate a ground school at the flight training organisation. The subjects are taught by specialists who each have extensive experience of working within the aviation sector.

At level 5, the first two modules ‘Basic Flying 1’ and ‘Basic Flying 2’ encompass the ‘hours building’ phase where students are required to complete the required hours of flying prior to completing the training required for the Licence Skills Test for the Commercial Pilot Licence (CAA, 2021d). Students are supported at a distance by module leaders at Middlesex University and continue to develop their capabilities as reflective practitioners. This is done by completing coursework that is based upon and aligned with the stage of flying development that the student is engaged in. The final two modules at level 5 are ‘Flight Instruction’ and ‘Flight Instruction Standardisation’. During this period the students undertake a flight instruction course at the FTO and learn the fundamentals of flight instruction. This is an eight week programme that combines ground school with flying practice. The flight instruction standardisation phase comprises an extended period of instructional flying where the degree students begin teaching their own students. Once again, during this period, they are supported by a module leader at the university who guides them to completing the associated degree modules.

At level 6 the students are continuing in their role as instructors and typically, begin the journey towards being employed by an airline. The first module ‘Advanced Flying’ is

associated with the training required for an ‘Instrument Rating’. This is where the student learns to fly in cloud with reference only to the instruments in the cockpit, an essential requirement for an airline pilot. The second module ‘Multi-Crew Cooperation’ prepares the student for working in a multi-crew environment, once again, the students are required to complete a training course at the FTO at the same time as taking the degree module. Students have a choice of pathway for the final two modules at this level: the flight instructor route or the airline route.

The flight instructor route allows the student to complete the degree while working as a flight instructor. The modules taken are ‘Evaluating and Managing Risk’ and ‘Threat and Error Management’. Within the module ‘Evaluating and Managing Risk’ the student is expected to critically evaluate and select responses to a wide variety of in-flight, human, environmental and other risk factors that affect each flight. Risks are considered to be vulnerabilities in the everyday experience of flying and students are supported in adopting a process of identifying, evaluating, mitigating, and managing risks. This module is wholly delivered by the module leader at Middlesex University and students use their prior and ongoing experiences of flight instruction as the supporting context for study. Within the module ‘Threat and Error Management’ the students are encouraged to recognise the inevitability of human error in the cockpit. Further, to understand this fallibility and promote their active engagement in identifying threats as a pre-emptive measure and to effectively mitigate the effect of errors as a reactive measure. Once more, the students critically reflect on their own experiences in relation to managing threats and errors as well as considering examples from the wider sector.

The airline route allows the student to complete the degree while working as a first officer for an airline. The final two modules of the degree are linked with the students gaining a ‘type rating’ and their early stage flying for the airline. The ‘type rating’ is effectively a licence to fly a particular type of aircraft, for example an Airbus A320 or a Boeing 737. The module ‘Aircraft Specifics’ encourages the student to critically reflect on their learning from taking the theoretical ground school element, the simulation phase of training and the initial flying of the aircraft within the type rating stage. The module also focuses on enabling the students to critique their experiential learning from their initial flights as a first officer. The final module ‘Airline Orientation and Integration’ turns the student’s attention to how they are orienting and integrating themselves into their airline’s organisation and culture. The students are encouraged to

demonstrate increasing criticality in taking account of different perspectives as they evaluate the effectiveness of their own practice. In the context of relatively early-stage line flying as a first officer, the students follow up their analysis by identifying relevant areas for improvement and further professional development. In this way, the degree is finished but doesn't end there. By presenting purposeful follow-up actions the student demonstrates their ability to lead and take responsibility for their ongoing professional development.

c) **Learning from practice**

Of crucial concern to the aviation pilot degree is the notion of *professional practice*. In fact, this is more than a notion; it is a fundamental expectation of attainment for those undertaking the degree programme. We have already considered the concept of 'professional' and how this can be conceived but what of 'practice'? What do we mean by *practice* and how can this be understood? It will become clear that a theoretical understanding of practice is required as a pre-requisite for any attempt at unlocking the complexities of work and learning.

Practice is such a useful and ubiquitous term that it is perhaps inevitable that it can sometimes be lazily applied, misunderstood or taken for granted. In relation to work and learning it is of central importance. In order to understand it better, it is helpful for us to consider the role of Aristotle (384BC – 322BC) as an instigator of modern conceptions of practice. Nicolini (2012, p. 23) explains a common view that Aristotle introduced the idea "... that practice and theory are two distinct and unequal epistemic objects" and that in this way "...laid the foundations for the historical demise of practice in the Western tradition." Also, that less known, Aristotle, in the guise of the author of *Nichomachean Ethics* "...established praxis as a separate form of knowing with its own logic and legitimacy, and which provided the basis for legitimating both." In his works, Aristotle articulates three types of knowing or intellectual disposition: *episteme*, this can be perceived as 'scientific knowledge' or gaining understanding of universal principles through analytic rationality; *phronesis*, can be understood as practical wisdom and *techne* as art or skill. Nicolini (2012, p. 26) assists in linking these concepts to modern understanding:

The aim of phronesis is to produce praxis or action informed by knowledgeable value-driven deliberations; the aim of techne, instrumental rationality is poiesis; i.e. the creation or production of material or durable artefacts.

Further, the connected concepts *techne/poiesis* can possibly be understood in modern terms as ‘making’ and this aimed specifically at material objects; while the connected concepts *phronesis / praxis* can possibly be described as ‘doing’.

Fundamentally, Aristotle laid the foundations for the legitimacy of *praxis* as a form of knowledge within the Western tradition, however, the notion of practical wisdom became lost until the twentieth century when Aristotle’s legacy was rediscovered.

Marx’s role in revitalising the concept of *praxis* should not be underestimated. Challenging the mentalist tradition and bringing to the forefront ideas of materialism, activity, the importance of physical processes and from the human perspective, simply ‘being’ in the world, provided a route to a better understanding of the connectivity between conscious thought, human activity and social existence.

Bourdieu’s work on habitus is closely related to the concept of ‘knowing in practice’. Experience is foregrounded as the catalyst for actors to internalise aspects of the social world and the subsequent behaviours of individuals and groups are based upon their interactions with experience. Importantly, the actors gain knowledge of ‘how to be’ in a particular context. Moreover, habitus helps us to recognise how the social (or practice) setting perpetuates itself through practices.

In trying to provide a concise answer to the question “What is practice?”, different definitions of practice can be found, from Nicolini (2012, p. 9):

‘[A practice is a] coherent and complex form of socially established co-operative human activities’ (MacIntyre 1981, p.187).

[Practice is] ‘doing, but not just doing in and of itself. It is doing in historical and social context that gives structure and meaning to what people do. In this sense, practice is always social practice’ (Wenger 1998, p.47).

In helping us to consider how practice can be conceptualised as an approach to theorising work and learning, Hopwood (2014) refers to the work of Hager (2011) who has described three identifiable approaches:

1. Psychological theories – behaviours and cognition – acquisition and transfer metaphors of knowledge, learning is seen as a product, often associated with reflection rooted in an individual epistemology of practice.
2. Sociocultural approaches – reject individual units of analysis and cognitive or technical rationality associated with behaviourism. Instead, metaphors of

participation are foregrounded – highlighting the social or relational nature of work and learning.

3. Practice approaches – Emergence replaces participation as the dominant metaphor, questions of temporality are expanded – rejection of linear, chronological ideas of learning, materiality is foregrounded, practice and learning are understood as complex (rather than complicated), non-linear, unpredictable emergence and multiplicity.

Hopwood (2014, p. 351) also helps to frame the notion of ‘knowing in practice’:

In abandoning metaphors of learning based on acquisition, possession and transfer, practice-based approaches conceive not of knowledge but of knowing. This is a performative rather than cognitive notion ... Gergen’s (1991) argument that knowledge is not something that people possess in their heads, but rather something that people do together (Gherardi, 2006). The idea of knowing in practice leads us to study knowing as an embedded social process, human and material, aesthetic, emotive and ethical, and above all, embedded in practice.

In particular, Hopwood (2014) conceptualises workplace learning as having four essential dimensions: temporal, spatial, bodily and material. He suggests that these dimensions are often conceived as invisible within important texts of work and learning. Hopwood’s conceptual framework considers two essential themes: the textured nature of practice and the connectedness of practice.

Theodore Schatzki has been well recognised as being influential in sign-posting the turn to practice within the late twentieth and early twenty-first centuries, Nicolini (2012, p. 2) assists in laying out the territory:

Schatzki suggested that the interest in practice in social theory builds on the intuition that ‘phenomena such as knowledge, meaning, human activity, science power, language, social institutions and human transformation occur within and are aspects or components of the field of practices’ (Schatzki 2001, p.2).

Nicolini (2012, p. 2) also describes the attraction of adopting the practice viewpoint in explaining:

That the appeal ...lies in its capacity to describe important features of the world we inhabit as something that is routinely made and re-made in practice using tools, discourse and our bodies. From this perspective the social world appears as a vast array or assemblage of performances made durable by being inscribed in human bodies and minds, objects and texts, and knotted together in such a way that the results of one performance become the resource for the other.

And takes the argument for adopting a ‘practice-based sensitivity’ further by co-opting the views of a series of theorists who propose that taking a practice view of the social can help to dissolve some of the problems that can’t be addressed by other traditional theoretical approaches, for example, “... the tendency of describing the world in terms of irreducible dualisms between actor/system, social/material, body/mind, and theory/action.” Nicolini (2012, p. 2)

Nicolini (2012, p. 3) goes on to emphasise five key elements of how practice-based approaches are radically different from other theoretical approaches:

All practice theories foreground the importance of activity, performance, and work in the creation and perpetuation of all aspects of social life.

practice theories bring to the fore the critical role of the body and material things in all social affairs.

practice theories carve a specific space for individual agency and agents.

adopting a practice approach radically transforms our view of knowledge, meaning and discourse.

all practice-based approaches foreground the centrality of interest in all human matters and therefore put emphasis on the importance of power, conflict, and politics as constitutive elements of the social reality we experience.

In an aim to introduce a framework to aid understanding, Reich and Hager (2014, p. 419) describe practice theories as resources that allow us to “...attend to the regularities of practice.”. This ‘attendance to regularities’ points to the notion of common characteristics or the building blocks of practice, however, these resources should not be conceived as static objects with a simple role, they carry energy, ultimately, they provide conceptual nodes from which practice can be more deeply explored and theorised. Reich and Hager (2014, p. 419) describe six common threads that can be used as a framework for theorising professional practice:

The first thread is that practice is a collective and situated process linking knowing, working, organising, learning and innovating, a “knowing-in-practice”. The second thread is that it is a socio-material phenomenon. This leads to the third thread that practices are embodied and a fourth thread that practices are relational. The fifth thread is that practices exist and evolve in historical and social contexts, shaped by complex forces, including power. The sixth thread is that practices are emergent in the sense that the ways that they change and evolve are not fully specifiable in advance.

The first thread, challenges the widely held notion of the fundamental relationship between knowledge and practice in that knowledge is something held in the mind and exists as a cognitive object that can therefore be transmitted. These authors cite Gherardi (2008, p.523) in helping to redefine the concept:

[...] knowing-in-practice” in which knowing is an activity that itself constitutes the practice, a collective and distributed “doing” [...] situated in time and space, and therefore as taking place in work practices. (Reich and Hager 2014, p. 421).

Reich and Hager add detail to this conceptual shift:

This shift from knowledge as product to knowing-in-practice opens up its analysis as *mediated* (in language, technology, collaboration and control); *situated* (specific contexts in time and space); *provisional* (constructed and constantly developing); and *pragmatic* (object-oriented and purposive) (Blacker, 1995, cited in Gherardi, 2012, pp. 20-21). (Reich and Hager 2014, p. 421).

The second thread involves recognition that practice is a sociomaterial phenomenon. Understanding this can be aided by taking a systemic view in that practice involves human actors, non-human objects and artefacts that exist with positional and temporal natures. This thread helps to describe the complex environment in which practice is enacted. Many forms of practice require rules to be followed, this is especially true within aviation, an obvious example being the requirement for pilots to work through checklists prior to take-off. Human involvement in practice is often intertwined and connected to material objects that are essential for practice to take place. This interconnectedness will often require recognisable ‘sayings and doings’ from the actors in the location and timeframe that practice is taking place. In aviation, communication phraseology to be used with Air Traffic Control (ATC) is guided through ‘Radiotelephony Manual: CAP 413’, (CAA, 2020). Practical guidance on the operational, safety and regulatory issues required for General Aviation pilots is provided by ‘The Skyway Code: CAP 1535’, (CAA, 2021e).

The third thread considers that practice is embodied within individuals and within other associated bodies as well as in material things. Practice can sometimes be exemplified by collective co-ordination of participants who may be engaged in patterns of practice that may be codified and prescribed. Even in heavily regulated and procedural forms of practice there may be uncertainty and dynamic ambiguity. This is the case in aviation where every flight is different due to weather, aircraft loadings and multiple other affects. Pilot and crew interactions, dialogic deliberations and embodied connections

with physical systems are crucial to flight safety. It is worth considering how each 'practice event' is unique and can never be exactly repeated.

In the fourth thread of considering practice as being relational, Reich and Hager (2014) have identified three types of relations: the first are relations between the people involved at the site of practice. Secondly, are the relations between the human participants (actors) and material objects, for example, with technologies or any non-human objects. Thirdly, are the changing relations between material objects and their environment, specifically, the spaces where practices occur or may carry influence. Contemporary theories of professional practice may use ideas of 'ecology', 'network', 'orchestration' and 'choreography' as tools for analysing practice. A crucial concept is that practices are often co-produced and that knowledge can be co-constructed. Within aviation pilot practice the relations between the flight crew, ground crew and air traffic services are particularly crucial. The human links with the complex array of technologies that constitute an aircraft and its support systems impose necessary levels of familiarity and capability with this material world for all concerned. An aircraft flight creates constantly changing relations between the material objects and the surrounding environment. The connection between the aircraft and all human occupants presents an unusual reliance on systemic safety.

The fifth thread helps us to consider how practice can change over time and how local representations of practice are the result of historic and socio-political arrangements. The practice of aviation pilots typically exists with a stringent economic backdrop. The costs of training within aviation are very high and this manifests itself at all stages of training, including when working for a commercial organisation. Power structures are constantly at play within the industry sector, for example, during the pandemic many aviation pilots became unemployed and job opportunities for new entrants plummeted (Independent, (2021), BALPA, (2021b)). Commercial aviation organisations began recruiting again as restrictions eased. Risks to discontinuity of employment are very real for all pilots, regular medical and recurrence testing for capability is the norm. Within the cockpit, practice is often shaped by power exerted from the organisation as well as that exerted within the team, for example, the relationship between captain and first officer, sometimes referred to as the 'cockpit authority gradient'.

Finally, the sixth thread that considers the emergent nature of practice can be readily conceptualised within professional aviation pilot practice. There are very few practices that take place in such a physically dynamic context. In flight, the aircraft operates at

high speed within an ever-changing, complex, natural environment. Within the aircraft, the complexity of the journey and the conditions must be managed by a series of transactions and collaborative workings by the crew. This requires a high degree of technical proficiency and equally a high degree of non-technical skills to be exercised by all of the human actors.

As we can see, learning has fundamental links to practice. A variety of modes of learning through practice have been identified and some of these are considered below.

Integration of work and learning

a) Apprenticeship

On entry to the degree in professional aviation pilot practice, the students will have already obtained a Private Pilot's Licence (PPL). However, prior to this, the majority will have begun their training with little or no knowledge of aviation pilot practice. They are most likely to have been absolute novices. At the beginning of training, in order to learn, they would need to be taught by, or work with, a more knowledgeable practitioner. Essentially, the transfer of knowledge and the practical abilities of handling of an aircraft would occur through a series of social exchanges, the relationship between novice and expert being absolutely crucial to the effectiveness of the process. In my first visit to the FTO, I recognised a familiar pattern of learning being enacted within the FTO. The trainee pilots were experiencing periods of formal theoretical learning within a classroom and this was being combined with episodes of development of technical proficiency under the tutelage of a more experienced practitioner. My prior experience led me to consider that what I was observing was similar to apprenticeship training and the Managing Director of the flight school agreed that there were similarities. This similarity encourages exploration of exactly how the technical and theoretical aspects in pilot practice are combined, in order to allow students to reach the higher levels of competence required of professional pilots. Interestingly, the PAPP degree, as we will see, has some connections with the developments of Higher and Degree Apprenticeships at Middlesex University as they have grown in prominence during the past decade.

Apprenticeships have long been recognised as a formalised approach to the development and transfer of occupational skills and knowledge. The historical purpose of apprenticeship was often rooted in learning a craft or trade. In the twentieth century, apprenticeships in the U.K. could be characterised in three ways: the first as being a

mode of training and learning that would often carry contractual obligations for the employer and the person in training; secondly apprentices were typically young people and as such, needed to be introduced to the workplace and learn how to operate with adult responsibilities within it; thirdly, that learning could take place while either on or off-the-job i.e. at the site of work or away from it. Fuller and Unwin (1998, p. 154) provide further insight into the transformational effect of apprenticeship:

Furthermore, apprenticeship is an international concept which provides a structure within which young people can learn and, most importantly, demonstrate their abilities and potential whilst, at the same time, discovering their identity.

Apprenticeships have also been described as examples of communities of practice (Bratton *et al.* 2010, p. 171, Fuller and Unwin, 1998) that has foundations in Vygotsky's sociocultural theory of learning. More recently, Lave and Wenger have helped to promote understandings of learning that is 'situated'. Although an apprentice will be situated at the site of practice, according to Lave and Wenger their positionality is dynamic as time progresses. The novice will transition from the periphery of the community towards the centre as their expertise develops. Ultimately, they should attain the status of 'master' or 'expert'. Wenger *et al.* (2002, p. 27) proposed that learning can occur as a result of participation in a community of practice and defined this as:

a unique combination of three fundamental elements: a domain of knowledge, which defines a set of issues; a community of people who care about this domain; and the shared practice that they are developing to be effective in their domain.

In Australia, Bates and O'Brien (2013) have shown how the experience of undergraduate students in aviation as members of a Community of Practice (CoP), is closely linked with professional identity and professional formation. Bratton *et al.* (2010, p. 171) provide further clarification of the three dimensional structure:

The domain creates a common sense of identity for the members, the community creates the social fabric for the learning, and the practice is a set of ideas, information, stories, documents and tools that community members share.

This resonates with my own experience of being an apprentice engineer during the 1970s. This experience was founded on a highly structured dual system of training and education. At this time in the U.K. Industrial Training Boards provided the organising frameworks for apprenticeships having been established following the Industrial Training Act 1964 (Fuller and Unwin 1998, Broadhead and Hague 2010). The first year

of training was undertaken ‘off the job’ in an industrial training centre (Broadhead and Hague 2010), the training being undertaken according to Engineering Industry Training Board (EITB) standards. Each trainee or apprentice would attend the local Technical College for one day and one or two evenings per week on a suitable programme that matched the skill area for the apprentice. This effective separation of theory from practice in post-War apprenticeships has not been without its critics (Fuller and Unwin 1998). The knowledge domain and sense of identity (as well as power relationships) were introduced from the first minute during my introduction to the training centre. The rules and regulations around health and safety were of immediate importance and were continuously related to the apprentices in each of the various areas of practice to which they were introduced. A period of ‘Broad-based Training’ meant that each trainee or apprentice would spend one week in every section or specialist area of engineering. This was followed by a period of ‘specialisation’ where the apprentice would undertake training to a higher level in their particular specialism.

Certainly, ideas, information, stories, documents and tools were shared during this period but also experiences were lived. The first year of training was followed by a further three years of work-based training and development in the apprenticeship. This was known as becoming ‘time-served’. The transfer into the industrial site of learning was hugely significant. In my case the transfer was to a large factory which formed part of an international packaging company. The European owned organization was very supportive in training and education; it also encouraged a multi-skilled approach for engineers wherever this was possible. In the 1970s the latter wasn’t commonplace within industrial settings as demarcation and single skill recognition was the norm. I worked and trained with skilled engineers and followed prescribed developmental training objectives according to EITB standards. I was required to keep a log book (learning diary) of significant jobs or pieces of work that I had undertaken and these were aligned to the training objectives. I needed to demonstrate ‘satisfactory’ competence in particular skills three times for this to be finally signed off as completed. The process was monitored by a training co-ordinator from the local EITB aligned engineering Group Training Association. The monitoring was a collaborative process between the training co-ordinator, the engineering foreman and myself. The community of practice at this site of learning was much larger and I was led towards completing an apprenticeship in mechanical engineering. I was encouraged to continue with part-time study in the subject area of engineering during this period and beyond. In reflecting on

this period I realise that much of the learning that I gained through taking this route, I have carried forward into subsequent roles. In particular, I can recognise the developed capacities to embed myself in the socio-cultural framework within a variety of sites of practice as well as the perhaps, linked underpinning of the requirement to engage in work.

In the English educational system apprenticeships can begin at level 2 although, most occur at level 3. It is not uncommon for apprentices to progress beyond level 3 into higher technical education, however, the UK lags behind its competitors in this regard (Department for Education, 2019). The Institute for Apprenticeships and Technical Education (2021) have produced occupational maps and very useful descriptors that categorise the potential development stages for apprentices:

Occupational Type	Technical Occupations	Higher Technical Occupations	Professional Occupations
Apprenticeship Levels	Level 2 and Level 3	Level 4 and Level 5	Level 6 and Level 7

Table 2.3: Occupational Types and Apprenticeship Levels.

Adapted from: Institute for Apprenticeships and Technical Education (2021).

During the last decade, significant work has taken place by government, employers and the HE sector in developing higher apprenticeships and degree apprenticeships. Middlesex University has contributed significantly to these developments (House of Commons Education Committee, 2018, p. 13), and in 2011 was one of only two universities that were awarded higher apprenticeship development funding by the UK government (Department for Business, Innovation and Skills, 2011). Outputs from this work included the development of higher and degree apprenticeships in construction, aviation, retail, health and social care, management and sales. Of interest here is that the development in aviation was not taken forward in the guise of an apprenticeship but as a stand-alone degree.

The Degree Apprenticeship Development Fund (DADF) was launched in 2016 with the intention of boosting capacity and internal infrastructure within higher education (Office for Students, 2019) and Middlesex University were awarded phase 2 funding to enhance access to the public sector professions in London (Lillis, 2018, p. 6). This timeline of activity over the last decade has particular importance to this research for two reasons: the first is that the development of the degrees in aviation at Middlesex University has

concurrency with degree apprenticeships that were developed for other sectors and this work emanated from the Institute for Work Based Learning; secondly, there are important pedagogical considerations as the recent developments in degree apprenticeships at Middlesex University have been described as ‘Work-Integrated Learning’. There is scope for extending our understanding of this term and in particular, understanding how it may be linked with the degree in aviation pilot practice.

In their literature review into work-integrated degrees in HE on behalf of the QAA, Lester, *et al.* (2016, p. 1) explain their conception of the term:

The term 'work-integrated' is used both as a broader term than 'work-based', and to emphasise connectedness of learning as opposed to academic and workplace learning taking place in parallel but independently of each other.

In recent work, Lillis and Bravenboer (2020, p. 728) illuminate the way that similar pedagogies can assist delivery in a variety of types of public sector degree apprenticeships. In following the work of Lillis (2018) and Lester and Bravenboer (2020), they highlight that:

successful WIL pedagogies are intrinsically resilient, potentially transformative for higher education provision post-COVID-19 if providers are organised to recognise and deploy them.

The evidence from Middlesex University on the successful implementation of public sector degree apprenticeships shows that this type of provision can work, however, in the case of pilot training there would be some key issues to resolve before degree apprenticeships could be considered. For many airlines, this could mean taking on the responsibility for foundation pilot training, whereas, this responsibility sits with the student, in most cases at present. Undertaking an apprenticeship requires the apprentice to be in related paid employment, rather than self-funding professional development, as is currently the norm. This would present a culture change for the sector. There are examples of pilot apprenticeships in the UK (Careers in Aerospace, 2021a) and these, sometimes, share the financial responsibilities for professional development between the trainee pilot and the employer. There are currently three traditional routes through pilot training: Integrated route, Modular route and Multi-Crew Pilot’s Licence (MPL), it is these that would need to be considered within any developments in pilot training (Careers in Aerospace 2021b).

b) Work Based Learning

As will become apparent, work-based degrees generally exist within the overlapping spaces between higher education and the profession. The context for the degree in professional aviation pilot practice can be conceptualised as primarily lying in the central area of Figure 2.1. Examination of what is understood by work-based learning will help towards positioning the aviation degree as a particular form of learning. The term ‘work-based learning’ can broadly be described as any learning that arises or is gained by someone operating at their place of work. This broad description encompasses the huge variety in the ways that people learn at work. Learning at work can occur at any time, it may be unplanned or arise unexpectedly, it can also be formally structured and planned. Much of this learning can go unaccounted for, alternatively, it may be recognised through formally recognised systems of attainment. When learning is accredited it is often recognised as being at a particular ‘level’. Within the English system of higher education an undergraduate degree programme begins at Level 4. Much work-based learning occurs below this level, however, since the late 1980’s there has been significant research and development in Work Based Learning (WBL) within Higher Education Institutions (HEIs) with the focus on higher level learning and in particular, the potential transformational impact that can occur for individuals and organizations through this form of work based learning. Work Based Learning has been described as a new paradigm in higher education (Boud and Soloman, 2001). In his inaugural lecture, Garnett (2004) helped towards defining WBL as understood at Middlesex University at this time:

A learning process which focuses University level critical thinking upon work, (paid or unpaid) in order to facilitate the recognition, acquisition and application of individual and collective knowledge, skills and abilities, to achieve specific outcomes of significance to the learner, their work and the University.

Middlesex University has played a pioneering role in the development of WBL within the U.K. and beyond, and in doing so, demonstrated extraordinary institutional commitment (Portwood and Garnett, 2000). During the 1990’s a research project that explored the curriculum in the workplace (Portwood and Costley, 2000, Portwood, 1993) led to the establishment of the National Centre for Work Based Learning Partnerships and became a Centre for Excellence in Teaching and Learning in Work Based Learning at the university having received this award from the Higher Education Funding Council for England (HEFCE) in 2005. The university established the Institute for Work Based Learning (IWBL) in 2007. Over this period, a curriculum in Work

Based Learning Studies was developed with programmes available at undergraduate degree and Master's degree levels. In 1997 a Professional Doctorate was introduced. This innovative work encouraged other U.K. HEIs to develop their own provision and WBL developed into an established mode, subject and field of study (Garnett *et al.*, 2009, Gibbs and Garnett, 2007). In 2009, HEFCE also awarded Middlesex University £8m to establish the Middlesex Organisational Development Network (MODNet).

WBL was also being developed overseas with particular interest and developments in Australia and Europe, specifically in the U.K., France and the Scandinavian countries (Costley, 2007). It has been recognised that there has been increasing research interest in WBL internationally, particularly between the years 2015 and 2020 (Bezerra *et al.* 2021). In their bibliometric and network analysis of research publications, Bezerra *et al.* show that there has been increasing interest in South Africa, Canada and USA. European and Australian research outputs were shown to be the highest numerically and Monash University (Australia) and Middlesex University (U.K.) with the most productive authors in WBL being based in these universities too.

The Work Based Learning Framework at Middlesex University (2011) provided the underpinning for curriculum and programme development in WBL and was developed with the foundations of a series of influential learning theories and approaches to learning. One of the most significant of these was the notion of 'Mode 2 knowledge' (Gibbons *et al.* 1994, Nowotney *et al.* 2003). Mode 2 knowledge has been described as having five key characteristics (Nowotney *et al.* 2003): the first is the recognition that Mode 2 knowledge arises from within a context of application. Effectively, this requires consideration of all aspects of the environmental conditions of activity in order to develop understanding. The second characteristic is 'trans-disciplinarity', this refers to an approach to problem solving that embraces the use of a range of theoretical perspectives and practical methodologies as a deliberate strategy. It differs from interdisciplinary and multi-disciplinary approaches in that the expertise is not necessarily drawn from pre-existing disciplines and that knowledge is perceived primarily within the expertise of the research teams and individuals as much as it can be gleaned from traditional sources. The third is the acceptance that sites of knowledge production have become more diverse. The capacity for instantaneous communication and digital sharing has greatly assisted in this. The fourth characteristic is that 'Mode 2' knowledge is reflexive. This encourages a dialogic approach to research and presents a challenge to a perhaps, traditional objective approach to inquiry. Finally, 'Mode 2' knowledge

requires new forms of quality control. The traditional process of ‘peer review’ becomes destabilised because of the lack of primacy of codified disciplines and this is compounded by the enabling of more producers of knowledge. This results in a need for the reframing and re-interpretation of the quality of knowledge.

Another significant theoretical influence on the Work Based Learning Framework was the Kolb (1984) experiential learning cycle. The WBL curriculum model was structured with modules that could overlap the phases of Kolb’s cycle. For example, the module ‘Review of Learning’ could be aligned to reflective observation on concrete work or practice experience. The module ‘Professional Development’ could be aligned to reflective observation that leads to abstract conceptualisation. The module ‘Practitioner Inquiry’ could consist of abstract conceptualisation that would inform active experimentation while the module ‘Negotiated WBL Project’ could find alignment with active experimentation that would, in turn, enhance concrete experience.

A further influence came from some ideas from work carried out in 1968, when Malcolm Knowles introduced the new concept of ‘andragogy’ into the field of adult education. Developing interest in adult learning led to Knowles initially defining andragogy as:

the art and science of helping adults learn, in contrast to pedagogy as the art and science of teaching children. (Knowles, 1980, p. 43).

This provided an important conceptual shift and laid the foundations for much future debate. Andragogy presented five underlying assumptions about the adult learner (Merriam, 2001, p. 5) stating that the adult learner:

- Has an independent self-concept and who can direct his or her own learning.
- Has accumulated a reservoir of life experiences that is a rich resource for learning.
- Has learning needs closely related to changing social roles.
- Is problem-centred and interested in immediate application of knowledge.
- Is motivated to learn by internal rather than external factors.

The ‘andragogical model’ presented later (Knowles *et al.* 2020:43) pointed to the developed assumptions of:

- The need to know: stating that adults need to know why they need to learn something before taking part in learning.

- The learner's self-concept: the self-conception of being able to direct their own learning.
- The role of the learner's experiences: in particular, recognising the richness of these as a learning resource, the need for individualised teaching and learning strategies and the recognition of the formation of identity in the learner.
- Readiness to learn: this links readily to the developmental or transition stages in learning, adults can conceive of the requirement for developmental stages.
- Orientation to learning: adult preferences are for task-centred, problem centred or life-centred learning.
- Motivation: can come from external factors such as promotion or higher pay, however, internal factors such as self-esteem or job satisfaction can carry equal influence.

Critics of the concept point to the problem of the absolute focus being on the individual learner while ignoring the socio-historical context in which learning takes place (Merriam, 2001). In later work, Knowles *et al.* (2020, p. 80) present the 'Andragogy in practice model' and this addresses some of the contextual deficiencies evident in previous iterations. However, the fundamental assumptions of andragogy provided useful sign-posts as to how the Work Based Learning Framework could be implemented with adult learners.

A final significant influence came from the work of Lave and Wenger (1991) where they challenged the traditional view that the learner was simply a receptacle to be filled with knowledge by being taught, the transmission model of learning. They recognised that learning would often rely on context, that diverse sites of learning existed and that the learner should be viewed as a co-participant. Most important, was not the fact that learning could be carried out at different locations but that it was a social process that was complex and relational. The relationships between people at work were described as 'communities of practice'. Communities of Practice (CoPs) can be recognised as consisting of three structural elements: a domain of interest where members of the community demonstrate a shared commitment and shared competence; a community, where members actively assist each other, build relationships and learn; a practice, where practitioners share their experiences, tools and expertise (Bratton *et al.* 2010, Matthews and Candy, 1999, Wenger-Trayner and Wenger-Trayner, 2015)

CoPs provide a useful focal point for analysis as they offer a notional boundary of activity and practice. Lave and Wenger (1991) considered the concept of peripheral

participation and particularly how newcomers become accepted into a community. The development of identity and the journey from novice towards expert are recognised as important issues and illustrate the dynamic nature of CoPs.

Critics of the theoretical insight provided by Lave and Wenger have pointed to the limitations in being able to apply their perspective the modern workplace within advanced industrial societies and to institutional environments that provide the site of work for many people. These situations are perceived as complex and often present barriers to employee learning (Fuller *et al.* 2005).

Each of these theoretical approaches held its own significance in the conceptual development of WBL programmes in the Institute for Work Based Learning. Added to this, reflection on practice (discussed below) provided a consistent pedagogical tool that was threaded through each module in the Work Based Learning Framework (Middlesex University, 2011).

Using the workplace as the object of study and learning from the experience of undertaking work as a means of improving practice, necessitates a distinctive pedagogical approach (Talbot and Lilley, 2014). WBL operates with a series of key characteristics, the first being that it can be used wherever 'work' takes place. The work may be paid or unpaid, for example, voluntary or community-based purposeful activities can be used as objects of study. Secondly, a thread of negotiation exists within the process of WBL. In individual programmes there is a crucial relationship between the learner and the work-based tutor or facilitator and through this relationship a formal agreement or learning plan will be established (Lester and Costley, 2010). Thirdly, a tri-partite relationship often exists in WBL between the student, the employer and the university, the employer plays an active part as an enabler at the site of learning and since work provides a focus for learning the employer may ultimately be a beneficiary of the process. More than this, there can be a transformational effect on the student as well as to organizational capital (Garnett *et al.* 2009) that results from the engagement in WBL.

A typical 'curriculum' for WBL in higher education may begin with the student being guided to reflect on their prior, experiential and recent learning. This supportive process can lead to the student gaining academic credit by demonstrating their ability to critically dissect and present their significant areas of learning and expertise. The accreditation of prior learning may include a combination of learning that has been

previously undertaken and pre-certified as being at HE level as well as learning that is being presented in a portfolio format that has resulted from the review of learning process. This process of developing a claim for prior learning can be hugely developmental with the student engaging in processes of increasing self-awareness, critical reflection, evaluation of past learning as well as considering the future directions for personal and professional development and study (Lester and Costley, 2010).

A key feature in the WBL 'curriculum' is the work based learning project. A work based project is normally centred around the normal practice of the student, it may focus on a problematic feature of everyday practice or an area that needs to be explored in order to instigate some kind of change or to develop new knowledge. It is inquiry-based learning, a form of work-based research that has potential to be transformational. Students may demonstrate their awareness of theory that relates to the project rather than using formal theory to drive the project forward (Talbot and Lilley, 2014). In working this way, students become practitioner-researchers. Garnett (2009) has explained how knowledge created through Work Based Learning projects can feed into the structural capital of the workplace.

The student-tutor relationship is essentially a partnership whereby the tutor facilitates student learning, they can act as a guide to the learning process. Tutors help the work-based student to navigate the process of undertaking work based learning and assist in their academic development. In considering the process of assessment, Lester and Costley (2010, p. 566) outline the fundamental stance of WBL:

The aim of assessment is generally to assess learners' progress as 'map-makers' or self-managing practitioners..., not to confirm their conformance as 'map-readers' (i.e. their mastery of propositional knowledge or ability to demonstrate occupational competence). Its focus is typically concerned with learners' reasoning and critical reflection, how they develop their capability as practitioners and practitioner-researchers, and how they make critical judgements in the work context
...

From these key characteristics of WBL it can be seen that the over-arching features of flexibility and openness present a democratic power to this mode of learning. The flexibility of WBL programmes is demonstrated by the fact that they can be structured to support individual students or they can be developed for organizational groups through partnerships with employers.

The Work Based Learning Framework (Middlesex University, 2011) provided a sophisticated mechanism for the development of university awards in Work Based Learning and Professional Practice. A key element in the success of this framework was the fact that it had been designed as a Middlesex University WBL Framework. This meant that it could be accessed and applied by any faculty or disciplinary area of the university. Another key feature was that it had a robust and integrated quality assurance process for the approval of awards and award titles. New awards, for example, with a significant industrial or commercial partner, would need to follow a standardised route through the School Academic Planning Committee, the Institute Academic Planning and Quality Committee, the University Academic Programme Planning Group and a Framework Programme Approval Panel with School representation before validation could occur. Although, this process appears to be complex, in practice, it proved to be agile and responsive. Indeed, this was the approval process followed by the undergraduate degrees in Professional Aviation Pilot Practice.

Criticisms of Work Based Learning, perhaps unsurprisingly, can be sourced within the academy. Lester and Costley (2010) have explained how the lack of traditional programme features such as: a substantive curriculum, written examinations and set assignments prove difficult to understand from a traditional HE perspective. The challenge that WBL sometimes presents to disciplinary ‘purity’ and traditional routes to professional status may sometimes provide a rationale for some of this pushback. The change in the role of academic staff can also present a challenge, staff undertaking familiar teaching roles working with a recognisable base of knowledge may become unsettled at having to make a transition to being facilitators of learning where the basis of knowledge lies in unfamiliar territory. Some members of the academy might hold the incorrect notion that work based learning is rooted in ‘training’ and that it somehow represents a reputational risk in terms of quality for HE. It is perhaps understandable that removing the main site of learning from the campus into the workplace can create uncertainties in relation to the control and quality assurance aspects of HE. Some academics may also have concerns about learners being constrained by employer-driven objectives within partnership WBL programmes and potential subsequent limitations on their critical perspectives.

c) Work Integrated Learning

Work-integrated learning (WIL) is a term that has gained increasing popularity in the United States, Canada, Australia and New Zealand and can often be conceived as

learning that is co-ordinated by and forms part of the student offer of an educational institution. The diversity of the WIL offer may include work placements, industry projects, mentoring, sandwich years, fieldwork, employer partnerships, continuing professional development, major simulations or virtual work integrated learning activities. (Lund, 2021). In HE in the UK, combining a degree with work-related experience is becoming increasingly of interest to students who are seeking streamlined routes into employment. There is recognition that WIL can assist in students gaining employability skills and can sometimes help towards the initial formation of their professional identity.

With such variety of WIL opportunities it is helpful to be able to understand more about the learning that can arise from each type of engagement. Boud *et al.* (2020) provide very useful guidance in helping us to understand the diversity of learning experience. The starting point is the assertion that any assessment of WIL experience should be generative of learning. In helping to frame the type of learning experience these authors explain how some versions of WIL, for example, nursing or teaching are ‘tightly coupled’ to other parts of the student programme that may have specified outcomes relating to professional development. Other versions of WIL may be found to be ‘loosely coupled’ and the learning outcomes can be much more varied. Interestingly, the degrees in aviation at Middlesex University have characteristics of assessment that can be described as being tightly coupled. This, perhaps, indicates how work-based programmes are sometimes difficult to categorise as they may occasionally present qualities of hybridity. Some concerns around WIL relate to assessment of the experience by the academy and to the authenticity of the assessment in relation to the lived experience of operating in the real world (Boud *et al.* 2020).

As can be seen, the landscape for WIL is complex in itself. It occupies part of the overall terrain that can be described as work-based learning. It is worth noting that there is a dynamism in the field of work and learning and that this can sometimes lead to new nomenclature that helpfully assists in understanding of innovative approaches although it may sometimes add to misunderstandings of how work and learning are intertwined. It is helpful to conceptualise WIL by considering the way in which it is structured within the specific programme and specifically *how* learning is integrated with, and arises from, work, in this specific context. By taking a broader view, the integration of work and learning can take place within all forms of work-based learning. The Quality Assurance Agency guidance on work-based learning (QAA, 2018b) shows that work-

based learning can be perceived as existing on a continuum that contains different modes of learning through work and that these can be portrayed according to their level of integration of work and learning.

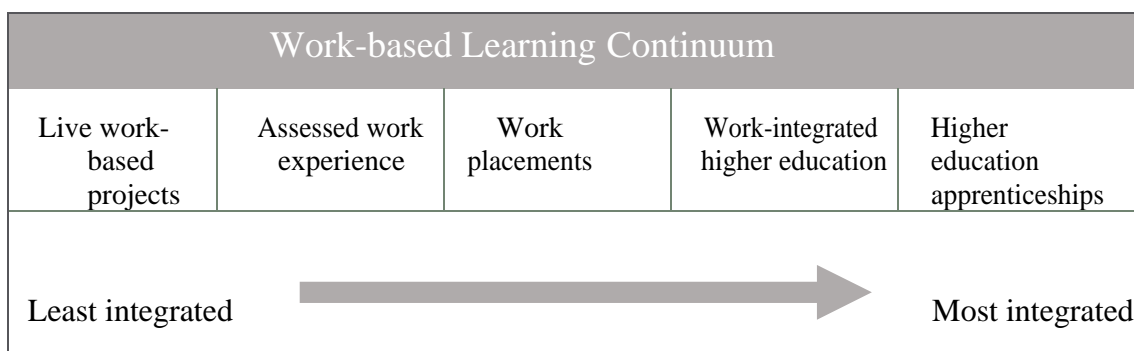


Figure 2.3: Work-based learning continuum. Source: QAA (2018b)

Lester *et al.* (2016, p. 8) provide another continuum that helps us to formulate further understanding of the landscape:

The current landscape of work-integrated degrees can be summarised as a continuum from programmes where the academic structure dominates but includes substantial periods of practice learning in the workplace, through models where the student is employed but follows a structured academic programme, to those where the degree is built around workplace learning on either an individual or a cohort basis.

What becomes clear from all of this is that the particular versions of work-based learning must be fully understood by any programme developers prior to embarking on programme design and consideration of pedagogical approaches.

d) Considering pedagogical approaches within the aviation degree

Pedagogy is influenced by and incorporated within the fundamental design of an academic programme. The degree in Professional Aviation Pilot Practice has roots in the transdisciplinary work based learning model for programmes developed at Middlesex University (Middlesex University, 2011). An important element of this model was negotiated learning (Bravenboer and Lester, 2016). This translated into some learning outcomes having the ability to be partly negotiated, in terms of appropriate professional evidence being presented, with the module tutor. For example, the topic of inquiry for a student presentation could be negotiated and the presentation would form part of the assessment for a particular module. Another key pedagogic feature embedded within the design of this programme was the intention to develop the pilots in

training as reflective practitioners. The Overview and Operation document (Middlesex University, 2014, p. 3) signalled this intention:

The programme is also designed to contribute the enhancement of professional aviation pilot practice by formally recognising (through the award of academic credit) the value of reflective practice. While professional pilots are required to regularly reflect on their practice it has not to date been a formal aspect of required CAA regulated ab initio pilot training. Similarly, while professional pilots are required to engage in Recurrent Review assessments of their practice and this does include a requirement for debriefing, at present this is not recognised through the award of academic credit. Lastly, while professional pilots are very accustomed to reflecting on the outcomes of aviation incidents as a means of continually raising safety standards, there has not been a well-established culture of proactively seeking opportunities for the enhancement of practice more broadly.

Reflection on practice has been recognised as an influential theoretical concept in a variety of areas of professional education, for example, social work and nursing (Thompson and Pascal, 2012). It can also be found in teacher education and within work-based learning.

The act of reflecting involves a deep review of an event or events that have been experienced. The intention is to gain a better understanding of why things occurred as they did and this requires focusing on the experience by taking different perspectives, for example, by considering what happened, who was involved, where it took place and the professional, social and political contexts (Bolton and Delderfield, 2018). Students are often introduced to reflective models as a means of learning how to structure their reflections (Middlesex University, 2019c) and in order to learn from them. The Kolb (1984) experiential learning cycle provides a useful example of how reflection is tied to learning. The ‘output’ from the Kolb cycle is *active experimentation*, this requires the student to actively engage in revised practice leading to a new experience. The learning cycle may then be repeated. Caution needs to be observed as instrumental use of reflective models may dilute the effect. The term ‘reflective model’ might be better re-framed as ‘method of reflective inquiry’.

The ‘process’ of reflection as applied in teaching is considered in an interesting way by Reynolds and Suter (2015, p. 199). These authors suggest that teachers could carry out reflective practice by considering different levels of reflective activity. For example, at a ‘technical’ level by reflecting upon everyday classroom and workshop practice and at a ‘critical’ level by reflecting on the *context* in which they carry out their practice. This is

not to be confused with the concept of critical reflection, here, the term is being used to direct attention to ‘critical-organizational’ factors.

Some of the benefits of reflective practice for students are perceived to be greater self-awareness, a deeper understanding of identity and personal agency within the work setting and in how they learn (Helyer, 2015). Critically reflective practice has strong associations with the higher level skills required in university graduates. This entails the uncovering of deeply held knowledge that may be tacit and not normally recognised in everyday practice.

Although reflective practice has achieved more recognition in professional learning, this is not without criticism. Reynolds and Suter (2015) present four areas of concern or criticism of reflective practice in relation to the practice of teachers. These include: doubts surrounding the effectiveness of the reflective process and a lack of critique; concerns around how well organizational cultures are able to support reflective practice, for example, through managerial support; concerns on how well the political, policy and socio-economic context may be supportive of teachers and finally, the fear of reflective practice becoming routinized, for example, becoming ‘just another thing to be done’.

Thompson and Pascal (2012) argue that despite its popularity, reflective practice has much scope for further theoretical analysis and development. These authors propose: the incorporation of issues of forethought and planning as a route to implementing ‘reflection-for-practice’; greater recognition of the role of language, meaning and narrative as key elements in the process of meaning making; appreciating the wider social context; greater recognition of the emotional dimension of reflection and power relationships; clarity of understanding of reflection and reflexivity; time considerations for both individuals and organizations and the development of a critical approach in addressing the issues of depth and breadth in criticality.

Reflection on practice plays a key pedagogical role within the degree in Professional Aviation Pilot Practice at Middlesex University as can be seen in the academic rationale (Middlesex University, 2014, p. 6)

The technical training elements of the programme are essentially classroom based and assessed through examination. The practical elements of flying training elements of the programme are delivered through a practice-based learning approach that integrates the demonstration of flying knowledge, understanding and skills with reflection on practice. The final stages of the programme build on the professional learning that early career pilots undertake and are delivered

through a work-based learning approach. This fully integrated approach has made it possible to create a coherent programme of study, which meets all the criteria for a work-based degree programme and all the regulated requirements of pilot training.

The additional requirement for the student to develop skills in reflection places added responsibility in their co-participation in learning. They become active agents in driving their own professional development forward. In the historical context of educational development, this learner-centred approach can be positioned as drawing on the behaviourist, humanist, constructivist and eclectic continuum as outlined by Boud (2012). Elements of each of these philosophical frameworks applied in an educational context can be connected to the design of the degree in Professional Aviation Pilot Practice. Similarly, strong connections can be made to other progressive influences on higher education: the experiential turn, the reflective turn, the competency turn and more recently, the practice turn.

Boud (2012) critiques the term ‘practice-based education’ and helps in presenting a critical definition of a term that may sometimes be applied loosely within higher education. In de-constructing the term, Boud asserts that any courses or programmes purporting to be ‘practice-based’ would need to incorporate practice within the professional or disciplinary area and within the contexts of normal practice. This means going beyond what a typical course may entail, specifically, going beyond simply offering a knowledge base of the practice but engaging in *the conduct of the practice*. Further, that a programme having a pedagogic *base* in practice must be conceptually understood. The term ‘education’ implying that this isn’t simply about training or preparation but an investment in a broader, longer term process.

Conceptually, as we have seen, the innovative undergraduate programmes in professional aviation pilot practice at Middlesex University had origins derived from work-based learning partnerships with the philosophical basis in eclecticism (Boud, 2012) and transdisciplinarity. This learner-centred approach enabled a degree of negotiation within some learning outcomes, something that had the potential to jar against the strict regulatory nature of aviation. The design of these original programmes was hybrid (Nottingham, 2016) in nature and the title of ‘professional practice’ indicated an important conceptual shift. Of specific interest within this research is an attempt to understand how this particular programme can be classified. Is it closer in resembling an example of practice –based education, work based learning or work-integrated learning?

In considering weaknesses in how higher-level workforce development is perceived and the subsequent effect on policies for skills and education Lester and Costley (2010, p. 571) outline the issue:

There is still a tendency to think in terms of discrete skills that need to be developed and upgraded, when more attention is needed to the development of ‘meta-skills’ or capabilities that enable people to become self-managing practitioners and self-directed learners.

This is of clear interest to this research here, as it focuses on the effectiveness in acquisition of competence, skills and knowledge of pilots in training.

In a similar vein, Barnett (in Bravenboer and Lester, 2016) describes an approach of developing professional competence as ‘reflective knowing’. Also, that a process of ‘metalearning’ resolves any limitations in operational and academic competence that may be encountered in “experiential learning” and “propositional learning”.

Metalearning for the life-world is a willingness critically to examine one’s learning. Putting it grandly, what is indicated here is a form of continuous action learning, where one’s projects and practices are ruthlessly evaluated by oneself, and jettisoned where appropriate. (Barnett, 1994, p.182)

The central position of reflective practice and specifically, critical reflection within the aviation degree encourages the development of skills in evaluation and critique of practice. Consideration of this approach may feed into achieving a more developed understanding of situated learning in the aviation degree.

Professional learning is invariably linked to context (see Fig. 2.1) and a feature of this is the learning environment. Engeström (1994) contrasts adaptive learning environments with those that he describes as ‘expansive’. In the former, the learner will focus on copying observable correct behaviours and effectively condition themselves to replicate. In an expansive learning environment the learners will be encouraged to critique and innovate in order to drive their practice forward. In this kind of environment, learners and workers will be able to critically analyse their practice in order to bring about development and change. This expansive approach is a feature of the aviation degrees at Middlesex University, in particular, during years two and three of the programme where students are heavily involved in the development of professional skills and knowledge through practice. The first year of the degree could be recognised as adaptive as the students are mainly required to replicate propositional knowledge in order to successfully complete professional examinations.

In considering how understanding is gained through work, Engeström *et al.* (1995) describe traditional and hierarchical structures in relation to the acquisition of expertise through learning. In one version, recognisable as a model where knowledge is stable and shared through a process of transmission, this can be viewed as gaining expertise through a top-down approach. In a second version, knowledge is gained through a process of enculturation, a kind of social absorption of expertise that may be gained unconsciously and can be perceived as a bottom-up approach. These writers propose that this presents a vertical hierarchy or model of expertise that misrepresents the broad nature of expertise and that a horizontal dimension should also be considered.

In their work, experts operate in and move between multiple parallel activity contexts. These multiple contexts demand and afford different, complementary but also conflicting cognitive tools, rules, and patterns of social interaction. The criteria of expert knowledge and skill are different in the various contexts. Experts face the challenge of negotiating and combining ingredients from different contexts to achieve hybrid solutions. The vertical master-novice relationship, and with it, in some cases, the professional monopoly on expertise, is problematized as demands for dialogical problem solving increase. Two central features of this newly emerging landscape of expertise may be designated as polycontextuality and boundary crossing. (Engeström *et al.* 1995)

Polycontextuality refers to the notion of individuals or work groups being engaged in multiple ongoing tasks, sometimes described as ‘activity systems’. Varying tasks may have differing levels of complexity and when experts move between tasks or engage in ‘boundary crossing’ they are required to adapt accordingly to the requirements of the new situation. These ideas may assist in the analysis of how student pilots operate and develop expertise within the complex and highly dynamic nature of their workspace in the cockpit. In addition, they may help in evaluating how student pilots operate in their varying roles shown at the intersections in Figure 2.1.

Objectives of this Project

1. Undertake a literature search and extensive reading around work and learning.

Further literature will be required to support the development of the research methodology and research tools.

2. Investigate the impact on students in taking the degree in professional aviation pilot practice.

An evaluation of the impact of taking the aviation degree on current students will be made.

3. Explore what is learned by students undertaking the joint degree programme.

A detailed examination of student learning in this particular aviation context will be carried out. This will uncover what and how students learn through the complex mixture of training, work and higher education.

4. Explore the pedagogical approaches within the degree programme.

The adopted pedagogical approaches within the university and flight training organisation will be examined in order to establish deeper understandings of how student pilots are being supported in their learning.

5. Examine issues relating to university and commercial organization partnerships.

The complexities of partnership working in this particular case will be evaluated.

6. Disseminate findings within the programme team, the university and wider community of practitioners in work and learning.

It is intended that the findings and conclusions from this research should be of interest to colleagues at the partner organisation, colleagues within the university as well as those engaged in learning through work. It will also be of interest to those in the aviation sector engaged in pilot training and development. Dissemination of this work is initially planned through the work and learning e-journal, the work and learning research group at Middlesex University, Faculty of Science and Technology staff groups, the Research Students Summer Conference and external events.

Conclusion

This chapter has presented some of the rich complexity of the site of learning that is experienced by aviation students undertaking a degree in Professional Aviation Pilot Practice. The perspectives of the professional dimension, the learning dimension of higher education and the integration of work and learning provide important theoretical foundations that will be used in further analysis of this case study. However, the literature review can only take us so far in generating real understanding of the case. It is crucial to gain the perspectives of students, other involved practitioners and evidence from the analysis of practice in order to build empirical evidence from which, a

developed understanding of *what* and *how* student pilots learn through undertaking the degree in PAPP can be based.

The following chapter will outline the methodological approach used in exploring the central focus of Figure 2.1, the practices of the student-practitioner, as well as those practices taking place within the contextual dimensions of training, work and higher education.

Chapter Three

Research Methodology

Introduction

This chapter discusses the rationale for adopting an interpretive, flexible research approach through a case study research design. The nature of case study is explored and defined and the research questions are presented. The importance of the role of insider-researcher is considered and the methods of data collection are specified. The potential for bias within the research is explored with reflection on the positionality of the researcher as well as the general issues of quality and validity. The ethical issues that arise are discussed with particular attention to carrying out research in the era of Covid-19. Finally, the role of practitioner researcher is considered in relation to the necessary skills for carrying out research; also by the ability to take constructivist and phenomenological perspectives that are fundamental to this research.

Research Approach

The research approach taken here has roots in the epistemology of constructivism. As Gray (2014) shows, this approach connects the researcher directly to the site of research and accepts that truth and meaning do not exist apart from the researcher but that the interaction of the subject (the researcher in this case) with the research is an essential and expected component. Since meaning is constructed, then researchers can create their own valid perspectives of the real world based on their own and their respondents' 'meaning making' processes. Constructionists assert the central notion that reality is socially constructed (Robson, 2002) and this leads naturally to the need for interpretation of the meanings actors attribute to their and others' statements, activities and practices.

Interpretivism is a key theoretical perspective that has close epistemological links with constructivism. The importance of the interpretive role in this research cannot be understated and the role has been played out in an essentially phenomenological paradigm (Gray, 2014, p. 25).

My role as an interpreter of this particular case study arises from my positionality within the set of programmes concerned (Thomas, 2016, p. 68). My career journey has led to this point and working as a programme leader for aviation programmes at

Middlesex University has enabled me to be an active agent in the research, an insider-researcher (Costley, *et al.* 2010). My own subjectivity, contextual understandings and pedagogical values as well as key professional roles as link tutor with the FTO, programme leader and module tutor provide the strong foundations to this research.

Case Study approaches have been criticised for their deficiencies in being generalizable (Flyvbjerg, 2006 and Thomas, 2011) or having an “*unscientific feel*” (Saunders *et al.* 2000:94). This is unsurprising within social inquiry given the complexities of describing and explaining the real world. Generalisation is closely tied to research within the natural sciences and the need to be able to infer replication and regularity through a process of induction. While induction aims to provide inferences to explanation, Thomas (2016, p. 70) persuasively argues:

Abduction is making a judgement concerning the best explanation for the facts you are collecting.

Furthermore, the real strength of case study arises from its ability to provide ‘*exemplary knowledge*’ (Thomas, 2016, p. 73). This means presenting an example of reality as explained from the context of the other and connecting this with one’s own context and experience. The site of practice and contextual basis are paramount. This kind of contextual, Mode 2 (Gibbons *et al.* 1994) abductive research can lead to examples of ‘good practice’ which could possibly be adapted or adopted in other contexts.

The Aristotelian idea of *phronesis* (Thomas, 2016, p. 72, Thomas, 2010, p. 578) is applicable here as it describes the powerful combination of practical knowledge, craft knowledge and judgement. These types of knowledge arise from practice, they are personally derived and enable sense to be made of particular situations and contexts. By nature, the context of practice exists in a moment of time and this fluidity enables a provisional, temporal perspective to be taken rather than the establishing of an induced theory. The validity of the perspective is founded on the practitioner working in their context and in the case of this research, interpreting the practice of others within their dynamic contexts. The dynamic and situated nature of the research area encouraged a flexible and predominantly qualitative research design to be adopted. This enabled the design to unfold and be adaptive where required, without the constraints of heavy pre-specification (Robson, 2002).

Research Questions

A framing theoretical question for this research is: ‘Does the integration of actual work and higher education in aviation pilot training improve the professional practice of student pilots?’

Research Questions

To determine the effectiveness and impact of integrating training, work and higher education:

- 1. Do student-practitioners in aviation learn best when combining higher education with the rigorous programme of training required within this sector?**
- 2. How can higher education influence ‘learning’ during the initial stages of professional development of aviation pilots?**
- 3. How does training based on ‘work’ influence ‘learning’ during the initial stages of professional development of aviation pilots?**
- 4. How well do any of the pedagogies used within the joint degree partnership support the integration of work and learning?**
- 5. What are the linkages between work, practice and study in this pedagogical context and in particular, how do they affect each other?**
- 6. How well do university / flight training organisation partnerships work in practice?**

These questions have been investigated using a case study approach.

Case Study

Helen Simons (2009, p. 21) provides clarity on the critical nature of Case Study:

Case study is an in-depth exploration from multiple perspectives of the complexity and uniqueness of a particular project, policy, institution, programme or system in a ‘real-life’ context. It is research- based, inclusive of different methods and is evidence-led. The primary purpose is to generate in-depth understanding of a specific topic (as in a thesis), programme, policy, institution or system to generate knowledge and/or inform policy development, professional practice and civil or community action.

A single-case design has been used for this study. In Yin’s (2014) terms, the unit of analysis is work-integrated learning in a Middlesex University and its flight training organisation partnership degree programme in professional aviation pilot practice. Thomas (2016) recommends the use of an ‘analytical frame’ for the case study and this provides helpful focus. Here, the analytical frame is ‘an analysis of pedagogy and student learning when integrating work, training, practice and higher education in an aviation degree.’

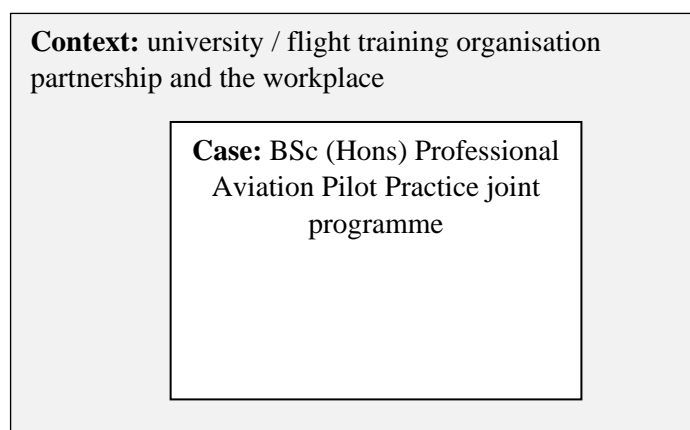


Figure 3.1 Planned WIL Case Study (single unit of analysis)

Gary Thomas (2016, p. 9) provides further and useful clarity:

The case study is not a method in itself. Rather, it is a focus and the focus is on one thing, looked at in depth and from many angles.

Thomas (2016) further explains how taking multiple perspectives to construct ‘a polyhedron of intelligibility’ (Foucault, 1981) is a core component of case study; the idea that looking at the subject from a number of different directions should lead to a richer, more balanced and fuller understanding of it, essentially, developing a three-dimensional conceptual model of the case in question.

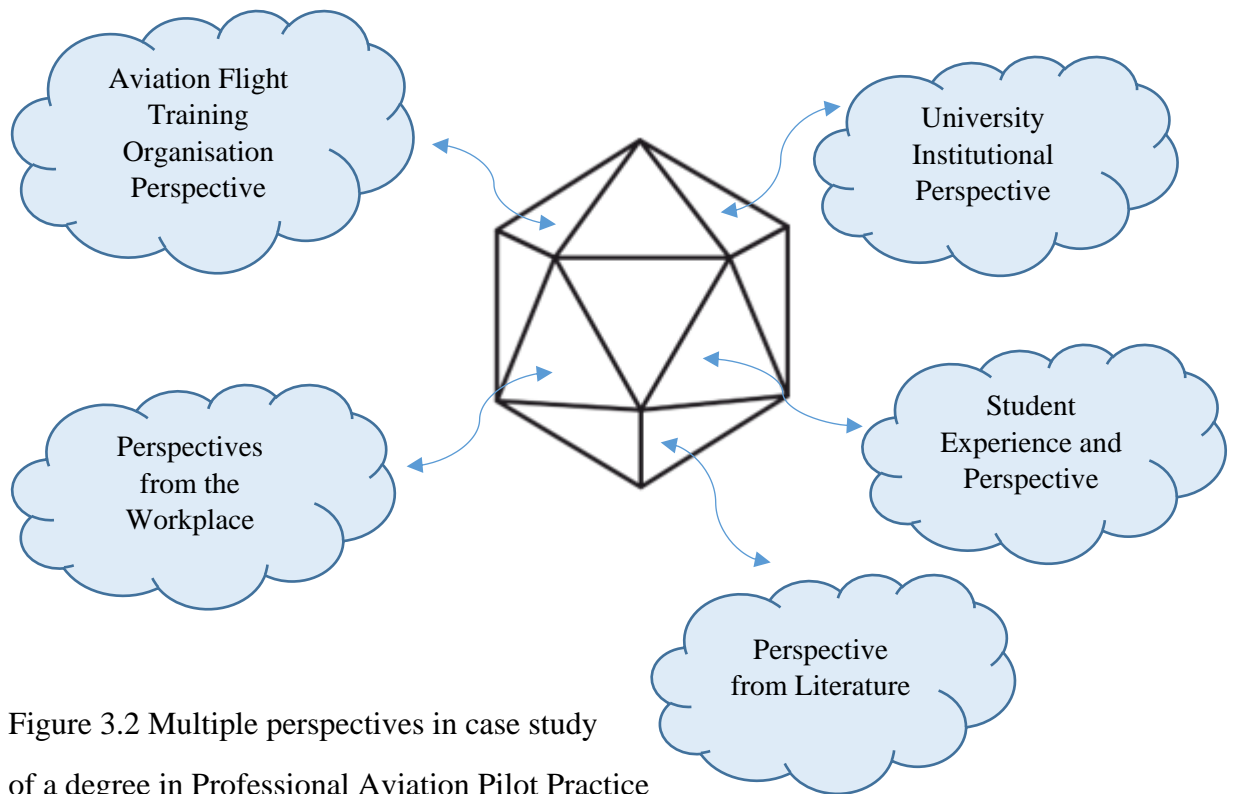


Figure 3.2 Multiple perspectives in case study of a degree in Professional Aviation Pilot Practice

This approach satisfies the metaphorical notion of ‘triangulation’ that is well understood in the practice of social research as a means of countering threats to the validity of the research. Triangulation involves the adoption of a variety of methods of analysis and perspectives on the object of research. Robson (2002, p. 174) shows how four types of triangulation may be considered:

Data triangulation, where more than one method of data collection is carried out. For example, gathered from documents, interviews, observation or other means.

Observer triangulation, where more than one observer is used in the research.

Methodological triangulation, where quantitative and qualitative approaches are combined and

Theory triangulation where multiple theories or perspectives are applied.

In this research, data has been triangulated and perspectives have been taken from:

Aviation – the specific flight training organisation partner

- Managing Directors and owners of partner organisation (Two interviews conducted)
- Training staff employed by the FTO (Two interviews conducted)

University – the institutional view of the higher education partner

- MU aviation team / staff (One interview conducted)

Student experience – views taken from students on this specific programme of study

- From questionnaires taken by students on each year of the degree programme.
- From student work completed on degree programme modules in each year of the programme.

(See ‘Methods of Data Collection’ below for student sample data)

Relevant Literature

- From the aviation sector, including theoretical sources and grey literature in the form of organizational documents and web sources.
- From theoretical sources on practice and professional practice
- From theoretical sources on WBL / WIL / HE

Insider Researcher Perspective

My role as an insider researcher carried much responsibility as the primary gatherer, collector and curator of these varying perspectives. The varying contexts: organizational, professional and personal (Costley *et al.* 2010, p. 1) needed to be carefully navigated. The organizational context was particularly challenging during this period of research as can be seen in the findings.

Trust is a key feature when carrying out any form of research, as Costley *et al.* (2010) explain:

When researchers are insiders, they draw upon the shared understandings and trust of their immediate and more removed colleagues with whom normal social interactions of working communities have been developed.

My varying roles as a Link Tutor (between Middlesex University and the partner FTO), colleague within the team of aviation staff, programme leader and tutor for some of the students, helped to create a complex site of research and one where I needed to engender trust with a significant variety of colleagues and students.

This unique position as an insider with multiple roles, allowed me to develop specialist knowledge and an informed perspective. There were significant advantages and opportunities in occupying this position as well as potential challenges. Some of the

advantages included being able to use relatively easy modes of communication with colleagues and easy access to sources of data that were necessary to inform the research. Access to both colleagues from the FTO and to those from Middlesex University was carried out virtually, due to the ongoing restrictions relating to the Covid-19 pandemic. Similarly, all contact with students was through digital modes, specifically, email, the Qualtrics survey tool and data captured through Zoom. Some of the opportunities included potentially adding value to the work of the teams at the FTO and within the university by carrying out professional discussions relating to their experiences and understandings of the degree programme. In this way, learning was created and shared through the dialogue.

Another opportunity existed by encouraging student participants to be active agents in the research, their agreement to take part opened up the possibility for them to learn from the research activities that they engaged with. Specifically, the Qualtrics survey questionnaires, these should have prompted each student to think deeply about their professional development, skills and competences. Some of the challenges included dealing with the constraints of working in real-time and matching the phase of research activity with the availability of colleagues. The most significant challenges arose from working within my varying roles as link tutor, programme tutor and colleague. The changing landscape for this programme during the research proved to be much more dynamic than I could have imagined, the political, strategic, organisational and operational issues were very much in the foreground at this time. Another challenge for the insider-researcher is to be able to deal with the natural constraint of being immersed in the project. This is where feedback is invaluable and taking the widest possible range of perspectives from others helps to strengthen the conceptual model that is being created. In the natural world, being so close to an object restricts perspective, it is the same here.

Reflection and Reflexivity in the Research Process

Continuous reflection on events in the compilation of this narrative was enabled by the recording processes employed at various stages of the research. The research diary proved invaluable and allowed time and space for reflexivity as events unfolded (Buckland, 2021). As Bolton (2006, p. 21) points out, effective reflection on practice engages the practitioner in the exploration of experience, values and professional identities and this requires openness and courage. The sensitivity of the researcher, in

recognising my own power and privilege in all interactions relating to this research required careful monitoring throughout. Reflexivity requires a deep awareness of self and this includes recognition of the influences that may help to shape the research consciously or unconsciously. These may be external or internal factors to the organizations involved and crucially here, factors that are personal to me, for example, my own biography, gender, ethnicity, social class and psychology (Costley, *et al.* 2010).

Case Study Design Thread

In discussing kinds of case studies, Thomas (2016, p. 112) helpfully shows the requirement for the ‘design thread’ of the case study to be made explicit. My use of the term ‘design thread’ is hardened by Thomas who describes this as a ‘chain’. The chain of design for the case study comprises: Subject – Purpose – Approach – Process. Each link in this chain needs to be considered at the research design stage as it helps to define what the research is and how it will be addressed.

Subject	Purpose	Approach	Process
			Single
			Multiple
Outlier	Intrinsic	Testing a theory	Nested
Key	Instrumental	Building a theory	Parallel
Local	Evaluative	Drawing a picture	Sequential
	Explanatory	Descriptive	Retrospective
	Exploratory	Interpretative	Snapshot
			Diachronic

Table 3.1 Mapping out the design for the case study ‘Practice as the Site of Learning: A Case Study of Higher Education in an Aviation Degree’

Source: Adapted from Thomas, 2016

In this research I considered the *subject* as a local knowledge case as the subject is closely linked to my personal experience and there is value in finding out more. I describe the *purpose* as intrinsic as I’m interested in this subject in its own right but also as explanatory with evaluative and exploratory features. The *approach* to the case study is descriptive but with illustrative and interpretative features and the overall *process* as a single case design and taking a snapshot of this particular situation.

Methods of Data Collection

Four methods of data collection were developed for this case study:

- Student questionnaires.
- Semi-structured interviews of FTO and university staff (based on the research questions).
- Content analysis (of student work).
- Critical incidents (recorded in research diary).

Emerging themes were drawn from the semi-structured interviews using the constant comparative method and a theme mapping approach. Finally, all data was combined into the themes that had emerged (Appendix 12). The process was emergent and adaptive; it is detailed below.

Student questionnaires

A questionnaire was designed for students taking each year of the degree programme. These were targeted according to the phase of training, for example, year 1 students were considered to be in an initial formation phase; year 2 students in a training phase and year 3 students in a work phase. (Sample sizes: year 1: n=22, year 2: n=10, year 3: n=10)

The purpose of the questionnaires was to gain the perspectives of students who were engaged with the various stages of the programme. This was a clear area for inquiry as ultimately, the students as invested participants and being central to the programme purpose, have an important voice.

Semi-structured interviews

Semi-structured interviews were carried out with very experienced members of staff involved in programme delivery and Directors at the FTO. A semi-structured interview was also carried out with an experienced staff member in the Middlesex University aviation team. This involved a member of staff who was employed in a full-time role wholly relating to aviation programmes delivery.

It is worth noting that all of these interviews were carried out during a time when the partner relationship was being destabilised by events that were affecting the future of the partnership (Buckland, 2021)

Content analysis

The intention of analysing the content of student work was to uncover the hidden detail of what happens at the site of practice and learning. The expectation was that this would provide the richest picture of student engagement with the degree programme as every module and associated phase of training could be considered. Student work contained a variety of formats, for example, reflective reports, professional development action plans, videos of flight instruction practice, student presentations. Writing reflective reports and reviewing training development in a critically reflective style is a consistent theme within the degree. Student work covers the complete professional development journey through the degree from the first day of ground school through to working as a flight instructor or first officer for an airline. Student work was analysed for the following modules:

Level 4

Pilot Review and Professional Development (WBS 1201)

Level 5

Basic Flying 1 (WBS 2201)

Basic Flying 2 (WBS 2202)

Flight Instruction (WBS 2205)

Flight Instruction Standardisation (WBS 2206)

Level 6

Advanced Flying (WBS 3207)

Multi Crew Co-operation (WBS 3208)

Evaluating and Managing Risk (PPT 3011) Threat and Error Management (PPT 3012)

Aircraft Specifics (WBS 3203)

Airline Orientation and Integration (WBS 3204)

The intention was to analyse three pieces of student work per module as a minimum with the option to sample more where this was felt to be beneficial. The analysis was carried out sequentially and fully for *each* module before moving onto the next as shown in the list above. In order to manage the large amount of data and to carry out the analysis in a systematic way a procedure for identifying classes and categories was adopted (Gray, 2014, p. 607). Common classes relating to the student and stage of the degree were identified while special classes described current competence levels, completed training and experience. Student data was added to each template (e.g. Appendix 13) and theoretical classes, linkages and patterns from data were identified. Research question prompts were added and used to probe each module.

Critical Incidents

Critical Incidents (Gray, 2014) have been used as part of the methodological approach in this research. These were used here as a means of 'live data-gathering'. The rationale for this inclusion is that the degree partnership was a living situation during the course of this research and the landscapes of both programme and partnership were seen to develop and change as the research progressed.

The concept of critical incident analysis actually emerged from the aviation sector over sixty years ago as Flanagan (1954) has explained. The 'critical incident technique' came from the U.S. Army Air Forces Aviation Psychology Program during World War II and was established to facilitate the selection and classification of aircrew. The initial work involved the development of a set of procedures for collecting direct observations of human behaviour in order to facilitate their potential usefulness in solving practical problems. The assessment and analysis of failure was a key feature of this early work. Towards the end of the twentieth century, critical incident analysis had been adopted and adapted within the fields of health, education and social work (Green Lister and Crisp, 2007).

Routine events within professional practice can be analysed using the critical incident approach and these incidents create an emotional response that may be felt positively or negatively by an individual (Gray, 2014). The quality of the analysis relies on the critical skills of the observer- participant while the activity can often be characterised as a continuous reflection on practice during the event. When used as a qualitative approach to evaluation, critical incidents are often recorded in a log or a diary. A structured narrative would comprise a description of the event followed by reflections that are based on analysis of practice. A critical review of the event could then unearth changes in knowledge, skills and values. In this research, a research diary was kept and critical incidents were recorded as events unfolded. Gibbs *et al.* (2007) argue that a sensitive and reflective approach in using this type of diary by work based students can enable them to confront ethical dilemmas and make future actions based on reason. A Critical Incident Analysis Framework (Green Lister and Crisp, 2007) was adapted and used to provide a structured approach to analysis.

Constant comparative method

A key step in interpretive enquiry is to be able to elicit themes from the mass of available data (Thomas, 2016, p. 204). The constant comparative method provides a

mechanism for this to be achieved. It requires the researcher to code and analyse the data by comparing incidents that arise, refining as concepts and exploring any relationships. The ultimate aim is to develop themes or categories that can be used for analysis.

NVivo

In order to help in managing the volume of data I downloaded NVivo 12.6.1 from Middlesex University. NVivo 12 is a software tool designed to aid qualitative data management and analysis.

Initially, I uploaded one interview transcript and used this data as a means of having something to explore and test the software tools and to formulate initial ideas on structure.

I created a series of nodes based upon what appeared to be significant topics. I used the Project Map in conjunction with the emerging nodes and carried out initial loose sorting. This helped me to think about structure before entering more data. I needed to envisage a sensible process for data management before introducing a large volume of data. I realised that the Mind Map tool would be more use in helping to visual various themes and topics. On testing this, I quickly realised that I might need to develop a series of maps that focused on the main research questions rather than a larger, single map. It also made sense to create folders within NVivo for each research question that I could use later as repositories for appropriately linked data. This created a consistent focus on the research questions and linked each repository directly with each mind map.

The next step was to introduce and test documentary data within the tool. I recognised that maintaining a large series of nodes for data gathering was preferable to allocating nodes to each repository after each activity. If I moved the nodes into folders they would become hidden from view and this created the possibility for replication and confusion in data handling.

As I revisited the interview transcripts I began to question my original concerns about driving the topics arising in the data towards the individual research questions, as it seemed that this was completely at odds with the whole purpose of using the constant comparative method. I recognised that the emergence of themes from the data was the key to maintaining the integrity of the research and that if a research question remained unanswered or partially addressed then that would just be the result of the research. I

resolved to rely on the organic emergence of themes from the data and to use these for analysis and discussion before addressing the research questions.

Theme mapping

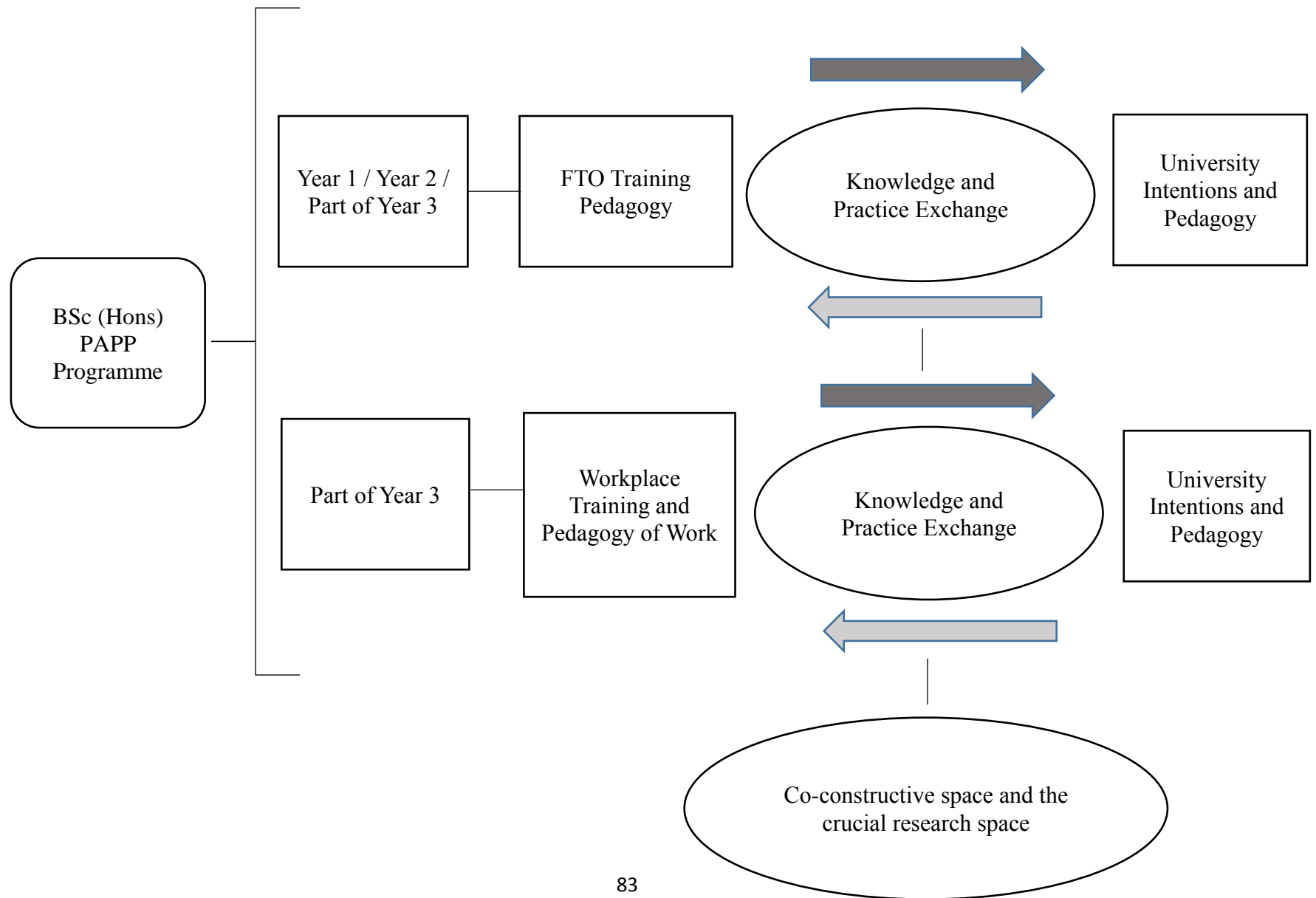
The semi-structured interviews formed a crucial part of the inquiry as they allowed data to be gathered from both the FTO and the university. The interview questions were formulated with reference to each of the research questions. This approach facilitated coding from the responses and allowed temporary constructs to be elicited from all interviews allowing the mapping of emergent thematic areas. Second order constructs solidified the emerging themes and these were used as repositories for discussion and analysis by also enabling the merging of data from student questionnaires, content analysis and critical incident analysis (Appendix 12).

Research Design

Initial work in planning the research led to the understanding that a series of pedagogical models were in operation as a result of the learning partnership between the FTO, the university and the workplace. Figure 3.3 shows how these were conceptualised. The rationale for this understanding was based upon the observation that the FTO, the university and any workplace providers were carrying out their own specific role that fed into the provision of the degree in aviation. The FTO had the primary focus of professional training in aviation; the university had the dual focus of delivery of an undergraduate higher education curriculum in aviation as well as managerial oversight of the whole provision. The primary focus for workplace providers was in providing the opportunity for the final two modules of the degree to be completed while the student was working as a first officer on an airline or as a flight instructor within the training organization. Consequently, an important feature of this inquiry was to recognise that the individual pedagogical approaches needed to be analysed separately, as a foundation for understanding any potential integration of programme pedagogy.

This conceptual understanding allowed me to recognise that in devising a strategy for questions and interviews I would need to be mindful that some questions would be answered within the respondents own frame of reference that would be rooted in their own primary focus.

Figure 3.3 Integrating Pedagogies



Using Context as a Framework for Inquiry

In considering the three year degree programme, the context changes and sites of learning move as the student progresses through stages of ‘initial formation’, ‘training’ and ‘work’ phases. Their professional capabilities and understanding change too, this is all a very dynamic process. There are two distinct transitional points: the first occurs when the students move from year 1 of the degree to year 2, this represents the transition from ‘initial formation’ to ‘training’. The initial formation period encompasses an intensive study period where the students are required to achieve pass grades in fourteen CAA regulated examinations (ATPLs) as well as complete a university module that introduces them to reflective practice and professional development. This can be considered as the point of *training transition*. The second transitional point occurs towards the end of year 2 of the degree and when the student begins year 3. This represents the transition from the intermediate training phase to the advanced phase. This can be considered as the point of *professional transition*. At this point the student has gained a commercial pilot licence, completed a course in flight instruction and has standardised their flight instruction practice through a period of working as an instructor at the FTO. In this way, the context of ‘work’ has been entered towards the end of year 2 of the degree. The transitional point provides a strong link in the development chain as it exemplifies the transition from trainee to professional.

Student Questionnaire Design

A questionnaire was designed for students taking each year of the degree programme (See Chapter 4, p.89). These were labelled ‘Initial Formation Phase Questionnaire’ for year 1 students, ‘Training Phase Questionnaire’ for year 2 students and ‘Work Phase Questionnaire’ for those in year 3. (Sample sizes: year 1: n=22, year 2: n=10, year 3: n=10)

The student questionnaires were designed with four parts:

1. FTO focus related questions: Aimed to establish how well the degree programme supports learning during the acquisition of the required ICAO (CAA) competences and ATPLs in the initial formation phase.
2. University focus related questions: Aimed to establish how well the degree develops the professional skill set, graduate attributes and higher education skills.

3. Workplace focus related questions: Aimed to establish how well the degree programme supports the acquisition of the required ICAO (CAA) competences and professional skill set. Note: this section not included in the Initial Formation Phase Questionnaire.
4. Integrated provision related questions: Aimed to establish how well this type of blended pedagogical approach works and what recommendations would the participant make to improve it?

Closed questions were used in Part 1, Part 2 and Part 3. The questions for Part 4 were open in order to draw out wider, individual responses.

Part 1 Questions relating to professional pilot development

These questions were designed to be asked of all of the student sample with the aim of gaining an indicator of progression over the period of the programme. The questions were centred on whether being on the degree programme had:

- improved student understanding of the role of a professional pilot
- improved knowledge in aviation
- improved flying proficiency

Part 2 Questions Mapping Graduate Skills

I decided to map the graduate skills from Annex D: outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees by the six characteristics that students will be assessed (Appendix 4). I deliberately listed the threshold level requirements as this is the point at which the student can achieve the award.

I then distilled the descriptors to how they would make sense to aviation pilot students. This mainly involved including the aviation context. For example, changing from: “The student has demonstrated an understanding of subject- specific theories, paradigms, concepts and principles.” To: “Able to understand aviation theories, concepts and principles.”

The intention was to move towards specific questions that could be asked of the students that link directly back to the Annex D descriptors.

In addition, the Middlesex University Graduate Attributes (Appendix 5) were compared to see if there were close links between these and those in Annex D. Some fitted reasonably neatly, however, some could only demonstrate partial connections and some didn't seem to connect at all, for example Graduate Attribute 5 mentions 'self and social awareness' and this could not easily be linked. This part of the process didn't work as easily as I had expected. On reflection, the Middlesex University Graduate Attributes pre-date Annex D as they have not been updated and existed in 2018. However, it made me more aware of the intrinsic nature of the Middlesex University Graduate Attributes, they appear to be designed to satisfy the needs of a student embedded within a university institution rather than reflecting some of the crucial attributes that link directly to practice. For example, being able to demonstrate being 'Technically competent' could be a useful generic attribute and should be possible to evidence from any form of practice or course specialism.

Part 3 Questions Aligning to the ICAO Competency Framework

Questions relating to the expected competencies of the workplace were drawn from the ICAO Competency Framework (Appendix 2). It was important to recognise that these competencies were established to verify desired observable behaviours of professional airline pilots; however, all of the ICAO competencies can be associated with the developing practice of student pilots.

Part 4 Questions on the effectiveness of the degree

The questions were designed to gain an insight into how effective the BSc (Hons) degree in Professional Aviation Pilot Practice is in the way it combines pilot training, higher education and the workplace. Open questions were used to solicit whether improvements could be made by the FTO, university or workplace provider in relation to the degree.

Development of the student questionnaire

University Qualtrics software was chosen to develop the questionnaire as this was an easily available professional tool. The software offered easy connectivity to other packages that would facilitate the analysis of results.

For a majority of the questions I had planned to offer just four responses: Not able / Able / Very able / Strongly able, however, the software package gave a large number of automated design options and I decided to use the five responses of Extremely well /

Very well / Moderately well / Slightly well / Not well at all as these responses fitted the questions equally well and the extra mid-point option was likely to add depth to the data (Robson, 2002, p. 294) rather than have any negative consequences as may sometimes be found when using rating-scale and Likert scale formats (Thomas, 2016, p. 195)

Three versions of the questionnaire were created to be targeted at students in Year 1, Year 2 and Year 3 of the degree programme. Year 2 and Year 3 questionnaires were exactly the same and the only change made to the Year 1 questionnaire was the removal of the questions in Part 3 that related to the work-related questions. I decided that these would not be suitable for students at the initial formation phase of development. Part 4 questions in the Years 2 and 3 questionnaires were included as Part 3 questions in the Year 1 questionnaire.

The intention of keeping the same questions for each Year group, wherever possible, was to enable comparison of student pilot responses across the programme and through each phase of development.

Qualtrics software allowed the creation of professionally formatted questionnaires that already contained the Middlesex University logo and could be viewed on a computer screen or via mobile phone.

Pre-testing of the questionnaire was carried out by sending to my own email address and then self-completion of the survey to ensure that the technical process was operable. In relation to pilot-testing, since the structure of the questionnaire had an essentially fixed format of rating- scale responses to graduate skills and ICAO competences this resulted in a fairly rigid format with little scope for ambiguity. Nevertheless, the initial responses were analysed for any potential problems that could be perceived in translation or operability. It was important to understand that web-based survey tools offer much flexibility and functionality; however, the opportunity for making errors is ever present (Gray 2014, p. 371).

Semi-structured Interview with Middlesex University Aviation Staff

This interview was carried out via Zoom and the session was recorded. The interview was transcribed. The question format in relation to associated research questions is shown in Appendix 10. One member of the Middlesex University staff team involved in aviation programme delivery was interviewed.

Semi-structured Interviews with FTO Staff Team

These interviews were all carried out via Zoom and these sessions were recorded. The interviews were transcribed. The question format in relation to associated research questions is shown in Appendix 8. Four members of the staff FTO team were interviewed.

The FTO degree programme manager and the FTO of Head of Training were interviewed with the main intention of gaining their perspectives from within the organization and from those closely associated with the students, the learning process and the delivery of the programme.

The questions used in semi-structured interviews with FTO directors and company owners were prioritised in favour of aiming to clarify their perspectives of the degree from their unique organizational standpoint. The intention was to determine details around the origin of the programme as well as establishing the value of the degree to the organization. Of particular interest was to generate evidence that could feed into research question 6: *How well do university / flight training organisation partnerships work in practice?* Questions to provide evidence for research questions 2, 3, 4 and 5 were also used (Appendices 9 and 10), the main research questions were supplemented with linked questions designed to assist in probing the main question. Two directors were interviewed.

Research Bias

From the outset I have been conscious that my positionality within this research would affect the process of inquiry. My real world perspective (Robson, 2002, Gray, 2014) would bring strengths to the study in relation to the advantages that a practitioner-researcher possesses, for example, the abilities to survey the landscape of inquiry and to select the most appropriate elements that support the research design. My multiple role as a programme leader, module leader, university link tutor, aviation team member and researcher afforded different perspectives and opportunities as a result of the small translations *within* my positionality. These small translations harnessed existing and sometimes new connections to my professional network that could be utilised as required. Each translation enabled a different form of access to participants and research data. A systemic description of this process might usefully recognise this as boundary crossing and inhabiting a different space at any particular state of positionality. The

conversations, relationships, modes of operation and ways of being change depending on the role being adopted at any particular moment in this community of practice (Wenger, 1998). The privileged access to the site of inquiry is a gift to the practitioner-researcher, it must be respected and with gratitude (Costley *et al.* 2010, p. 58).

Working as an interpreter of findings from the research also carries privilege as well as power that must be treated carefully by the researcher. Experience and prior knowledge provided advantages when constructing and analysing this research, however, the problem of unintended bias was ever present. Lincoln and Guba (1985) as cited in Robson (2002, p. 172) suggest three forms of threat to the validity of flexible design research: reactivity, respondent biases and researcher biases. Reactivity relates to the presence of the researcher and how this may affect either the setting for the research or the behaviour of those involved as participants in the research. This required vigilance throughout the research activity and reflexivity to mitigate the threat. Keeping a research diary provided a useful space for timely recording of events as well as enabling the possibility of review. Respondent bias exists on a continuum ranging from responses that the participant thinks that the researcher wants, to not giving any response at all. It is the responses that arise between the extremes that carry most value. It is worth considering that each respondent has their own positionality that colours their responses and that this is to be expected and valued within social research of this type. It is the duty of the researcher to recognise and uncover the nuances of response. The threat of researcher bias can skew the findings from the research as a result of favouring particular methods within research design, selecting particular participants or asking questions that lead to preferred responses.

Costley, *et al.* (2010) describe the power and control that can be exerted by the researcher and show that interviews can simply be an instrumental or manipulative dialogue that result in the researcher monopolising interpretation. The researcher is likely to bring a certain world view into the research domain and this can be discovered by adopting a reflexive approach. In my case, I recognised the emotional attachment to the FTO that had developed over a number of years of working with the partner organization, their staff and students. A huge amount of emotional capital (Cottingham, 2016) can be generated as a result of close day-to-day working that involves resolving many difficulties in the pursuit of student and organizational success. I recognised that I had been involved in an extensive collaborative struggle in becoming involved in a new programme that needed to prove itself as an innovative concept that carried value within

the aviation sector. The potential for greater researcher bias as a result of *prolonged involvement* in ethnographic research is highlighted by Robson (2002) and there may be similarities here. Finally, triangulation provides the most useful strategy to mitigate the identified threats to validity and the triangulating of data within this research was the preferred approach.

Issues of Quality and Validity

Thomas (2010, p. 579) suggests some key elements of a phronesis-based case study. He presents this as "... an anatomy, ... of case narrativity, of story making, using abduction ...". The key elements that are proposed are very helpful in demonstrating the inherent strengths leading to legitimacy of case study. By considering these, the 'nomothetic-idiographic dilemma' can, perhaps become less contested. There are eight key elements:

1. Questioning and surprise, intelligent noticing and serendipity
2. Heuristic and incremental chunking
3. Narrative diachronicity
4. Particularity
5. Intentional state entailment
6. Canonicity, breach and counterfactualty
7. Context sensitivity and negotiability
8. Analogy

Within this research as with most research, *questioning* combined with *intelligent noticing* are essential skills in driving the work forward and uncovering important tracks that lead to insight. In this type of research, *serendipity* can often arise during the process of interviewing as the perspectives of others can never be fully understood until they are articulated. This 'giving a voice' during the data-gathering phase of research can be a crucial step in the co-construction of knowledge. The element of discovery by the act of finding out, *the heuristic* is worked towards using the intrinsic framework of case study. The practice of crafting and building the case by adopting differing perspectives enables the creation of the narrative (the story) of the case. This crafting and interweaving of perspectives involves a process of continuous questioning on the part of the researcher as they seek to find insight. The temporality of this research has already been mentioned, however, the element of *narrative diachronicity* helps us to recognise that change occurs over time. In this research the keeping of a research diary has been helpful in keeping a record of unfolding events that impact on the case study.

These events have often arisen from the organizational or operational domains but the diary has also provided a useful repository for recording new angles, thoughts or ideas relating to the developing case. The element of *particularity* sits at the heart of the case study, more so, it is in the DNA, there is no more to say on this, it requires no more justification. Gaining a sense of participant's values, desires and beliefs in relation to their work that relates to this research is linked to the element of *intentional state entailment*. This is similar to obtaining 'thick descriptions' when engaging in phenomenological research (Gray, 2014, p. 30). The element of *canonicity, breach and counterfactuality* can be used by instigating the imagination on the part of the researcher. This would require the conceptual erasure of a particular key event and replacing this with an alternative reality through employing "What if" questions. The value of this kind of analysis might be found, for example, with new solutions being proposed to aid future decision-making. The element of *context sensitivity and negotiability* recognises the importance of interpretation. Of primary concern is the capability of the researcher to recognise and explain with clarity the context of the case study. Secondary, though of great importance, is the recognition that the case will be interpreted by the reader who will bring their own history, and capacities for negotiating the research. The final element, *analogy*, continues the emphasis on interpretation. It requires the reader or the researcher to engage in acts of translation, comparison and juxtaposition in finding similarities across contexts.

It is worth leaving the last word to Thomas (2011, p. 32) on how the *process* of case study and tacit capabilities and understanding of the researcher help to resolve any concerns around the issues of quality and validity in phronetic inquiry:

It is this phronesis that enables the construction of the good case study, its critical reading and use. But the study must be framed not in the diluted constructs of generalising natural science but rather in questioning and surprise, heuristic, particularity, analogy, consonance or dissonance with my own situation. The case study should be judged by its offer to my understanding.

Ethical Issues

The process to ensure that this research was carried out in an ethical way started by meeting the requirements of Middlesex University for research ethics. This is administered through the Middlesex Online Research Ethics (MORE) form and this in turn, is processed by the Trans Disciplinary DProf Research Ethics Committee for

approval or non-approval. This research was approved by the committee on 7th September 2020. Research approval is embedded in the wider process of programme approval for the professional doctorate, whereby the ethical approach to the research must be deeply considered and articulated within the submission made by the individual.

Permissions from the partner organization (FTO) were necessarily obtained from these stakeholders at the planning and approval phase of the research. Permission from student participants was obtained through the issue of a letter to invite participants (Appendix 1), this contained a participant information sheet and consent form. The participant information sheet outlined the extent of any required involvement and activities in the research. This participant information sheet and consent form was adapted for other participants with minor wording changes to suit the nature of their participation. These versions were for staff from the FTO and Middlesex University staff. An additional benefit of using the Qualtrics survey tool for student questionnaires was that a message could be included at the beginning of the online questionnaire to check that the student was still happy to take part. Effectively, this allowed a second form of consent from students before proceeding. All forms of consent have been stored on my laptop computer and a backup hard drive only.

Working ethically with the partner organization was a key concern during the course of the research and I needed to remain mindful of the commercial, professional relationship between the university and its partner as well as the student-related joint educational operational relationship with the FTO.

The Covid-19 pandemic arose during my period of study and affected all aspects of life at global, national and local levels. During this research I adhered to the requirements of Middlesex University in carrying out the research and this required keeping abreast of regularity in rule changes, regulations and advice about what behaviours were allowed at any one time. Specifically, I needed to:

- Remain updated and follow guidance from Middlesex University in relation to campus working.
- Remain updated and follow U.K. government guidance on living, travelling and working (U.K. Government Coronavirus 2020).
- Remain updated and follow Scottish government guidance in relation to travel and working in Scotland (Scottish Government 2020).

- Ensure that all research activities could be carried out using online platforms.
- Remain flexible and recognise where face-to-face interviews may have been possible then recognising that some participants might prefer this. This could only be considered when governments and university guidance would permit this.

Importantly, Gibbs, *et al.* (2007, p. 366) argue strongly that a perhaps, traditional, instrumental and process driven approach to the teaching and subsequent application of ethics in research may not prove as effective as it could be. They propose that “...*phronesis* – practical wisdom and the application of good judgement to human conduct...” should be privileged, particularly in carrying out work-based practitioner-led research and that the ethic of care is a key element when working and researching within multi-communities of practice.

Practitioner Researcher

In carrying out the role of practitioner and insider researcher it was important not to forget that I was also a learner undertaking the journey to a Professional Doctorate. This required me to remain mindful of the necessity to meet the requirements of the learning process (Costley *et al.* 2010, p. 4) that I was engaged in and to be reflexive in my role as practitioner researcher. This allowed me to contemplate my positionality, capacity and capabilities to carry out the research. Indeed, the *practice* of being a practitioner researcher can partially be associated with the deployment of a non- technical skill set, similar to the NOTECHS required of aviation pilots. The categories of *co-operation, leadership and management, situational awareness and decision making* (Flin *et al.* 2003) underpinned by the linked requirement of *communication* all require consideration when working in the context of practitioner researcher. It is not difficult to see how these categories can perhaps, apply to all forms of practice.

Costley and Lester’s (2012, p. 259) epistemological perspective on the work-based professional doctorate helps to illuminate some key requirements of the practitioner researcher and the essential foundations of the research approach adopted in my research here:

Epistemologically, this kind of work-based learning draws on three traditions: an action-based pragmatism that emphasises the interdependence of knowing and doing, a constructivist and to some

extent phenomenological perspective that sees the learner as making sense of situations from an individual and autonomous position, and an action-research or praxis-oriented philosophy where there is a concern to create and learn from change through enquiry-driven processes.

The following chapter shows how I enacted this praxis-oriented philosophy in order to facilitate better understandings of my practice.

Chapter Four

Project Activity and Findings

Introduction

This chapter begins with a contextual analysis that outlines the integration of student roles in this particular example of WIL and aviation professional practice. Further, the integrated organizational context is presented and this provides the opportunity to consider the separate identities of the organizations but also the agreed connectedness and what this means in relation to pedagogy and partnership.

The responses from student questionnaires are presented and the findings from these are discussed in Chapter Five. The detailed approach to semi-structured interviews involving flying training staff, company managers and directors and staff from the Middlesex University aviation team is also presented here. Specifically, the process that was used to determine emerging themes is explained. The specific findings from all semi-structured interviews are discussed in Chapter Five. The content analysis and findings from student work from eleven degree modules are presented here. Once again, there is further discussion in Chapter Five on this gathered data.

Contextual Analysis

The conceptual overview of the site of learning provided in Figure 2.1 emphasises the usefulness of systemic mapping of the WIL terrain. This type of diagram provides a tool that can be used as a template to aid contextual analysis of WIL in any particular sector and provides a starting point for deeper analysis of pedagogy. For example:

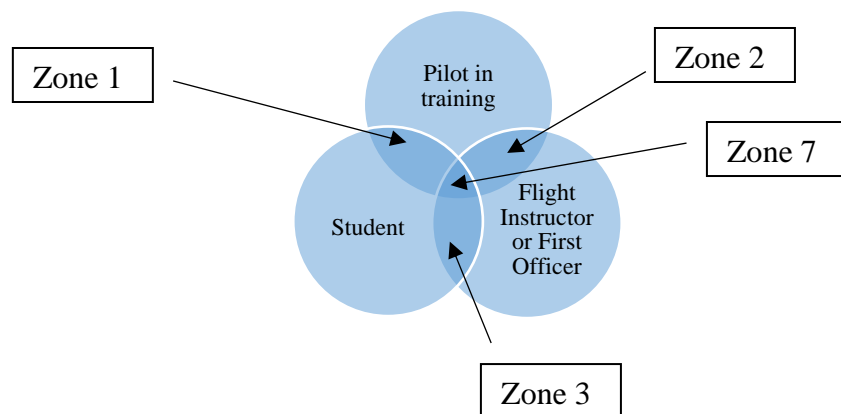


Figure 4.1 Integration of student roles

Focusing on Zone 1 (Figure 4.1) allows for specific and deeper consideration of the impact of HE study on pilots in training and vice-versa. Focusing on Zone 2 allows for specific and deeper consideration of the relationship between pilot in training and their role as an employee, either as a flight instructor or first officer. Focusing on Zone 3 allows for specific and deeper consideration of the impact of HE study on students in their employed role as a flight instructor or first officer.

The overlapping ellipses (Figure 4.2) provide an opportunity for deeper analysis of the organizational context in which professional aviation pilot practice is being developed.

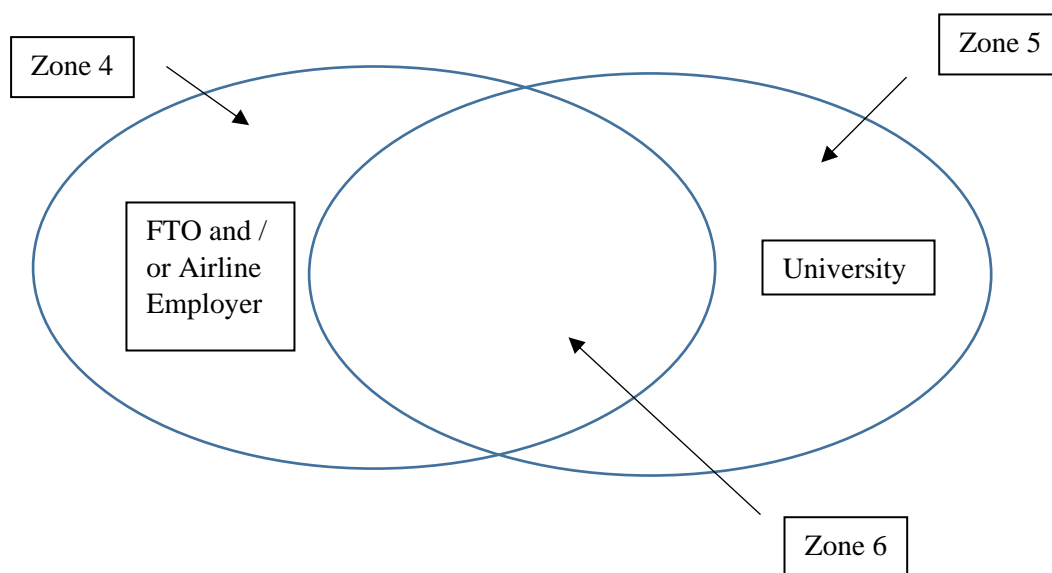


Figure 4.2 Integrated organizational context

Focusing on Zone 4 allows for specific and deeper consideration of the FTO or airline employer. Note that this context changes as the employed status of the student emerges. The impact of pedagogy from within the FTO or workplace with an airline employer is apparent here. Focusing on Zone 5 allows for specific and deeper consideration of the role of the university and any adopted pedagogies that affect pilot development. Focusing on Zones 4 and 5 allows for specific and deeper consideration of the complex relationship between partner organizations as they engage in facilitating the professional training and development of student aviation pilots. The complexity arises due to the joint pedagogical responsibilities, partnership working within a commercial agreement and the potential involvement of airline or aviation sector employers. Focusing on Zone 6 allows for specific and deeper consideration of the effectiveness of the combined organizational contexts in delivering the aviation degree programme. Zone 7 in Figure

4.1 represents the centre of the nexus and the final result from this entire endeavour, professional aviation pilot practice as achieved through a joint FTO / Middlesex University degree programme.

Project Activities and Findings

Student Questionnaires

The questionnaires were developed for distribution via Qualtrics. Participant Information Sheets and Consent Forms were sent with the email invitation to participate (Appendix 11).

The questionnaire targeted for Year 1 was sent to 22 students and achieved only 2 responses. The possible reason for this is the intense nature of ATPL study and students are likely to prioritise this above all else. The questionnaire targeted for Year 2 was sent to 10 students and achieved only 1 response. The questionnaire targeted for Year 3 was sent to 10 students and achieved 4 responses.

However, the responses are indicated below (note: Q1 in Qualtrics relates to consent to begin the study):

Part 1

The following questions relate to taking the aviation degree programme:

Q2 How well has being a student on the BSc (Hons) Professional Aviation Pilot Practice improved your understanding of what is required in the role of a professional pilot?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		1	1		
Year 2 (n=1)			1		
Year 3 (n=3)			3		

Q3 How well has being a student on the BSc (Hons) Professional Aviation Pilot Practice improved your aviation knowledge?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)	1		1		
Year 2 (n=1)				1	
Year 3 (n=3)		2	1		

Q4 How well has being a student on the BSc (Hons) Professional Aviation Pilot Practice improved your flying proficiency?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)	1			1	
Year 2 (n=1)		1			
Year 3 (n=3)		1	2		

Part 2

The following questions relate to what you may be able to do as a student on the BSc (Hons) degree in Professional Aviation Pilot Practice.

Knowledge and Understanding

At this stage of the degree programme, how well are you able to:

Q5 Demonstrate knowledge and understanding in aviation?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		1		1	
Year 2 (n=1)	N/R onwards	0	0	0	0
Year 3 (n=3)		3			

Q6 Understand aviation theories, concepts and principles?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		1	1		
Year 2 (n=1)					
Year 3 (n=3)	1	2			

Q7 Carry out research and analysis in aviation and extract relevant points?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)			1	1	
Year 2 (n=1)					
Year 3 (n=3)		2	1		

Cognitive Skills

At this stage of the degree programme, how well are you able to:

Q8 Select, evaluate and comment on reading, research and primary sources?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)			1	1	
Year 2 (n=1)	N/R onwards	0	0	0	0
Year 3 (n=3)		2	1		

Q9 Present your view or argument, consider alternative views and explain complex ideas?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		1	1		
Year 2 (n=1)					
Year 3 (n=3)	2	1			

Q10 Solve problems, make decisions in complex and unpredictable circumstances?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		2			
Year 2 (n=1)					
Year 3 (n=3)	1	2			

Q11 Produce creative work?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)			2		
Year 2 (n=1)					
Year 3 (n=3)		1	2		

Practical Skills

At this stage of the degree programme, how well are you able to:

Q12 Show evidence of developing and applying skills in aviation?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		2			
Year 2 (n=1)					
Year 3 (n=3)	1	2			

Q13 Complete practical tasks independently?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		2			
Year 2 (n=1)					
Year 3 (n=3)		3			

Q14 Demonstrate technical skills?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		2			
Year 2 (n=1)					
Year 3 (n=3)		3			

Q15 Present your work in different formats and gather, process and interpret data effectively?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)			2		
Year 2 (n=1)					
Year 3 (n=3)		1	2		

Transferable Skills

At this stage of the degree programme, how well are you able to:

Q16 Communicate information, ideas, problems and solutions verbally, electronically and in writing in suitable formats?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		1		1	
Year 2 (n=1)					
Year 3 (n=3)		3			

Q17 Demonstrate numeracy and digital skills?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1(n=2)		1	1		
Year 2 (n=1)					
Year 3 (n=2)	2		1		

Q18 Contribute to group discussions or project work?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)			2		
Year 2 (n=1)					
Year 3 (n=3)			3		

Q19 Manage your learning with minimal or no supervision?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		1	1		
Year 2 (n=1)					
Year 3 (n=3)		2	1		

Q20 Demonstrate initiative or personal responsibility?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		2			
Year 2 (n=1)					
Year 3 (n=3)	1	1	1		

Q21 Reflect on your work?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		1	1		
Year 2 (n=1)					
Year 3 (n=3)	2	1			

Professional Competences

At this stage of the degree programme, how well are you able to:

Q22 Achieve the professional competence required in aviation, appropriate for this stage of your training?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)		1	1		
Year 2 (n=1)					
Year 3 (n=3)		3			

Q23 Adhere to the rules and conventions in aviation?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)	1	1			
Year 2 (n=1)					
Year 3 (n=3)		3			

Part 3 (for Year 1, but shown as Part 4 in Year 2 and Year 3 questionnaires)

The following questions relate to how effective the BSc (Hons) degree in Professional Aviation Pilot Practice is in the way it combines pilot training, higher education and the workplace.

Q24 How well do you think that this type of blended approach of training, higher education and workplace development works in professional pilot training?

Response	Extremely well	Very well	Moderately well	Slightly well	Not well at all
Year 1 (n=2)			2		
Year 2 (n=1)					
Year 3 (n=3)		2	1		

Q25 What improvements (if any) would you suggest could be made:

By the FTO in relation to your studies and the degree?

Open response: N/A (year1)

Work on interpersonal skills when dealing with students to foster a more supportive environment. I decline to comment further via this format in fear of repercussion.

By Middlesex University in relation to your studies and the degree?

Open responses:

Perhaps keep better communication with the students, as there was a time where no one in my class had heard any feedback or next steps for months when other classes were having planned catch up sessions and so on. Another thing that could be better is to provide us with a timetable as this is something I don't have and would find it beneficial to assist in planning my university work alongside the FTO plan.

A more standardised approach to what each module leader is looking for would be good. There is a large variation in support and quality of feedback between module leaders, some of which is not constructive. In addition, sorting out the student finance issues with the loan system, to ensure students don't receive bailiff's letters despite having nothing to do with the payment of fees. Finally, ensuring that when a student specifically requests that a query sent to a module leader is kept

confidential, it is kept confidential and not disclosed to third parties almost immediately, as this removes any and all trust between student and module leader.

I feel that Middlesex could try and have more practical or web based activities for us to complete within the degree apart from the actual module work. This could be one to one with the uni leaders or in group situations with other degree students. It could help us consider our reflective practice etc. before we move onto a new module and produce more work. Could develop and improve our work even more.

I quite like being able to do the presentations over Zoom as this saves having to arrange for a lecturer to come to the FTO to watch my presentations. I feel like this is something which would be worth you carrying on doing.

By workplace providers in relation to your studies and the degree?

Open response: N/A (year1)

Employer had very little input other than my gaining of employment allowing me to both progress, and discuss topics with colleagues.

Part 3 (for Year 2 and Year 3 questionnaires, note the change in question numbering)

Q24 - Part 3 These questions relate to your pilot capabilities in operational flying. How do you rate your pilot competencies in the following areas?

Pilot Competencies	Excellent	Good	Average	Poor	Terrible
Application of procedures: Year 2					
Year 3		3			
Compliance with regulations Year 2					
Year 3		3			
Communication in normal and non-normal situations Year 2					
Year 3	1	2			
Automated aeroplane flight path management Year 2					
Year 3		1	2		
Manual aeroplane flight path management					

Year 2					
Year 3	1	2			
Leadership Year 2					
Year 3		2	1		
Teamwork Year 2					
Year 3	1	1	1		
Problem solving Year 2					
Year 3		3			
Decision making Year 2					
Year 3		2	1		
Situation awareness Year 2					
Year 3		3			
Management of information Year 2					
Year 3		2	1		
Workload management Year 2					
Year 3		3			

(Note: results have been displayed for Year 2 and Year 3 in the same table above)

Semi-structured Interviews

The semi-structured interviews of flying training staff, company managers and directors and Middlesex University aviation team staff were all carried out virtually and recorded using Zoom. The interviews were transcribed and coded using a manual technique. The temporary constructs from all interviews were sorted into emerging thematic areas and second order constructs could start to be recognised. These were:

Learning Mode / Student Considerations / Issues for the Academic / Feedback and Assessment / Developing as a Professional / Partnership / Pedagogy / Pedagogical Issues / Impact of Pedagogical Approach / Middlesex University Pedagogy / FTO Pedagogy

From these thematic areas it was possible to visualise sub-themes in some areas. For example, in the second order construct of ‘Student Considerations’ the following sub-themes emerged:

- Perceptions of the degree
- Widening participation
- Employment
- Issues for Students

In the second order construct of ‘Developing as a Professional’ the following sub-themes emerged:

- Professional environment
- Student responsibility

In the second order construct of ‘Pedagogy’ the following sub-theme emerged:

- Collaboration

In the second order construct of ‘Middlesex University Pedagogy’ the following sub-themes emerged:

- Reflective Practice
- Developing Skills and Attributes
- Transition points
- The Role of the Academic

In the second order construct of ‘FTO Pedagogy’ the following sub-themes emerged:

- Pilot Development
- Skills Acquisition

In the second order construct of ‘Pedagogical Issues’ the following sub-theme emerged:

- Communication

In the second order construct of ‘Partnership’ the following sub-themes emerged:

- Joint partner working
- Feelings about the partnership

- Programme rationale
- Programme closure
- Operational issues

The following nine second order constructs were considered as emerging themes and these were used as repositories in NVivo:

- Learning Mode
- Student Considerations
- Developing as a Professional
- Issues for Academics
- Pedagogy
- FTO Pedagogy
- Middlesex University Pedagogy
- Pedagogical Issues
- Partnerships

The sub-themes were used as a means of organising data in NVivo. The nine emerging themes that arose from interview responses provided an overarching view of the programme from both FTO and Middlesex University perspectives. This, therefore, provided a solid basis for discussion and analysis of the joint programme within this research. The emerging themes provided a mechanism for the merging of data from student questionnaires, content analysis and critical incident analysis (Appendix 12).

Semi-Structured Interviews of Flying Training staff

These interviews produced 55 temporary constructs and these were elicited from two senior members of staff who had extensive experience in aviation, the degree programme and working for the FTO.

Semi-Structured Interviews of Company Managers and Directors

These interviews produced 77 temporary constructs and these were elicited from the two company managers, directors and owners who had extensive experience in managing and operating the flight training organisation. The directors had been involved in the degree programme from its inception in 2013.

Semi-Structured Interview of Middlesex University Aviation Team Staff

The interview produced 49 temporary constructs and these were elicited from a senior member of staff who had extensive experience in Higher Education and in leading programmes and modules in aviation degree programmes at Middlesex University.

Content Analysis and Findings from Student Work

Student work from eleven degree modules was analysed and the findings are presented here below:

Level 4

Pilot Review and Professional Development (WBS 1201): at this stage the student will have successfully completed the Private Pilot's Licence and be studying towards ATPL examinations. The module requires them to submit a reflective report based on their learning from taking the PPL and a Professional Development Action Plan. They will have completed around 50 hours of flying in a light, single engine aircraft flying under visual flight rules.

Findings from this module:

There is evidence that students recognise the importance of *adopting professional values*. Students may set objectives of improving professionalism and the wearing of uniform seen as important to help instil confidence in themselves as pilots and future instructors:

A further objective of mine in assisting my professional development is to improve my attitude with regards professionalism and indeed professionalism as a whole... Wearing a uniform, I believe, is something that is often overlooked: it is of significant importance. The wearing of a uniform demonstrates being part of a team. It is also good for team spirit. The logo on the uniform also advertises the company and the brand. From the public's point of view the wearing of a uniform is reassuring: they are in safe hands - this is a professional outfit with high standards. (Student Data 1)

Learning from flying experience is represented as a major feature in student reports. Some students keep a learning journal of all flights and use this as a means of reflecting on their practice in order to improve:

but I am still learning every time I go flying I am learning something new of which I can document in my learning journal for future reference. To become a confident pilot, it needs practice, time and reflection. (Student Data 2)

The personal impact of *human factors* is significantly represented in student work. Students have recognised the need for motivation, determination, patience and persistence as well as the need to develop self-confidence. There is recognition of learning that plans do not always go as expected and that sometimes it is possible to dwell on negative feelings, for example, after a de-brief. The aim to be positive when things are going wrong, has been stated, as well as learning that the right result is linked to the effort that you put in. The value in improving preparation and time management has been recognised as well as the need for better planning in relation to rest periods from training, study and work in order to maintain fitness.

A key issue for pilots at this early stage is in learning to deal with psychological pressure, in particular, in learning to deal with stress:

The situation taught me that I needed to learn how to cope better with psychological pressure in the aircraft. The whole problem was self-perpetuated by my fear of not finding the airfield and its circuit, causing me to act erratically to combat the issue. (Student Data 4)

Learning from errors is also crucial:

Infringing on airspace was a humiliating experience initially but it created a further awareness of the tribulations of solo navigation. Without this, I wouldn't have adopted more sustainable techniques of navigation that reduce the margin for error as a PPL holder. (Student Data 4)

Learning to deal with failure and disappointment is evident in some student work.

In considering the links to HE pedagogy, *professional development planning* was recognised as being a useful process at this stage:

I hope that by following this professional development plan; I will mature as an individual, my flying skills will develop - I will become a more experienced, reliable and efficient, safer and professional operator - my personal attitudes towards flying and towards my career as a whole inevitably benefiting. Taking the time to write this plan has given me food for thought. In recognising and outlining the areas I wish to improve upon has not only provided me with an opportunity to learn, but also, I hope, make the remainder of my course - a transition into becoming a commercial pilot - a much more efficient and streamlined process. (Student Data 1)

There was also recognition that the course information on degree structure helped in forward planning and understanding what is to come. The professional style of the documentation was perceived to be professional.

Importantly, in this first module, students are able to see some benefits of *reflective practice* in improving their pilot practice:

After thoroughly addressing all aspects of the event I talked about in the report I gave myself critical feedback and areas to work on in order to strengthen my skills as a pilot. If it were not for the Report, I would have potentially brushed my mistakes and weaknesses to the side and not have come to the realization that I can progress into a much better version of myself as a pilot. (Student Data 5)

Level 5

Basic Flying 1 (WBS 2201): at this stage the student will be working on the ‘hours building’ of flying phase. A minimum of 150 hours of flying are needed prior to CPL entry. The module requires them to submit a reflective report based on their learning from flying experiences during the ‘hours building’ phase.

Findings from this module:

Learning from *flying experience* is represented in all student reports. One student report details an event where the student experienced a serious engine fault as Pilot in Command. Recent training and preparation for abnormal or emergency events was helpful in this situation:

I as PIC/US quickly calmed myself assessing the situation and informed ... of my decision to maintain the aircraft at a low level and to bring back the power. I there after informed ATC (Air Traffic Control) of the situation with my Pan-Pan call. (Student Data 6)

One reason I performed my radio calls well is due to my use of the following well-known procedure in aviation to aviate, navigate and lastly communicate (SKYbrary, 2020). This allowed me to have the aircraft under control and have a plan of action so that I was prepared to be able to make the call as calmly as possible. (Student Data 6)

A different experience showed the value of preparation:

this situation has taught me the importance of a proper briefing about the destination aerodrome. (Student Data 7)

Another experience of technical failure demonstrates the link between the physical and human systems:

Experiencing a radio failure was completely new to me and therefore I experienced an element of anxiety and panic. (Student Data 8)

The impact of *human factors* is evident in student work; dealing with stress and the requirement for decision-making are key factors:

I would say I was at optimal levels of stress, hence enhancing my decision making. Although an urgency is something I'd never want to come across in the real world, experiencing this situation has given me the opportunity to develop as a pilot. (Student Data 6)

self-doubt and panic started to slowly appear. As stress began to increase, I was less and less focused on flying the aircraft and began to worry more about what could be rather than the now. (Student Data 6)

I tried to keep myself as calm as possible and just fly the aircraft. I was also happy with my decision making in initiating a go-around rather than trying to land when it wasn't safe. (Student Data 7)

by losing contact with them I felt isolated, especially as a low hour pilot. I also started to doubt myself questioning if I had made a mistake leading to my loss of radio contact. (Student Data 8)

The emotional response features largely in these reports, low hours pilots reported feelings of stress, panic, lack of confidence and embarrassment in some cases. However, actions based on training and prior study led to safe outcomes:

for example, reading back landing clearance. I felt this made the flight safer and greatly reduced my feelings of stress and made me feel fully in control of the situation. This taught me how I respond to new and stressful situations and how going forward I should approach these events in a more pragmatic way. (Student Data 8)

Reflection on practice was seen as beneficial in these early stages of flying development:

Reflecting on my actions and emotions during this flight has allowed me to understand that even though there were not many negatives, that I can still take time to learn from the positives – the things that did go well. (Student Data 6)

The *action planning* stage of the reflective process was considered valuable:

Creating this plan will allow me to enhance my skills as I transition from a PPL (Private Pilot's Licence) holder to a CPL (Commercial Pilots Licence) holder. I've found using the Gibbs model very effective, breaking down this experience into the six stages has allowed me to reflect upon this experience making me think about things differently and

how I plan to act if this was to occur again in the future. (Student Data 6)

I found using Gibbs cycle to be very effective for me and I learned a great deal from it. It allowed me to breakdown the event clearly and thoroughly identifying the key points to build an action plan upon. Additionally it provoked me to thoroughly examine my feelings to really identify how I responded to the situation and by studying this it has increased my confidence should I have any other unusual situations when flying. The technique showed me I learn best from questioning why I felt a certain way about my actions and using this to build an action plan. (Student Data 8)

Basic Flying 2 (WBS 2202): at this stage the student will have accumulated a significant number of flying hours. 150 hours are required before entering CPL training. To apply for a CPL the student must complete at least 25 hours of dual flight instruction, including 10 hours of instrument instruction and 15 hours of visual flight instruction. Five hours of the instrument instruction can be taken in a simulator. At least five hours of the flight instruction must be completed in a 4-seat aeroplane with a variable pitch propeller and retractable landing gear. The student also needs to complete at least 5 hours of night flight instruction, comprising 3 hours of dual instruction, which will include at least 1 hour of cross country navigation and 5 solo take-offs and 5 solo full stop landings. The student must have at least 200 hours of flight time before conducting the skills test for CPL and 100 hours must be as Pilot in Command (CAA 2021d). The module requires them to submit a reflective report based on their learning from flying experiences during this more advanced ‘hours building’ phase.

Findings from this module:

Once again, learning from *flying experience* is represented in all student reports. The expected flying proficiency for a commercial pilot is much higher than for a private pilot. Evidence from one student shows how mistakes were made in a mock skills test in relation to maintenance of altitude and in landing technique in windy conditions. The problem of altitude maintenance was recognised as resulting from higher workloads during planning a diversion and the stalling exercise. The need for systematic multi-tasking was also recognised by the student and a plan was created to enable better management of the flight with effective use of knee-board notes for the diversion and a better work cycle for instruments and lookout. The one-to-one support and guidance from the flying instructor was seen to be particularly important, in particular, in helping to develop student confidence and understanding the professional role:

He was actually very happy with my decision making, but just wished I had tried a little harder to attempt the landing. He reminded me that after I pass my exam, I would be a commercial pilot and that brings a lot of expectations with the name. So even though my decision making was correct, I need to keep in mind that I have the skills and ability to fly in such weather conditions and perform a good landing. (Student Data 9)

Other student work shows that the transition to flying multi-engine aircraft can present difficulties due to the higher speed of the aircraft:

By advancing the throttles slightly and increasing the speed I had slightly less time to process all the information I was being given, and the checks and manoeuvres I had to carry out. This was enough to cause me to become very stressed and disorientated. (Student Data 10)

I felt amazed at just how much faster a pilots brain must work when flying at the higher speeds associated with a multi-engine aircraft, to maintain full control of the situation and not feel as though they are having to catch up to the aircraft. (Student Data 10)

High levels of proficiency in navigation are required for the CPL. Some student work shows that unplanned in-flight diversions can present real challenges rather than just a pre-planned exercise:

On the day in question, the weather was poor so the diversion I made in order to reach my destination was for real – as opposed to being simulated by my instructor. (Student Data 11)

I found the entire diversion leg from start to finish to be extremely stressful and felt that I didn't have the capacity to cope with this as well as fly the airplane efficiently. Reflecting on this, having since done more diversions on navigation flights, I feel this was mostly due to a lack of diversion practice and a lack of self-esteem. (Student Data 11)

I have learnt as a result of this experience, that until I become proficient at a certain task (in this case, the diversion planning in-flight) I struggle to have the mental capacity to focus on other equally as important tasks at the same time. (Student Data 11)

Once again, *human factors* are seen to play a crucial part in pilot performance. However, the link between pilot proficiency and mental processing are strongly highlighted. The evidence shows how vital the realistic training exercises are in pilot development. The role of the instructor in providing experienced guidance and support was seen to be of extremely high value.

Taking the Commercial Pilots Licence Skills Test can also prove to be stressful, it is recognised as an important point of transition and is financially costly for the student:

Doubting my abilities during the flight led to me becoming stressed, so was not a good action. I did manage to control the stress to a certain degree, and try not to let it affect my flying too much. To that extent, I feel it was a positive, as it showed me that even under pressure; I can still fly the aircraft. (Student Data 10)

The overall impact of the CPL training course was seen to be valuable:

My Commercial Pilots Licence training course has been challenging, but very beneficial, and I feel that I have certainly come out of it a much better pilot. (Student Data 10)

In relation to *reflection on practice*, some students begin to explore and utilise different models of reflection at this stage. University staff encourage this for some students and resources are provided to enable this exploration. The engagement with reflective practice is seen to be of varying depth and intensity. Where students apply themselves strongly in reflection, the events are deconstructed in greater detail and there is potential for better understanding as a result. Some students have gained from engaging in wider reading around critical reflection at this stage.

Flight Instruction (WBS 2205): at this stage the student will complete a Flight Instruction Course that takes around ten weeks. This comprises a 30 hour flying course with 125 hours of ground school and requires successful completion of a skills test at the end. During this module the students are learning to become flight instructors. They are learning about how to carry out instruction in the classroom as well as in the air. Blending the roles of instructor and responsible Pilot in Command presents a complex challenge. The module requires them to submit a reflective report based on their learning from instructional experiences during the flight instruction course as well as a learning diary from this period. Successful completion of the skills test is also required.

Findings from this module:

Important learning is gained from the course instructor who simulates being a student in the cockpit. The instructor draws from their experience in introducing typical student errors that the student instructor must deal with. Students are also seen to learn from their own errors, for example, in dealing with the unexpected weather conditions. The instructor exemplifies the required capabilities in demonstrating how to deal with unforeseen problems and has the ability to ensure flight safety.

The inherent limitations of the simulated instructional environment were recognised by one student who considered the effects of ‘cockpit gradient’ in the instructor-student

relationship, however, instructor communication and support was seen as extremely valuable in all cases:

I felt grateful for having faced a situation like this with an experienced pilot beside me, giving me the correct advice and teaching me the skills essential to my safety and how to teach students to deal with any similar situation. (Student Data 14)

Learning from professional discussions and back seating on peer flights during the course were also found to be beneficial pedagogical approaches in flight instructor student learning.

The transition to becoming a flying instructor and recognising the requirements of this additional professional role is apparent in student module work. In particular, there is recognition of the importance of 'putting yourself in the position of the student' in order to improve own instructional practice. The importance of working to a high standard as an instructor as well as maintaining and improving own pilot skills and knowledge is emphasised in some student work. Some students are able to scope out their future actions as a flying instructor and begin to explain their ideas and strategies for effective student learning:

It is important to create a working environment where students feel comfortable enough to raise concerns, question decisions and also offer solutions. This can be achieved through clear communication and encouragement. (Student Data 14)

I am starting to see more areas that can be developed in the role as a flight instructor. One is using the effective aide memoirs. (Student Data 13)

A student may be learning but they are still considered crew when it comes to general airmanship, keeping a good look out and listening on the radio. CRM is a crucial element to the FI role which will be developed continuously throughout my training. (Student Data 13)

The reflection on practice has enabled students to analyse their experiences and construct concrete ideas about the development of themselves and their own practice as flight instructors. It is evident that they are able to hone in on particular attributes and capabilities requiring further development:

Forward thinking is a vital skill in order to be ahead of the aircraft and would have greatly assisted this situation. This will allow more spatial awareness and will allow better control and planning in the event of any unforeseen situation. (Student Data 14)

Having not experienced this before I was indecisive and lacking confidence to decide on how to deal with the situation. On the ground we debriefed the flight and discussed how to deal with weather like this in

the future, and ways to build confidence in decision making. After a constructive debrief I was more positive about the situation and more confident to deal with any similar situation more appropriately in the future. (Student Data 14)

During this flight I was responsible for the radio, departure procedures, flying the aircraft, navigation and teaching, all whilst trying to fly accurately to set an example to the student and speaking in synchronisation with my flying. This uses a lot of my mental capacity so I have to manage the flight effectively by thinking ahead in time, which is a skill that can only be developed with experience. (Student Data 13)

During teaching the same exercise back (acting instructor) I experienced capacity saturation. I certainly struggled with keeping my situational awareness in terms of navigation and building a mental picture in regards to other aircraft in the vicinity. This I feel is a weak area that can be developed. (Student Data 13)

will be interesting to see how my skills develop further, namely my mental capacity. Over time I will develop methods that will enable me to better cope with the teaching and flying elements in the role. Situational awareness is an aspect of this, as well as skills such as leadership. I will be the pilot in command so teaching people of all ages and asserting this role in a mature manner is a personal asset that will be developed. Quick decision making is another area that will certainly be developed in my new role. (Student Data 13)

The weekly progress diary acts as a mini-learning journal for the period of the Flight Instructor Course. It seems to be very effective and allows the student to give a snapshot of their most important learning points from the course as well as encouraging deliberate and ongoing reflection on practice.

Some students are able to incorporate their wider reading to good effect. For example, by citing and referencing useful sources on instructional issues, human factors, aviation theory, Crew Resource Management and reflective practice.

Flight Instruction Standardisation (WBS 2206): at this stage the student will be a CPL licence holder and FI Licence holder. The student will normally have achieved a night rating allowing them to fly in hours of darkness. They will have good flying experience, typically around 240 hours. They can fly solo in a light aircraft under visual flight rules. They can carry out flight instruction under supervision, they are considered 'restricted' until they have enough experience and meet the CAA requirements. Students will have completed a one week introduction to the ways of working as a flight instructor at the FTO. The module requires completion of a portfolio of negotiated flight instruction experience, a presentation based on learning from flying instruction practice and completion of a professional development action plan.

Findings from this module:

The transition to becoming a professional pilot and the associated expectations were recognised in some student presentations:

Particularly this course and also the CPL it was the main get out from it, is the transition from private to professional pilot and that's how I go about it, this flight and all of the other training flights, I am a professional pilot, so whether it's best friend, worst enemy, still got to have that professionalism and conduct the flight in that professional manner. (Student Data 15)

Also, on taking responsibility and maintaining professionalism:

The responsibilities of the Pilot in Command... really, even the CPL course, I am the Pilot in Command but you're not really, there's somebody there to watch you, there's somebody there who's always keeping an eye on you, whereas with the flight instructor and my role as a flight instructor it's... it almost becomes very real it's...I really am Pilot in Command now, it really is my responsibility to care for this aircraft, care for the people in it, so I think that certainly helps with the professionalism because, as I say, it's now out of the training world as in 'I am the student' and it's really I've got a responsibility here, so it all becomes very real-life now, which is where I have to maintain this professionalism. (Student Data 15)

The Professional Development Action Plan helps the students to clarify and formalise their thinking:

I found a key change in the way I looked at flying happened when converting the PPL to a CPL. This milestone was the change from recreational to professional aviation which significantly changed my outlook and way of thinking. At this point I began to take my profession extremely seriously given that all my flying was and is single pilot. That is, I am solely responsible for the operation of my aircraft and the safety of both it and the passengers. (Student Data 15)

Another student found value in creating the forward plan and recognised that the structure assisted in monitoring self-progress and gave a better sense of being prepared for what was ahead.

During their practice as a flight instructor the student instructors learn to adapt their teaching in relation to each of their individual students. Some student instructors experience difficulties in particular aspects of their own student's progression and this can be challenging to deal with. It requires some resilience on the part of the student instructor. Student instructors have an organizational and peer support system that enables flying student progression, for example, a PPL student may be placed with

another instructor for a short period in order to provide an alternative approach to teaching and learning:

This learning experience made me a better instructor as I learned a lot about students and also about my abilities to instruct. (Student Data 16)

There are significant references in student work of recognising the responsibility of the role of the flight instructor. Leadership in the instruction process is exemplified by references to decision making and some students recognise the need to develop authority as an instructor. Student instructors also describe the initial difficulties of time and workload management. There are indications of identity formation and developing professionalism within all of the student flight instructor's work. One student mentioned important points about gaining professionalism by improving planning, turning up for work early and finishing things before leaving as a flight instructor. One student instructor described how being kind, courteous and professional enabled the development of mutual respect with their own students (Student Data 17).

Some students used the Kolb (1984) cycle as a means of reflecting on their learning from a particular event. Reflective practice continued to be seen as being useful, for example, through perceived benefits of completing a learning diary and writing up learning events that required further focus on experiences from practice. Student instructors demonstrated very strong presentation skills and could link wider knowledge sources within their own presentations. Improved communication skills and improved confidence were also described.

One student described how the role was both rewarding and challenging:

Being an instructor is so rewarding and I am really enjoying getting a variety of flights and being able to manage both my students. Seeing your student fly solo and flourish throughout the course is incredible, but also don't get disheartened when things don't quite go your way. (Student Data 16)

Level 6

Advanced Flying (WBS 3207): at this stage the student will have completed the CAA requirements for flight instructor standardisation and will be an unrestricted flying instructor. The student will be aiming to complete the Instrument Rating, an essential requirement for being able to fly to Instrument Flight Rules.

Findings from this module:

Student presentations provided useful insights into the development of practice and specific key points of learning. One student talked about some of the challenges in being a flight instructor. Issues of self-belief, time management, fatigue, weather and stress. Some emphasis was made here about decision-making and gaining experience.

Another student considered a specific challenging scenario while providing flight instruction. The student used professional and theoretical sources in helping to describe the experience. The importance of maintaining situational awareness was described and how the instructor plays a crucial role in providing a layer of defence in preventing an undesired aircraft state. In giving the example from own practice, the student explained how frustration can sometimes be experienced by the instructor. Trying to instil the idea of captaincy into the student is important and sometimes there may be self-doubt and the flight instructor questions their own ability. The student instructor described how it is important to hold the student to a high standard and that there are no special cases. Students undertaking flying instruction are sometimes under financial pressures and this can add to flight instructors concerns as they feel a responsibility for student progress. A variety of solutions may be utilised to solve progression issues, for example, instructors may sometimes change the lesson and do something else, sometimes encourage back-seat flying with other students to get the picture of the circuit, sometimes sitting in the radio tower to get a better sense of radio work and sometimes, taking a sterner approach is necessary with the student. This particular student instructor explained:

You learn on the job with different students requiring different approaches. (Student Data 19)

Another student presentation included comments about learning from experience as a flight instructor. In a busy FTO, quick turnarounds and building hours quickly may be possible for a flight instructor. The number of taught hours can lead to tiredness for a new instructor and in this case, five hours would normally be enough. More experienced instructors may be able to do a little more, however, the problem of fatigue is taken seriously in aviation and instructors are never forced to fly. Good personal habits in gaining a full eight hours of sleep and taking rest when required were explained. A number of real-world work-related topics were also raised within the same presentation, for example, gaining experience of flying schedules and factors that may affect smooth running of these. Sometimes, flying students may be late or not turn up for lessons, aircraft defects and maintenance may also impinge on smooth operations. Marginal

weather conditions are hard for less experienced instructors to judge and they ask more senior instructors for advice. This senior instructor explained that they had learned respect for the weather and wanted to set a good example for other instructors. Similarities were recognised in linking on-time performance required by airlines to on-time performance at the FTO. Close links between work, practice and study are reflected in this module.

Significant experience was gained from the training and flying practice. One student reflected on a challenging flight into an international airport using the Instrument Landing System (ILS). Turbulent conditions resulted in a 'go-around' and the student recognised the experience of stress and reduction of mental capacity in this situation. However, the experience was seen to breed confidence and a positive view was taken in relation to any future similar situations. The student also noted the development journey that they had taken:

It made me realise how far I have come since I first got my pilots license in 2016, from flying a small single engine aircraft in the local area to flying into an international airport in a twin with the big jets around me felt like a massive achievement. (Student Data 20)

The experiences gained from both real and simulated flying during this phase were seen to hold much value:

I think that these experiences have helped prepare me for the future, as I believe they have increased my ability to handle more complicated issues in the air and tackle them with a much more mature frame of mind. Each module I complete not only advances my hands-on flying ability and situational awareness but gives me the tools I require to develop into a more professional aviator in preparation for the airlines. (Student Data 20)

Multi Crew Co-operation (WBS 3208): at this stage the students on this programme will have completed a significant number of hours of flying instruction (600 hours may not be uncommon) and will have the Instrument Rating. They will also have recently completed the Multi-Crew Co-operation (MCC) course and this is the last step in training before being able to present to the airline industry as a qualified pilot. This may have been the first time that the students have encountered techniques in Crew Resource Management (CRM). This system of management enables the flight crew to maintain safe and efficient operation of the aircraft, reduce errors and avoid stress (SKYbrary, 2022a).

The module guides the student towards critical reflection on the acquisition and application of non-technical skills (NOTECHS) and demonstration of understanding of their importance in a range of professional contexts and scenarios. Students are also expected to develop a critical understanding of the purpose and application of appropriate checklists and standard operating procedures.

Findings from this module:

In undertaking the MCC course, students recognise that it is unlike any of their previous training as the focus is not the acquisition of technical knowledge or aircraft handling skills but on being able to work with and manage other members of the team. Students learn how to operate in a multi-crew environment and this is quite difficult to adapt to since much of their previous flying may have been single pilot and as PIC when instructing.

Initially I struggled to get out of my single pilot mind-set and I really had to concentrate on working in the multi-crew environment. I felt throughout the course this progressed well. (Student Data 22)

In completing module work, students are encouraged to reflect on their learning in relation to NOTECHS. This skill set includes categories of: Leadership and Managerial Skills, Co-operation, Decision Making and Situational Awareness (Flin *et al.* 2003) with Communication Skills being central to all categories. Students take part in practice scenarios and simulated flight operations as either Pilot Flying (PF) or Pilot Monitoring (PM), within each role they are expected to demonstrate NOTECHS.

In relation to *Leadership and Managerial Skills* one student recognised the positive aspect of sharing their mental model with the PM following an emergency simulated event, however, they also considered the potential negative impacts of neglecting to inform other crew members and passengers and how this would have had negative implications as the flight progressed

In relation to *Co-operation* students began to consider resources beyond the cockpit:

If this situation occurs again, I would like to see myself using more of the available resources such as the cabin crew and Air Traffic Control (ATC) to be able to offset some of the workload. It is easy to forget about the valuable resource that cabin crew can provide and co-operating with them and keeping them up to date is just as important as the two flight crew members co-operating. (Student Data 21)

In relation to *Decision Making* one student recognised the potential complexities of a shared approach and ways of dealing with this:

Having someone else on the flight deck with me was difficult to adapt to, as I had to trust them to make decisions and I had to learn how to become a PM. Luckily, we were given lots of techniques and tools to aid with decision making and conflict resolution should a disagreement occur. (Student Data 21)

Other students highlighted their first understandings of decision making tools, for example, t-DODAR (Time, Diagnosis, Options, Decision, Assigned, and Review) and BRAN (Benefit, Risks, Alternatives, Do Nothing).

In relation to *Situational Awareness* one simulated event with an error imposed, resulted in a near miss of flying into terrain, this was particularly shocking for the PM and PF and important learning was recognised. This also demonstrated the importance of simulated practice. In another simulation that centred on an unwell passenger, the students lost situational awareness due to PM and PF being distracted by the incident and this led to further problems in flight management.

Student work exhibits a stronger connection with a variety of professional and academic sources at this stage. Students are able to integrate models of reflection in their work and utilise these as frameworks to help them think critically about specific events from their training and practice. This approach, when blended with a base of authoritative professional and academic knowledge sources presents a persuasive strength in student work:

Over time, I have become more willing and confident in seeking out information independently, if it be technical information from an aircraft manual or textbook, or whether the query would benefit more from speaking to another professional such as an air traffic controller. (Student Data 23)

The practical and experiential nature of flight training was valued in one example of student work:

I identified through reflection that some events cannot be appreciated, taught in a classroom or learned from a book. The practical side of flight training is important in refining understanding by learning through experience. (Student Data 22)

The module re-visits some of the university-led pedagogical tools that have been used earlier in the programme. For example a personal SWOT Analysis gives the student the opportunity to review their progress and consider the future from a personal perspective. The Development Path Analysis gives the opportunity to review the professional journey to date and this allows near future objectives to be identified. The Development Action Plan allows the student to specify near term objectives and to provide the details

on how these will be achieved. This includes consideration of required resources, success criteria and timeline. Very mature and professional responses were evident in these parts of student work and included much self-insight and concern for improved performance.

Interestingly, the role of the FTO in supporting continuing professional development was recognised in the action plan of one student:

I have the help of colleagues and the ... (FTO)... team to support me in this process. (Student Data 22)

This is an important point about the underpinning support that the FTO provides; the foundational support structure of the FTO sometimes may go unnoticed.

Evaluating and Managing Risk (PPT 3011): at this stage the student will have completed all of the training requirements for airline entry. Students may take this module as one of the pathways to completing the degree while working as a flight instructor. Their practice as a flight instructor is likely to be at an advanced level at this point. This module aims to develop students' ability to critically evaluate and select responses to a wide variety of in-flight human, environmental and other risk factors that affect each flight.

Findings from this module:

Students are able to describe how they identify, evaluate, mitigate and manage the risks associated with flying as an instructor. This is achieved through the development of a portfolio that outlines a selection of risks that have been drawn from their experience in aviation. The selected risks have elements of technical, human and operational factors. Typical examples are the risk of icing on the aircraft, bird strikes, pilot fatigue and aircraft defects.

All of the student work highlighted the important role of FTO operational rules and training, for example, the mandatory requirement for instructors to undertake internal training on the threats of winter flying, icing and procedures for de-icing.

In relation to the risk of bird strikes, students included very good references to official data in support of explaining the risk. Once again, FTO systems were highlighted with references to annual safety reviews, the safety management system and safety notices. The FTO operations manual was referred to as one of the guiding factors in mitigating the risks of students damaging the aircraft on landing. Adverse weather was seen to be a potential contributing factor in students damaging an aircraft on landing; the FTO

stipulates set weather minima for all pilots and formal procedures for student solo navigation flights, once more, demonstrating professionally regulated operations and procedures.

One student utilised a structured approach to analysis for each example of risk, this involved four stages: Identification of Risk, Evaluation of Risk, Risk Matrix and Mitigation and Management of Risk. The student presented a particularly useful inquiry into the future work setting by considering the risk of pilot fatigue:

With the growing demand of daily commercial flights, airline pilots are subject to long working hours with short rests and breaks between. (Student Data 25)

Official data and theoretical sources were used to support the inquiry alongside personal experience:

as a flight instructor, I've experienced fatigue due to trying to utilize a day of good weather to get students flying. This resulted in slight burnout by the end of the day. (Student Data 25)

The requirement to formalise students own understanding in relation to risk was seen to be of some value:

As I carried out my detailed analysis of each risk, I deliberately targeted arguments and concepts from different perspectives. Doing so has allowed me to think broadly about each applicable risk and create mitigation and management methods that I can effectively implement in the future. (Student Data 25)

The reflective briefing requirement of the module, whereby the degree student was required to reflect on their own experience in relation to a risk event proved valuable in this case:

The process of evaluating and managing risk has provided a new perspective into my working practice as a pilot. By utilising the process effectively with regards to this event, I worked towards reducing the known level of risk to an acceptable and practical level. I desire to further improve on this skill specifically in relation to my upcoming airline pilot career. (Student Data 25)

Most student work indicates very good alignment with the expected standards of written presentation at Level 6. Report writing was seen to be at an acceptable professional level in some cases. Reflective briefings were seen to be of value in every case.

Using reflective practice has really helped me develop into a professional pilot and one reflection I noted in my action plan "I am going to always check multiple sources for my weather briefings". (Student Data 26)

Threat and Error Management (PPT 3012): at this stage the student will have completed all of the training requirements for airline entry. Students will be taking this module as the final module on the pathway to completing the degree while working as a flight instructor. This module aims to establish and reinforce the inevitability of human error in the cockpit, and promotes active engagement in identifying threats as a pre-emptive measure and to mitigate the effect of errors as a reactive measure.

In this final module of the degree, students have the opportunity to demonstrate the integration of technical and non-technical knowledge, understanding, skills and professional competencies drawn from professional pilot training and operational flying practice.

Findings from this module:

Students had prepared and delivered off-line presentations that met the brief of producing a review of case studies that identified threat and error management operational issues. All students were able to demonstrate a good understanding of Threat and Error Management. This was evident within student presentations where the theoretical basis of threats and error were defined as well as likely occurrences that could lead to an undesired aircraft state. Students were able to compile a series of case examples relating to threat and error management that related to their own context and composed effective strategies for managing the specific examples. Students were seen to use a mixture of authoritative sources, both professional and academic in support of their work. The use of case examples from their own experience was seen to be effective in the exploration of Threat and Error Management and in developing a deeper appreciation of this topic.

Each student presentation was followed up with an online and asynchronous student led symposium discussion to debate findings and conclusions with other practitioners. Students were expected to contribute to each discussion thread on the understanding that this formed part of the normal work required for the module and the level of their interaction would affect their own final module grade.

There was active involvement and discussion in the symposium with all parties benefitting from the interactions. The professional discussion was seen to influence and support others and it developed wider understanding through sharing of practice.

Students finalised their module submission by creating an operational improvement action plan demonstrating how the findings from their work in the module would be

incorporated into their continuing professional practice. The action plan provided a final opportunity to summarise and review what had been learned from the case study inquiries. The action plans were structured in the formal structure of Objectives – Actions - Resources - Success Criteria –Time. This can be viewed as an interesting way for the students to complete the degree as it means that the continuing development of their professional practice doesn't end here. One student recognised some of their own development:

because it is something that I have actually noticed from having done this course, that a lot of what I am making standard practice is translating over to other elements of my job. I find several outcomes are especially true of my mind-set: - I am now far more analytical. I spend a lot more time first analysing a problem before acting on trying to correct it. I think this has helped me to come across more calm, composed and ultimately more competent, as the outcome is usually far more desirable. (Student Data 29)

Aircraft Specifics (WBS 3203): at this stage the student will have gained employment with an airline as a first officer and be ready to commence type rating for the aircraft that they have been employed to fly. Undertaking a type rating involves studying through a period of ground school and simulated practice relating to the specific aircraft. Finally, the student will fly the real aircraft and demonstrate initial competence under supervision.

Once type rating has been achieved, the student will commence a period of line training, this involves flying normal airline routes with passengers while under the supervision of a training captain and safety pilot. Eventually, the safety pilot will not be required and a training captain will be needed until sufficient sector (individual flight) experience has been gained.

This module is taken as part of the degree 'airline' pathway as an alternative to the flight instruction route and is consequently, the third module in year 3 for students on this pathway. Students are required to produce a reflective review of their experience of undertaking type rating and a larger report on their initial experiences of line flying.

Findings from this module:

The training period of the type rating is described by students as being challenging and intense. Students are required to demonstrate their learning of the highly complex

aircraft systems and procedures as well as performing safe simulated flights and finally safely flying the real aircraft.

One student describes significant learning from events during the simulation phase of type rating. In one event, a technical error was made in not setting standard pressure. In a real aircraft this could result in flying at the incorrect altitude with very dangerous consequences. The student's reflection on this event described the learning gained and how the experience helped to modify future practice. In a further simulated event, both members on the flight deck made errors relating to an unsafe aircraft condition being flown on a go-around. One of the factors highlighted in this event was the issue of tiredness as a result of a long training period in a full-motion simulator.

Sometimes, type rating training allows trainee first officers to train alongside experienced captains who may be required to train on a new type of aircraft. This can normally present benefits to the degree student as they are able to be guided by the more experienced practitioners:

There were six of us on the course in total however I was the only new first officer; everyone else was an experienced captain. Having this level of experience around me proved to be a massive asset. The teamwork and communication skills we developed during the ground school phase of the type rating became vital later in the type rating particularly during emergency procedures in the simulator. (Student Data 31)

One of the most valuable lessons my colleagues taught me was that the captain and first officer are there to support each other. Even captains can make mistakes and it is the first officer's job to point these out to keep the aircraft safe. (Student Data 31)

However, the more experienced practitioners can benefit from the degree students too, as they are fresh from flight school and have an immediate training and learning mind-set. They are able to share study techniques and modern perspectives as a result.

Once more, the period of type rating is reported as being challenging:

The long days and endless amounts of information had me working flat out. (Student Data 31)

Long, intensive simulator sessions present particular demands as they can occur at varying times during the 24 hour window and students may find this exhausting. One student reported the need to be determined and the benefits of having a good work ethic.

One student recognised the characteristic of type rating theoretical ground studies and practical simulator training to focus upon operating the aircraft at the extremes of its normal operational envelope. Dealing with aircraft faults and adverse environmental

conditions are clearly useful experiences for when non-normal conditions, however, the student noted that in the transition from type rating to operational line flying, three key elements arose:

- i) the type of theoretical knowledge required;
- ii) the handling characteristics of the aircraft during the landing phase of flight;
- iii) the operational tasks required of crew members.

The first element refers to the need for applied knowledge. In reality, this is achieved by flying the actual aircraft and requires the student to blend their prior theoretical knowledge with the real situation. New knowledge for the student was created by blending the practice of flying with prior knowledge. This featured within the second element whereby learning to handle the aircraft under different weight conditions was experienced. Simulated practice often occurred with mid-range weight settings and adaptation was required in the real aircraft. The third element refers to the need for students to gain understanding of the wider range of operational engagement, once on the line.

During the period of line training, the experiences from flying the real aircraft in a fully operational commercial setting, provides further significant challenges for the student pilots as well as representing valuable opportunities to continue their development of professional practice. In one event, where the student had made a technical error in the final stages of taxiing, the line training captain demonstrated very supportive skills in the situation and the student recognised the benefits of this type of leadership and reported that they would carry this into their future practice when they have achieved captaincy.

A student reported an event of a bird strike that resulted in damage to an external sensor, this caused the captain's instrument display to give faulty readings, the 'stick shaker' activated making a loud and continuous noise in the cockpit as a stall warning indicator. The startle effect was experienced and the student was required to declare an emergency to ATC. The student also took control of the aircraft while the captain determined to solve the problem. The result was a safe return to the airport after 2 hours to burn off fuel. The PF and PM made use of a decision making tool in the cockpit and demonstrated very good mutual support during a highly stressful situation. During the event, much co-ordination was carried out both in the air and on the ground, facilitated by ATC. The official report of this event fed into the company safety management

process and learning was shared. The student learned much from the event and continual knowledge building was thought to be crucial:

I am extra vigilant in my studies and maintenance of emergency procedure knowledge, especially non-normal checklist memory items, of which there are not many, but all could be lifesaving. (Student Data 30)

One student reported on their first line flight as taking place in the dark and that the flight was extremely short, lasting only ten minutes. The demands of the new experience were compounded by acclimatising to the higher speed and power of the aircraft as well as in executing timely checks. Once more, excellent support was provided by the captain in understanding the challenges that the student faced. The benefits of prior training were acknowledged by the student:

but knowing I had gone through years of training made me confident that I was able to fly the aircraft safely to the destination. (Student Data 31)

In another event during the first week, the student encountered ice accretion on the aircraft. The ice warning alarm sounded and the student observed the accretion of ice on the wing at what appeared to be an alarming rate. The captain reassured the student by explaining that things would be fine as long as speed was maintained and no more ice developed. The experience generated fear as the ice degrades aircraft performance and could lead to serious handling issues:

Even though I had been through the type rating to prepare me for a situation like this, experiencing it for real was an entirely different feeling. I think the biggest difference between the simulator and real life is the fear factor. (Student Data 31)

The student recognised positive outcomes from the experience, for example, by talking with the captain about the situation and developing an action plan should the situation have developed into something worse. The student also recognised that they needed to be prepared for many different scenarios and that it is important to remain calm, discuss what is happening with the captain and then make a decision with little panic or distress. The student created a series of forward actions from reflecting on this event and these included deeper analysis and attention to weather charts as well as further study of aircraft systems and air incident reports of the particular aircraft type.

In another event, one student experienced a problem with an auto-pilot malfunction. In this case, the student was able to confidently take control in manually flying the aircraft and recognised their confidence was perhaps, a result of prior experience as a flight instructor.

One student report involved the absence of a captain at the airport due to delays in commuting. There was a necessity to make decisions on fuelling in order to minimise any flight delay. The student was required to deal with the situation while considering operational regulations, particularly noting that the captain must make the final decision on how much fuel must be carried. The operational demands required careful navigation and the student demonstrated how they could adhere to regulations; carry out decision-making while being adaptable to circumstances.

In one event, a student noticed that different captains had different ways of dealing with a particular high-workload departure; prior experiences had led the student to recognise that any variations or inconsistencies in practice could lead to confusion during a critical stage the flight:

when flying with a captain for the first time I recognised that it was extremely important for us to discuss the departure and understand clearly the techniques we were going to implement throughout the procedure. Thus, in establishing a shared mental model, the threats could be mitigated and the problems alleviated (Student Data 32)

Airline Orientation and Integration (WBS 3204): at this stage, the student will have completed line training and will be continuing to build their experience as a first officer.

This module is part of the degree 'airline' pathway and is consequently, the final module in year 3 for students on this pathway. The module allows the student to consider their orientation and integration into their airline's organisation and culture. Students are encouraged to develop their ability to critically reflect on their own performance during the early stages of working with their airline employer. This evaluation will help to identify areas for improvement and further professional development in the form of purposeful follow-up actions that they can take beyond the end of the degree programme.

Findings from this module:

The management of fatigue was considered within one student report. Inquiring into this topic helped the student to recognise the personal responsibility associated with fatigue management in aviation. Flying on the line helped the student to develop an awareness of factors that contributed to fatigue. Tight turnaround times and uncertain nutritional breaks had been anticipated in contributing to fatigue, however, varying shift patterns,

commuting long distances before and after shifts and operating away from the normal base all added to the potential for fatigue.

Finding, assessing and adapting mitigation techniques was an important focus during my integration into the company. (Student Data 34)

Some solutions included establishing a routine and mental list of tasks to achieve efficiency and maintain safety during turnarounds. In addition to this, ensuring that meals could be taken before duty as well as maintaining nutrition with high protein snacks and keeping hydrated. Ensuring adequate rest was seen to be of particular importance and this could sometimes be achieved by using overnight hotel accommodation and sensibly managing any commute. Good multi-crew co-operation involved discussions between crew members in order to establish how many sectors they had flown prior to this day and what shift patterns they had worked. This helped to develop a shared understanding of who may be most prone to any effects of fatigue and assisted the crew in effectively distributing workload as well as in monitoring degraded performance in others.

One student reflected on flying in the post-Covid 19 environment and in discussions with colleagues discovered that the airline employer had shifted the priority from operational efficiency to safety. The lack of recency in pilot practice was of particular concern along with the heightened risk of runway excursions. In aiming to mitigate this risk, the student recognised that runway excursions can occur due to a multitude of possible errors. The student aimed to improve technique and knowledge and this needed to include effective CRM (Crew Resource Management), decision-making skills, and thorough study of previous runway excursion-related events. The student had observed that on two smooth landings on the same day that touchdown occurred slightly later than expected. Discussion with the captain revealed that the student had momentarily delayed in reducing thrust and this was the source of error.

Another area of student concern was the problem of skill fade. This is:

the decay of ability or adeptness over a period of non-use. (Skybrary, 2022b)

The student reported that long periods of absence can cause a pilot's situational awareness and decision-making skills to fade. Asking the captain to slow down when completing checklists or briefings is particularly daunting for new first officers, however, the student explained how they had developed improved communication and leadership skills by asking the captain to slow down on many recent occasions. In each

case, the captain had thanked the student for pointing out their momentary lack of situational awareness. The student observed:

Briefing while the co-pilot is struggling to keep up renders the exercise almost useless. Similarly, giving a thorough brief to a pilot who is distracted yields the same result. (Student Data 35)

Another student described their experiences of working through the period of the pandemic. In this case, the student experienced a dramatic increase in workload along with other colleagues. Specific precautions had to be taken to ensure the safety of passengers and crew during the pandemic and this added to the demands of commercial operations. The students flexibility, sense of responsibility and concern for the wider community led to agreeing to extra duties on their days off:

I felt an overwhelming sense of responsibility. (Student Data 33)

Commercial pressures were high and the student experienced some fatigue after a period of intense flying duties. From this, the student recognised the need to manage workload and took positive actions towards a safer and more sensible work-life balance. During this period, the student also developed a better awareness of how other areas of the business operated and the demands that they faced, for example, in engineering and in the operations department.

When critically reflecting on flying events, one student reflected on the experience and learning gained from an expected low visibility landing. As PF the student considered threat and error management and focused the brief on managing the threat of low visibility. Careful briefing was required due to the likely situation to be encountered as well as because the student had not flown a go-around in this type of aircraft before. The student drew upon prior knowledge from an experience that had been reflected upon in a previous degree module reflective report. The flight was particularly demanding and low visibility conditions were encountered very close to the runway, the student safely landed the aircraft. The student recognised the benefits of the experience:

I do believe that exposure to these types of experiences is one of the best ways of building confidence, and although not pleasant has been of benefit to me. (Student Data 34)

In this situation, the landing was an unexpected outcome as a go-around was thought to be the most likely occurrence followed by a planned landing at an alternative location. The student observed:

Achieving an open mind-set is perhaps the most difficult goal to set targets for; however I learned from this experience how important it is to

consider all possible outcomes, not just the most likely. (Student Data 34)

Important learning was also identified by the student in relation to CRM, specifically in communication, networking and teamwork.

Another student also experienced learning in communication and teamwork from a different experience in a flying event. In this case, the student had received a non-standard command from the captain and this resulted in a chain of events that centred on a loss of situational awareness by the first officer. The situation was resolved safely when the student called for a go-around and this allowed the crew to engage in a mental re-set.

Communication and teamwork featured largely in another flying event where a student was acting as PM. In this case, there was an engine malfunction during the flight. This became obvious when a loud bang and shudder were experienced and the right-side engine began to fluctuate in power, while making banging sounds. After gathering information on very poor weather at the destination, the crew decided to return to the departure airport. The student played a full part in team decision-making as well as carrying out essential support for the captain who was flying the aircraft. The student also reassured the cabin crew and assisted in planning for a potentially worsening situation:

I suggested that we explore the possibility and actions we would take if the situation were to worsen and to brief our options in the case of an engine failure or shut down. (Student Data 33)

The reason for the fault was still unknown and the engine performance continued to worsen. The captain declared a PAN-PAN to ATC, which indicates a state of distress but not a full emergency. However, ATC escalated the call to a full emergency. Fortunately, the aircraft landed safely with no injuries to passengers or crew. The student made the following reflections:

The captain and I communicated well, being efficient while continually reviewing the situation to ensure we both shared the same mental model.

The actions we took during the flight, use of DODAR and the priorities we maintained I believe were valuable and well thought out. We didn't rush or allow the startle of the event to compromise our decision making or conduct of the flight. (Student Data 33)

Critical Incidents

Due to the commercially sensitive nature of some of these incidents there is a need to present the critical incident diary separately for any examiners of this work. The diary will be made available, although, will not be attached to any final publication of this research.

The diary contains my views and analysis of what happened during the critical period between April 2019 and June 2021 in relation to the undergraduate degree programmes in aviation at Middlesex University leading to the ultimate closure of the associated commercial partnerships. This part of the research was intended to partially inform research question six: *How well do university / Flight Training Organisation partnerships work in practice?*

Discussion of the research findings follows in Chapter Five.

Chapter Five

Discussion of Findings

Introduction

This chapter begins with discussion on the findings from students who responded to the questionnaires that aimed to gather data on developing graduate skills, pilot competencies and student experience of the joint programme. This is followed by a discussion on findings from content analysis of student work from eleven modules of the joint degree programme. This discussion continues with the logical sequence of modules as presented in Chapter Four and in this way, assists in developing a clear picture of the student journey in developing professional practice. This is followed by discussion on the emerging themes that came from the semi-structured interviews of flying training staff, company managers and directors and Middlesex University aviation team staff. Each theme is amalgamated with and supported by comments from these interviews. The approach to discussion on critical incidents is briefly explained and a signpost to supplementary information is provided.

Discussion on Findings from Student Questionnaires

The perspectives from student questionnaires were limited by the low number of responses; this led me to concentrating on depth of analysis in all areas of the research in order to increase the evidence base. However, for these respondents, attending the degree has moderately improved their understanding of the requirements of being a professional pilot (Q2) and has made a good impact on their aviation knowledge (Q3). Attending this programme has improved their flying proficiency very well (Q4).

In relation to questions around *Knowledge and Understanding*, the students can demonstrate their knowledge and understanding of aviation very well (Q5) and similarly understand aviation theories, concepts and principles very well with improved understanding shown in year 3 (Q6). The students can carry out research and analysis in aviation and extract relevant points quite well in year 3 but not so well in year 1 (Q7).

In relation to *Cognitive Skills*, there appears to be an improvement in student capabilities in being able to select, evaluate and comment on reading, research and primary sources in year 3 compared to those in year 1 (Q8). Students are able to present

their view or argument, consider alternative views and explain complex ideas very well, once again, with improved perception of this in year 3 (Q9). Students are able to solve problems, make decisions in complex and unpredictable circumstances very well (Q10) and feel they can produce creative work to a moderate level (Q11).

In relation to *Practical Skills*, these students say that they can show evidence of developing and applying skills in aviation very well (Q12). The students report that they can complete practical tasks independently very well (Q13) and similarly, demonstrate technical skills very well (Q14). Students are able to present their work in different formats and gather, process and interpret data effectively to a moderate level (Q15).

In relation to *Transferable Skills* the students report that they can communicate information, ideas, problems and solutions verbally, electronically and in writing in suitable formats very well (Q16). Students say that they can demonstrate numeracy and digital skills at least moderately well but extremely well in some cases in year 3 (Q17). Students can contribute to group discussions or project work to a moderate level (Q18) and can manage their learning with minimal or no supervision, at least moderately well but very well in some cases (Q19). Students say that they can demonstrate initiative or personal responsibility very well in most cases (Q20) and indicate that they can reflect on their work better by the time they are in year 3 (Q21).

When considering their *Professional Competences*, students are consistent in their reporting, they report that they are able to achieve the professional competence required in aviation, appropriate for this stage of their training, mostly very well (Q22). Similarly, they consider that they are able to adhere to the rules and conventions in aviation, mostly very well (Q23).

It can be seen that student responses above, relating to the questions that were framed around the graduate skills from Annex D: outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees (Appendix 4) are generally, very good. There are only four responses to questions in the 'slightly well' category of response from 22 questions and no responses below this in the 'not well at all' category.

In more general questions about the programme, when asked "How well do you think that this type of blended approach of training, higher education and workplace development works in professional pilot training?" the students reported from moderately well to very well (Q24).

The open responses to Question 25 relating to what improvements could be made by the FTO, the university and the employer in relation to their studies and the degree elicited some valuable responses as can be seen in Chapter 4. These were incorporated into the collection of data in NVivo.

Part 3 of the questionnaire focused on questions relating to pilot capabilities in operational flying and asked the students to rate their pilot competencies as specified in the ICAO Competency Framework (Appendix 2). Across the twelve skill areas it can be seen that students in years 2 and 3 feel that they generally have a good level of skills and good pilot competency as a result of following this programme.

Discussion on Findings from Content Analysis of Student Work

The analysis of student work from the first module in year 1 of the degree (WBS 1201) gave the sense that the students were very much ‘finding their way’ in the early stages of their professional practice. They showed that they were adapting to and beginning to adopt the norms of the profession that they had entered. There is recognition that ‘being professional’ is an expectation and they are aware of being connected to the flight training organization.

The experience of flying provides a focus for learning. The students face significant challenges in this early-stage learning environment. As they reflect on their experiences they articulate the demands of gaining proficiency in flying solo across the country. Their reflections show how they have been able to learn from mistakes and feed this experience into developing better future practice. The licence skills test for PPL is an important point of transition and any failure can be particularly challenging to deal with.

The link between human factors and gaining flying proficiency to the acceptable standard has been very well exposed within student data. Personal attributes such as motivation, determination, patience and persistence and the need to develop self-confidence are important at this stage of pilot development. Of significant importance is learning to cope with the psychological pressure when flying. At this stage, the act of flying solo across country can be extremely challenging due to the need for self-reliance in navigating and flying the aircraft. These early-stage encounters with the demand for

psychological resilience help to introduce the student to something that is a recurring demand for aviation pilots at all stages of their career.

Learning from reflective practice has been initiated at this early stage, the module requirement for a reflective report and a professional development plan have acted as catalysts to activate student 'thinking' about their practice, in ways that may not otherwise have occurred. The process of professional development planning has been recognised as being helpful in setting goals and there is recognition of learning about areas for improvement from writing the professional development plan.

The analysis of student work from the first module in year 2 of the degree (WBS 2201) Basic Flying 1 showed that students were learning significantly from building hours of flying experiences. The *practice* of developing flying proficiency exposes the student to the real world demands of aviation in each sortie. The fundamental risks of aviation can be seen in some of the student reflective reports. It is worth considering that not every flying event is problematic and that most flying passes without incident. This does not diminish from the fact that aviation is a very dynamic practice and that each flying event is unique.

Within each of the reported events there is significant emphasis in describing the psychological response to the unusual circumstances facing each of the pilots. Stress, panic, lack of confidence, self-doubt and embarrassment are recognised within these events. Stress and panic are understandable given the potential dangers in abnormal flying situations. Learning to deal with the impact of these human responses is of crucial importance and these particular events help to begin to build an accumulative storage of vital experience. The capacity to solve problems in high-intensity situations is a requirement for all aviation pilots, it needs to be learned and this can only come from real-world practice.

Two of the reported events related to technical problems related to the aircraft and one situation related to prior preparation. All events demonstrated that the pilots were relatively low on hours of flying practice. However, the responses to each situation all demonstrated that the high level of prior training and development played a part in successful outcomes.

Learning from reflection on practice is evident once more, with students recognising that structured approaches to reflection encourage different ways of thinking and enable learning through questioning.

The analysis of student work from the second module in year 2 of the degree (WBS 2202) Basic Flying 2 shows how students are prepared through the CPL training course for the license skills test. At this stage, the students are attempting to demonstrate that they are capable of flying to the standards required of a commercial pilot and are consequently, trying to develop this kind of professional mind-set. It can be seen that the link between flying to a commercially proficient standard and the dealing with the psychological pressures of doing so, are very challenging. In some instances, flying a faster and more powerful aircraft adds to the complexity and signifies a particular shift in required understanding for the student. Once more, the real-world classroom setting of the aircraft cockpit provides the essential site for learning. The role of the flying instructor is shown to be of extreme value in providing close one-to-one guidance and support at this stage. Through reflection on their practice, students are able to deconstruct their experiences and careful analysis can lead to important action plans to improve future practice. The achievement of CPL status represents an important transition for the student pilots in relation to their own concept of professional standing.

Undertaking the flight instruction course and successful achievement of this, represents another important milestone for students. Student work for the third module of the degree in year 2 (WBS 2205) shows how students learn to carry out instructional flights as well as ground school briefings and tuition. The combined responsibilities of teaching and being the pilot in command of the aircraft present a further significant challenge for students at this stage of their development. They are learning an additional professional role as well as continuing to develop in their main role as aviation pilots. New skills are required for the instructional role, for example, presentation and teaching skills for ground school briefings and instructional skills to be used within air exercises. Students are required to develop a stronger understanding of their aviation practice in both theoretical as well as flying proficiency dimensions. Students value the support provided by their own instructor during the flight instruction course, it is important to recognise that the student flight instructors are continuing with their own development as pilots as well as learning to be instructors. Flight instruction requires greater mental capacity when flying due to the combined demands of maintaining flight safety,

providing professional instruction including synchronised speaking in describing a particular skill and maintaining situational awareness in relation to navigation. Student instructors need to develop skills in forward thinking during flight as well as leadership and interpersonal skills as part of this role. Students also need to develop confidence and decision making in order to carry out this role. The instructional role will require them to act with maturity and authority as they will be required to teach people from different age groups and with different sensibilities.

The reflective report, once more, provides a useful conduit into deeper analysis of the students own practice. It is apparent that the ongoing reflective activity allows some students to demonstrate a better awareness of their own strengths and capabilities as well recognising areas for development. The resulting action plans, once again, present very useful sign-posts as to future direction in professional development.

The first module in year 3 of the degree ‘Advanced Flying’ incorporates another significant step in the route to commercial and professional flying as it aligns with the Instrument Rating course. Students gain the capability of flying using instruments alone, they are also then able to fly in cloud (Instrument Meteorological Conditions - IMC). Also of significance is the transition to flying a multi-engine aircraft. There is a sense of developing professionalism in student work. Within presentations students were able to speak with more maturity about their work role; this is signified by connecting their own developed experiences to specific emerging issues. For example, articulating their developed understanding of effective instructional techniques as well as important personal human factors such as having self-belief, dealing with stress and improving decision-making. Close connections with the world of commercial aviation were also evident in student work, for example, learning to cope with fatigue in the instructional work role. This is an important issue for all commercial pilots and students were seen to have adopted good professional habits of ensuring enough sleep and rest during demanding schedules of instructional flying. A further similarity with commercial aviation was experienced by some instructors learning to deal with rapid turnaround times between lessons, the requirement for very good time management being paramount. This has strong similarities to the work in commercial aviation where tight turnaround times are likely to be experienced.

Gaining experience was valued by all students and it is worth considering how *experience* leads to *knowledge* and then to *action* in the real world, for example, by resulting in better decision-making:

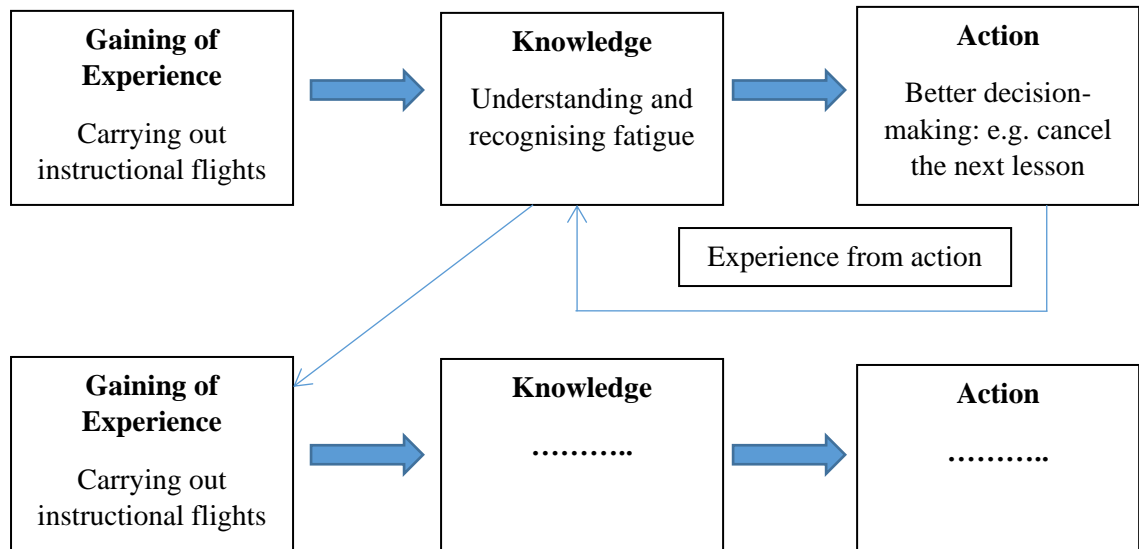


Figure 5.1: Process: Experience, Knowledge, Action

Within aviation, some of these ‘real world’ actions could be considered with reference to the non-technical skills (Flin *et al.* 2003). For example, other categories e.g. situational awareness are perceived as being central to aviation practice and may find utility in other professional areas. Figure 5.1 illustrates how experience from action can add to knowledge on a specified area of practice. This enhanced knowledge may be utilised in future practice, for example in future instructional flights. However, it is likely that other issues may also arise; for example, a flight instructor may experience a loss of own situational awareness when carrying out instruction while maintaining focus on student actions in the cockpit. Recognising and understanding this may lead to the instructor taking action to maintain situational awareness and subsequently adding this experience from action to their overall understanding of carrying out instructional flights. In this incremental way, knowledge and skills within specific areas of practice may be developed and used to build the level of expertise.

The second module in year 3 of the degree ‘Multi-Crew Co-operation’ (MCC) incorporates the final stage of training required before entering an airline or other commercial flying role. Adapting to multi-crew flying represents a significant change for many students at this point. The MCC training course introduces important concepts of Crew Resource Management (CRM) and non-technical skills (NOTECHS). This skill

set includes categories of: Leadership and Managerial Skills, Co-operation, Decision Making and Situational Awareness. The emphasis here is on the development and practice of social skills and cognitive skills in the operational role.

In relation to CRM, Bennett (2019, p. 1363) notes from his work that there are:

Claimed psycho-social benefits included greater empathy, the opportunity to self-actualise, greater self-awareness, improved self-confidence and improved self-esteem.

Within student work it was possible to see examples of increased self-awareness and empathy, particularly in respect of the new way of working with others. The introduction to CRM presented an opportunity for students to re-appraise their role; they were finding new ways to operate with their future airline roles in mind, as well as recognising how CRM could apply in their current role as a flight instructor.

The blend of critical reflection on specific events from training and practice with a good base of authoritative professional and academic knowledge sources presents strength in student work that is persuasive when considering level 6 learning outcomes.

The role of the FTO in supporting continuing professional development was recognised by one student, consequently, making an important point about the underpinning support that the FTO provides. Sometimes, the foundational support structure that the FTO provides may go unnoticed. There is something here about the professional purposeful intention of the FTO and perhaps, the sense of care for students that needs to be recognised.

For students taking the Flight Instruction pathway to degree completion the third module in year 3 of the degree is 'Evaluating and Managing Risk'. Students need to establish their fundamental understanding of what risk means and to view this within the context of aviation. The students have scope to review their own selection of risks and these have elements of technical, human and operational factors. Authoritative professional and academic materials are sourced as part of the inquiry process into particular types of risk. Examples of types of risk are: the risk of icing on the aircraft, bird strikes, pilot fatigue, loss of situational awareness and aircraft defects. Each risk is framed within the context of their own experience and current or future practice. In most cases, students demonstrated their understanding and application of models of risk

assessment and in all cases there is strong evidence of working within regulatory guidance from aviation sector standards and FTO company policies or operational standards.

In relation to pedagogy, the students are guided by the university module leader who provides tutorial guidance and feedback on draft submissions. As with other modules, there are guiding materials within the virtual learning environment. However, students are able to draw from their prior and experiential learning as a way of providing secure connections between their theoretical inquiry, reflective briefing and real world practice.

The final module in year 3 for students taking the 'Flight Instruction' pathway to degree completion is 'Threat and Error Management'. Quite naturally, the students are at the most advanced phase of their practice to date and this module provides the opportunity to demonstrate learning gained through professional pilot training, higher education and operational flying practice.

The pedagogical approach taken within this module relies upon students being guided towards creating their own presentations, these then lead to professional discussions. In this way, each group member contributes a presentation and multiple interactions take place as each student is required to discuss and comment on each presentation. The notion of 'student as expert' is seen to be most evident within this module and is perhaps, unsurprising given the relatively advanced stage of training and instructional practice. At this point, the students on this programme are unlikely to possess high levels of commercial airline experience; nevertheless, they are likely to be senior flight instructors with many hours of experience and a significant level of expertise. Sometimes, groups of students from this programme are mixed with airline pilots from another programme and this contributes to interesting sharing of practice.

In most presentations, students are seen to confidently display their understanding of threat and error management and they are able to critically reflect on incidents from their own experience that illustrate specific threats or errors. Students are also able to explain how they can apply management tools to threats and errors in order to mitigate these. Students are able to draw from professional, academic and wider sources in support of their work. In critiquing the work of other students, each student has the opportunity to gain wider and different perspectives on the central topic of threat and error management. The resulting operational action plan allows the student to carry

forward personal and professional development actions beyond the degree, thus, embedding the notion of *continuing* professional development.

The third module in year 3 for students taking the 'Airline' pathway is 'Aircraft Specifics'. For most students, the entry into a job with an airline represents a huge professional transition as this is the role that they have been working towards from the beginning of flight training. The critically reflective reporting for this module demonstrates that students undergo a particularly challenging and intensive period of development. During this period, the student transits from technical ground school training focused on the aircraft type to simulated flying practice and finally, to flying the real aircraft in a commercial setting with passengers. The working environment is where their chosen profession is enacted; the operational domain comes into full focus and presents unexpected challenges.

During type rating, the ground school phase and simulation phase concentrate on dealing with the development of technical knowledge and non-normal scenarios. Students learn with others who may or may not be more experienced and good teamwork and communication are key factors in success at this stage. Simulated flying provides very useful preparation for the rigours of operational flying. Students experience some of the intensity of flying the real aircraft and experience tiredness when involved in a long simulated flight as well as from simulations that mimic operational flight times that take place very late or in the early hours of the day. Students require determination and benefit from having a good work ethic. Students learn from technical errors that they have made during simulations as well as being able to recognise where errors in CRM have occurred. Students learn to deal with very challenging non-normal events during flight simulations and this once more, tests their technical skills in flying proficiency as well as their non-technical skills. In the final stage of type rating, the blend of theoretical learning and the practice of flying the real aircraft results in new learning being established. Flying the real aircraft presents many challenges and experiences that students need to absorb quickly.

During line training there is a work-based pedagogy that is perhaps, unrecognised in those terms by the organizational operators. Within the line training phase, training captains act as safeguards, teachers and guides to good practice. Training *during* work influences learning markedly. Three key elements are exposed on the transition from

type rating to operational line flying. The first relates to the need for applied knowledge, this is gained through the blend of prior theoretical knowledge with operational flying. This is how the student begins to create their own schema of practice to cope with the new environment. The second relates to the specific proficiency of aircraft handling.

The dynamic, real-world environment provides a particular challenge than that experienced in the simulator; however, one of the main features of this is dealing with the aircraft at the phase of landing. Varying aircraft weight and environmental conditions present a complex challenge. The third element relates to learning the required operational tasks of each crew member as well as developing wider operational awareness.

Students, in their university work, begin to observe and comment on examples of leadership by senior colleagues during this period of development. The importance of non-technical skills and CRM has been brought sharply into focus during this phase. Students also demonstrate reflexivity in this regard. Each student reported particularly challenging events that had occurred during their experience of flying on the line and this presented natural opportunities for considering how leadership played a part in each situation. In some cases, students observed that they would aim to emulate perceived good examples of leadership as they move forward with their career. It can be seen that students begin to gradually assert themselves as they gain more confidence and experience in their role, the issue of cockpit gradient may be most obvious to students at the beginning of line training. Students need to be able to adapt to working with different captains who may have slightly different working practices.

In line flying events, students needed to deal with high stress situations. In some instances, these were caused by aircraft malfunction or external environmental factors affecting the aircraft or flight. Students have a high level of responsibility and they are expected to collaborate in decision-making, this often requires the use of decision-making tools that aid discussions between the flight crew. Students may experience fear and are required to be resilient. There is a need to retain clarity of thought during unexpected circumstances as well as an ability to stay calm and not panic or succumb to distress. Students are expected to develop confidence in their role and act with autonomy in some situations where the captain may be unavailable. Students as first officers have a central role in the success of any flight and need to demonstrate high

levels of management and leadership to an appropriate level as well as excellent flying proficiency.

From the university perspective, in this module, students are seen to effectively use a range of reflective models in uncovering their practice. The process, once more, encourages students to consider their future practice based on the results of their learning from critical thinking and critical reflection. In concluding the module, all students realise there is more to learn, for example, by continuing to study aircraft systems, operational information and air incident reports in order to further their knowledge.

The final module in year 3 for students taking the 'Airline' pathway to degree completion is 'Airline Orientation and Integration'. The students are beginning to establish themselves in their role as a first officer and are likely to be located near their base of operations. They will be flying regularly with the airline.

At this point, students are becoming embedded into the normal routines of working life with the airline. However, these routines are often challenging as aviation schedules vary and unexpected delays can arise. Operational demands may require great flexibility from the student pilot including working away from the normal base of operations. Varying shift patterns and long commuting distances contribute to fatigue and students need to be able to develop strategies to mitigate this. Student pilots need to learn how to manage their own health and welfare. Ensuring adequate rest, maintaining nutrition and hydration are essential parts of this process. Students learn to manage their duty times by asserting their preferences. The fatigue management process extends into the operational role as all crew members should be aware of any potentially fatigued colleagues. Students also learn about the organizational attitudes to fatigue reporting.

The Covid-19 pandemic created particular demands for some students, for example, feeling the commercial pressures to keep operating and supporting key workers and the community at large who relied on air services. This was against a backdrop where many aviation employees had lost their jobs and those remaining felt obliged to work extra duties because they were "lucky to have a job". All students at this stage displayed exceptional senses of responsibility.

The Covid-19 pandemic also presented issues for some pilots who suffered from a lack of recent practice due to long periods of absence from flying. This problem presented itself in the form of skill fade and examples of this included slight changes in proficiency in landing technique and losing situational awareness during briefings. Students are seen to critique process efficacy, assert themselves and recognise their own developed skills in communication and leadership.

All students discussed their experiences from very challenging flying events. Effective CRM played a central role to the successful outcome in each of the difficult flights. There is particular intensity in student learning during these scenarios that cannot be replicated through simulation. Students are required to be resilient in their role as pilots although they may not always recognise this in their module work. Critical reflection has allowed the students to view the events from differing perspectives and it is apparent that the reflective reporting is a valuable exercise for the students. The HE tutor support plays an important part in encouraging student inquiry into their own practice and this typically helps students to develop their critical thinking about their experiences. Students are seen to build on previous learning from experience and understand that they gain confidence from their commercial pilot experiences. In flying events they also recognise how communication, teamwork and networking skills are crucial to their role and how they are impacted by these from others. Decision-making is an essential skill for any pilot and students are required to engage fully in this, sometimes, in very challenging circumstances. This involves very good collaborative skills and the flight crew benefit from maintaining an open mind-set to potential future events and options. Sharing a mental model between the first officer and captain is necessary at all stages of a flight, however, this may not always occur in practice. Students need to be able to recognise when there is a discrepancy and take action to restore. The learning gained from real-world practice is tangible, the students are seen to blend their propositional knowledge with flying proficiency and operations in order to create new understandings of their practice.

Discussion of Emerging Themes from the Interviews

Student Considerations

A variety of issues emerged from the gathered data that appeared to centre on general considerations of the student and their position as programme participant. Some of the

data helped in presenting a conflicting picture of the perception of the degree and its value. The role of student's parents sometimes seems a significant factor in making the choice to enter the degree programme. Parents often play a crucial role, as most students enter the programme post-18 and taking a university degree is often a preferred route. Parents often play a central role in financing the expensive route through flight school training and may often see the integration of a degree as a very beneficial addition. However, some data shows that some students see the degree as a secondary objective and that the primary aim is to get on a flight deck. For some students, there may be a gradual realisation of the value of the degree as they progress over the three years of study. The value of the degree in aviation has been recognised by FTO staff:

We have seen evidence, even recently, of people who have been turned down for a senior job because they didn't have a degree.

The link between the degree programme and successful students being able to enter highly paid employment is strongly evidenced:

what has happened with that degree, it has got people into very high paying jobs, salaries of sixty thousand plus, who would not be in that job if it wasn't for the degree programme.

Recruitment into the degree was seen as beneficial for the sector as well as for the students, many of whom relied on the student maintenance loan as a means of financial support through their period of study. There is evidence of widening participation, social mobility and particular examples of transforming student futures that have occurred as a result of this programme. Additionally, the programme was found to be particularly beneficial for encouraging female pilots into the profession, with the early opportunity for gaining airline experience proving helpful for those who may wish to start families and return to their career. In 2021 in the U.K. only 4.7% of aviation pilots were female (Statista 2021) with 18% of the student cohort on the degree programme being female at the time of writing.

There is strong evidence that the programme offers very good routes into work experience and employment. Students gain work experience as flight instructors during years 2 and 3 of the degree and for some, this leads to extended employment as a flight instructor. Students often progress into employment as first officers with airlines either

during or shortly after the end of the degree programme. Examples of these airlines include Wizz Air, Ryanair, Loganair and TUI Airways.

There are issues for students to contend with and it has been recognised that the majority of entrants are transitioning through a phase of emerging maturity having recently left the mandatory stage of school education. At the same time, the students are required to navigate different roles as participants in this degree programme, it is a complex arrangement. They are student customers of a joint university and FTO partnership, engaging in a commercial agreement with both. They also become flight instructors with commercial and work responsibilities during the course of the degree and finally, they may become an organisational employee with an FTO or airline in year 3 of the degree. The mix of training, higher education and work in the context of aviation can sometimes present pressures of time for some students; however, there is evidence of students feeling an overall sense of pride in being associated with the university programme.

Developing as a Professional

Responses indicated that initial professional orientation occurs from the beginning of the programme

there's a lot of guidance being given because we are dealing largely with people straight out of school, they have little or no experience of a workplace and they don't know what to expect and they're unaware of what it is that we expect of them.

The issue of the uniform assists in underscoring that the students have entered a professional environment:

people come in with us and do their PPL in their jeans and tee shirts and then day one of the degree they get issued with that uniform and actually that's a big change in their attitude as well and suddenly, they are standing a foot taller and they're looking smarter and their attitude changes because they are now on a professional course and it's just the issue of that uniform and being part of the degree that makes that small change but it's recognisable I think.

Professional orientation is seen to be a continuing process throughout the degree programme as different phases of professional attainment are achieved. An example of

the recognition of gaining professionalism occurs when the student licence changes from being a private pilot to a commercial pilot (CPL):

I would say the last quarter of the CPL course, there's an attitudinal change takes place because it has to.

The focus on reflective learning within the degree is seen to assist in the developing professionalism of the learner:

I think a lot of that is about the reflective learning, a lot of the stuff that you guys really focus on, the training logs, the journals and all of that which they don't do with a normal licence, so, it is huge what the university degree adds to them as individuals in becoming really reflective practitioners and true professionals in every sense of the word, we're just amazed at the difference in them at the end of the three years.

In relation to students developing particular professional qualities or attributes there is significant recognition that students learn about taking responsibility. This occurs from the first year where they become responsible for their own progression by needing to study for and pass the ATPL examinations. The student relationship with their flying instructor can instil a sense of responsibility, as the students don't want to let their instructors down. As students become flying instructors they develop feelings of responsibility for their own students. Students are recognised as continually wishing to emulate the more experienced aviation practitioners. Other attributes are that the students become more self-disciplined, are able to admit mistakes and are more sympathetic in offering help to their peers.

Students naturally become aware that they are studying and working in professional surroundings. The FTO is recognised as a professional environment with a highly experienced staff group. The staff group promote the representation of the training environment as a workplace. The FTO provides professional oversight of all student flying, for example, flight instructors are required to authorise flight plans for students during the 'hours building' phase. Compliance to expected behaviours is required and students develop their awareness of the underpinning regulatory requirements of aviation.

Learning Mode

Responses suggested that the students are initially operating in two different contexts that arise from the joint degree programme. The FTO is the primary context and this

may last for two and a half years as a minimum, for some students the final two modules may be taken while employed at an airline and this would then become the primary and notably, also the third context for students to work within. The university context is perceived as secondary and being at a distance from the students:

via the training organization, there'll be a lot of context setting about what's expected of them from the physicality and the geography of where they are and operating in a cohort together, in groups there'll be a lot of sort of peer-managed reflecting what the expectations are. I think it is much harder grasping what the university expects of them because we're at a distance.

because they are so much surrounded by the flight training organisation it's very likely that it will be balanced ...be skewed towards what the flight training organisation wants and so, it's hard to carve a way for the university side to sort of have an equal status and obviously, doesn't ... I'd say grabbing their attention is tough.

University staff felt that the blended learning approach could be strengthened, perhaps, by increasing the interaction between students by including more working in small groups. Advantages were perceived in enabling the students to take cues from observing peer work and enabling some self-assessment that could help to contextualise their progress. This could help to create a richer learning experience. The need for synergy in training and higher education was recognised with any misalignment being potentially problematic as the degree modules closely match the varying phases of training. Huge benefits could be seen in having a degree programme that is integrated with the employment that the student is seeking, the programme was seen as having very strong motivational hooks for the students.

Issues for the Academic

Much reliance was seen to be placed on the academic being able to understand the professional sector and norms that would lead them to be able to contextualise communications with the student in relation to their work:

it's about the academic institution...trying to reflect as authentically as we can, what we think of as ...how we can kind of mirror and bounce back at the student, attributes and qualities that we think that they will need in their employment and that their organisations will look for from them and so, it's about us tuning in to them, it puts a big emphasis on the academic tuning into how to contextualise things so that we're saying it in the right way, that they hear us.

Some evidence pointed to the benefits of having experienced practitioners who have previously worked in WBL or Professional Practice programmes. Some of the techniques of guiding students, for example, by encouraging them to gather information from the workplace were seen to be of value. Not having enough relatable knowledge or expertise could be seen as a potential limitation for some tutors.

Pedagogy

Responses from staff at the FTO suggest that the degree structure is transparent and has become embedded at the FTO; the professional development route is clearly understood. The varying contextual settings that the students encounter as they progress through the degree present particular pedagogical challenges for FTO and university staff. In some stages, the students are required to absorb codified theoretical knowledge and demonstrate their retention of this through examinations; other stages require the development of pilot competencies and proficiency. As the developmental journey progresses, the blending of practice and application of theory become routine. The higher education dimension is integrated throughout and essentially takes the form of facilitating professional development. The varying pedagogical contexts are shown in Figure 3.4.

The approach to learning design in the university and FTO was considered to be not fully integrated by university staff. The varying contexts that the students experience within the programme present a certain amount of complexity, however, improvements could be made in helping the students to ‘map’ their progress by ensuring that each module presents opportunities for student self-assessment and then linking this to mechanisms or actions that lead to improvement. The university pedagogy could be viewed as being directed by individual tutors at module level rather than through a team developed approach.

An important feature of learning design was seen to be in creating content that relates to the disciplinary area in order to increase the relevance of activities for students; this was found to be particularly helpful in the earlier stages of the programme:

but they appreciate it if you customise the activities and make them targeted to their area. They value the effort that you put into customising it because it means they don't have to waste that cognitive effort on doing the transferal into their own sphere of reference. Whereas, when

they're more adept and more confident, more fluent in the skill, they're quite happy to do that transferal.

Significantly, university staff viewed a collaborative approach to facilitating learning as being of value as well as perceiving students as being learners:

to think of them as a learner as opposed to someone who passes an exam.

The intention being to encourage the students to become active agents in their own development.

Middlesex University Pedagogy

Responses indicated that tutors needed to communicate the degree programme requirements to students and that this was part of a process of context setting for higher education. Preparing the students to recognise how syllabus and learning outcomes would be aligned with flight training was required as well as establishing modes of communication and awareness of university resources.

Providing individual student support and guidance is a feature of the work carried out by tutors on the programme. Tutors adopt their own approaches to this and may set additional or related tasks to those required in coursework assessments. Some tutors use 'hooks' to encourage students to adopt a learning mind-set. For example, by pointing to the expense of flying lessons and helping them to recognise that if they make errors in flying a particular circuit and then repeat the errors in subsequent circuits it becomes expensive if no self-review has occurred:

So, to think of ways that we can ...harness their motivation like that, to think about OK so, how do I optimise that thinking process, that's going to help me quickly, calm down, re-assess, identify what to do next and try it out.

The development of a 'tool-kit' that aids study and is developed through it, has been recognised by both university and FTO staff groups.

the thing is, they are using a number of recommendations from Middlesex...in terms of tools...they are actually, physically using those methods. They are using the theories to apply themselves to either to solving a problem or working a solution or dealing with a safety aspect.

When they've done their flight instructor presentation to yourselves, the university and ourselves as part of their assessment, it was only at that point I realised that they were using tools that Middlesex had given them you know, Kolb's theory and various other things...They kind of use that methodology for adapting things... You know we've got some students

doing other jobs, they might be a fleet manager or safety officer or something like that, so, they draw on the tools that so, they say I don't know how to become a safety officer, so, they draw on those tools to help them to do that.

One of the cornerstones of the pedagogical approach adopted by the university is in enabling reflective practice. It is recognised as a central thread that runs through all modules on the degree and is a consistent feature of module assessments. Students are encouraged to explore and use a variety of models of reflection during the degree programme, for example, Gibbs (1988) Reflective Cycle, Rolfe *et al.* (2001) The 'What' reflective model, Driscoll (2007) model of reflection, Kolb (1984) Experiential learning cycle and Johns' (2000) Model for structured reflection all of which are found in the student resource Middlesex University (2019c). Some students find other models of reflection through their wider reading and bring these into their work. Tutors will ensure that the application of reflective models is correct in relation to the experiences being described by the student through a process of dialogic feedback.

The importance of feedback in promoting professional development has been recognised by university tutors:

I like to think that one of the things that they are going to learn from us is that gradually, they'll recognise, you know what, although I'm interested in the grade and yes the grade matters, I'd like to think that what they're going to put more value on is what the feedback is or what they're learning about themselves which is going to help them steer how to improve because that is fundamentally what we are trying to teach them is reflective practice and how to steer your development.

The importance of learning through experience has been recognised by FTO staff:

because they need to have some tangible experiences to reflect on from the start, so, people sometimes say we learn from mistakes but in aviation we can't. We don't want to be learning from mistakes. We like to learn from other people's mistakes, so, that's where the reflective learning comes in but you do need to have experiences, they need to go out in the real world.

this idea of being a reflective practitioner, in it's very core helps them to gain a higher level of maturity or an earlier level of maturity than if they hadn't been involved in the degree programme, so yes, I think it is positive.

University staff have recognised how reflective practice and models can enable analytical skills and thinking skills:

I think that the vehicle that we have of using the reflective models is very good for hanging analytical skills onto, because it's a stage of that process, so, it's in there, so, I think that the vehicle of also pushing them to think what is critical reflection and what is critical analysis? Distinguishing between analysis and critical analysis and reflection and critical reflection, I think that that's a boon that comes from the academic environment. I know, it's hard to think in their own practice environment, it would be more ad hoc as to whether they would be exposed to that.

it's not about the model, it's about what you put into your thinking processes and the model is just there to guide you and make sure that you are honest and sharp.

Developing literacy skills is seen as a feature of student engagement with the degree, however, university staff recognise that better targeting of literature could be facilitated. It has been recognised that improvements in support for information literacy more generally, could be made at module level.

University tutors promote the notion of professional development planning as part of the degree and actively encourage students to be forward looking; some modules incorporate action plans as part of the module assessment.

FTO staff have indicated significant points of transition for students in the programme, these include the milestones of completion of ATPL examinations in year 1, the achievement of the Commercial Pilot Licence in year 2 and the achievement of a period of work as a flight instructor at the end of year 2. University staff have recognised how some students transition into gaining a better organizational view when they enter the airline in year 3. The students are encouraged to look at the wider activities within the company and broaden their outlook within a larger organization:

So, it's a complete change in focus ...I do notice that... I still need to do a job with many of the students which is to get them to shift their focus from just themselves at the centre of their practice, to being aware of others and how they affect and have an impact on others.

University staff have recognised that rapid transformation of students professional capabilities is taking place during the degree programme:

I would say that they....develop very rapidly actually...in year 2, I think we've talked as a team about it, how there's very rapid transformation between the first module of year 2 and then the last module in year 2. ...They're almost unrecognisable in terms of their fast-forwarding their development and I think that that it is a testimony of how there is

something happening that is very effective about them absorbing what are professional requirements and so... with the flight instruction and FIS you can see that not only can they now see themselves as an instructor but that they've also,...they can put themselves in different shoes, so, as the student customer but as the flight instructor, employee as it were... and the responsibilities that they have to a customer, so I think that has enabled them to grow significantly and then in year 3, especially if they're going down the commercial airline route...there's a huge amount that the training with the airline does to help contextualise it and make it even more authentic and real.

There are examples of where the university staff team have provided longer-term support for some students who have left the FTO and entered airlines. Progression for some students in earlier cohorts was slower in some cases due to varying work-related reasons. FTO staff recognise the value of good tutor and student liaison:

the actual liaison between the tutors and the students has been first class.

The role of the academic in communicating with the students in their own terms is seen as important by university tutors. For example, being able to 'tune in' to sector-specific language and knowledge base allows for realistic framing of feedback and support. This can extend to the academic 'borrowing' of practice-related knowledge and applying it to their own facilitation of learning with the student e.g. in discussing the necessity for explicitly following the stages of a reflective practice model and showing how this same approach must apply when using decision-making models in the cockpit.

Significant value is seen in some modules where students are required to deliver presentations as part of the module assessment. These have particular value when university staff and FTO staff have been able to collaborate in the assessment. Face-to-face presentations at the FTO are considered to be the most effective as these enable learning to be shared between student, FTO staff and university staff. During the Covid-19 pandemic face-to-face meetings were not possible and virtual assessments were conducted.

The university has particular responsibility in ensuring that the intended learning outcomes and academic skills (Appendix 4) are achieved by each student. In relation to '*knowledge and understanding*' aviation students are required to demonstrate a depth of understanding of their chosen field of study and accompany this with their understanding of how to critically analyse their professional practice. In their university work, most students are able to demonstrate clear, critical insight and a thorough understanding of subject-specific theories. Pre-degree study for ATPL examinations has

provided essential underpinning knowledge for all students and they are able to consolidate their understanding as they progress through the degree modules. Aviation students conduct background investigation into relevant topics, for example, crew resource management and can critically appraise sources of information within the module 'Multi Crew Co-operation'. In relation to *'cognitive skills'* aviation students have shown that they are able to select, evaluate and comment on relevant reading and integrate primary sources from their experience within their work. For example, in the module 'Aircraft Specifics', when reflecting on the experience of managing the energy of the aircraft in turbulent conditions when attempting to land, a student will reflect on the decision to carry out a 'go-around' and systematically evaluate the complex range of physical and human factors that led to the action taken. They will draw from aviation protocols and techniques as well as from human factors related knowledge sources. An example of where students demonstrate their abilities to develop and sustain an argument occurs when developing their presentation for the module 'Threat and Error Management'. Students also take part in asynchronous professional discussions as part of this process. Additionally, in relation to cognitive skills, students are able to demonstrate consistent and autonomous problem-solving capabilities in their role as flight instructors. This is evident within student submissions for the module Flight Instruction Standardisation. The capacity to deal with complex and unpredictable circumstances is essential when carrying out flight instruction. Quite naturally, within the aviation degree, student pilots are required to demonstrate high levels of competence in discipline-specific *'practical skills'*. These are technical in nature and are required to be carried out autonomously with accuracy, co-ordination and proficiency. This level of skill is achieved during year two of the aviation degree where these attributes are an essential requirement when achieving the commercial pilot licence and the associated module 'Basic Flying 2'. In relation to demonstrating practical skills of inquiry, aviation students are required to develop presentations on professional topics in negotiation with their tutors. Within the modules 'Flight Instruction Standardisation' and 'Advanced Flying', students will draw together supporting knowledge sources, data and materials and demonstrate their interpretation of these through their presentation and a subsequent *viva voce* style professional discussion. Student pilots are typically able to demonstrate *'transferable skills'* during the degree programme. For example, in their work as flight instructors they need to be able to communicate information, ideas problems and solutions in a highly proficient manner during pre-flight briefings and longer technical briefings. They are required to do this verbally, in writing or via electronic means.

Student pilots are able to use a range of vocabulary and have high levels of numeracy and typically demonstrate good digital literacy skills. There are some opportunities to demonstrate group working within the degree programme, for example in the modules ‘Flight Instruction’ and ‘Threat and Error Management’. Throughout the degree, aviation students are required to manage their learning and work without supervision, to take initiative as well as personal responsibility. The ability to reflect critically and independently is a key component. In relation to ‘*professional competences*’ these are fully aligned with the degree programme, regulated by the UK CAA and achievement is mandatory for all students.

FTO Pedagogy

FTO staff and university staff recognised that the student attention in year 1 is primarily focused on studying for and passing the ATPL examinations. ATPL theory is delivered within a structured format by experienced instructors who have their own specialisms. Instructors bring in their own experiences as a way of explaining the theoretical concepts. Before the pandemic, guest speakers were also invited in order to motivate students and broaden their view of the aviation sector. Speakers would often explain the importance of record-keeping and the value in keeping a learning journal; this was seen as highly valuable by FTO staff.

In year 2 there is a structured programme of flying that leads to the students completing the CPL. During the hours building phase, the students undertake preparatory flights that are similar to the flights required when taking the CPL course. In this way, the students gain familiarity with flying to particular airfields and gain important knowledge in navigation. Instructors use their prior knowledge in teaching the students as they are better placed to point out the features and the procedures required at specific airfields. Students require authorisation from a flight instructor before carrying out a cross-country flight during hours building, this ensures professional oversight from the FTO. Knowledge sharing also occurs as a result of hearing about accidents or incidents in the wider sector:

They need to have heard about an accident, they need to have considered could that happen here? Could that happen in my environment? How can I put that in my library of skills, you know, to work on...I mean.

Students find value in being able to access case examples from formal reports e.g. from the AAIB.

Students are seen to develop a range of skills at the FTO. It is recognised that they gain confidence from specific achievements during the programme and that some resilience is required to successfully complete their studies. Students are encouraged to show respect for their tutors and fellow students during the ATPL ground school for year 1 by adopting good classroom and study behaviours. Developing a good work ethic is promoted by FTO staff. Student ability to study and motivation to study are issues for selection and recruitment at the FTO and attempts to mitigate these are made through psychometric testing and airline selection techniques. An expected weak area on entry to the programme is in personal development due to age and low experience level:

we know that they'll be weak in personal development because they've never had a job and never been employed ... and that's the job that we do over the three and half years that they're with us, we mature them, we get them inter-personal skills. When they're employed as flight instructor they'll be sitting next to a stranger every other day. So, their inter-personal skills will develop because when they get a job with an airline they could be sitting next to a different captain that they don't know, every day of the week.

Year 2 of the degree programme is seen as particularly transformational in relation to student confidence, ability and aptitude. It has also been recognised that the FTO is preparing the students for the rigours of life in professional aviation, for example, engaging in recurrent testing on a six-monthly basis. There is an expectation that students will operate to the highest possible standards.

Pedagogical Issues

The physical remoteness between the FTO and the university was suggested to be a barrier to good communication between students and university tutors. Benefits were perceived in establishing better physical connections between the FTO and university through increased university tutor visits to the FTO. An increase in virtual connections had occurred during the pandemic; however, increased physical presence was seen as desirable.

The risks of university tutors becoming too close to specialised aviation content were recognised as a potential issue of concern, however, the advantages of closer collaborative working between tutors at the FTO and university were also recognised. It was recognised that further integration of FTO and university approaches to student learning could be achieved in online module and programme pages.

Partnership

Several factors were presented in describing the rationale for the degree programme. Firstly, the FTO considered that it would be a means of addressing the lack of academic recognition for professional aviation pilots. A second factor was the observation that there were young people in the cadet programme that demonstrated ability, aptitude and work ethic but didn't have the money to pursue pilot training. Having student status was seen as a way of providing tangible financial support towards the training and the degree. In effect, this was a mechanism that had the potential to improve wider participation in a profession that has high cost training. The FTO also described their interest in improving access to the profession for female pilots; the possibility of earlier entry to a degree was seen as significant for this group.

Work-based learning was described as being important in the early discussions by stakeholders:

they engaged with several universities and chose Middlesex because Middlesex had the Institute for Work Based Learning.

I think that was way back in 2013, was when we started the conversation and ...we started the programme in 2015, there was about 18 months of development work.

The FTO demonstrated enthusiasm for the partnership:

we saw terrific value to having the degree, there's no doubt about that.

And recognised how it added value to the business:

because it's unique, it's a unique selling point.

The partnership with Middlesex University was perceived as adding to organizational credibility. The positive view of the programme was supported by a recognised demand for the degree programme from parents in their contacts with the FTO. Similarly, university staff had experienced significant interest in the degree at the main aviation training recruitment event 'Pilot Careers Live'.

At an operational level, the partnership was described as working well by FTO staff and the provision of this type of degree partnership was seen as beneficial to both students and the partner organizations. Pride in student achievement was also indicated. University staff described how they needed to orientate themselves within their role

within the programme partnership and that they had learned a significant amount from working with students and the FTO.

At a strategic level, university staff recognised how the wider policy dimension for higher education and universities can sometimes affect partnerships. Also, that close partnership working can lead to better joint understanding and a potentially, highly creative relationship. It was recognised that knowledge transfer had taken place in a variety of ways at programme level, with some additional transfer from the university to FTO in organizational development relating to HE. However, further opportunities remained unexplored due to programme closure.

The directors of the FTO remain unsure of the exact reason for programme closure. This, in itself should be troubling for the university. There are deep-seated feelings about the partnership and serious concerns about why it failed to continue.

The directors of the FTO described some operational difficulties, for example, the need for better pre-selection of students into the programme, the recognition of some failures by students who had entered the programme and the need for healthy numbers in student recruitment and progression to make the programme viable. Positive actions had been taken to address these issues and it was suggested that patience was required in a new development:

In terms of the industry, it was visionary because no-one else had done it before. So, when you start any programme, ...you light a fire, you know, sometimes, it takes a while to take hold.

when you design something from scratch, it takes a while to fine tune and develop and we'd got to that point. It's almost like digging a diamond mine and then giving up a half a metre away from the diamonds. You know we've spent five years digging a diamond mine and we were just about to reap all the diamonds and they've given up and walked away.

Responses from directors of the FTO indicate very poor communications from the university at a strategic level. There is clear evidence of bitter disappointment from the FTO in the closure of the degree programme by the university.

Responses point to gaps in mutual understanding between the FTO and university. This lack of understanding may be grounded within the operating culture of each organization. Unsurprisingly, it is clear that the FTO was inexperienced in delivering a programme of HE and was learning about the expectations of running a joint programme. For its part, the university demonstrated some inexperience in collaborative working with this external partner. Responses from the FTO directors indicated that

much useful learning had been drawn from the experience of working with Middlesex University and that this would be helpful as they move forward with a new HE partner.

Discussion on Findings from Critical Incidents

The perspectives from critical incidents that occurred during the period between April 2019, when reviews of aviation programmes were scheduled, until June 2021 when the programmes were closed, have been documented and analysed within a critical incident diary that also contains analysis of the events. This diary is presented as a supplement and contains a variety of commercial information and communications that must remain confidential. The diary will be made available only to advisers and examiners of this research.

A Critical Incident Analysis Framework (Green Lister and Crisp, 2007) was adapted and used to provide a structured approach to analysis of the diary. The outputs from this framework have been used to inform Chapter 6, in particular, to assist in feeding into research question six: *How well do university / flight training organisation partnerships work in practice?*

In reviewing the emails that relate to the university failure to implement a programme review I created a timeline of events in order to clearly establish what happened when, as an aid to analysis. This process was very helpful, particularly, in allowing me to review the details of communications.

As we have seen, this particular aviation degree and partnership failed to continue, however, the impact of this failure was felt more widely, both within the university and with three aviation degree partner organizations. In considering the impact within the university, the effects of discontinuing the degree provision had a destabilising and direct impact on the aviation team of staff as their futures became uncertain with planned programme closure. There were lost opportunities in relation to developing the evident strengthening of provision of aviation programmes, in particular, with recruiting to the already validated Masters degree programme and engaging in inter-disciplinary working with other staff in the faculty. The leading position of the university with this type of undergraduate degree provision was also given up along with the potential for other partnerships within this global industry. The loss of intellectual capital and particularly structural capital (Garnett, 2001) in this respect can be seen as a lost opportunity. The university also failed to capitalise on client capital in the form of

potential knowledge transfer, the university had a direct connection to a large technological global corporation through one of the aviation partnerships. The impact of discontinuing undergraduate aviation degree provision also had a destabilising effect on three partner organizations. For the organization connected to this particular study, the impact of discontinuation proved to be very problematic; in particular, the uncertainty caused by the slow progress of programme review had a detrimental impact on effective marketing and recruitment. For example, the partner organization was unable to continue to advertise the degree without an ongoing contractual agreement with the university. This seriously jeopardised the partner's business model. Unsurprisingly, the slow progress of programme review raised concern within the partner about the future commitment of the university and they managed risk by considering another university that could offer a similar undergraduate programme. Other aviation partners had also sought to manage risk in the same way and following a series of communications with all aviation partners, the university decided to close the whole provision.

Discussion on Findings from Literature

The perspectives from literature were taken in relation to key themes that had roots within the specified profession, higher education and recognised approaches to the integration of work and learning.

In considering the professional dimension for aviation pilots the nature of professional knowledge was outlined (Lester, 2012) It has been seen that pilots are required to undertake intense periods of learning where propositional knowledge is acquired, for example, during ATPL studies or type rating. Students also gain new knowledge through application, perhaps most readily understood here as through training and flying practice. However, knowledge is also gained in context and within this case study it can be seen that 'work' provides, perhaps, the most powerful context. When student pilots are executing their chosen role, this is where all of the prior learning and study, development and practice merge and allow professional practice to take place. The foundations have been laid for further learning that will occur at the site of practice. This recognition of the power of learning through work agrees with the view of Lester and Costley (2010, p. 562) as outlined in Chapter One.

It is helpful to identify the contextual phases that student pilots experience (Figure 5.2). These can generally be associated with each year of the degree programme. Students also require training during the work phase; however, the general phases of initial

formation, training and work provide helpful descriptors of progression for these student pilots. This kind of mapping enables initial consideration of significant points of transition. These points normally represent the need to adopt new protocols for practice, new levels of responsibility and translations to new sites of operation and their associated cultures (Fenwick, 2013). For aviation students in this case, the boundaries are fluid as work and training are intertwined at the end of year 2 and the beginning of year 3. Once more, the representation is valuable as it presents an opportunity for analysis of the potential struggles and challenges that students may experience at these stages, as well as exposing developments in practice.

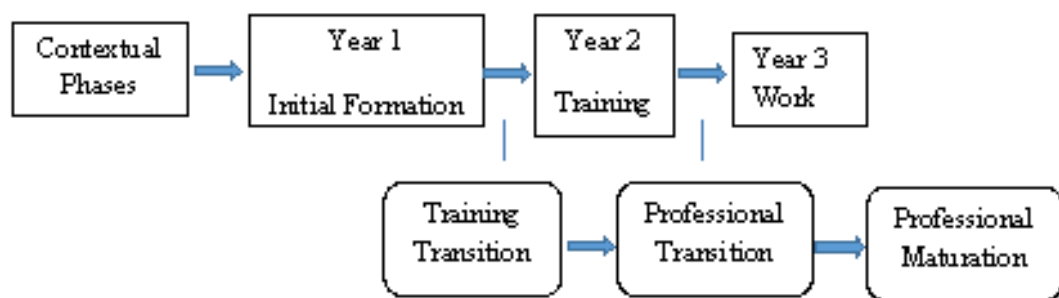


Figure 5.2: Transition Points in the Aviation Degree

Practice for professional pilots can often be experienced as being highly intensive and sometimes stressful. It can be described as a socio-material phenomenon (Reich and Hager, 2014) whereby the human and material elements can combine in regular or irregular ways. Pilots, just like many professionals, are situated in their practice and it is from this position that they are seen to learn most effectively about their practice. It is impossible to fully replicate the experience of confusion and loss of situational awareness when piloting an aircraft in to land with two hundred passengers. It is in these scenarios, and others that are less intense, that pilots are able to form their own schemas from knowing-in-practice. Theories of practice (Nicolini, 2012, Hopwood, 2014) can direct our attention towards the fundamental nature of what practice is and how we can learn through it.

In taking up the challenge for higher education, with the aim of solving future skills challenges (Universities UK, 2018), universities may wish to examine how practice-based programmes can be flexibly delivered through the academy. The most important feature of any approach is in the area of programme design. Boud's (2012) assertion

that a conceptual understanding is needed for programmes that have a base in practice is of fundamental concern. Many universities in the U.K. have engaged in the development and delivery of degree apprenticeships across a range of sectors and professions during the last decade. This has helped to embed this particular form of work-based learning within these institutions, Middlesex University has played an important role in this initiative through its Centre for Apprenticeships and Skills. The degree in professional aviation pilot practice is firmly based in the conduct of practice and can be positioned on the work-based learning continuum (QAA, 2018b). It is a form of work-integrated higher education and can be recognised as being a specific type of work-integrated learning.

The basis in practice for the aviation degree has been exemplified within the student module submissions. These tell the developing story of the acquisition of pilot competences, skills and knowledge. In addition to the expected technical skills required for flying proficiency, students require the important human elements of motivation, determination, patience, persistence, the need to develop self-confidence, the ability to be decisive and resilience (Appendix 14). These human factors are supplemented more formally as the degree progresses with the NOTECHS (Flin *et al.*2003). Further, students are observed to develop meta-skills through their interactions with university tutors. Student-practitioners demonstrate abilities of self-management in practice and self-direction in learning (Lester and Costley, 2010). The development of meta-skills can best be achieved through engaging in critical self-reflection and this in turn, can be supported through higher education pedagogy.

In relation to pedagogical approaches, Lillis (2018) presents teaching, learning and assessment as one of the key areas of focus for ‘best practice’ in delivering work-integrated learning programmes. It is worth recognising the importance of *teaching* as a key component within work-integrated learning alongside the *facilitation of learning*. This is an important distinction and it would be helpful for programme developers to create detailed *maps of interaction* between tutors and students for the various stages of a work-integrated programme at the design stage. Lillis (2018) also refers to workplace mentoring as a key area of pedagogy. This is worth more consideration as to how this can operate within the aviation programme. Currently, workplace mentors are not specified although important individual connections are made throughout the training and work stages. Perhaps, of more interest within this aviation programme is the concept of Community of Practice. There is a strong sense of community at the FTO

between staff and students and it could be helpful for this to be more understood and developed.

The notion of Community of Practice is intrinsically linked to the success or failure of work based learning partnerships, the community contains actors who can affect the strategic viability of the partnership and its ongoing life. The lifespan of this aviation degree programme at Middlesex University is likely to be approximately ten years from its inception in 2014. It is worth considering the phases of programme development, stable operation and teach out, these could loosely be estimated in time periods of four years, two years and four years respectively. However, in this particular case, the partner organization is continuing this form of higher education with another university. The potential transient nature of work based programmes was recognised by Garnett (2002). Garnett's model (2002, p. 91), describing "The development and evolution of a work based learning partnership" outlines two reasons for a partnership to end: that objectives have been achieved or the partnership is no longer attractive. However, the model also contains an operational and evolutionary 'loop' indicating that it is sometimes possible for partnerships to manage change and evolve, thereby extending the life of the partnership. The model can act as a useful strategic reference point for work based programme partners, managers and staff. In this particular example of the aviation degree partnership it is clear that environmental change could not be managed and this led to a fault in the operational and evolutionary loop.

In following the work of Stewart (1997), Garnett (2001, p. 78) considers how intellectual capital may be described using three categories:

Human capital – concerned with knowledge and capabilities of individuals and groups of workers (a key issue is making individual tacit knowledge explicit).

Structural capital – the means by which the organisation captures, develops, codifies and shares knowledge so that it can be effectively applied.

Client capital – systems and processes by which the organisation taps into the human and structural capital of client organisations (e.g. suppliers, partners, customers).

Garnett contends that universities are on familiar ground when working in the arena of human capital but that the implementation of programmes in work based learning draws the university into the territories of structural and client capital that are less well

understood. In this particular case of aviation degree provision there were missed opportunities in utilising available structural and client capital in expanding the programme offer, e.g. to other partners and through already validated postgraduate provision.

Chapter Six follows with conclusions and recommendations from the case study.

Chapter Six

Conclusions and Recommendations

Introduction

This project has explored a particular case of work-integrated learning as experienced by student-practitioners undertaking an undergraduate degree in Professional Aviation Pilot Practice through Middlesex University and a partner flight training organisation. The inquiry has drawn from a range of perspectives that have helped to frame a detailed account of ‘what’ and ‘how’ aviation students learn through work, practice and study at sites remote from the campus. This chapter will summarise the findings of the project by concluding on the research questions that were formulated at the beginning of the project. The limitations of this project will be presented and explained. Key lessons from this research that may inform future programmes of work based learning will be considered and recommendations that have emerged from the project process will be made. The chapter will be finalised with suggestions on the directions for future research.

Research Questions

This project was guided by the research questions below and conclusions are drawn for each question:

- 1. Do student-practitioners in aviation learn best when combining higher education with the rigorous programme of training required within this sector?**

Student-practitioners have indicated within their work that the requirements of higher education have directed their attention onto their aviation practice in a more focused way than may have happened otherwise. This has been confirmed in their interviews by staff at the FTO. Staff at the FTO have also observed that students on the degree programme exhibit more professional characteristics than modular students who are not taking the degree. There is scope for inquiry into how higher education can provide further support for students undertaking the rigorous programme of training, specifically, in preparation for the professional journey and changes of context.

2. How can higher education influence ‘learning’ during the initial stages of professional development of aviation pilots?

The students are introduced to reflective practice and professional development planning in year 1 of the degree; these act as catalysts in activating ‘thinking’ about their professional practice. However, some students forget some of the early introductory concepts and need re-introducing to some of the ideas from higher education once ATPL examinations have been completed. The process of critically reflective practice enables the creation of useful action plans for enhancing future practice and may also lead to experimentation within new events, again with the intention of improvement in practice. The reflective process enables students to become more evaluative about their practice and more analytical. Students are directed towards using authoritative professional and academic sources in order to build their knowledge base and to encourage constructivist approaches to their own work. As part of assessed work, student presentations encourage active inquiry into pilot practice, specifically, into their own practice as flight instructors and first officers. Students are expected to meet FHEQ Level 6 outcomes in completing the degree and the degree modules are designed to enable this, specific outcomes include the demonstration of knowledge and understanding, cognitive, practical and transferable skills. Further expectations include being able to demonstrate initiative, take personal responsibility and display problem-solving skills.

3. How does training based on ‘work’ influence ‘learning’ during the initial stages of professional development of aviation pilots?

Professional training at the FTO provides vital support to students embarking on a career as an aviation pilot. Training to professional standards throughout the degree ensures that flight safety is paramount. In year 2, the training and development leading to attaining commercial pilot status has particular significance and relies on students performing to sector accepted expectations in commercial practice. Also, in year 2 the students are able to build on their qualifications and experience in a real work role when becoming a flight instructor. Students experience the challenges of a new professional role and need to adapt to the work context. There is a formation of identity occurring at this point and students gain operational experience as well as more confidence from increased flying and carrying out instruction. Learning for student instructors is influenced through FTO peer support. Students find much value in their community of practice as they seek to develop in their role. Students are seen to develop stronger

communication and interpersonal skills as well as a work ethic. Students enjoy this role, however, it can present challenges, both human and technical. Students may experience tiredness and fatigue and they require resilience when dealing with challenging students. Students develop skills in time-management and are required to deal with stressful situations. Students are responsible for safety management in their role as flight instructors as they operate as pilot in command.

In year 3 of the degree students begin the phase of training that leads to working in the cockpit of an airline. This involves training for the Instrument Rating including an intensive period of simulations and flying a multi-engine aircraft. This is followed by the MCC course that develops cockpit management and multi-crew flying skills. Students learn some of the essential elements of CRM and non-technical skills: leadership and managerial skills, co-operation, decision-making and situational awareness, also, communication as the integral key. When students enter an airline, training continues as they learn to operate and fly a new type of aircraft. The students, once again, enter an intense period of ground-school and simulated flying before flying the real aircraft. Students need to draw upon their prior learning from the beginning of flight training and use all of the previously developed attributes to help them make this important transition. Training continues in the initial stages of line-flying with the support of a training captain. At this point, work and training are combined until confident pilot competencies are demonstrated in the role of first officer.

4. How well do any of the pedagogies used within the joint degree partnership support the integration of work and learning?

The pedagogy of the FTO is multi-faceted. In year 1 the pedagogy has been designed to support students in their aim to complete the mandatory CAA ATPL examinations. Group teaching is provided through the series of subject areas and these are delivered by tutors with appropriate expertise in aviation. In year 2 the FTO facilitate the 'hours building' phase of pilot development. This is an extended practicum. Students build their experience of real flying within the structured commercial operation of a flight school. Learning through this flying practise is supported through the community of peers, FTO professionals and university tutors. CPL training provides focused instructor support towards the achievement of the commercial licence and this represents a significant point of transition for the student, attitudinal and behavioural changes are observed as the students become more professionally oriented. The follow up training as a flight instructor effectively blends training in instructional techniques within the

classroom and at the second site of practice, in the air. Degree students are required to drive their own understandings of aviation theory forward as they learn to teach their own students. Students also begin to develop an understanding of the commercial and personal aspects of work as a flight instructor. The extended period of work as an instructor represents another important period of experience building, flying skills are honed and instructional techniques improved. Degree students are able to take the final steps at the FTO in gaining the requirements for airline entry by taking the instrument rating and the MCC course. Students gain important experience from simulated practice and flying multi-engine aircraft and close tutor support at the FTO is required throughout this stage. Within the MCC course the students learn to focus on human factors and working with others within the context of an airline work role. It can be seen throughout the varied pedagogy of the FTO that the context of commercial aviation underpins the student journey. The site where learning takes place is also a site of professional practice.

The pedagogy of the university promotes the development of reflective practice as a key theme throughout the degree. Students are encouraged to use a learning journal as a means of recording events from their flying experiences. Regular reflective reporting throughout the degree allows students to critically reflect on their own practice using a suitable reflective model. Students submit draft work to the tutors who act as 'professional development advisers'. Feedback normally includes advice on honing use of the reflective model and prompting further thinking around specific aspects of the experience being described. In this way, the students can maximise the learning that they take from their experiences. The process helps them to rationalise their experiences through the evaluative process and they are able to develop confidence from their analysis and the conclusions that they carry forward into future practice. The co-constructive element with tutors is a key feature and tutors use on-line tutorials as part of the support process.

In some modules, presentations provide opportunities for students to inquire into specific aspects of their practice and to demonstrate their capabilities in connecting theoretical ideas with their practice. Follow up question and answer sessions with tutors take the form of professional discussions and learning becomes a two-way process. Students are encouraged at all stages to develop their wider reading and to integrate both professional and academic sources into their module submissions. Professional development planning is another recurring feature of the pedagogy and students benefit

from the regular attention that they pay to this. The planning assists in ensuring that the complex framework of pilot development is understood and students are able to set targets for milestones. The costs of pilot training are significant and the planning process helps in recognising the timeframe of when funds may be required.

The pedagogy of the workplace is experienced for all students within the FTO as they work as flying instructors, some students also move into airline roles during the degree. Within the FTO, students work within the professional flying community and they develop their practice under the tutelage of more experienced instructors and aviation professionals. Work presents challenges for young instructors, not least, the necessity to take responsibility in the work role and to begin to develop skills in management and leadership. Students learn to cope with the ethical dimension as they are operating as 'standards setters' and beginning to recognise how power and authority are being enacted in their role. Student instructors carry a crucial responsibility in that they act as a barrier to the occurrence of unsafe events. This all takes place within the professional and operational context of the FTO which in itself, can be viewed as a systemic pedagogical domain.

On entering an airline, students complete ground school and simulator training before flying the real aircraft. The pedagogical approach during this period is intensive, however, the intensity and modes of learning can be viewed as part of a developmental continuum for aviation pilots. Students learn to work closely with another student during the simulations as a means of developing cohesion on the flight deck. Students are closely supported by type rating instructors during this phase. The scale of operations as well as the scale of the aircraft represents a step-change for students. Responsibility for passenger safety is of key concern and students undertake wider training within the organization to ensure that commercial operational standards are maintained. Students are supported by training captains during the initial stages of working on the airline and this is considered to be a period of training with important de-briefing by the captain following each flight. University tutors play a supportive role during the final stages of the degree. The pedagogical approaches adopted throughout the joint degree programme lead to successful outcomes for students and they are able to operate in professional roles in aviation.

5. What are the linkages between work, practice and study in this pedagogical context and in particular, how do they affect each other?

Close links between work practice and study are shown to exist within this degree programme. The pedagogical context can be viewed as a systemic whole with specific individual organizational pedagogies operating within this joint degree programme. The university plays a crucial role in maintaining a connection to the student at each stage of development. The role of the FTO is extremely significant as a site of work and learning. The role of the airline is of extreme value to the student pilot as this is the intended professional destination for many. Students may be employed by any of the well-known airlines and this presents a potential disconnect with an academic award. However, the degree was designed with this kind of professional progression in mind and the link between the student and the university is seamless.

At the beginning of year 3 students are already developing a clear sense of being at work in their role as flight instructor. The development of experience through practice provides an increasingly rich source for student inquiry into their developing professional practice. Critical reflection, as a particular element of the pedagogical design, provides a continuous mechanism for professional development and improvements in work. This process continues during early stages of line-training and at this point it is anticipated that students will have adopted reflective practice as part of their key skill set.

The degree programme represents a particular model of work-integrated learning. The contextual phases of 'initial formation', 'training' and 'work' enable the student-practitioner to make a highly significant professional transition. The integration of higher education has been seen to affect positively the 'signature pedagogy' (Shulman, 2005) of pilot training in this case.

The pedagogical approaches of both the university and FTO have proved to be successful with students normally achieving very good classifications. The programme has developed from an uncertain start into a programme with regular progression and completions. However, managing and operating joint higher education work-based programmes at a distance can present issues for pedagogy. The normal disciplinary operational demands may occasionally affect student's ability to progress and this requires flexibility in the HE partner. On-line support systems through a VLE should be maximised and this is an area for development in this case.

6. How well do university / flight training organisation partnerships work in practice?

The evidence from this particular university / flight training organisation partnership presents a mixed picture. The question is best answered by considering it from the perspectives of the central characters: the flight training organisation, Middlesex University and the students.

For the FTO this partnership was considered to be a successful partnership. It gave the FTO a unique selling point and added significantly to their commercial brand. The degree programme added significantly to the professional development of student pilots, an important consideration for the FTO and the wider sector. At an operational level, the FTO felt that the partnership worked extremely well and the connections with the university allowed them to learn and develop expertise in operating a joint programme in higher education. At the strategic level, the partnership became recognised as a failure.

For Middlesex University the rate of student progression was of some concern in 2019, however, programme developments at the FTO and increased staffing resource at the university had addressed these concerns with resulting increases in progression and attainment. The non-standard WIL programme structure proved problematic at the interface of university administration systems with consequent effect on student progression in some cases. The aviation degree programmes were the only professional practice programmes of their type being supported by a team of staff within the faculty, there was scope for wider integration of the staff group with other faculty areas, for example, in psychology. This could have further strengthened the programmes and increased the standing of the subject area of aviation within the faculty. The ultimate demise of the aviation partnerships has resulted in the loss of a leading position and reputation that had been developed within higher education provision for aviation pilots in the U.K. by Middlesex University.

For the students the programme works well in delivering a flexible and valuable learning experience that leads to highly paid employment. The evidence shows that students move into employment as pilots with airlines, the air ambulance, aerial data acquisition services and the Royal Navy.

In relation to lessons learned from the partnership, it is evident that close attention is required from both university and the FTO partner to the shared understanding of

programme outcomes and expectations. There are lessons here for university programme teams in relation to how they operate and how they connect within the institution. It is sometimes easy for practitioners in work-based learning to create their own silos of operation and to some extent, this happened in this case. Intellectual capital was wasted and opportunities were missed in delivering an already validated postgraduate programme that could have engaged staff from across the faculty and further knowledge-sharing opportunities within the university were missed. The faculty were also unable to leverage the commercial and industrial connections with aviation partners. There may be issues surrounding agility of response within university systems and regular attention is needed to risk management and programme review. The once per year Annual Monitoring Review (AMR) at the university may not be sufficient for these types of partnerships.

Limitations of the Research Approach

The research approach was limited by the amount of gathered data, in particular, by the limited numbers of student responses to the questionnaire. I attempted to increase the numbers of responses with further contact and this was unsuccessful. The impact of this failure was tempered by the richness of data received through the interviews and content analysis.

The way that the research was conducted was impacted by the Covid-19 pandemic. My preference was to be able to carry out face-to-face interviews at the site of the FTO. However, this proved to be impossible due to the restrictions in place at the time. Regular visits to the FTO had been taking place prior to the pandemic and the restrictions also prevented access to normal face-to-face meetings with students. I overcame this challenge by carrying out rigorous online interviews and elicited significant emerging themes; I applied highly focused attention to the process of content analysis, carried out critical incident analysis as a means of better understanding the partnership issues and supported all of this with appropriate underpinning literature and a research diary to guide my thinking.

The research was carried out during a difficult period for university and FTO partner staff teams due to the university's decision to close all aviation provision. Part of the impact of this was to destabilise the university staff team and introduced uncertainty about their futures. The FTO partners were also destabilised during this period, however, good communications and relationships were maintained at programme level.

Key Lessons to Inform Future Programmes in Work Based Learning

The key lessons are focused on the themes of pedagogy, the student experience and work based learning partnership:

Pedagogy

Conceptualising programmes as systems at the design stage can assist in recognising the integrated pedagogical terrain e.g. the nature of work-based relationships: are they tri-partite or quadripartite?

Systemic diagramming (e.g. Figure 2.1) can assist course designers with initial understandings of how planned work-based partnership programmes are structured and how the contextual dimensions combine in providing a conceptual overview of the site of learning.

Systemic diagramming (e.g. Figure 5.2) can assist with the recognition of contextual phases of development and the significant transition points for the learner.

That reflective practice is useful as a core component in the professional development of student aviation pilots and this could equally be useful in other programmes of professional practice.

That learning ‘in context’ and at the site of practice enables students to incrementally build knowledge and skills within specific areas of practice through the process of ‘experience – knowledge- action’ (Figure 5.1).

That training organizations and workplace organizations can sometimes provide powerful resources for learning that universities are unable to provide.

The Student Experience

Through the process of learning at the site of practice, students gain skills, knowledge and experience that enable entry into their chosen profession.

Students engaged in this work based programme were seen to develop attributes related to the broad categories of: Human Factors, Emotional Responses, Professional Skills

and Pilot Skills (Appendix 14). Many of these attributes are generic and may be useful in course design for other professional areas.

Work Based Learning Partnership

Consistent strategic awareness is required for work based partnerships in order to mitigate risks. Partners should be mindful of the transient nature of work based partnerships and aim to ensure that the operational - evolution loop (Garnett, 2002) is maximised. This requires a regular environmental scan by university managers, course teams and partners in order to effectively manage change.

Universities should maintain robust and transparent processes of partnership management and aim for an inclusive approach with course teams, ULTs and partners to ensure clarity in shared objectives. This would minimise any potential misunderstandings of what is happening at programme level by maximising the shared knowledge of participants.

Recommendations

1. To share the key concepts of skills, attributes, competencies and working practices required of student pilots that have surfaced within this research. The key concepts can be utilised by joint programme staff teams as well as by students working as flight instructors in helping to develop their own student's awareness of the requirements of aviation pilot practice.
2. The key concepts of skills, attributes, competencies and working practices required of student pilots may also be used for student recruitment purposes where aviation programmes operate. For those intending to enter aviation pilot training it would be helpful to have a clear understanding of what the aviation pilot role entails.
3. Programme developers to map the integration of teaching and facilitation of learning episodes within programme design. Joint programme staff teams may also gain benefits by considering where episodes of teaching and facilitation occur within existing programme designs.
4. Further development in understanding how the Community of Practice can provide support within this programme of work-integrated learning. This would be facilitated by the university staff team and provide benefits for students, FTO and university staff teams.
5. For university course teams and joint partners to take a strategic environmental sense-check at regular intervals. This could minimise risks to programme continuity and maximise opportunities for development.
6. An evaluation of how university–commercial organization partnerships work in practice should be undertaken at Middlesex University. This should include a review of operational and monitoring processes as well as considering active approaches to risk and opportunity management. I will be recommending this to the Partnerships Office at Middlesex University.

Future Research

This research has offered some insights into a variety of areas that relate to programmes of professional practice for aviation pilots, however, the focus on a specific Case Study has offered some signposts to associated research that would carry much value. For example, *‘the effectiveness of degree study in the ongoing careers of aviation pilots’*. It would be useful to understand more about any longer-term impact of degree-level study on pilots in the aviation sector. There is also scope for consideration of *‘pedagogical modelling for work-based programmes in different professional sectors’*. This would lead to better understandings of how work-based learners learn best within particular sites of learning. Finally, there would be value in examining *‘higher education institutional approaches to work-based learning organizational partnerships and their success or failure’*. This could help universities and commercial partners to better understand the benefits and potential pitfalls before entering strategic relationships.

Conclusion

The framing theoretical question for this research was: ‘Does the integration of actual work and higher education in aviation pilot training improve the professional practice of student pilots?’ This question can be answered positively on the basis of this research. Higher education has been seen to operate as a critical conduit and enabler in the complex pedagogical network within this degree. The roles of the flight training organisation and airline employers have been shown to be equally critical to this partnership in learning. This research has also demonstrated the sometimes transient nature of higher education-commercial partnerships and has illustrated some of the impacts when failure occurs.

This case study has shown that the concept of “practice as the site of learning” is fundamental to aviation pilot training and development. As we have seen, the real world cannot be fully replicated, even within aviation. Aviation pilot development may exist towards the end of a continuum that represents safety-critical practices that require real-world development of experience for practitioners; however, there are many other kinds of practice where the practitioner and site of learning should be foremost in our thinking.

Chapter Seven

A Reflexive Account of Personal Learning and Professional Journey

Personal Learning from the Case Study

Unintended learning came from a period of programme transition during which the expected programme renewal didn't take place. This was a particularly turbulent period in terms of university and partner relations. The difficulties of this period were compounded by the emergence of Covid-19 and this created unprecedented complexities for all individuals and organizations. My role during this period varied between module leader, programme leader, university link tutor, programme developer and aviation team colleague depending on which part of my practice I was engaged with at any one time. The unintended learning centred on the complexities of operating in a role that occupied the space that exists between the university and the partner organization.

The experience of disappointment at programme closure was difficult to deal with, when it appeared to me that the programmes were becoming stronger and the aviation team could see strengthening progression and achievements. Also, the realisation that some of the routes for the kind of widening participation that I have always believed in, were being closed off by my university, was equally disappointing. I felt much frustration in what I perceived as untapped potential within this programme area and continued to view this as a wasted opportunity for Middlesex University.

In considering the 'bottom line' for this research I have come to recognise that if the political and strategic dimensions are not carefully handled, then this may present risk to any programme. Simply put, the opportunity for student learning at the site of practice could be curtailed by organizational loss of focus on all environmental aspects of the partnership. This is of overriding concern since any ambitions for pedagogy, professional sector development or finance may not be realised as a result of political and strategic problems in the partnership.

I also discovered that the role of interpreter and the act of interpretation can have powerful consequences. I learned that there is significant responsibility in compiling a case study that represents the real world activities and professional lives of individuals and organizations. There is pressure in trying to accurately represent the lived reality,

however, I came to realise that it would be impossible to capture everything as there is much complexity in these kinds of sites of learning. Moreover, the act of interpretation must be seen for what it is, an act of interpretation based on the best efforts of the researcher at that moment in time.

Personal Learning from the Professional Doctorate

The impact of the professional doctorate may be most beneficial in terms of capacity building at the level of the individual and this may supersede the specific change that may occur as a result of the actual project (Boud, *et al.* 2021). This recognition of capacity can lead to consideration of the essential skill set and understandings required of all practitioners. At a basic level, it is worth considering that the non-technical skills from aviation, the health sector (and others) can be applied in many practice scenarios, including that of the Doctoral candidate. Flin *et al.* (2002) show that the non-technical skills feature most readily, in what are considered “high reliability” team environments, however, the capacity to demonstrate leadership, situation awareness, decision-making, teamwork and communication are necessary when engaging with the professional doctorate.

One of the key lessons that I have learned from this research relates to the attributes of situation awareness and decision-making, in that I should have started much earlier with everything. However, I feel that I have improved my capabilities in the practice of research. The production of a workable and effective case study research design was an important process for me to experience. Justifying this approach through the creation of a sensible theoretical structure that could be threaded together was not only challenging but essential in demonstrating how *this* case study could be researched.

I realised during the data-gathering phase that if I had produced the framework for analysis within NVivo much earlier, then I could have begun the targeted data collection sooner. This would have allowed more time for analysis and reflection. Establishing the analytical approach in order to deal with the varying types of data, proved to be more challenging than I had expected. I realised that I shouldn't apply too much structure that would guide the data towards the research questions but that an emergent strategy was required. This was an important thing for me to realise, the crucial connection between the data and the case. Answering the research questions was of secondary importance to

maintaining the integrity of the link between what was being exposed and the real-world situation.

I learned the value of parsimony and selectivity when faced with the challenges of an overwhelming amount of literature or data to handle. Recognising that you can't, and most importantly shouldn't read everything, was helpful in keeping the project in perspective.

I learned about the benefits that can be gained through simply reading and writing. I have found that the process of writing can be generative in itself; it helps me to create as I go along and allows me to connect threads of ideas that have come from my research and my experience (Pizzolato, 2021).

I have developed confidence in dealing with the literature, specifically, in recognising where the strongest work lies and where some author's explanations are too blinkered. I have recognised that my experience and understanding of the field is more worthwhile than I realised. In considering why this is so, and why I should think this way, I suspect that the answer, as for many, lays in my upbringing and the ingrained experiences of working class life. Secondly, after a long career I have recognised that the world of work can sometimes be harsh on those that toil within it. Make no mistake, work can hurt people. I have experienced very difficult times within the workplace and realise that this is not uncommon. Workplaces are complex and precarious. However, I have also experienced exhilaration in the workplace particularly when collaborating with colleagues and improving experiences for students. Workplaces, particularly in education can bring much purpose and joy to working life.

I have come to recognise how undertaking the professional doctorate solidifies foundational knowledge, enables deeper knowledge acquisition and how this leads to a strengthening voice for the practitioner. I now feel much more confident about sharing my thinking and experiences from practice and realise that *my* experience has validity simply because I have put myself into the position that allows *me* to gain this experience. I shouldn't be surprised by this, I have spent years explaining the potential transformational impact of work based learning and helping other students to recognise *their* own development.

So, what next? The answer is in developing impact by writing more. This research has exposed topics that should find interest within the community of work and learning:

- Transitions in the development of professional practice.

- High intensity practice.
- Failure of work based partnerships and lessons learned.
- Widening participation through leadership.

Call to Action

This research shines a light on the opportunities and potential pitfalls that may await when attempting to facilitate flexible learning through real-world practice (Talbot *et al.* 2020).

Ultimately, the case study presents a story that is shared by an extensive range of actors, participants and observers. This case study adds to the over-arching story of the developing understanding of how people work and learn, consequently, it doesn't represent an ending but feeds into the continuing developing narrative. As I have learned, work based learning can sometimes be a complex thing to become involved in, however, the engagement can often be supremely worthwhile and this is my experience.

Overall, this is a story that mandates practitioners of all persuasions to recognise their role as interpreters and critically reflective active agents in their own case work.

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Appendices

Appendix 1 Letter to invite participants and Student Consent Form



Middlesex University,
The Burroughs,
Hendon
London NW4 4BT

PARTICIPANT INFORMATION SHEET (PIS) AND CONSENT FORM

1. Study title : Practice as the Site of Learning: A Case Study of Higher Education in an Aviation Degree

2. Invitation

You are being invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

Thank you for reading this.

3. What is the purpose of the study?

The purpose of the study is to carry out an in-depth inquiry into how and what students learn when they are students on the joint BSc (Hons) Professional Aviation Pilot Practice degree at Middlesex University / Tayside Aviation

The duration of this study is from February 2020 until February 2022.

4. Why have I been chosen?

You have been chosen because of the particular stage of the programme that you are currently entering and because you will be able to provide very useful information about the degree programme that you are studying. Another 52 students are being invited to take part.

5. Do I have to take part?

It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep and be asked to sign a consent form. If you decide to take part you are still free to withdraw at any time and without giving a reason.

A decision to withdraw at any time, or a decision not to take part, will not affect you in any way as a student on the degree programme.

6. What will happen to me if I take part?

If you decide to take part you will be asked to complete questionnaires (this will be a maximum of three but likely to be fewer) and to allow analysis of your online learning journal and coursework submissions.

Any data, observations or information derived from these may be used anonymously in the case study of the degree programme.

Please note that in order to ensure quality assurance and equity this project may be selected for audit by a designated member of the ethics committee at Middlesex University. This means that the designated member can request to see signed consent forms. However, if this is the case your signed consent form will only be accessed by the designated auditor or member of the audit team.

7. What do I have to do?

In taking part in questionnaires the time required for this is likely to be 5-10 minutes. You will be able to complete the questionnaire at a suitable time that suits you and it is not intended that completing these will interrupt your programme of study.

The duration of this research is from February 2020 until February 2022 and you may be contacted more than once during this period in relation to this study.

8. What are the possible disadvantages and risks of taking part?

There is no known risk or disadvantages in participating in this project.

9. What are the possible benefits of taking part?

We hope that participating in the study will help you to think more deeply about your study programme, your professional skills and what you have learned from taking part. However, this cannot be guaranteed. The information we get from this study may help us to improve the BSc (Hons) Professional Aviation Pilot Practice degree at Middlesex University / Tayside Aviation.

10. Will my taking part in this study be kept confidential?

All information that is collected about you during the course of the research will be kept strictly confidential. Any information about you which is used will have your name, student number and address removed so that you cannot be recognised from it.

All data will be stored, analysed and reported in compliance with the Data Protection Legislation of the UK.

11. What will happen to the results of the research study?

The results of the research will be published as part of the Doctorate in Professional Studies programme being undertaken by the researcher. The results are likely to be published in 2022. You will be able to obtain a copy of the published results by contacting the researcher by email at K.Buckland@mdx.ac.uk

You will not be identified in any report/publication.

12. Who has reviewed the study?

The Research Ethics Committee(s), which reviewed the study is the Middlesex University, School of Health and Social Sciences, Education Studies Ethics sub-Committee.

13. Contact for further information

Keith Buckland – researcher
Room T120, Town Hall, Faculty of Science and Technology,
Middlesex University, The Burroughs,
Hendon, London NW4 4BT
Tel: 02084115614
E: K.Buckland@mdx.ac.uk

Dr Mehmet Ali Dikerdem – supervisor
Room W009, Williams Building,
Middlesex University, The Burroughs,
Hendon, London NW4 4BT
Tel: 02084116230
E: M.Dikerdem@mdx.ac.uk

Thank you for taking part in this study.

Note: As a participant you will be given a copy of this information sheet and a signed consent form to keep.

Date 09/05/21 – version 2

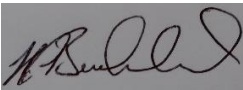
Participant Identification Number:

CONSENT FORM

Title of Project: Practice as the Site of Learning: A Case Study of Higher Education in an Aviation Degree

Name of Researcher: Keith Buckland

1. I confirm that I have read and understand the information sheet dated 5th May 2021 for the above study and have had the opportunity to ask questions.
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.
3. I agree that this form that bears my name and signature may be seen by a designated auditor.
4. I agree that my non-identifiable research data may be stored in National Archives and be used anonymously by others for future research. I am assured that the confidentiality of my data will be upheld through the removal of any personal identifiers.
5. I understand that any interview may be recorded and subsequently transcribed.
6. I agree to take part in the above study.

_____ Name of participant	_____ Date	_____ Signature
_____ Name of person taking consent (if different from researcher)	_____ Date	_____ Signature
Keith Buckland	5th May 2021	
_____ Researcher	_____ Date	_____ Signature

1 copy for participant; 1 copy for researcher;

Appendix 2 3rdEdition ICAO Competencies for Aeroplane Pilots (IATA 2019)

ICAO competency framework to develop competency-based training and assessment for aeroplane pilot licenses, ratings, and recurrent training

Competency	Description	Observable behaviours (OB)
Application of procedures and compliance with regulations	Identifies and applies appropriate procedures in accordance with published operating instructions and applicable regulations.	OB 1.1 Identifies where to find procedures and regulations OB 1.2 Applies relevant operating instructions, procedures and techniques in a timely manner OB 1.3 Follows SOPs unless a higher degree of safety dictates an appropriate deviation OB 1.4 Operates aeroplane systems and associated equipment correctly OB 1.5 Monitors aircraft systems status OB 1.6 Complies with applicable regulations OB 1.7 Applies relevant procedural knowledge
Communication	Communicates through appropriate means in the operational environment, in both normal and non-normal situations.	OB 2.1 Determines that the recipient is ready and able to receive information OB 2.2 Selects appropriately what, when, how and with whom to communicate OB 2.3 Conveys messages clearly, accurately and concisely OB 2.4 Confirms that the recipient demonstrates understanding of important information OB 2.5 Listens actively and demonstrates understanding when receiving information OB 2.6 Asks relevant and effective questions OB 2.7 Uses appropriate escalation in communication to resolve identified deviations OB 2.8 Uses and interprets non-verbal communication in a manner appropriate to the organizational and social culture OB 2.9 Adheres to standard radiotelephone phraseology and procedures OB 2.10 Accurately reads, interprets, constructs and responds to datalink messages in English
Aeroplane Flight Path Management, automation	Controls the flight path through automation.	OB 3.1 Uses appropriate flight management, guidance systems and automation, as installed and applicable to the conditions (see Part I, Chapter 1, for the definition of conditions) OB 3.2 Monitors and detects deviations from the intended flight path and takes appropriate action OB 3.3 Manages the flight path safely to achieve optimum operational performance OB 3.4 Maintains the intended flight path during flight using automation while managing other tasks and distractions OB 3.5 Selects appropriate level and mode of automation in a timely manner considering phase of flight and workload OB 3.6 Effectively monitors automation, including engagement and automatic mode transitions
Aeroplane Flight Path Management,	Controls the flight path	OB 4.1 Controls the aircraft manually with accuracy and smoothness as appropriate to the situation

manual control	through manual control.	<p>OB 4.2 Monitors and detects deviations from the intended flight path and takes appropriate action</p> <p>OB 4.3 Manually controls the aeroplane using the relationship between aeroplane attitude, speed and thrust, and navigation signals or visual information</p> <p>OB 4.4 Manages the flight path safely to achieve optimum operational performance</p> <p>OB 4.5 Maintains the intended flight path during manual flight while managing other tasks and distractions</p> <p>OB 4.6 Uses appropriate flight management and guidance systems, as installed and applicable to the conditions (See Part I, Chapter 1, definitions)</p> <p>OB 4.7 Effectively monitors flight guidance systems including engagement and automatic mode transitions</p>
Leadership and Teamwork	<p>Influences others to contribute to a shared purpose.</p> <p>Collaborates to accomplish the goals of the team.</p>	<p>OB 5.1 Encourages team participation and open communication</p> <p>OB 5.2 Demonstrates initiative and provides direction when required</p> <p>OB 5.3 Engages others in planning</p> <p>OB 5.4 Considers inputs from others</p> <p>OB 5.5 Gives and receives feedback constructively</p> <p>OB 5.6 Addresses and resolves conflicts and disagreements in a constructive manner</p> <p>OB 5.7 Exercises decisive leadership when required</p> <p>OB 5.8 Accepts responsibility for decisions and actions</p> <p>OB 5.9 Carries out instructions when directed</p> <p>OB 5.10 Applies effective intervention strategies to resolve identified deviations</p> <p>OB5.11 Manages cultural and language challenges, as applicable</p>
Problem Solving and Decision Making	Identifies precursors, mitigates problems; and makes decisions.	<p>OB 6.1 Identifies, assesses and manages threats and errors in a timely manner</p> <p>OB 6.2 Seeks accurate and adequate information from appropriate sources</p> <p>OB 6.3 Identifies and verifies what and why things have gone wrong, if appropriate</p> <p>OB 6.4 Perseveres in working through problems while prioritizing safety</p> <p>OB 6.5 Identifies and considers appropriate options</p> <p>OB 6.6 Applies appropriate and timely decision-making techniques</p> <p>OB 6.7 Monitors, reviews and adapts decisions as required</p> <p>OB 6.8 Adapts when faced with situations where no guidance or procedure exists</p> <p>OB 6.9 Demonstrates resilience when encountering an unexpected event</p>
Situation awareness and management of information	Perceives, comprehends and manages information and anticipates its	<p>OB 7.1 Monitors and assesses the state of the aeroplane and its systems</p> <p>OB 7.2 Monitors and assesses the aeroplane's energy state, and its anticipated flight path.</p> <p>OB 7.3 Monitors and assesses the general environment as it may affect the operation</p>

	effect on the operation.	<p>OB 7.4 Validates the accuracy of information and checks for gross errors</p> <p>OB 7.5 Maintains awareness of the people involved in or affected by the operation and their capacity to perform as expected</p> <p>OB 7.6 Develops effective contingency plans based upon potential risks associated with threats and errors</p> <p>OB 7.7 Responds to indications of reduced situation awareness</p>
Workload Management	Maintain available workload capacity by prioritizing and distributing tasks using appropriate resources.	<p>OB 8.1 Exercises self-control in all situations</p> <p>OB 8.2 Plans, prioritizes and schedules appropriate tasks effectively</p> <p>OB 8.3 Manages time efficiently when carrying out tasks</p> <p>OB 8.4 Offers and gives assistance</p> <p>OB 8.5 Delegates tasks</p> <p>OB 8.6 Seeks and accepts assistance, when appropriate</p> <p>OB 8.7 Monitors, reviews and cross-checks actions conscientiously</p> <p>OB 8.8 Verifies that tasks are completed to the expected outcome</p> <p>OB 8.9 Manages and recovers from interruptions, distractions, variations and failures effectively while performing tasks.</p>

Appendix 3 Descriptor for a higher education qualification at level 6 on the FHEQ:
bachelor's degree with honours

The descriptor provided for this level of the FHEQ is for any bachelor's degree with honours which should meet the descriptor in full. This qualification descriptor should also be used as a reference point for other qualifications at level 6 of the FHEQ, including bachelor's degrees, and graduate diplomas.

Bachelor's degrees with honours are awarded to students who have demonstrated:

- a systematic understanding of key aspects of their field of study, including acquisition of coherent and detailed knowledge, at least some of which is at, or informed by, the forefront of defined aspects of a discipline
- an ability to deploy accurately established techniques of analysis and enquiry within a discipline
- conceptual understanding that enables the student:

- to devise and sustain arguments, and/or to solve problems, using ideas and techniques, some of which are at the forefront of a discipline

- to describe and comment upon particular aspects of current research, or equivalent advanced scholarship, in the discipline

- an appreciation of the uncertainty, ambiguity and limits of knowledge
- the ability to manage their own learning, and to make use of scholarly reviews and primary sources (for example, refereed research articles and/or original materials appropriate to the discipline).

Typically, holders of the qualification will be able to:

- apply the methods and techniques that they have learned to review, consolidate, extend and apply their knowledge and understanding, and to initiate and carry out projects
- critically evaluate arguments, assumptions, abstract concepts and data (that may be incomplete), to make judgements, and to frame appropriate questions to achieve a solution - or identify a range of solutions - to a problem
- communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.

And holders will have:

the qualities and transferable skills necessary for employment requiring:

- the exercise of initiative and personal responsibility

- decision-making in complex and unpredictable contexts

- the learning ability needed to undertake appropriate further training of a professional or equivalent nature.

4.15.1 Holders of a bachelor's degree with honours will have developed an understanding of a complex body of knowledge, some of it at the current boundaries of an academic discipline. Through this, the holder will have developed analytical techniques and problem-solving skills

that can be applied in many types of employment. The holder of such a qualification will be able to evaluate evidence, arguments and assumptions, to reach sound judgements and to communicate them effectively.

4.15.2 Holders of a bachelor's degree with honours should have the qualities needed for employment in situations requiring the exercise of personal responsibility, and decision-making in complex and unpredictable circumstances.

4.15.3 Bachelor's degrees with honours form the largest group of higher education qualifications. Typically, learning outcomes for these programmes would be expected to be achieved on the basis of study equivalent to three or four full-time academic years and lead to qualifications with titles such as Bachelor of Arts, BA (Hons) or Bachelor of Science, BSc (Hons). In addition to bachelor's degrees at this level are short courses and professional 'conversion' courses, based largely on undergraduate material, and taken usually by those who are already graduates in another discipline, leading to, for example, graduate certificates or graduate diplomas.

Appendix 4 Annex D: outcome classification descriptions for FHEQ Level 6 and FQHEIS Level 10 degrees

Not successful	Third-class honours (3rd)	Lower second-class honours (2.2)	Upper second-class honours (2.1)	First-class honours (1st)
<p>The student did not achieve the required course learning outcomes and:</p> <p>did not consistently demonstrate sufficient knowledge and understanding, cognitive, practical and transferable skills</p> <p>did not consistently demonstrate adequate initiative and personal responsibility</p> <p>did not consistently demonstrate ability to reflect on their work</p> <p>did not consistently demonstrate problem-solving skills</p>	<p>The student achieved all their required course learning outcomes and:</p> <p>demonstrated knowledge and understanding, cognitive, practical and transferable skills</p> <p>demonstrated initiative and exercised personal responsibility</p> <p>demonstrated some ability to reflect on their work</p> <p>demonstrated problem-solving skills</p>	<p>The student achieved all their required course learning outcomes and:</p> <p>demonstrated strong knowledge and understanding, cognitive, practical and transferable skills</p> <p>demonstrated initiative and personal responsibility</p> <p>demonstrated an ability to reflect on their work</p> <p>demonstrated strong problem-solving skills</p>	<p>The student achieved all their required course learning outcomes and:</p> <p>demonstrated thorough knowledge and understanding, cognitive, practical and transferable skills</p> <p>demonstrated good initiative and personal responsibility</p> <p>demonstrated an ability to reflect critically on their work</p> <p>demonstrated thorough problem-solving skills</p>	<p>The student achieved all their required course learning outcomes and:</p> <p>consistently demonstrated advanced knowledge and understanding, cognitive, practical and transferable skills</p> <p>consistently demonstrated exceptional initiative and personal responsibility</p> <p>consistently demonstrated ability to reflect critically and independently on their work</p> <p>consistently demonstrated exceptional problem-solving skills</p>

Knowledge and understanding

A systematic extensive and comparative understanding of key aspects of the field of study, including coherent and detailed knowledge of the subject and critical understanding of theories and concepts, at least some of which is at, or informed by, the forefront of defined aspects of a discipline.

Not successful	3rd (pass or threshold)	2.2	2.1	1st
The student's knowledge and understanding of the subject is inadequate, without the required breadth or depth, with deficiencies in key areas.	The student has demonstrated a depth of knowledge and understanding in key aspects of their field of study, sufficient to deal with terminology, facts and concepts.	The student has demonstrated a sound breadth and depth of subject knowledge and understanding, if sometimes balanced towards the descriptive rather than the critical or analytical.	The student has demonstrated sophisticated breadth and depth of knowledge and understanding, showing a clear, critical insight.	The student has shown exceptional knowledge and understanding, significantly beyond the threshold expectation of a graduate at this level and beyond what has been taught.
The student has demonstrated inadequate understanding of subject-specific theories, paradigms, concepts and principles, including their limitations and ambiguities.	The student has demonstrated an understanding of subject-specific theories, paradigms, concepts and principles.	The student has consistently demonstrated an understanding of subject-specific theories, paradigms, concepts and principles as well as more specialised areas.	The student has demonstrated a thorough understanding of subject-specific theories, paradigms, concepts and principles, and a sound understanding of more specialised areas.	The student has demonstrated an exceptional understanding of subject-specific theories, paradigms, concepts and principles, and in-depth knowledge, if not mastery of a range of specialised areas.
The student has not produced sufficient evidence of background investigation, analysis, research, enquiry and/or study.	The student has conducted general background investigation, analysis, research, enquiry and/or study using established techniques, with the ability to extract relevant points.	The student has conducted background investigation, analysis, research, enquiry and/or study using established techniques accurately, and can critically appraise academic sources.	The student has conducted thorough background investigation, analysis, research, enquiry and/or study using established techniques accurately, and possesses a well-developed ability to critically appraise a wide range of sources.	The student has conducted independent, extensive and appropriate investigation, analysis, research, enquiry and/or study well beyond the usual range, together with critical evaluation, to advance work and/or direct arguments.

Cognitive skills

A conceptual understanding of a level that is necessary to devise and sustain arguments, and/or to solve problems and comment on research and scholarship in the discipline, with an appreciation of the uncertainty, ambiguity and limits of knowledge.

Not successful	3rd (pass or threshold)	2.2	2.1	1st
The student has displayed an over-reliance on set sources. They have not demonstrated an adequate ability to select and evaluate reading and research.	The student has demonstrated the ability to select, evaluate and comment on reading, research and primary sources.	The student has selected, evaluated and commented on reading, research and primary sources, sometimes beyond the set range.	The student has thoroughly selected, critically evaluated and commented on reading, research and primary sources, usually beyond the set range.	The student has demonstrated an exceptional ability to select, consider, evaluate, comment on and synthesise a broad range of research, primary sources, views and information and integrate references.
The student's arguments and explanations are weak and/or poorly constructed, and they are not able to critically evaluate the arguments of others or consider alternative views.	The student has shown the ability to devise and sustain an argument, with some consideration of alternative views, and can explain often complex matters and ideas.	The student has argued logically, with supporting evidence, and has demonstrated the ability to consider and evaluate a range of views and information. They have clearly and consistently explained complex matters and ideas.	The student has demonstrated the ability to make coherent, substantiated arguments, as well as the ability to consider, critically evaluate and synthesise a range of views and information. They have demonstrated a thorough, perceptive and thoughtful interpretation of complex matters and ideas.	The student has made consistent, logical, coherently developed, and substantiated arguments, and demonstrated the ability to systematically consider, critically evaluate and synthesise a wide range of views and information. They have demonstrated sophisticated perception, critical insight and interpretation of complex matters and ideas.
The student has shown a limited ability to solve problems and/or make decisions.	The student has demonstrated an ability to solve problems, applying a range of methods to do so, and the ability to make decisions in complex and unpredictable circumstances.	The student has consistently solved complex problems, selecting and applying a range of appropriate methods, and can make decisions in complex and unpredictable circumstances.	The student has demonstrated thorough problem-solving skills, selecting and justifying their use of a wide-range of methods, and can make decisions in complex and unpredictable circumstances with a degree of autonomy.	The student has demonstrated a wide range of extremely well-developed problem-solving skills, as well as a strong aptitude for decision-making with a high degree of autonomy, in the most complex and unpredictable circumstances.

The student has shown little or no real creativity.	The student has produced some creative work.	The student has consistently demonstrated creativity.	The student has shown a high level of creativity and originality throughout their work.	The student has demonstrated exceptional creative flair and originality.
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Practical skills

An ability to manage one's individual learning and to deploy accurately established techniques of analysis and enquiry within a discipline or as necessary for the discipline.

Not successful	3rd (pass or threshold)	2.2	2.1	1st
The student has not demonstrated sufficient evidence of discipline-specific skills development or application.	The student has demonstrated evidence of developing and applying discipline-specific specialist skills.	The student has consistently demonstrated the development and informed application of discipline-specific specialist skills.	The student has demonstrated a capable and effective application of discipline-specific specialist skills.	The student has demonstrated an accomplished and innovative application of discipline-specific specialist skills.
The student has attempted practical tasks/processes but followed a limited, procedural or mechanistic formula, and they contain errors, with little or no independence.	The student has completed practical tasks and/or processes accurately and with a degree of independence.	The student has consistently completed practical tasks/processes mainly independently in an accurate, well-coordinated and proficient way.	The student has performed practical tasks and/or processes autonomously, with accuracy and coordination.	The student has autonomously completed practical tasks and/or processes with a high degree of accuracy, coordination and proficiency.
The student has demonstrated a lack of technical, creative and/or artistic skills in most, or key, areas.	The student has demonstrated technical, creative and/or artistic skills.	The student has consistently demonstrated well-developed technical, creative and/or artistic skills.	The student has a thorough command of highly-developed relevant technical, creative and/or artistic skills.	The student has a full range of exceptional technical, creative and/or artistic skills.

The student has not presented their research findings clearly or effectively, and their gathering, processing and interpretation of data is unsatisfactory.	The student has presented their research findings, in several formats, and has gathered, processed and interpreted data effectively.	The student has consistently presented their research findings effectively and appropriately in many formats, and has gathered, processed and interpreted data efficiently and effectively.	The student has presented thorough research findings perceptively and appropriately in a wide range of formats, and has gathered, processed and interpreted a wide range of complex data efficiently and effectively.	The student has presented research findings perceptively, convincingly and appropriately in a wide range of formats, and has gathered, processed and interpreted a wide range of complex data efficiently and effectively.
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Transferable skills

Personal and enabling skills appropriate to the discipline, including the ability to communicate information, ideas, problems and solutions to both specialist and non-specialist audiences, the exercise of initiative and personal responsibility, and decision-making in complex and unpredictable contexts.

Not successful	3rd (pass or threshold)	2.2	2.1	1st
The student is not able to sufficiently express ideas and convey clear meaning verbally, electronically and/or in writing, uses inaccurate terminology, with many errors in spelling, vocabulary and syntax. They have been unable to demonstrate consistently basic numeracy and digital literacy skills.	The student can communicate information, ideas, problems and solutions verbally, electronically and in writing, with clear expression and style. They have also demonstrated numeracy and digital literacy skills.	The student can consistently and confidently communicate information, ideas, problems and solutions verbally, electronically and in writing. They show a clear, coherent, expressive style, with a range of vocabulary. They have consistently demonstrated strong numeracy and digital literacy skills.	The student can communicate information, ideas, problems and solutions with a high-degree of proficiency verbally, electronically and in writing. They have a clear, fluent and expressive style with appropriate vocabulary. They have a high standard of numeracy and digital literacy skills.	The student can communicate information, ideas, problems and solutions to an accomplished level verbally, electronically and in writing. They have shown an accurate, fluent, sophisticated style. They possess exceptional numeracy and digital literacy skills.

The student has made infrequent contributions to group discussions and/or project work.	The student has demonstrated a capability of making useful contributions to group discussions and/or project work.	The student has consistently demonstrated the capability to make coherent and constructive contributions to group discussions and/or project work.	The student has demonstrated the capability to make strong, valuable contributions to group discussions and/or project work, with an understanding of team and leadership roles.	The student has demonstrated the capability to make clear, authoritative and valuable contributions to group discussions and/or project work, with exceptional teamwork and leadership skills.
The student has demonstrated little or no ability to manage their learning and/or work without supervision.	The student has shown an ability to manage their learning and work with minimal or no supervision.	The student has consistently shown an ability to systematically manage their learning and work without supervision.	The student has shown a strong ability to systematically manage their learning and work without supervision.	The student has shown an exceptional ability to manage their learning on their own initiative, and work without supervision.
The student has not demonstrated adequate initiative or personal responsibility.	The student has demonstrated initiative and/or personal responsibility.	The student has consistently demonstrated initiative and/or personal responsibility.	The student has consistently demonstrated well-developed initiative and/or personal responsibility.	The student has demonstrated exceptional initiative and/or personal responsibility.
The student has shown little or no ability to reflect on their work.	The student has demonstrated the ability to reflect on their work.	The student has consistently demonstrated a well-developed ability to reflect on their work.	The student has demonstrated the ability to reflect critically on their work.	The student has demonstrated an exceptional ability to reflect critically and independently on their work.

Professional competences (to the extent that they are expressed by the course learning outcomes)

Typically, where a degree award requires an assessment of professional competencies, no award will be made if the student does not meet them. Providers remain free to set course learning outcomes above the threshold and classify students accordingly.

Not successful	3rd (pass or threshold)	2.2	2.1	1st
The student has not demonstrated achievement of professional competence when assessed against the requirements of a professional, statutory or regulatory body (PSRB).	The student has demonstrated achievement of professional competence when assessed against the requirements of a PSRB.			
The student has failed to adhere to the appropriate rules and/or conventions set by regulators or the industry.	The student has adhered to the appropriate rules and/or conventions set by regulators or the industry.			

Guidance 3xv Graduate Attributes

It is important for our graduates to be able to demonstrate an agile, professional and ethically informed skillset that is in high demand by employers operating in regional, national and multinational spheres.

The University has therefore identified a number of attributes it believes are necessary for graduate success, and these are provided as a framework for the production of programme level learning outcomes that will allow each student to understand and identify where their programme has allowed them to develop these skills.

These attributes, set out below, have been developed within an appreciation of the Framework for Higher Education Qualifications, SEEC Credit Level Descriptor 6, with themes drawn from the World Economic Forum's identification of necessary skills for the next decade and HEPI's 2015 review of required skills for employability.

To ensure the attributes are demonstrable throughout our portfolio, programme teams will be required to explicitly show how and where their programme outcomes map to these through validation and review.

Middlesex University Graduate Attributes allow students to be:

- **GA 1: Strong communicators:** confident both in written and verbal communication and demonstrating an appreciation of the need for active listening and the appropriate sourcing of information;
- **GA 2: Effective team players:** through the application of interpersonal skills including negotiation and collaboration;
- **GA 3: Digitally literate:** maintaining currency in the selection and use of IT, demonstrating confident use of social media and/or other platforms to foster communication;
- **GA 4: Ethically informed:** able to understand their roles as citizens and make a positive contribution to the communities they operate within through appreciation of social responsibility;
- **GA 5: Culturally competent:** demonstrating a global outlook through self and social awareness, knowledge, empathy and respect;
- **GA 6: Resourceful:** capable of complex problem solving and critical thinking, research and enquiry, time management, analysis and evaluation, in the process supporting their development as autonomous learners and practitioners;
- **GA 7: Creative:** capable of generating new ideas, cognitive flexibility, synthesis and/or entrepreneurship;
- **GA 8: Numerate:** showing the ability to work with numbers, such as data gathering, analysis, presentation and interpretation according to the needs of their discipline.

Appendix 6 Aims of the BSc (Hons) degree in Professional Aviation Pilot Practice

- *To provide opportunities for individuals to combine the achievement of a CAA approved professional aviation pilot license and Flight Instructor qualification with gaining a BSc (Hons) degree through work-based learning*
- *To broaden opportunities for access to professional pilot careers to meet the projected need for commercial pilots in the UK and international aviation sector*
- *To enable individuals to develop higher-level knowledge and understanding, and cognitive, practical, personal and enabling skills from the study of their own work-based learning as a preparation for becoming a professional pilot*
- *To provide opportunities for individuals to develop the high-level knowledge, understanding and skills required to operate single pilot, co-pilot and multi-pilot single and multi-engines in the commercial air transportation sector*
- *To appropriately prepare individuals to gain employment as a licensed professional pilot and/or flight instructor within the commercial sector*
- *To contribute to the enhancement of professional practice in the aviation industry by formalising the requirement for ongoing reflective practice and enabling professional pilots to develop their careers as senior leaders in the sector*

(Middlesex University, 2019a)



Staff Announcement
www.intra.mdx.ac.uk

02 December 2021

[Redacted]

[Redacted]

Appendix 8 Semi-structured interview questions with FTO staff team

Research Q2

How can higher education influence 'learning' during the initial stages of professional development of aviation pilots?

Linked questions: (Focus on the university input and student engagement with HE in relation to the programme)

- a) What do the students learn from taking part in this higher education programme?
- b) What specifically, do they learn through higher education?
- c) Does engagement with the university and higher education develop their skills, knowledge or other attributes?
- d) What attributes might students develop as a result of this approach?

Research Q3

How does training based on 'work' influence 'learning' during the initial stages of professional development of aviation pilots?

Linked questions: (Focus on the FTO input and employer engagement in relation to the programme)

- a) How do student pilots benefit from 'training' based on 'work' in this programme?
- b) What do they learn from this approach?
- c) What attributes might students develop as a result of this approach?

Research Q4

How well do any of the pedagogies used within the joint degree partnership support the integration of work and learning?

Linked questions: (Focus on pedagogy and how it operates within the programme)

- a) How would you describe the pedagogy used within this programme?
- b) How well does this pedagogical approach work? If yes, why is this? If no, how can it be improved?
- c) How does the pedagogy link with what happens at the FTO?
- d) How does the pedagogy link with what happens in the workplace?
- e) How well does the pedagogy support the integration of work and learning?

Research Q5

What are the linkages between work, practice and study in this pedagogical context and in particular, how do they affect each other?

Linked questions: (Focus on the student journey and the links between work, practice and study within the programme)

- a) How would you describe the student professional journey on this programme?
- b) Are there significant developmental transition points that you have recognised?
- c) Do you think that studying for the degree informs practice?

- d) Do you think that aviation practice informs their studies?
- e) How do you think that 'work' plays a part in the developmental journey for these students?

Research Q6

How well do University / Flight Training Organisation partnerships work in practice?

Linked questions: (Focus on programme partnerships)

- a) Are there any complexities in operating partnership programmes of this type?
- b) Work based partnership programmes could be considered as 'non-standard' compared to other university programmes, what are your thoughts on this?
- c) Do you think there are underlying 'political tensions' in relation to operating these types of programme.
- d) If there are any, how can any difficulties be overcome?
- e) Do you think partnership programmes of this type are worth doing? Why?

Appendix 9 Semi-structured interview organizational questions

1. How would you describe the purpose of ***** Ltd? What are the organizational aims?
2. How do you see the degree fitting into this purpose?
3. What value does the degree add to ***** as an organization?
4. Can you briefly describe how the partnership with MDX and the opportunity to run the degree came about?
5. What are the things that you would do better or differently with hindsight?
6. What could the university have done better or differently with hindsight?
7. What learning are you taking into the next stage of delivering higher education provision at *****?

Note: These were followed by questions found in Appendix 8.

Appendix 10 Semi-structured interviews with Middlesex University aviation programme staff

Research Q2

How can higher education influence 'learning' during the initial stages of professional development of aviation pilots?

Linked questions: (Focus on the university input and student engagement with HE in relation to the programme)

- e) What do the students learn from taking part in this higher education programme?
- f) What specifically, do they learn through higher education?
- g) Does engagement with the university and higher education develop their skills, knowledge or other attributes?
- h) What attributes might students develop as a result of this approach?

Research Q3

How does training based on 'work' influence 'learning' during the initial stages of professional development of aviation pilots?

Linked questions: (Focus on the FTO input and employer engagement in relation to the programme)

- d) How do student pilots benefit from 'training' based on 'work' in this programme?
- e) What do they learn from this approach?
- f) What attributes might students develop as a result of this approach?

Research Q4

How well do any of the pedagogies used within the joint degree partnership support the integration of work and learning?

Linked questions: (Focus on pedagogy and how it operates within the programme)

- f) How would you describe the pedagogy used within this programme?
- g) How well does this pedagogical approach work? If yes, why is this? If no, how can it be improved?
- h) How does the pedagogy link with what happens at the FTO?
- i) How does the pedagogy link with what happens in the workplace?
- j) How well does the pedagogy support the integration of work and learning?

Research Q5

What are the linkages between work, practice and study in this pedagogical context and in particular, how do they affect each other?

Linked questions: (Focus on the student journey and the links between work, practice and study within the programme)

- f) How would you describe the student professional journey on this programme?

- g) Are there significant developmental transition points that you have recognised?
- h) Do you think that studying for the degree informs practice?
- i) Do you think that aviation practice informs their studies?
- j) How do you think that 'work' plays a part in the developmental journey for these students?

Research Q6

How well do University / Flight Training Organisation partnerships work in practice?

Linked questions: (Focus on programme partnerships)

- f) Are there any complexities in operating partnership programmes of this type?
- g) Work based partnership programmes could be considered as 'non-standard' compared to other university programmes, what are your thoughts on this?
- h) Do you think there are underlying 'political tensions' in relation to operating these types of programme in a university.
- i) If there are any, how can any difficulties be overcome?
- j) Do you think partnership programmes of this type are worth doing? Why?

Appendix 11 Email to students

Dear

I'm inviting you to take part in a research study that I am carrying out. The purpose of the study is to carry out an in-depth inquiry into how and what students learn when they are students on the BSc (Hons) Professional Aviation Pilot Practice degree at Middlesex University / Tayside Aviation.

What do I need to do to take part?

1. Read the attached Participant Information Sheet and Consent Form.
2. Add your signature and date.
3. Send the signed form back to me by email – K.Buckland@mdx.ac.uk

Then I will send you an email via Qualtrics with a link to a short questionnaire it should only take 5-10 minutes of your time as many of the answers are multi-choice.

(Note that the email will show as coming from: Keith Buckland noreply@qmailserver.com)

I think that you will find the questions interesting as they relate directly to your experience on the aviation degree programme.

Thank you for considering helping with this research.

Kind regards,

Keith

Qualtrics Email message – sent with link

Research Study Invitation

Dear Student,

Thank you for agreeing to take part in my research, I very much appreciate this. I don't think that the questionnaire will take you too long as each question is fairly short.

I'm hoping to gather some interesting data, thanks again for being involved!

Keith

Revised Initial email to students:

Dear

I'm inviting you to take part in a research study that I am carrying out. The purpose of the study is to carry out an in-depth inquiry into how and what students learn when they are students on the BSc (Hons) Professional Aviation Pilot Practice degree at Middlesex University / Tayside Aviation.

What do I need to do to take part?

1. Read the attached Participant Information Sheet and Consent Form.
2. Add your signature and date at the end – this can just be your typed name.

3. Send the form back to me by email – K.Buckland@mdx.ac.uk

Then I will send you an email via Qualtrics with a link to a short questionnaire it should only take 5-10 minutes of your time as many of the answers are multi-choice.

(Note that the email will show as coming from: Keith Buckland noreply@qemailserver.com)

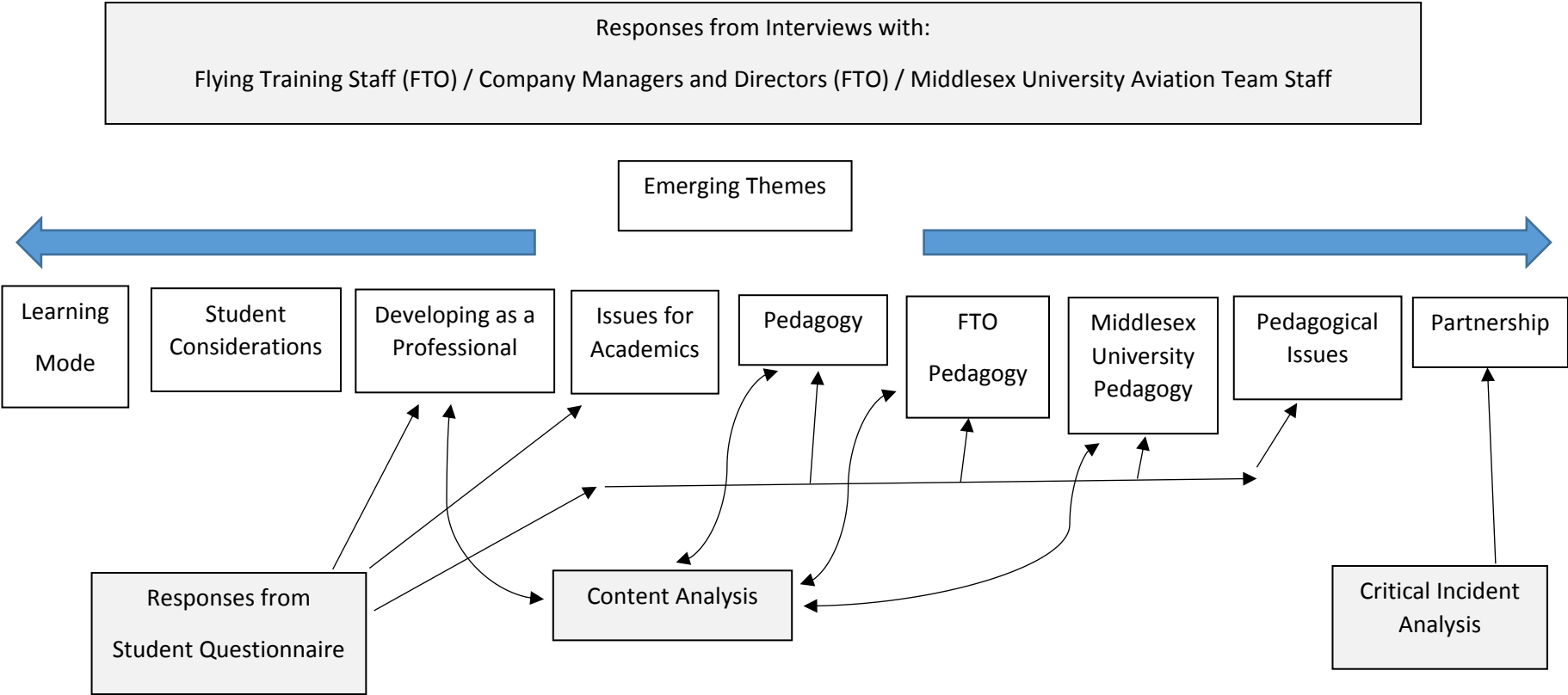
I think that you will find the questions interesting as they relate directly to your experience on the aviation degree programme.

Thank you for considering helping with this research.

Kind regards,

Keith

Appendix 12 Merging Data



Appendix 13 Example of Content Analysis Process

Common classes:	Student pilot	Year 2 of degree	Module WBS 2205 Flight Instruction
Special classes:	CPL licence holder. Good flying experience, typically around 210 hours. Can fly solo in a light aircraft under visual flight rules.		
Student Data 1	<p>Has picked a particular event – the instructor acting as student during Exercise 4.2 (Effects of Supplementary Flying Controls) - The Use of Flaps. Gibbs cycle identified as the chosen model of reflection due to previous success with this model (on previous modules). Instructor raised flaps all at once when told to (rather than in stages) – in order to demonstrate the need for precise instruction. The aircraft started to immediately sink and pitch down requiring the trainee instructor (*****) to intervene. Has followed the stages of the Gibbs cycle and integrated some theory from aviation relating to flap usage to confirm good practice. Back seating and sitting in peer briefings are explained as beneficial. Learning from peers is emphasised and the value of discussions (professional) is recognised. Also, the recognition of how the instructor communicates and provides information is seen as valuable (learning from the master). The analysis stage also includes recognition of the importance of ‘putting yourself in the position of the student’ in order to improve your own instructional practice (i.e. taking their needs into account).</p> <p>The conclusion recognises the importance of working to a high standard as an instructor and maintaining / improving own pilot skills and knowledge. Some wider reading has been included and supports the general ideas being communicated. The student had adapted the Gibbs cycle by completing the action plan stage (and called this ‘development’ before the conclusion and explained why. The weekly progress log is in effect a mini-learning journal for the period of the FIC. It seems to be very effective and allows the student to give a snap-shot of their most important learning points from the FIC. The FIC completion certificate is included as evidence.</p>		
Student Data 2	<p>...and many of the skills gained as an instructor will be on the job rather than learning on the course.I feel that teaching back exercises on the FI course has helped me gain a better understanding in the material. One of the main differences is that I was sitting on the right hand seat, up until this point all my flying had been from the left hand seat. During this flight I was responsible for the radio, departure procedures, flying the aircraft, navigation and teaching, all whilst trying to fly accurately to set an example to the student and speaking in synchronisation with my flying. This uses a lot of my mental capacity so I have to manage the flight effectively by thinking ahead in time, which is a skill that can only be developed with experience. When I am acting as the instructor I feel like I am teaching myself as well as the student on how to fly a medium level turn accurately. During teaching the same exercise back (acting instructor) I experienced capacity saturation. I certainly struggled with keeping my situational awareness in terms of navigation and building a mental picture in regards to other aircraft in the vicinity. This I feel is a weak area that can be developed.... I have also learnt through the experience of acting as the instructor to be more aware of the navigation of the aircraft and I will set myself landmarks and fly between them during exercises. This has allowed</p>		

Student Data 3

me to build a good mental picture of where I am. It also allows me to concentrate more on the lesson I am teaching to the student which is making the flight more effective. I am starting to see more areas that can be developed in the role as a flight instructor. One is using the effective aide memoirs. A student may be learning but they are still considered crew when it comes to general airmanship, keeping a good look out and listening on the radio. CRM is a crucial element to the FI role which will be developed continuously throughout my training. My flying is still developing more in the non-technical sense. I feel the FI role, in a nutshell, heavily involves aircraft flight path management and cockpit management. Of course, the technical areas of flying the aircraft and knowing the theory behind what I am doing is important. However, I do not feel at this stage these areas of my flying skills are being challenged or developed compared with the non-technical skills, and that I feel is the key to flight instructing. as a working FI will be interesting to see how my skills develop further, namely my mental capacity. Over time I will develop methods that will enable me to better cope with the teaching and flying elements in the role. Situational awareness is an aspect of this, as well as skills such as leadership. I will be the pilot in command so teaching people of all ages and asserting this role in a mature manner is a personal asset that will be developed. Quick decision making is another area that will certainly be developed in my new role. There is a tight schedule that has to be followed on a daily basis so being efficient during flights making sensible timely decisions will be refined with experience.

I was teaching two sorties in one flight; exercise 9.1 which is medium level turns and exercise 15 which is advanced turns. I completed both exercises to a good standard in an area to the northeast of *****. Once they had been completed, I looked back towards the area of ***** and the reporting point that I had planned to use to re-join into ***** airspace and the cloud had formed an extremely low wall along the northern side of the **** River. Having not experienced this before I was indecisive and lacking confidence to decide on how to deal with the situation. My instructor ***** ended up taking control of the aircraft as he could see I was struggling and initiated a steep descent to get us below the clouds and fly low level into *****. He calmly showed me how to deal with the situation, always maintaining safety as a priority. On the ground we debriefed the flight and discussed how to deal with weather like this in the future, and ways to build confidence in decision making.

Initially I felt embarrassed for giving up so easily and angry I hadn't taken any action to at least attempt to deal with the adverse weather. I did feel underconfident in my abilities which lead to the situation. After a constructive debrief I was more positive about the situation and more confident to deal with any similar situation more appropriately in the future.

I felt grateful for having faced a situation like this with an experienced pilot beside me, giving me the correct advice and teaching me the skills essential to my safety and how to teach students to deal with any similar situation.

.....believe the reasoning behind my lack of decisiveness and authority can be explained by a concept known as Cockpit Gradient. "In terms of responsibility for decision-making, authority may also be thrust reluctantly onto another person (knowingly or unknowingly) by colleagues who shirk responsibility or feel under-confident." (SKYbrary)

It is important to create a working environment where students feel comfortable enough to raise concerns, question decisions and also offer solutions. This can be achieved through clear communication and encouragement. Many different strategies can be implemented to encourage a mistake friendly environment (Terada, 2020). Discussing things as an open-ended question

	<p>with multiple solutions helps students develop a deeper understanding of a topic and why certain answers are correct and why others are not. I want to concentrate on developing this skill to ensure my students have an effective learning experience and feel comfortable coming to me with any issues. Forward thinking is a vital skill in order to be ahead of the aircraft and would have greatly assisted this situation. This will allow more spatial awareness and will allow better control and planning in the event of any unforeseen situation.</p> <p>From the event I reflected on during my CPL course and now this event, it is evident that dealing with emotion and lack of confidence is a reoccurring issue throughout my training. Although stress and emotion were not the main factor in my actions it certainly played a part in my initial negative reaction to the unforeseen situation. It is important to have a good balance of emotion and stress and have methods to control them for it to positively affect performance and decision making.</p> <p>In terms of flying in bad weather, experience and working your way up to flying to the limits is the best way in feeling more confident in calm flying in these conditions. The progression from being the student to being the most experienced one in the cockpit is an important learning curve that is going to take time and confidence to develop.</p> <p>It is important for me to develop confidence and decision making due to the nature of my upcoming job role. When flying with students I will always be the most experienced and senior person in that aircraft so I will not be able to look on someone else to make decisions for me or deal with any unnerving situations. I am pleased I had this experience during the course to prepare me even more for my job role as a flight instructor.</p> <p>Action Plan</p> <ul style="list-style-type: none"> • I will continue to improve my decision-making skills and learn from every experience, both positive and negative, to develop my knowledge and proficiency • I will continue to develop confidence in my own abilities • I will continue to build experience and knowledge through; flying practice and effective study seeking out senior instructor advice if needed • I will work on the skill of foreword thinking to be ahead of the aircraft and plan as much as possible on the ground. <p>The use of the Gibbs' Reflective Cycle in this report was hugely advantageous and valuable in recognising each consequence and why they happened and in addition, each feeling and why they existed. This method of reflection was very constructive, and I will definitely use it again in the future.</p>
Theoretical classes: Key linkages and patterns from data	The Flight Instructor plays a key role in demonstrating exemplary practice and providing student support. Students 'act' as being the Flight Instructor in the cockpit during the FIC. There are multiple challenges for student FIs, they carry much responsibility. Some students gain more from HE by engaging fully in RP and wider reading. Students are able to instruct after successful course completion.
Research Question Prompts	<ul style="list-style-type: none"> • <i>HE influencing learning?</i> – wider reading aids thinking – reflection on practice aids analysis and deeper understanding of own practice – learning diary encourages this too – tutor guidance / module + library resources helps student to review their practice. Action plans from RP can provide very good platforms for future practice.

	<ul style="list-style-type: none">• <i>Training based on work influencing learning?</i> – the FIC provides development of instructional technique on the ground and in the air. The student begins to formulate their own ideas of being an instructor at work and how they will carry out this role. Gaining instructional flying proficiency is very challenging with the students needing to adapt to multiple demands in the cockpit. Learning to be a classroom instructor presents further challenge.• <i>Pedagogies supporting the integration of work and learning?</i> The FTO pedagogy has a fundamental intention of preparing the students to be an instructor within the FTO. Classroom and flying practice are the main sites of learning. Reflective practice helps the students to review their performance during FIC.• <i>Links between work, practice and study, how do they affect each other?</i> The learning diary provides an opportunity for ongoing reflection during the FIC. Students have a MDX tutorial before commencing the FIC.
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Appendix 14 Attributes noted from student work

Human Factors

Motivation

Determination

Patience

Persistence

Need to develop self-confidence

Being decisive

Mental toughness or resilience

Not to dwell on negative feelings (maintain a positive mind-set)

Emotional Responses

Dealing with humiliation

Dealing with failure and disappointment

Dealing with anxiety and panic

Dealing with self-doubt

Professional Skills

Preparation

Time-Management

Planning of rest periods

Maintaining a healthy life-style and fitness

Pilot Skills

Speed of thought when in a more powerful aircraft

Developing mental capacity

Dealing with emergencies or potential emergencies and maintaining focus

Dealing with stress (psychological pressure)

Forward thinking

Spatial awareness

Planning

Decision-making

Situational awareness

Building a mental picture

Communication

Leadership